REPUBLIC OF SERBIA
Ministry of Environmental Protection
Environmental Protection Agency

REPUBLIC OF SERBIA
INFORMATIVE INVENTORY REPORT
TO LRTAP CONVENTION FOR 2025

Belgrade, 2025

Contents

EXECUTIVE SUMMARY

Serbian Informative Inventory Report (IIR) and the complete set of NFR tables represent Serbian official submission under the United Nations Economic Commision for Europe (UNECE) Convention on Long range Transboundary Air Pollution (LRTAP). Starting from the first submission, Serbia reports all pollutants in prescribed reporting format from 1990 as a base year to the latest inventory year. Serbia is required to annually report data on emissions of air pollutants covered in the Convention and its Protocols:

Main pollutants: nitrogen oxides (NOx), non-methane volatile organic compounds (NMVOC), Sulphur oxides (SOx), ammonia (NH3) and carbon monoxide (CO);

Particulate matter (PM): primary PM (fine particulate matter (PM2,5) and coarse particulate matter (PM10) as well as total suspended particulates (TSPs);

Priority heavy metals (HMs); Lead (Pb), Cadmium (Cd) and mercury (Hg);

Persistent organic pollutants (POPs): Polychlorinated dibenzodioxins/dibenzofurans (PCDD/Fs),

Polycyclic aromatic hydrocarbons (PAHs), hexachlorobenzene (HCB) and polychlorinated biphenyls (PCBs).

1. INTRODUCTION

The Republic of Serbia became a party to the Convention on Long-range Transboundary Air Pollution (CLRTAP) and to the Protocol on Long-term Financing of the Cooperative Programme for Monitoring and evaluation of the Long-range Transmission of Air Pollutants in Europe on 8 October 1991.

The Republic of Serbia has also ratified following protocols under the LRTAP Convention: Protocol on Long-term Financing of the Cooperative Programme for Monitoring and evaluation of the Long-range Transmission of Air Pollutants in Europe (EMEP), Protocol on Heavy Metals, and Protocol on Persistent Organic Pollutants. Table 1.1 shows the status of ratification of international treaties under the CLRTAP and status of ratification in Serbia.

Table 1. Status of ratification of international treaties under the CLRTAP

Treaty	Signed by the Parties	In force since	Ratified by Serbia
Convention on Long-range Transboundary Air Pollution (CLRTAP)	1979	1983	1991
Protocol on Long-term Financing of the Cooperative Programme for Monitoring and evaluation of the Long-range Transmission of Air Pollutants in Europe (EMEP)	1984	1988	2001
Protocol on Persistent Organic Pollutants	1998	2003	2012
Protocol on Heavy Metals	1998	2003	2012
Protocol to Abate Acidification, Eutrophication and Ground-level Ozone ("Gothenburg Protocol").	1999	2005	Postponed

In accordance with CLRTAP Executive Body's Decision 2002/10, on emission data reporting under the Convention and the Protocols in force, Serbia is obliged to report on air emissions in line with

Emission Reporting Guidelines and methodology described in EMEP/EEA Emission Inventory Guidebook 2023 Specifically, the application of annual emissions under the CLRTAP consists of the preparation of:

1. NFR formats (emission inventory) and
2. Informative Inventory Report (IIR).

The NFR nomenclature (CLRTAP) is consistent with the CRF nomenclature under the UN Framework Convention on Climate Change (UNFCCC), with the overall aim of harmonization reporting formats. The national inventory is updated annually in order to reflect the availability of new information, sectorial improvements, implementation of higher tier (for example, Tier 2), change in methodology, identification of time series inconsistency, the accuracy of the estimates and the reduction of the uncertainty. Adjustments are applied retrospectively to earlier years, which accounts for any difference in previously published data.

1.1 NATIONAL INVENTORY BACKGROUND

The present Serbian CLRTAP Inventory for the period 1990 to 2022 was compiled according to the recommendations for inventories as set out by the UNECE Executive Body and in the EMEP/EEA Emission Inventory Guidebook 2023

An important pre-condition for efficient data management system and development of the inventory is a clearly defined organization, competences and responsibilities of institutions involved in the process of developing the inventory, which includes a number of steps to be taken in the collection and processing of data, calculation, control and verification of emission inventories and documentation and communication to competent international bodies.

The total emissions time series by pollutants in 1990, 1995, 2000, 2005, 2010, 2015, 2020, 2022 and 2023 in Serbia are given in table 2.

Table 2. The total emissions time series by pollutants in 1990, 1995, 2000, 2005, 2010, 2015, 2020, 2022 and 2023 in Serbia

Pollutant	Unit	1990	1995	2000	2005	2010	2015	2020	2022	2023
NO_x	**kt**	180.58	150.63	145.36	163.63	145.84	143.38	139.97	140.81	139.07
NMVOC	**kt**	199.15	148.75	152.52	156.02	142.79	132.85	147.03	143.53	140.11
SO_x	**kt**	576.61	499.70	463.31	442.89	400.62	361.79	359.11	321.96	332.36
NH_3	**kt**	122.98	112.79	104.77	104.71	88.97	83.67	75.56	66.60	58.78
$PM_{2.5}$	**kt**	54.78	34.84	40.05	39.78	42.65	37.94	55.43	55.72	58.18
PM_{10}	**kt**	73.27	49.76	54.16	54.39	56.64	52.43	71.47	72.27	75.32
TSP	**kt**	158.15	100.21	87.49	114.81	103.80	93.19	91.81	92.65	95.51
BC	**kt**	4.39	2.73	3.15	3.11	3.77	3.32	5.17	5.32	5.43
CO	**kt**	517.64	351.32	400.11	403.21	348.23	269.21	368.48	357.89	377.45
Pb	**t**	372.19	285.45	196.72	234.69	105.65	35.83	35.01	33.96	30.78
Cd	**t**	3.97	2.41	1.95	1.87	1.83	2.09	2.76	2.11	2.65
Hg	**t**	2.75	2.14	2.11	2.17	2.08	1.67	1.61	1.33	1.55
As	**t**	7.73	6.08	5.58	5.52	5.04	5.17	5.46	4.81	5.09
Cr	**t**	11.60	6.85	7.27	10.05	10.37	8.80	11.83	11.30	11.19
Cu	**t**	15.56	9.99	8.81	12.34	13.73	13.77	38.01	41.49	43.98
Ni	**t**	16.89	9.95	8.76	22.90	21.39	14.40	13.61	14.18	11.73
Se	**t**	19.92	17.17	16.33	15.49	13.68	14.02	14.46	12.62	13.16

Zn	**t**	49.83	30.39	36.91	54.66	62.52	48.81	65.75	67.80	65.22
PCDD	**g I-TEQ**	70.43	44.56	53.43	60.10	58.72	50.79	71.58	69.07	74.94
benzo a pyren	**t**	11.14	6.61	8.81	8.29	7.87	6.30	9.72	8.75	9.91
benzo b fluoranthen	**t**	12.78	7.49	10.42	9.71	8.74	6.82	10.38	8.84	10.46
benzo k fluoranthen	**t**	5.02	2.95	4.10	3.82	3.40	2.65	4.03	3.42	4.06
Indeno 1,2,3 pyren	**t**	5.92	3.55	4.61	4.38	4.25	3.46	5.39	4.98	5.52
Total 1-4 PAH	**t**	40.66	20.88	29.44	29.55	27.59	21.93	32.60	29.15	32.89
HCB	**kg**	2.87	2.50	2.31	2.23	2.12	2.21	2.32	2.14	2.15
PCB	**kg**	844.22	837.02	816.17	774.37	805.48	725.21	733.40	700.86	752.71

1.2 INSTITUTIONAL ARRANGEMENTS

In terms of organizational arrangements, a centralized model has been applied in Serbia. From institutional point of view, Ministry of Environmental Protection is a National Focal Point for LRTAP Convention, while inventory preparation is under responsibility of Serbian Environment Protection Agency (SEPA).

SEPA undertakes all activities in preparation of NFR tables and IIR from collecting data. All data that are necessary for preparation these tables were collected in SEPA. The main official sources of activity data for the inventory of pollutant emissions are given in table 1.3.

Activity data provided through questionnaires completed directly by individual emission sources or other specialized institutions are used in the development of the inventory to calculate and check data provided by official publications.

The main official sources of activity data for the inventory of pollutant emissions are:

- The Central Bureau of Statistics that, on the basis of the statistic survey programme, collects data on the amounts of raw materials and products relating to activities defined by the National Classification of Business Activities;
- The Ministry of Interior keeps databases of road and off-road vehicles.
- SEPA that collects data from emission point sources

Activity data provided through questionnaires completed directly by individual emission sources or other specialized institutions are used in the development of the inventory to calculate and check data provided by official publications.

1.3 INVENTORY PREPARATION PROCESS

The process of inventory preparation has three main phases: (1) planning, (2) preparation and (3) reporting and archiving. The preparation of the inventory includes the following three stages as illustrated below.

I Planning

In the first stage specific responsibilities are defined and allocated: as mentioned before, the SEPA has the overall responsibility for the national CLRTAP inventory, and also, SEPA is executive institution for this inventory.

Planning phase includes activities related to organizational and technical aspects of inventory

preparation such as: preparation of timetable according to EMEP reporting programme, preparation a schedule of data collecting and data analysis activities, data quality control and quality assurance activities, review of existing/updated reporting guidelines and guidebooks, review of emission factors and analysis of recommendations for inventory improvement from previous submissions or gave by expert review teams if such exists.

In accordance with Air Pollution Studies No. 15, Guidelines for Estimating and Reporting Emission Data under the Convention on Long-range Transboundary Air Pollution8, TFEIP, 2003 each Party should submit to the LRTAP Convention data on emissions in electronic format as follows:

- Each year until 15 February Parties should submit complete inventory with information on air emissions listed in Part B, and for all sectors listed in Annex III of reporting guidelines in the calendar year which ends 13 months before aforementioned,
- Every fifth year, starting from year 2000, until 15 February information on emissions from Large Point Sources. i.e. sources which emit more than 500 tonnes of SO2, NOx, NMVOC-a or total suspended particles (TSP).
- Every fifth year until 15 February information on emission projections and activity data projections for years 2010, 2015, 2020, 2030 and 2050.
- Every fifth year, starting from 1990, until 1 March Parties should submit in electronic format spatial distribution of emissions in EMEP grid 50x50
- Each year until 15 March, starting from 2007, Parties should submit Informative Inventory Report.

Detailed and updated information related to deadlines and scope of reporting are available on official EMEP9 /CEIP10 web page – www.ceip.at/.

Inventory preparation

Inventory preparation phase includes identification and updating of emission sources according to Nomenclature for Reporting, collection and processing of activity data, emission calculation and recalculations if necessary, filling the database and preparation of report and tables. In the second stage, the inventory preparation process, SEPA collect activity data and all other relevant information needed for estimating emissions. SEPA is also responsible for methodological choices due to data availability.

Inventory management

For the inventory management a reliable data management to fulfill the data collecting and reporting requirements is needed. As mentioned above, data collection is performed by the SEPA.

Data management is carried out by using MS Excel spreadsheets, which is a very flexible system that can easily be adjusted to new requirements.

The data is stored on a central network server for National Registers of Polluters in SEPA premises.

1.4 METHODS AND DATA SOURCES

Methodologies

Emission estimates were prepared using the methodology agreed upon by the Executive Body - EMEP/EEA air pollutant emission inventory guidebook — 2023. Further, other internationally applied methodologies and guidelines including National PRTR register and Intergovernmental Panel on Climate Change (IPCC) Guidelines were used.

Emissions from road transport are calculated using application COPERT 5 version 5.2.2 that contains

activity data on vehicle fleet and procedures for emissions calculation from road transport.

In combination with software tools, EMEP/EEA methodology aims to obtain consistency, completeness, comparability and transparency of the emissions estimates utilizing two basic methodological approaches:

- "Bottom-up", where total emissions from defined territory are determined by summing the measured/estimated emissions from all individual sources on defined territory. In case when one or more sources are missed out inventory is incomplete which leads to lower level of emissions.
- "Top-down" where total emissions from defined territory are determined from aggregate statistical data (for instance total fuel consumption or cement production) and average emission factors that give the best estimation of activities (sectors) under consideration.

Due to evident advantages and shortcomings of both approaches inventory agency in practice utilize both of them with emphasis on achieving a balance between resources available and quality of estimations.

Emissions are calculated on the base of the standard methods and procedures of EMEP/EEA Air Pollutant Emission Inventory Guidebook “Technical Guidance to Prepare National Emission Inventories” (2023).

Emission factors used are default except for coal (lignite), which is the most important fuel in Serbia to obtain, primarily electricity in large thermo-power plants, but also for heat and steam production in communal and industrial thermo plants.

During 2016 a detailed analysis of available data concerning the use of coal (lignite) in electricity and heat production, as well as the technical characteristics for coal has been carried out. It was found that the amount of sulfur in lignite is around 0.5%, but net calorific value is rather low, ranging between 6,000 - 7,000 kJ/kg of fuel.

Based on the available data, national emission factor for lignite was calculated and average value is 1350 g/GJ. Default value for this type of fuel in EMEP/EEA emission inventory guidebook 2023 is 1680 g/GJ.

Also new elementary lignite analysis was performed for the period 2015 – 2023 based on which a new national emission factor for this period was calculated and average value is 1162 g/GJ.

The levels of methods used for the different NFR sectors are given in table 3.

Table 3. The levels of methods used for the different NFR sectors**:**

Public electricity and heat production, Petroleum refining	Tier 1
Iron and steel, Non-ferrous metals, Stationary combustion in manufacturing industries and construction: Other	Tier 2
Civil aviation (domestic, LTO), International aviation (LTO)	Tier 1
Vehicles, Road transport: Gasoline evaporation, Road vehicle tire and brake wear, Road surface wear	COPERT
Railways	Tier 1
National navigation (Shipping)	Tier 1
Commercial / institutional: Stationary, Residential: Stationary plants	Tier 1
Coal mining and handling, Oil – Exploration, production, transport, Refining/storage, Distribution of oil products	Tier 1
Natural gas	Tier 1
Venting and flaring	Tier 1
Cement production	Tier 1
Lime production	Tier 1

Asphalt roofing	Tier 1
Road paving with asphalt	Tier 1
Quarrying and mining of minerals other than coal, Construction and demolition, Storage, handling and transport of mineral products, Other	Tier 1
Ammonia production	Tier 1
Nitric acid production	Tier 1
Other chemical industry	Tier 2
Iron and steel production, Aluminium production, Copper production, Lead production, Other metal production (Magnesium production)	Tier 2
Pulp and paper	Tier 1
Food and drink	Tier 2
Wood processing	Tier 1
Consumption of persistent organic pollutants and heavy metals	Tier 1
Decorative coating application, Industrial coating application	Tier 2
Degreasing, Dry cleaning Chemical products	Tier 2
Printing, Domestic solvent use including fungicides Other product use	Tier 2
Dairy cattle on slurry, Cattle non-dairy, Sheep Goats, Horses, Swine, poultry	Tier 1
Synthetic N-fertilizers	Tier 1
Solid waste disposal on land	Tier 1
Waste water handling	Tier 1
Cremation	Tier 1
Forest fires	Tier 1

Official data sources

Activity data needed for emissions calculation are extracted from regular publications and databases of Central Bureau of Statistics and other relevant governmental organizations and ministries. For particular sub-sectors and source categories, more detailed data are required then those published in official statistical reports, such as disaggregated energy balance, vehicle fleet etc. Beside official publications inventory agency sent questionnaires directly to some of the Large Point Sources asking for activity data which they use for emissions calculations in order to check consistency of data provided by different sources.

1.5 KEY CATEGORIES

The identification of key categories is described in the “EMEP/EEA air pollutant emission inventory guidebook 2023” (EEA 2023)”. It stipulates that a key category is one that is prioritised with-in the national inventory system because its is significantly important for one or a number of air pollutants in a country's national inventory of air pollutants in terms of the absolute level, the trend, or the uncertainty in emissions (EEA 2023).

Furthermore, it is good practice to identify the national key categories in a systematic and objective manner. This can be achieved by a quantitative analysis of the relationship between the magnitude of emission in any year (level) and the change in emission year to year (trend) of each category’s emissions compared to the total national emissions;

To focus the available resources for improvement in data and methods on categories identified as key. The identification of key categories in national inventories enables the limited resources available for preparing inventories to be prioritised; more detailed, higher tier methods can be selected for key categories. Inventory compilers should use the category specific methods presented

in sectoral decision tress in the sectoral volumes;

The analysis should be performed at the level of NFR categories or subcategories at which the guidebook methods and decision trees are provided in the sectoral volumes. Where possible, some categories should be disaggregated by main fuel types that each air pollutant emitted from each category should be considered separately;

For each key category, the inventory compiler should determine if certain subcategories are particularly significant usually, for this purpose, the subcategories should be ranked according to their contribution to the aggregate key categories. Those subcategories that contribute together more than 60% to the key category should be treated as particularly significant. It may be appropriate to focus efforts towards methodological improvements of these most significant subcategories.

All notations, descriptions of identification and results for key categories included in this chapter are based on the latest Inventory Guidebook (EEA 2023).

The identification includes all NFR categories and all reported gases

SO2, NOx, NMVOC, NH3, CO

PM: TSP, PM10, PM2.5

HM: Cd, Hg, Pb

POP: PAH, PCDD/F, HCB, PCB

Used methodology for identification of key categories: Approach 1

The methodology follows the IPCC approach to produce pollutant-specific key categories and covers for both level and trend assessment. In Approach 1, key categories are identified using a predetermined cumulative emissions threshold. Key categories are those which, when summed together in descending order of magnitude, cumulatively add up to 80% of the total level.

The suggested aggregation level of analysis for Approach 1 provided in Table 2-1 of Chapter 2 of the EMEP/EEA emission inventory guidebook 2019 was used. No special considerations like disaggregation to main fuel types have been made. For reasons of transparency, the same level of aggregation for all pollutants was used.

The presented key category analysis was performed by the SEPA with data for air emissions of the submission 2022 to the UNECE/LRTAP. For all gases a level assessment for all years 1990 (base year) and 2023 (last year), as well as a trend assessment for 1990 to 2023 was prepared.

In the following tables are presented important sources for many pollutants, separately key categories by sectors.

1.A Combustion Activities

Table 4. Sources for pollutants, separately key categories by sectors.

1.A Combustion Activities is the most important sector for emissions reported to UNECE.

NFR	Category
1A1a	Public electricity and heat production
1A1c	Manufacture of solid fuels and other energy industries
1A2a	Stationary combustion in manufacturing industries and construction: Iron and steel
1A2c	Stationary combustion in manufacturing industries and construction: Chemicals
1A2e	Stationary combustion in manufacturing industries and construction: Food processing, beverages and tobacco
1A2f	Stationary combustion in manufacturing industries and construction: Non-metallic minerals
1A2gvii	Mobile Combustion in manufacturing industries and construction: (please specify in the IIR)
1A2gviii	Stationary combustion in manufacturing industries and construction: Other (please specify in the IIR)
1A3bi	Road transport: Passenger cars
1A3bii	Road transport: Light duty vehicles
1A3biii	Road transport: Heavy duty vehicles and buses
1A3bv	Road transport: Gasoline evaporation
1A3bvi	Road transport: Automobile tyre and brake wear
1A4ai	Commercial/institutional: Stationary
1A4bi	Residential: Stationary
1A4cii	Agriculture/Forestry/Fishing: Off-road vehicles and other machinery

1.B Fugitive emissions

NFR	Category
1B1a	Fugitive emission from solid fuels: Coal mining and handling
1B1b	Fugitive emission from solid fuels: Solid fuel transformation
1B2av	Distribution of oil products

2. Industrial processes and product use

NFR	Category
2A2	Lime production
2A5a	Quarrying and mining of minerals other than coal
2B10a	Chemical industry: Other (please specify in the IIR)
2C1	Iron and steel production
2C7a	Copper production
2D3a	Domestic solvent use including fungicides
2D3b	Road paving with asphalt
2D3h	Printing
2D3i	Other solvent use (please specify in the IIR)
2H1	Pulp and paper industry
2H2	Food and beverages industry
2K	Consumption of POPs and heavy metals (e.g. electrical and scientific equipment)

3. Agriculture

NFR	Category
3B1a	Manure management - Dairy cattle
3B1b	Manure management - Non-dairy cattle
3B3	Manure management - Swine
3B4gi	Manure mangement - Laying hens
3Da1	Inorganic N-fertilizers (includes also urea application)
3Dc	Farm-level agricultural operations including storage, handling and transport of agricultural products
3F	Field burning of agricultural wastes

4. Waste

NFR	Category
5A	Biological treatment of waste - Solid waste disposal on land
5C1bv	Cremation

5. Memo item

NFR	Category
11B	Forest fires

1.6.QA/QC AND VERIFICATION METHODS

Quality management system

SEPA is responsible for the preparation of GHG and air pollutant inventory under UNECE/CLRTAP and UNFCCC.

SEPA is also responsible for coordination and implementation of QA/QC activities for the national inventories. A quality manger is in place.

The QA/QC plan is an internal document to organize, plan and implement QA/QC activities. Once developed for the next submission, it is referenced and used in subsequent inventory preparation, or modified as appropriate.

National QA/QC Plan includes following elements:

- Responsible institutions;
- Data collection;
- Preparation of inventory;
- QC Procedures;
- QA Procedures and Verification;
- Uncertainty evaluation;
- Organisation of the activities in quality management system;
- Documentation and archiving.

Institutional arrangements within the SEPA regulate the responsibilities of all engaged institutions for implementation of the requirements of the National QA/QC Plan.

The QC procedures are performed by experts, who are directly involved in the process of preparation of inventory with their specific responsibilities.

The QC experts are responsible for activity data provision, involved in the choice of method and selection of emission factors, and preparing the sector inventories (including preparation of reporting tables and respective chapters from the national reports).

All institutions – data providers, are responsible for quality of information, which are necessary for preparation of national emission inventories.

Quality Assurance (QA) is a planned system of review procedures conducted by personnel not directly involved in the inventory compilation/development process. The quality assurance process includes expert review was conducted in two stages: a review of the initial set of emission estimates and, a review of the estimates and text of the Inventory Report.

The QA procedures include the following checks:

- Transparency means that Parties should provide clear documentation and report a level of disaggregation that sufficiently allows individuals or groups other than the designated emission

expert or the compiler of the inventory or projection to understand how the inventory was compiled and assure it meets good practice requirements. The transparency of reporting is fundamental to the effective use, review and continuous improvement of the inventory and projection;

- Consistency means that estimates for any different inventory years, gases and source categories are made in such a way that differences in the results between years and source categories reflect real differences in emission estimates. Annual emissions, as far as possible, should be calculated using the same method and data sources for all years, and resultant trends should reflect real fluctuations in emissions and not the changes resulting from methodological differences. Consistency also means that, as far as practicable and appropriate, the same data are reported under different international reporting obligations. For projections, consistency means that a year of the submitted inventory is used as a basis;

- Comparability means that the national inventory and projection is reported in such a way that allows it to be compared with other Parties. This can be achieved by using the reporting templates and through the use of the harmonized Nomenclature for Reporting (NFR);

- Completeness means that estimates are reported for all pollutants, all relevant source categories and all years and for the entire territorial areas of Parties covered by the reporting requirements set forth in the provisions of the Convention and its protocols;

- Accuracy means that emissions are neither systematically overestimated nor underestimated, as far as can be judged. This implies that Parties will endeavour to remove bias from the inventory estimates and minimize uncertainty.

For 2020 submission the QA procedures are implemented by sector experts within the SEPA, who are not directly involved in the preparation of inventory.

Information of the QA/QC activities

The cycle of QA/QC activity for inventory consists of the following steps:

1. The QA/QC Manager prepares a Plan for implementation of QA/QC activities for the current submission. The checklists with all specific QA/QC procedures are part of the plan;

2. The plan for QA/QC is sent to all engaged QC and QA experts for implementation;

3. In the process of preparation of inventory the QC experts (activity data provider and SEPA's experts) apply each of the specific procedures set in the checklist for each of the sources categories they are responsible for.

4. The QA/QC Manager coordinates the exchange of the check lists between the QC experts for correction of the findings with input data for calculation of emissions (activity data and EF).

5. The QA/QC Manager send to the QA experts the prepared by SEPA's expert and/or external consultants CRF/NFR tables and respective chapters from NIR/IIR;

6. The QA/QC Manager coordinate the exchange of the check lists between the QA experts and SEPA's expert and/or external consultants for correction of the findings with quality of the inventory (CRF/NFR and NIR/IIR);

7. The QA/QC Manager prepares a summary of the results from implemented QA/QC checks.

8. The QA/QC Manager prepares an attendant file for implemented procedures;

9. The QA/QC Manager is responsible for documentation and archiving of all documents, related to perform QA/QC procedures, and archiving of inventory in SEPA.

QA/QC activities of data provider

Based on the National QA/QC Plan each of the institutions has nominated experts, responsible for preparation of the required information as well as for implementation of QA/QC procedures.

The QC experts are all experts from the institutions, who are providing data for preparation of national emission inventories.

All institutions are responsible for quality of information. The institutions are obligated to implement all requirements of the international and national standards for collection, processing and provision of activity data from them competence.

Table 5. QA/QC and verification methods

Activity	QC checks / reviews		QC others (Correction)	
	Expert name	Period / deadline	QA / QC manager / other person	Deadline
DATA COLLECTION ACTIVITIES				
Checks all input data for emission calculations properly referenced	Andjelka Radosavljevic	Until the beginning of December	Ivana Dukic	December
Check availability of literature material	Andjelka Radosavljevic		Ivana Dukic	
ACTIVITY DATA ENTRY IN DATABASES AND EMISSION CALCULATION				
Check criteria for selection of activity data, emission factors and other necessary parameters for emissions calculation	Andjelka Radosavljevic	December	Ivana Dukic	December
Cross-check descriptions of input data and the emission factors with information about categories	Andjelka Radosavljevic	December	Ivana Dukic	December
Check the correctness of interpretation and use of activity data and emission factors	Andjelka Radosavljevic	December	Ivana Dukic	December
Check that the parameters and units are accurately recorded	Andjelka Radosavljevic	December	Ivana Dukic	December
Check that used appropriate conversion factors	Andjelka Radosavljevic	December	Ivana Dukic	December
Check whether the unit is properly marked in the worksheets	Andjelka Radosavljevic	December	Ivana Dukic	December
Check the consistency of data between the categories	Andjelka Radosavljevic	December	Ivana Dukic	December
Identified e.g. activity data common to several categories	Andjelka Radosavljevic	December	Ivana Dukic	December
Check the consistency of the activity data	Andjelka Radosavljevic	December	Ivana Dukic	December
Check the consistency of time series of input activity data for each category	Andjelka Radosavljevic	December	Ivana Dukic	December
DATABASES ITEMS				
Check whether all the categories covered by the emission sources that exist in the country, if not whether there are marked with the appropriate notation key („NO“)	Andjelka Radosavljevic	December	Ivana Dukic	December
Check whether there is double counting, i.e. duplication of entries	Andjelka Radosavljevic	December	Ivana Dukic	December
Check out the use of units and all necessary conversions of the same	Andjelka Radosavljevic	December	Ivana Dukic	December
Used to check the consistency of data on activities	Andjelka Radosavljevic	December	Ivana Dukic	December

for each pollutant within each category.				
Check the correctness of the emissions calculation	Andjelka Radosavljevic	December	Ivana Dukic	December
Check the consistency of trends	Andjelka Radosavljevic	December	Ivana Dukic	December
PREPARING IIR (INFORMATIVE INVENTORY REPORT)				
Check the values in the text and excel tables	Andjelka Radosavljevic	10. February to 14th March	Ivana Dukic	the 14th March
Check out the Figures	Andjelka Radosavljevic	10. February to 14th March	Ivana Dukic	the 14th March
ARCHIVING				
Archiving Excel Table	Andjelka Radosavljevic	from April -…		
Archiving of data sources	Andjelka Radosavljevic	from April -…		
Archiving IIR	Andjelka Radosavljevic	from April -…		

1.7 GENERAL UNCERTAINTY EVALUATION

The overall uncertainty is closely related to the emission sources data uncertainty (fuels, activities, processes, etc.) and to the emission factor uncertainty.

The same team in SEPA, which is dealing with GHG inventory, is also responsible for preparation of UNECE/CLRTAP inventory. At the moment tier 1 uncertainty analysis is implemented in the GHGs inventory under UNFCCC.

For UNECE/CLRTAP a quantitative estimate of inventory uncertainty for each source category and for the inventory in total will be presented in the next submissions.

1.8 GENERAL ASSESSMENT OF COMPLETENESS

According to reporting guidelines, in cases when methodological and data gaps exist in the inventory, parties to the Convention are required to inform and explain in a transparent manner the reason of their appearance, also the emission of certain emission sources from the inventory. To accomplish this, Parties have to use designated notation keys, Explanation of the meaning and the purpose of notation keys are presented in the following subchapter.

The emission data presented in this report were compiled according to the Guidelines for Reporting Emission Data approved by the Executive Body for the UNECE/LRTAP Convention.

The inventory is complete with regard to reported gases, reported years and reported emissions from all sources, and also complete in terms of geographic coverage. All relevant pollutants are covered by the Serbian inventory and are reported for the years 1990–2023.

Notification keys are used according to the Guidelines for Estimating and Reporting Emission Data under CLRTAP to indicate where emissions are not occurring in Serbia, where emissions have not been estimated or have been included elsewhere as suggested by EMEP/EEA Emission Inventory Guidebook 2023 The main reasons for different allocations to categories are the allocation in national statistics, insufficient information on the national statistics, national methods, and the impossibility to disaggregate emission declarations.

Table 6. Notification keys used in NFR emission tables for sectors and sub-sectors

Notification key	Meaning	Purpose
NO	Not occurring	For activities or processes which do not exist in Republic of Serbia/ for emissions by sources of compounds that do not occur for a particular compound or source category;
NE	Not estimated	Where emission occur, but have not been estimated or reported
NA	Not applicable	When activity or process exist, but it is assumed that they do not result with emission / Is used for activities which are believed to result in emission which are insignificant to national totals;
IE	Included elsewhere	Where emissions for mentioned activity or process are calculated and included in inventory, but did not separately presented for this source category / For emissions of pollutants which are calculated, but included elsewhere from expected source category in the inventory;
C	Confidential	For emissions by sources of compounds which could lead to the disclosure of confidential information
NR	Not relevant	According to paragraph 9 in the Emission Guidelines, Emission inventory reporting should cover all years from 1980, Onwards, if data are available, Where emissions are not strictly required by the different Protocols, e.g. for some parties emissions of NMVOC prior to 1988

Table 7. Sources reported as "NE"

NFR code	Substance(s)	Reason for not estimation
1 A 1 a	All relevant	No available data for Hard coal from 1992-1999 and from 2010-2023
1 A 1 a	All relevant	No available data for Light oil-gas oil from 1990-2004
1 A 1 a	All relevant	No available data for Biomass from 1990-2006
1 A 1 b	All relevant	No available data from 1990 - 1999
1A2c	All relevant	No available data for Combustion in industry using liquid fuels for 1990 and from 1993-2007
1A2c	All relevant	No available data for Combustion in industry using biomass from 1990-2007
1A2d	All relevant	No available data for Combustion in industry using liquid fuels from 1990-2007
1A2d	All relevant	No available data for Combustion in industry using biomass from 1990-2007 and for year 2011
1A2d	All relevant	No available data for Combustion in industry using Solid fuels for 2014
1A2e	All relevant	No available data for Combustion in industry using liquid fuels from 1990-

		2007
1A2e	All relevant	No available data for Combustion in industry using biomass from 1990-2007
1A2f	All relevant	No available data for Plaster (gypsum) manufacture for 1993 and from 2004-2023
1A2f	All relevant	No available data for Fine ceramic materials from 2016-2023
1A2f	All relevant	No available data for Roadstone coating (asphalt) plants for 1994
1A2gvii	All relevant	No available data for Diesel from 1990-2006
1A2gvii	All relevant	No available data for Gasoline: four-stroke 1990-2006
1A2gviii	All relevant	No available data for Hard coal from 1991-2004, for 2008, 2011, 2012 and from 2014-2023
1A2gviii	All relevant	No available data for Brown coal from 1990-2004
1A2gviii	All relevant	No available data for Gaseous fuels from 1991-2004
1A2gviii	All relevant	No available data for Heavy Fuel Oil from 1991-2004
1A2gviii	All relevant	No available data for Light oil-gas oil from 1990-2004
1A2gviii	All relevant	No available data for Biomass for all years except 2006 and 2007
1A2gviii	All relevant	No available data for Other Biomass from 1990-2007
1A4ai	All relevant	No available data for Gaseous fuels from 1990-2007
1A4ai	All relevant	No available data for Liquid fuels from 1990-2007
1A4bi	All relevant	No available data for Other Liquid Fuels from 1990-2006
1A4bi	All relevant	No available data for Gaseous Fuels for 1990 and 1991
1A4ci	All relevant	No available data for Gaseous fuels from 1990-2006
1A4ci	All relevant	No available data for Liquid fuels from 1990-2006
1A4ci	All relevant	No available data for Biomass from 1990-2007
1A4ci	All relevant	No available data for Hard Coal and Brown Coal from 2013 - 2016
1A4cii	All relevant	No available data for Diesel-Agriculture from 1990-2006
1A4cii	All relevant	No available data for LPG from 1990-2006
1A4cii	All relevant	No available data for Gasoline: four-

		stroke from 1990-2006 and from 2013-2023
1B1c	All relevant	No available data
1B2c	All relevant	No available data for Flaring in oil refineries 1990-1999
1B2d	All relevant	No available data
2A6	All relevant	No available data
2B10a	All relevant	No available data for Urea for 2010
2B10a	All relevant	No available data for Ethylene from 1993-1995
2B10a	All relevant	No available data for Polyethylene Low Density from 1993-1995
2B10a	All relevant	No available data for Polyethylene High Density from 1993-1995
2B10a	All relevant	No available data for Styrene from 1990-1999 and from 2014-2023
2C7a	All relevant	No available data for Secondary copper production from 1990-1999
2L	All relevant	No available data
3Da2a	All relevant	No available data
3Da2b	All relevant	No available data
3Da2c	All relevant	No available data
3Da3	All relevant	No available data
3Da4	All relevant	No available data
3Db	All relevant	No available data
3Dd	All relevant	No available data
5B1	All relevant	No available data
5B2	All relevant	No available data
5C2	All relevant	No available data
5D2	All relevant	No available data from 1990-2003
5E	All relevant	No available data

Table 8.Explanation of the notation key "IE"

NFR code	Substance(s)
1A3di(ii)	All relevant
1A3eii	All relevant
1A4aii	All relevant
1A4bii	All relevant
1A4ciii	All relevant
1A5a	All relevant
1A5b	All relevant
2A1	NOx, NMVOC, SOx, CO, HMs and POPs (except PCBs)
2A2	NOx, SOx, CO
2A3	NOx, SOx, CO

2B10b	All relevant

Table 9. Sources reported as "NO"

NFR code	Substance(s)
1 A 3	All relevant
1A3ai(ii)	All relevant
1A3di(i)	All relevant
1A3ei	All relevant
1A5c	All relevant
2B3	All relevant
2B5	All relevant
2B6	All relevant
2B7	All relevant
2C2	All relevant
2C7b	All relevant
2C7c	All relevant
2C7d	All relevant
2G	All relevant
2H3	All relevant
2J	All relevant
3B4a	All relevant
3B4f	All relevant
3B4h	All relevant
3I	All relevant
5C1a	All relevant
5C1bi	All relevant
5C1bii	All relevant
5C1biii	All relevant
5C1biv	All relevant
5C1bvi	All relevant
5D3	All relevant
6A	All relevant
6B	All relevant
11A	All relevant
11C	All relevant

2. EXPLANATION OF KEY TRENDS

This chapter gives an overview of the methodology for the key source analysis by observed pollutants, the results of key sources analysis with an overview of the change in share from 1990 to 2023, then overview of direct emissions of large point sources in Serbia.

2.1. The methodology for key source analysis

The methodology used to identify key source categories of individual pollutant follows the quantitative Approach 1 described in the IPCC Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories. In Approach 1, key categories are identified using a predetermined cumulative emissions threshold. Key categories are those which, when summed together in descending order of magnitude, cumulatively add up to 90 % of the total.

2.2. Key source analysis

The analysis of key sources in Republic of Serbia includes all pollutants under CLRTAP and associated protocols: pollutants which causes acidification, eutrophication and ground-level ozone (SO_2, NO_X, CO, NMVOC and NH_3), particles (TSP, PM_{10} and $PM_{2,5}$), heavy metals (Pb, Cd and Hg), other heavy metals (As, Cr, Cu, Ni, Se and Zn) and persistent organic pollutants (benzo(a) pyrene, benzo(b) fluoranthene, benzo(k) fluoranthene, Indeno (1,2,3-cd) pyrene, total PAHs, PCDD/PCDF and PCB). National emissions have been disaggregated into the categories according to required reporting format (NFR).

SEPA conducted key source analysis. Here are presented the most important sources for each pollutant separately.

Table 10. Summary of key and main sources and their contributions to overall pollutant emissions and percentage of emission change

NFR Code	NFR Categooy	% Contributions to pollutant totals for key categories (cumulative 80%)																																																				Sum of KC % Contributions	Rank
																																								PAHs															
		NO_X		NMVOC		SO_X		NH_3		$PM_{2.5}$		PM_{10}		TSP		BC		CO		Pb		Cd		Hg		As		Cr		Cu		Ni		Se		Zn		PCDD/ PCDF		benzo(a) pyrene		benzo(b) fluorant		benzo(k) fluorant		Indeno (1,2,3-cd)		Total 1-4		HCB		PCBs			
		LA	TA	LA	TA	LA	TA	LA	TA	LA	TA	LA	TA	LA	TA	LA	TA	LA	TA	LA	TA	LA	TA	LA	TA	LA	TA	LA	TA	LA	TA	LA	TA	LA	TA	LA	TA	LA	TA	LA	TA	LA	TA	LA	TA	LA	TA	LA	TA	LA	TA	LA	TA		
1A1a	Public electricity and heat production					91																																																91	6
1A1b	Petroleum refining																																																						
1A1c	Manufacture of solid fuels and other energy industries																																																						
1A2a	Stationary combustion in manufacturing industries and																																																						
1A2b	Stationary combustion in manufacturing industries and																																																						
1A2c	Stationary combustion in manufacturing industries and																																																						
1A2d	Stationary combustion in manufacturing industries and																																																						
1A2e	Stationary combustion in manufacturing industries and																																																						
1A2f	Stationary combustion in manufacturing industries and																																																						
1A2gvii	Mobile Combustion in manufacturing industries and																																																						
1A2gviii	Stationary combustion in manufacturing industries and																																																						
1A3ai(i)	International aviation LTO (civil)																																																						
1A3aii(i)	Domestic aviation LTO (civil)																																																						
1A3bi	Road transport: Passenger cars																																																						
1A3bii	Road transport: Light duty vehicles																																																						
1A3biii	Road transport: Heavy duty vehicles and buses																																																						
1A3biv	Road transport: Mopeds & motorcycles																																																						
1A3bv	Road transport: Gasoline evaporation																																																						
1A3bvi	Road transport: Automobile tyre and brake wear																																																						
1A3bvii	Road transport: Automobile road abrasion																																																						
1A3c	Railways																																																						
1A3di(ii)	International inland waterways																																																						
1A3dii	National navigation (shipping)																																																						
1A3ei	Pipeline transport																																																						
1A3eii	Other (please specify in the IIR)																																																						
1A4ai	Commercial/institutional: Stationary																																																						
1A4aii	Commercial/institutional: Mobile																																																						
1A4bi	Residential: Stationary																																																						
1A4bii	Residential: Household and gardening (mobile)																																																						
1A4ci	Agriculture/Forestry/Fishing: Stationary																																																						

NFR Code	NFR Categooy	% Contributions to pollutant totals for key categories (cumulative 80%)																																																					
																																								PAHs															
		NO_x		NMVOC		SO_x		NH_3		$PM_{2.5}$		PM_{10}		TSP		BC		CO		Pb		Cd		Hg		As		Cr		Cu		Ni		Se		Zn		PCDD/ PCDF		benzo(a) pyrene		benzo(b) fluorant		benzo(k) fluorant		Indeno (1,2,3-cd)		Total 1-4		HCB		PCBs		Sum of KC % Contributions	Rank
		LA	TA	LA	TA	LA	TA	LA	TA	LA	TA	LA	TA	LA	TA	LA	TA	LA	TA	LA	TA	LA	TA	LA	TA	LA	TA	LA	TA	LA	TA	LA	TA	LA	TA	LA	TA	LA	TA	LA	TA	LA	TA	LA	TA	LA	TA	LA	TA	LA	TA	LA	TA		
1A4cii	Agriculture/Forestry/Fishing: Off-road vehicles and other																																																						
1A4ciii	Agriculture/Forestry/Fishing: National fishing																																																						
1A5a	Other stationary (including military)																																																						
1A5b	Other, Mobile (including military, land based and recreational																																																						
1B1a	Fugitive emission from solid fuels: Coal mining and handling																																																						
1B1b	Fugitive emission from solid fuels: Solid fuel transformation																																																						
1B1c	Other fugitive emissions from solid fuels																																																						
1B2ai	Fugitive emissions oil: Exploration, production, transport																																																						
1B2aiv	Fugitive emissions oil: Refining / storage																																																							
1B2av	Distribution of oil products																																																						
1B2b	Fugitive emissions from natural gas (exploration, production																																																						
1B2c	Venting and flaring (oil, gas, combined oil and gas)																																																						
1B2d	Other fugitive emissions from energy production																																																						
2A1	Cement production									9		4																																										13	18
2A2	Lime production																																																						
2A3	Glass production																																			52																				52	11
2A5a	Quarrying and mining of minerals other than coal											10		10																																								20	14
2A5b	Construction and demolition																																																						
2A5c	Storage, handling and transport of mineral products																																																						
2A6	Other mineral products (please specify in the IIR)																																																						
2B1	Ammonia production																																																						
2B2	Nitric acid production																																																						
2B3	Adipic acid production																																																						
2B5	Carbide production																																																						
2B6	Titanium dioxide production																																																						
2B7	Soda ash production																																																						
2B10a	Chemical industry: Other (please specify in the IIR)																																																						
2B10b	Storage, handling and transport of chemical products (please																																																						
2C1	Iron and steel production									5								49		94				60		65		84		39		87		48		99		85												82		99				897	1
2C2	Ferroalloys production																																																						
2C3	Aluminium production																																																						

NFR Code	NFR Categooy	% Contributions to pollutant totals for key categories (cumulative 80%)																																																		Sum of KC % Contributions	Rank
		NO_X		NMVOC		SO_X		NH_3		$PM_{2.5}$		PM_{10}		TSP		BC		CO		Pb		Cd		Hg		As		Cr		Cu		Ni		Se		Zn		PCDD/ PCDF		PAHs: benzo(a) pyrene		benzo(b) fluorant		benzo(k) fluorant		Indeno (1,2,3-cd)		Total 1-4		HCB		PCBs			
		LA	TA	LA	TA	LA	TA	LA	TA	LA	TA	LA	TA	LA	TA	LA	TA	LA	TA	LA	TA	LA	TA	LA	TA	LA	TA	LA	TA	LA	TA	LA	TA	LA	TA	LA	TA	LA	TA	LA	TA	LA	TA	LA	TA	LA	TA	LA	TA	LA	TA	LA	TA		
2C4	Magnesium production																																																						
2C5	Lead production																																																						
2C6	Zinc production																																																						
2C7a	Copper production																					63				34				57																								154	3
2C7b	Nickel production																																																						
2C7c	Other metal production (please specify in the IIR)																																																						
2C7d	Storage, handling and transport of metal products																																																						
2D3a	Domestic solvent use including fungicides			18																																																		18	15
2D3b	Road paving with asphalt									7		13		28		15																																						63	10
2D3c	Asphalt roofing																																																						
2D3d	Coating applications																																																						
2D3e	Degreasing																																																						
2D3f	Dry cleaning																																																						
2D3g	Chemical products																																																						
2D3h	Printing			10																																																		10	20
2D3i	Other solvent use (please specify in the IIR)			6						43		12		6				20				21																																108	5
2G	Other product use (please specify in the IIR)																																																						
2H1	Pulp and paper industry	13								11		4				11		30																																				69	8
2H2	Food and beverages industry			16																																																		16	17
2H3	Other industrial processes (please specify in the IIR)																																																						
2I	Wood processing																																																						
2J	Production of POPs																																																						
2K	Consumption of POPs and heavy metals																							23																												89		113	4
2L	Other production, consumption, storage, transportation or																																																						
3B1a	Manure management - Dairy cattle			16				22																																														38	13

% Contributions to pollutant totals for key categories (cumulative 80%)

NFR Code	NFR Categooy	NO_X		NMVOC		SO_X		NH_3		$PM_{2.5}$		PM_{10}		TSP		BC		CO		Pb		Cd		Hg		As		Cr		Cu		Ni		Se		Zn		PCDD/ PCDF		PAHs benzo(a) pyrene		PAHs benzo(b) fluorant		PAHs benzo(k) fluorant		PAHs Indeno (1,2,3-cd)		PAHs Total 1-4		HCB		PCBs		Sum of KC % Contributions	Rank
		LA	TA	LA	TA	LA	TA	LA	TA	LA	TA	LA	TA	LA	TA	LA	TA	LA	TA	LA	TA	LA	TA	LA	TA	LA	TA	LA	TA	LA	TA	LA	TA	LA	TA	LA	TA	LA	TA	LA	TA	LA	TA	LA	TA	LA	TA	LA	TA		
3B1b	Manure management - Non-dairy cattle			9				8																																											16	16
3B2	Manure management - Sheep																																																			
3B3	Manure management - Swine							35						10																																					45	12
3B4a	Manure management - Buffalo																																																			
3B4d	Manure management - Goats																																																			
3B4e	Manure management - Horses																																																			
3B4f	Manure management - Mules and asses																																																			
3B4gi	Manure mangement - Laying hens							6						7																																					13	19
3B4gii	Manure mangement - Broilers																																																			
3B4giii	Manure mangement - Turkeys																																																			
3B4giv	Manure management - Other poultry																																																			
3B4h	Manure management - Other animals (please specify in IIR)																																																			
3Da1	Inorganic N-fertilizers (includes also urea application)	79						10																																												90	7
3Da2a	Animal manure applied to soils																																																			
3Da2b	Sewage sludge applied to soils																																																			
3Da2c	Other organic fertilisers applied to soils																																																			
3Da3	Urine and dung deposited by grazing animals																																																			
3Da4	Crop residues applied to soils																																																			
3Db	Indirect emissions from managed soils																																																			
3Dc	Farm-level agricultural operations including storage,									6		40		19																																					65	9

% Contributions to pollutant totals for key categories (cumulative 80%)

NFR Code	NFR Categooy	NO_X		NMVOC		SO_X		NH_3		$PM_{2.5}$		PM_{10}		TSP		BC		CO		Pb		Cd		Hg		As		Cr		Cu		Ni		Se		Zn		PCDD/ PCDF		PAHs								HCB		PCBs		Sum of KC % Contributions	Rank
																																						benzo(a) pyrene		benzo(b) fluorant		benzo(k) fluorant		Indeno (1,2,3-cd)		Total 1-4							
		LA	TA	LA	TA	LA	TA	LA	TA	LA	TA	LA	TA	LA	TA	LA	TA	LA	TA	LA	TA	LA	TA	LA	TA	LA	TA	LA	TA	LA	TA	LA	TA	LA	TA	LA	TA	LA	TA	LA	TA	LA	TA	LA	TA	LA	TA	LA	TA		
3Dd	Off-farm storage, handling and transport of bulk agricultural																																																		
3De	Cultivated crops			7																																															7	21
3Df	Use of pesticides																																																		
3F	Field burning of agricultural residues															55																										96		99		99		98							447	2
3I	Agriculture other (please specify in the IIR)																																																		
5A	Biological treatment of waste - Solid waste disposal on land																																																		
5B1	Biological treatment of waste - Composting																																																		
5B2	Biological treatment of waste - Anaerobic digestion at biogas																																																		
5C1a	Municipal waste incineration																																																		
5C1bi	Industrial waste incineration																																																		
5C1bii	Hazardous waste incineration																																																		
5C1biii	Clinical waste incineration																																																		
5C1biv	Sewage sludge incineration																																																		
5C1bv	Cremation																																																		
5C1bvi	Other waste incineration (please specify in the IIR)																																																		
5C2	Open burning of waste																																																		
5D1	Domestic wastewater handling																																																		
5D2	Industrial wastewater handling																																																		
5D3	Other wastewater handling																																																		
5E	Other waste (please specify in IIR)																																																		
6A	Other (included in national total for entire territory) (please specify																																																		

2.3. Results of the level and trend assessment (approach 1)

As the analysis was made for all pollutants reported to the UNECE and as these pollutants differ in their way of formation, most of the identified categories are key categories for more than one pollutant - in total 36 key sources were identified.

Table 11. Key Categories for NOx emissions for the year 2023

Level Assessment					
NFR Category Code	**NFR Category**	**Pollutant**	**Year (2023) Estim. [kt] Ex,t**	**Level Assessment Lx,t**	**Cumulative Total of Lx,t**
1A1a	Public electricity and heat production	NOx	66.7075	47.97%	47.97%
1A3bi	Road transport: Passenger cars	NOx	16.3309	11.74%	59.7%
1A3biii	Road transport: Heavy duty vehicles and buses	NOx	14.7168	10.58%	70.3%
3Da1	Inorganic N-fertilizers (includes also urea application)	NOx	5.3949	3.88%	74.2%
1A2gvii	Mobile Combustion in manufacturing industries and construction: (please specify in the IIR)	NOx	5.1475	3.70%	77.9%
1A4bi	Residential: Stationary	NOx	4.7377	3.41%	81.3%

Trend Assessment							
NFR Category Code	**NFR Category**	**Pollutant**	**Base Year (1990) Estimate [kt] Ex,0**	**Latest Year (2023) Estimate [kt] Ex,t**	**Trend Assessment Lx,t**	**% Contribution to the trend**	**Cumulative Total of Lx,t**
1A1a	Public electricity and heat production	NOx	97.69	68.09	0.047	21.88%	21.9%
1A3biii	Road transport: Heavy duty vehicles and buses	NOx	28.50	14.73	0.040	18.55%	40.4%
3Da1	Inorganic N-fertilizers (includes also urea application)	NOx	0.87	4.04	0.026	12.12%	52.6%
1A3bii	Road transport: Light duty vehicles	NOx	1.01	4.10	0.019	8.85%	61.4%
1A4cii	Agriculture/Forestry/Fishing: Off-road vehicles and other machinery	NOx	NE	2.51	0.016	7.21%	68.6%
1A2gvii	Mobile Combustion in manufacturing industries and construction: (please	NOx	3.85	4.78	0.012	5.60%	74.2%

	specify in the IIR)						
1A4ai	Commercial/institutional: Stationary	NOx	0.82	1.70	0.007	3.35%	77.6%
1A4bi	Residential: Stationary	NOx	4.49	4.37	0.007	3.29%	80.8%

Table 12. Key Categories for NMVOC emissions for the year 2023

Level Assessment

NFR Category Code	NFR Category	Pollutant	Year (2023) Estimate [kt] Ex,t	Level Assessment Lx,t	Cumulative Total of Lx,t
1A4bi	Residential: Stationary	NMVOC	40.5581	28.95%	28.95%
1B1a	Fugitive emission from solid fuels: Coal mining and handling	NMVOC	25.5472	18.23%	47.2%
1B2av	Distribution of oil products	NMVOC	14.6766	10.48%	57.7%
2D3a	Domestic solvent use including fungicides	NMVOC	7.9262	5.66%	63.3%
1A3bi	Road transport: Passenger cars	NMVOC	6.3925	4.56%	67.9%
2H2	Food and beverages industry	NMVOC	6.2341	4.45%	72.3%
3B1a	Manure management - Dairy cattle	NMVOC	6.0268	4.30%	76.6%
2D3h	Printing	NMVOC	4.2934	3.06%	79.7%
1A3bv	Road transport: Gasoline evaporation	NMVOC	3.7692	2.69%	82.4%

Trend Assessment

NFR Category Code	NFR Category	Pollutant	Base Year (1990) Estimate [kt] Ex,0	Latest Year (2023) Estimate [kt] Ex,t	Trend Assessment Lx,t	% Contribution to the trend	Cumulative Total of Lx,t
1A3bi	Road transport: Passenger cars	NMVOC	30.96	7.39	0.077	25.71%	25.7%
1A4bi	Residential: Stationary	NMVOC	38.35	38.90	0.068	22.70%	48.4%
1B2av	Distribution of oil products	NMVOC	11.25	13.32	0.034	11.30%	59.7%
3B1a	Manure management - Dairy cattle	NMVOC	14.25	7.32	0.020	6.68%	66.4%
2H2	Food and beverages industry	NMVOC	13.34	7.13	0.016	5.26%	71.7%
1A3bv	Road transport: Gasoline evaporation	NMVOC	2.79	3.71	0.009	3.02%	74.7%
2D3d	Coating applications	NMVOC	3.05	0.81	0.007	2.30%	77.0%
3B1b	Manure management - Non-dairy cattle	NMVOC	6.82	4.02	0.007	2.22%	79.2%

2D3a	Domestic solvent use including fungicides	NMVOC	9.39	8.16	0.007	2.20%	81.4%

Table 13. Key Categories for SOx emissions for the year 2023

Level Assessment					
NFR Category Code	**NFR Category**	**Pollutant**	**Year (2023) Estimate [kt] Ex,t**	**Level Assess-ment Lx,t**	**Cumulative Total of Lx,t**
1A1a	Public electricity and heat production	SOx	294.3851	88.57%	88.57%

Trend Assessment							
NFR Category Code	**NFR Category**	**Pollutant**	**Base Year (1990) Estimate [kt] Ex,0**	**Latest Year (2023) Estimate [kt] Ex,t**	**Trend Assessment Lx,t**	**% Contribution to the trend**	**Cumulative Total of Lx,t**
1A2gviii	Stationary combustion in manufacturing industries and construction: Other (please specify in the IIR)	SOx	13.19	8.55	0.015	37.20%	37.2%
1A1a	Public electricity and heat production	SOx	519.09	301.19	0.008	21.30%	58.5%
1A2e	Stationary combustion in manufacturing industries and construction: Food processing, beverages and tobacco	SOx	3.91	0.18	0.003	8.47%	67.0%
1A2c	Stationary combustion in manufacturing industries and construction: Chemicals	SOx	2.12	0.40	0.002	5.49%	72.5%
1A1c	Manufacture of solid fuels and other energy industries	SOx	3.28	0.41	0.002	4.77%	77.2%
2H1	Pulp and paper industry	SOx	0.70	1.29	0.001	3.24%	80.5%

Table 14. Key Categories for NH3 emissions for the year 2023

Level Assessment					
NFR Category Code	**NFR Category**	**Pollutant**	**Year (2023) Estimate [kt] Ex,t**	**Level Assessment Lx,t**	**Cumulative Total of Lx,t**
3B3	Manure management - Swine	NH3	18.0765	30.75%	30.75%

3B1a	Manure management - Dairy cattle	NH3	14.0446	23.89%	54.6%
3Da1	Inorganic N-fertilizers (includes also urea application)	NH3	6.7436	11.47%	66.1%
3B1b	Manure management - Non-dairy cattle	NH3	5.8412	9.94%	76.1%
3B4gi	Manure mangement - Laying hens	NH3	4.2096	7.16%	83.2%
3B3	Manure management - Swine	NH3	18.0765	30.75%	30.75%

Trend Assessment

NFR Category Code	NFR Category	Pollutant	Base Year (1990) Estimate [kt] Ex,0	Latest Year (2023) Estimate [kt] Ex,t	Trend Assessment Lx,t	% Contribution to the trend	Cumulative Total of Lx,t
3Da1	Inorganic N-fertilizers (includes also urea application)	NH3	1.09	5.05	0.051	38.03%	38.0%
3B3	Manure management - Swine	NH3	46.12	25.12	0.032	24.25%	62.3%
3B1a	Manure management - Dairy cattle	NH3	33.20	17.05	0.015	11.14%	73.4%
3B2	Manure management - Sheep	NH3	2.73	2.37	0.009	6.75%	80.2%

Table 15. Key Categories for PM 2.5 emissions for the year 2023

Level Assessment

NFR Category Code	NFR Category	Pollutant	Year (2023) Estimate [kt] Ex,t	Level Assessment Lx,t	Cumulative Total of Lx,t
1A4bi	Residential: Stationary	PM2.5	48.1112	82.69%	82.69%

Trend Assessment

NFR Category Code	NFR Category	Pollutant	Base Year (1990) Estimate [kt] Ex,0	Latest Year (2023) Estimate [kt] Ex,t	Trend Assessment Lx,t	% Contribution to the trend	Cumulative Total of Lx,t
1A4bi	Residential: Stationary	PM2.5	43.60	46.73	0.033	20.18%	20.2%
1A1c	Manufacture of solid fuels and other energy industries	PM2.5	1.98	0.25	0.029	18.05%	38.2%

2D3i	Other solvent use (please specify in the IIR)	PM2.5	0.62	1.49	0.018	10.76%	49.0%
1A3biii	Road transport: Heavy duty vehicles and buses	PM2.5	1.30	0.49	0.016	9.66%	58.6%
1A1a	Public electricity and heat production	PM2.5	1.44	0.98	0.010	6.04%	64.7%
1A3bi	Road transport: Passenger cars	PM2.5	0.40	0.93	0.009	5.81%	70.5%
2A2	Lime production	PM2.5	0.45	0.10	0.005	3.26%	73.8%
1A2gvii	Mobile Combustion in manufacturing industries and construction: (please specify in the IIR)	PM2.5	0.01	0.26	0.005	3.05%	76.8%
3B1a	Manure management - Dairy cattle	PM2.5	0.33	0.17	0.004	2.33%	79.1%
1A4ai	Commercial/institutional: Stationary	PM2.5	0.51	0.15	0.003	2.05%	81.2%

Table 16. Key Categories for PM10 emissions for the year 2023

Level Assessment

NFR Category Code	NFR Category	Pollutant	Year (2023) Estimate [kt] Ex,t	Level Assessment Lx,t	Cumula-tive Total of Lx,t
1A4bi	Residential: Stationary	PM10	49.3656	65.54%	65.54%
3Dc	Farm-level agricultural operations including storage, handling and transport of agricultural products	PM10	5.2983	7.03%	72.6%
2A5a	Quarrying and mining of minerals other than coal	PM10	2.6025	3.46%	76.0%
1A1a	Public electricity and heat production	PM10	2.2131	2.94%	79.0%
2D3b	Road paving with asphalt	PM10	1.9807	2.63%	81.6%

Trend Assessment

NFR Category Code	NFR Category	Pollutant	Base Year (1990) Estimate [kt] Ex,0	Latest Year (2023) Estimate [kt] Ex,t	Trend Assessment Lx,t	% Contribution to the trend	Cumulative Total of Lx,t
1A4bi	Residential: Stationary	PM10	44.69	47.96	0.047	19.69%	19.7%
1A1c	Manufacture of solid fuels and other energy industries	PM10	2.84	0.35	0.030	12.78%	32.5%

2A2	Lime production	PM10	2.23	0.48	0.019	7.95%	40.4%
2A5a	Quarrying and mining of minerals other than coal	PM10	1.32	1.39	0.017	7.14%	47.6%
1A1a	Public electricity and heat production	PM10	3.30	2.22	0.016	6.77%	54.3%
2D3i	Other solvent use (please specify in the IIR)	PM10	0.73	1.64	0.014	5.96%	60.3%
1A3bi	Road transport: Passenger cars	PM10	0.47	1.31	0.012	5.15%	65.4%
2D3b	Road paving with asphalt	PM10	1.27	2.34	0.009	3.89%	69.3%
1A3biii	Road transport: Heavy duty vehicles and buses	PM10	1.38	0.69	0.009	3.84%	73.2%
1B1a	Fugitive emission from solid fuels: Coal mining and handling	PM10	1.84	1.53	0.007	3.16%	76.3%
3Dc	Farm-level agricultural operations including storage, handling and transport of agricultural products	PM10	5.65	5.47	0.007	2.91%	79.3%
3B3	Manure management - Swine	PM10	0.76	0.44	0.006	2.63%	81.9%

Table 17. Key Categories for TSP emissions for the year 2023

Level Assessment					
NFR Category Code	**NFR Category**	**Pollutant**	**Year (2023) Estimate [kt] Ex,t**	**Level Assessment Lx,t**	**Cumulative Total of Lx,t**
1A4bi	Residential: Stationary	TSP	52.1417	54.59%	54.59%
2D3b	Road paving with asphalt	TSP	9.2432	9.68%	64.3%
2A5a	Quarrying and mining of minerals other than coal	TSP	5.3090	5.56%	69.8%
3Dc	Farm-level agricultural operations including storage, handling and transport of agricultural products	TSP	5.2983	5.55%	75.4%
1A1a	Public electricity and heat production	TSP	3.2336	3.39%	78.8%
1B1a	Fugitive emission from solid fuels: Coal mining and handling	TSP	2.8421	2.98%	81.7%
Trend Assessment					

NFR Category Code	NFR Category	Pollutant	Base Year (1990) Estimate [kt] Ex,0	Latest Year (2023) Estimate [kt] Ex,t	Trend Assessment Lx,t	% Contribution to the trend	Cumulative Total of Lx,t
2B10a	Chemical industry: Other (please specify in the IIR)	TSP	55.93	0.07	0.213	43.14%	43.1%
1A4bi	Residential: Stationary	TSP	47.39	50.60	0.149	30.13%	73.3%
2D3b	Road paving with asphalt	TSP	5.92	10.90	0.036	7.26%	80.5%

Table 18. Key Categories for BC emissions for the year 2023

Level Assessment

NFR Category Code	NFR Category	Pollutant	Year (2023) Estimate [kt] Ex,t	Level Assessment Lx,t	Cumulative Total of Lx,t
1A4bi	Residential: Stationary	BC	4.6737	86.01%	86.01%

Trend Assessment

NFR Category Code	NFR Category	Pollutant	Base Year (1990) Estimate [kt] Ex,0	Latest Year (2023) Estimate [kt] Ex,t	Trend Assessment Lx,t	% Contribution to the trend	Cumulative Total of Lx,t

1A4bi	Residential: Stationary	BC	4.09	4.58	0.091	37.88%	37.9%
1A2gvii	Mobile Combustion in manufacturing industries and construction: (please specify in the IIR)	BC	0.00	0.16	0.040	16.82%	54.7%
1A2e	Stationary combustion in manufacturing industries and construction: Food processing, beverages and tobacco	BC	0.03	0.18	0.030	12.61%	67.3%
1A3bvi	Road transport: Automobile tyre and brake wear	BC	0.00	0.08	0.021	8.84%	76.1%
1A4cii	Agriculture/Forestry/ Fishing: Off-road vehicles and other machinery	BC	NE	0.07	0.019	7.97%	84.1%

Table 19. Key Categories for CO emissions for the year 2023

Level Assessment					
NFR Category Code	**NFR Category**	**Pollutant**	**Year (2023) Estimate [kt] Ex,t**	**Level Assessment Lx,t**	**Cumulative Total of Lx,t**
1A4bi	Residential: Stationary	CO	283.7300	75.17%	75.17%
1A3bi	Road transport: Passenger cars	CO	28.2637	7.49%	82.7%

Trend Assessment							
NFR Category Code	**NFR Category**	**Pollutant**	**Base Year (1990) Estimate [kt]**	**Latest Year (2023) Estimate [kt]**	**Trend Assessment Lx,t**	**% Contribution to the trend**	**Cumulative Total of Lx,t**

			Ex,0	Ex,t			
1A3bi	Road transport: Passenger cars	CO	192.51	35.33	0.217	48.64%	48.6%
1A4bi	Residential: Stationary	CO	281.12	268.06	0.152	34.16%	82.8%

Table 20. Key Categories for Pb emissions for the year 2023

Level Assessment					
NFR Category Code	NFR Category	Pollutant	Year (2023) Estimate [t] Ex,t	Level Assessment Lx,t	Cumulative Total of Lx,t
2C1	Iron and steel production	Pb	16.0816	52.24%	52.24%
1A1a	Public electricity and heat production	Pb	3.8043	12.36%	64.6%
1A4bi	Residential: Stationary	Pb	2.8566	9.28%	73.9%
1A3bi	Road transport: Passenger cars	Pb	2.8279	9.19%	83.1%

Trend Assessment							
NFR Category Code	NFR Category	Pollutant	Base Year (1990) Estimate [kt] Ex,0	Latest Year (2023) Estimate [kt] Ex,t	Trend Assessment Lx,t	% Contribution to the trend	Cumulative Total of Lx,t
1A3bi	Road transport: Passenger cars	Pb	345.84	2.47	0.069	49.99%	50.0%
2C1	Iron and steel production	Pb	4.19	22.32	0.042	30.52%	80.5%

Table 21. Key Categories for Cd emissions for the year 2023

Level Assessment					
NFR Category Code	NFR Category	Pollutant	Year (2023) Estimate [t] Ex,t	Level Assessment Lx,t	Cumulative Total of Lx,t
2C7a	Copper production	Cd	0.8281	31.24%	31.24%
1A4bi	Residential: Stationary	Cd	0.7925	29.90%	61.1%
1A1a	Public electricity and heat production	Cd	0.4603	17.36%	78.5%
2D3i	Other solvent use (please specify in the IIR)	Cd	0.2563	9.67%	88.2%

Trend Assessment

NFR Category Code	NFR Category	Pollutant	Base Year (1990) Estimate [kt] Ex,0	Latest Year (2023) Estimate [kt] Ex,t	Trend Assessment Lx,t	% Contribution to the trend	Cumulative Total of Lx,t
2C7a	Copper production	Cd	2.27	0.73	0.173	46.80%	46.8%
1A4bi	Residential: Stationary	Cd	0.66	0.79	0.088	23.84%	70.6%
2D3i	Other solvent use (please specify in the IIR)	Cd	0.08	0.24	0.051	13.92%	84.6%

Table 22. Key Categories for Hg emissions for the year 2023

Level Assessment					
NFR Category Code	NFR Category	Pollutant	Year (2023) Estimate [t] Ex,t	Level Assessment Lx,t	Cumulative Total of Lx,t
1A1a	Public electricity and heat production	Hg	0.7338	47.26%	47.26%
1A1c	Manufacture of solid fuels and other energy industries	Hg	0.2667	17.17%	64.4%
2C1	Iron and steel production	Hg	0.1220	7.86%	72.3%
1A2f	Stationary combustion in manufacturing industries and construction: Non-metallic minerals	Hg	0.1219	7.85%	80.1%

Trend Assessment							
NFR Category Code	NFR Category	Pollutant	Base Year (1990) Estimate [kt] Ex,0	Latest Year (2023) Estimate [kt] Ex,t	Trend Assessment Lx,t	% Contribution to the trend	Cumulative Total of Lx,t
1A1c	Manufacture of solid fuels and other energy industries	Hg	1.08	0.13	0.125	45.49%	45.5%
2C1	Iron and steel production	Hg	0.00	0.18	0.044	16.00%	61.5%
1A1a	Public electricity and heat production	Hg	1.11	0.75	0.039	14.28%	75.8%

1A2f	Stationary combustion in manufacturing industries and construction: Non-metallic minerals	Hg	0.13	0.12	0.018	6.67%	82.4%

Table 23. Key Categories for As emissions for the year 2023

Level Assessment					
NFR Category Code	**NFR Category**	**Pollutant**	**Year (2023) Estimate [t] Ex,t**	**Level Assessment Lx,t**	**Cumulative Total of Lx,t**
1A1a	Public electricity and heat production	As	3.6227	71.21%	71.21%
2C1	Iron and steel production	As	0.6091	11.97%	83.2%

Trend Assessment							
NFR Category Code	**NFR Category**	**Pollutant**	**Base Year (1990) Estimate [kt] Ex,0**	**Latest Year (2023) Estimate [kt] Ex,t**	**Trend Assessment Lx,t**	**% Contribution to the trend**	**Cumulative Total of Lx,t**
2C1	Iron and steel production	As	0.42	0.70	0.043	33.75%	33.7%
2C7a	Copper production	As	1.06	0.36	0.037	29.11%	62.9%
1A1c	Manufacture of solid fuels and other energy industries	As	0.40	0.05	0.021	16.44%	79.3%
1A2gviii	Stationary combustion in manufacturing industries and construction: Other (please specify in the IIR)	As	0.12	0.11	0.014	10.64%	89.9%

Table 24 Key Categories for Cr emissions for the year 2023

Level Assessment					
NFR Category Code	**NFR Category**	**Pollutant**	**Year (2023) Estimate [t] Ex,t**	**Level Assessment Lx,t**	**Cumulative Total of Lx,t**

2C1	Iron and steel production	Cr	3.9901	35.64%	35.64%
1A1a	Public electricity and heat production	Cr	2.3040	20.58%	56.2%
1A4bi	Residential: Stationary	Cr	1.4839	13.26%	69.5%
2C7a	Copper production	Cr	1.0873	9.71%	79.2%
1A3bi	Road transport: Passenger cars	Cr	1.0730	9.59%	88.8%

Trend Assessment

NFR Category Code	NFR Category	Pollutant	Base Year (1990) Estimate [kt] Ex,0	Latest Year (2023) Estimate [kt] Ex,t	Trend Assessment Lx,t	% Contribution to the trend	Cumulative Total of Lx,t
2C7a	Copper production	Cr	3.17	0.96	0.170	27.99%	28.0%
2C1	Iron and steel production	Cr	2.41	5.07	0.144	23.66%	51.7%
1A1a	Public electricity and heat production	Cr	3.49	2.35	0.091	15.04%	66.7%
1A3bi	Road transport: Passenger cars	Cr	0.09	0.94	0.085	14.05%	80.7%

Table 25. Key Categories for Cu emissions for the year 2023

Level Assessment

NFR Category Code	NFR Category	Pollutant	Year (2023) Estimate [t] Ex,t	Level Assessment Lx,t	Cumulative Total of Lx,t
1A3bi	Road transport: Passenger cars	Cu	23.2910	52.96%	52.96%
1A3biii	Road transport: Heavy duty vehicles and buses	Cu	8.7059	19.80%	72.8%
1A3bii	Road transport: Light duty vehicles	Cu	5.3037	12.06%	84.8%

Trend Assessment

NFR Category Code	NFR Category	Pollutant	Base Year (1990) Estimate [kt] Ex,0	Latest Year (2023) Estimate [kt] Ex,t	Trend Assessment Lx,t	% Contribution to the trend	Cumulative Total of Lx,t
2C7a	Copper production	Cu	8.61	3.17	1.334	38.18%	38.2%
1A3bi	Road transport: Passenger cars	Cu	1.66	20.36	1.195	34.20%	72.4%
1A3bii	Road transport: Light duty vehicles	Cu	0.20	4.71	0.304	8.71%	81.1%

Table 26. Key Categories for Ni emissions for the year 2023

Level Assessment					
NFR Category Code	**NFR Category**	**Pollutant**	**Year (2023) Estimate [t] Ex,t**	**Level Assessment Lx,t**	**Cumulative Total of Lx,t**
1A1a	Public electricity and heat production	Ni	3.8084	32.47%	32.47%
2C1	Iron and steel production	Ni	3.5781	30.51%	63.0%
1A2gviii	Stationary combustion in manufacturing industries and construction: Other (please specify in the IIR)	Ni	1.7090	14.57%	77.6%
2C7a	Copper production	Ni	0.9867	8.41%	86.0%

Trend Assessment							
NFR Category Code	**NFR Category**	**Pollutant**	**Base Year (1990) Estimate [kt] Ex,0**	**Latest Year (2023) Estimate [kt] Ex,t**	**Trend Assessment Lx,t**	**% Contribution to the trend**	**Cumulative Total of Lx,t**
2C1	Iron and steel production	Ni	0.14	6.71	0.206	44.35%	44.4%
1A2gviii	Stationary combustion in manufacturing industries and construction: Other (please specify in the IIR)	Ni	4.85	1.43	0.098	21.12%	65.5%
2C7a	Copper production	Ni	2.87	0.87	0.060	12.80%	78.3%
1A1a	Public electricity and heat production	Ni	6.49	3.89	0.041	8.86%	87.1%

Table 27. Key Categories for Se emissions for the year 2023

Level Assessment					
NFR Category Code	**NFR Category**	**Pollutant**	**Year (2023) Estimate [t] Ex,t**	**Level Assessment Lx,t**	**Cumulative Total of Lx,t**
1A1a	Public electricity and heat production	Se	11.3131	85.94%	85.94%

Trend Assessment

NFR Category Code	NFR Category	Pollutant	Base Year (1990) Estimate [kt] Ex,0	Latest Year (2023) Estimate [kt] Ex,t	Trend Assessment Lx,t	% Contribution to the trend	Cumulative Total of Lx,t
1A2gviii	Stationary combustion in manufacturing industries and construction: Other (please specify in the IIR)	Se	0.19	0.22	0.017	39.04%	39.0%
1A4bi	Residential: Stationary	Se	2.25	0.77	0.016	35.82%	74.9%
2A3	Glass production	Se	0.11	0.04	0.003	6.48%	81.3%

Table 28. Key Categories for Zn emissions for the year 2023

Level Assessment

NFR Category Code	NFR Category	Pollutant	Year (2023) Estimate [t] Ex,t	Level Assessment Lx,t	Cumulative Total of Lx,t
1A4bi	Residential: Stationary	Zn	32.7480	50.21%	50.21%
2C1	Iron and steel production	Zn	10.7331	16.46%	66.7%
1A3bi	Road transport: Passenger cars	Zn	7.2807	11.16%	77.8%
1A3biii	Road transport: Heavy duty vehicles and buses	Zn	3.4484	5.29%	83.1%

Trend Assessment

NFR Category Code	NFR Category	Pollutant	Base Year (1990) Estimate [kt] Ex,0	Latest Year (2023) Estimate [kt] Ex,t	Trend Assessment Lx,t	% Contribution to the trend	Cumulative Total of Lx,t
1A4bi	Residential: Stationary	Zn	29.14	31.98	0.108	20.40%	20.4%
2C1	Iron and steel production	Zn	4.35	16.12	0.101	19.04%	39.4%
1A3bi	Road transport: Passenger cars	Zn	2.04	6.46	0.093	17.46%	56.9%
1A1a	Public electricity and heat production	Zn	4.37	2.80	0.059	11.12%	68.0%
1A1c	Manufacture of solid fuels and other energy industries	Zn	1.66	0.21	0.035	6.65%	74.7%

1A3bii	Road transport: Light duty vehicles	Zn	0.16	1.40	0.027	5.14%	79.8%
1A2gviii	Stationary combustion in manufacturing industries and construction: Other (please specify in the IIR)	Zn	1.74	0.90	0.026	4.89%	84.7%

Table 29. Key Categories for PCDD/PCDF emissions for the year 2023

Level Assessment					
NFR Category Code	**NFR Category**	**Pollutant**	**Year (2023) Estimate [g I-TEQ] Ex,t**	**Level Assessment Lx,t**	**Cumulative Total of Lx,t**
1A4bi	Residential: Stationary	PCDD/PCDF	55.5480	74.12%	74.12%
2C1	Iron and steel production	PCDD/PCDF	10.8733	14.51%	88.6%

Trend Assessment							
NFR Category Code	**NFR Category**	**Pollutant**	**Base Year (1990) Estimate [kt] Ex,0**	**Latest Year (2023) Estimate [kt] Ex,t**	**Trend Assessment Lx,t**	**% Contribution to the trend**	**Cumulative Total of Lx,t**
2C1	Iron and steel production	PCDD/PCDF	0.73	10.44	0.143	42.83%	42.8%
1B1b	Fugitive emission from solid fuels: Solid fuel transformation	PCDD/PCDF	6.32	1.66	0.078	23.24%	66.1%
1A4bi	Residential: Stationary	PCDD/PCDF	54.00	52.82	0.027	8.10%	74.2%
1A1a	Public electricity and heat production	PCDD/PCDF	3.85	2.60	0.022	6.55%	80.7%

Table 30. Key Categories for Benzo a pyren emissions for the year 2023

Level Assessment

NFR Category Code	NFR Category	Pollutant	Year (2023) Estimate [t] Ex,t	Level Assessment Lx,t	Cumulative Total of Lx,t
1A4bi	Residential: Stationary	benzo a pyren	9.4377	95.22%	95.22%

Trend Assessment							
NFR Category Code	NFR Category	Pollutant	Base Year (1990) Estimate [kt] Ex,0	Latest Year (2023) Estimate [kt] Ex,t	Trend Assessment Lx,t	% Contribution to the trend	Cumulative Total of Lx,t
1A4bi	Residential: Stationary	benzo a pyren	10.19	8.66	0.033	41.55%	41.6%
1B1b	Fugitive emission from solid fuels: Solid fuel transformation	benzo a pyren	0.34	0.09	0.021	26.12%	67.7%
1A2e	Stationary combustion in manufacturing industries and construction: Food processing, beverages and tobacco	benzo a pyren	0.20	0.05	0.011	13.64%	81.3%

Table 31. Key Categories for Benzo b flouranthen emissions for the year 2023

Level Assessment					
NFR Category Code	NFR Category	Pollutant	Year (2023) Estimate [t] Ex,t	Level Assessment Lx,t	Cumulative Total of Lx,t
1A4bi	Residential: Stationary	benzo b fluoranthen	9.7932	93.63%	93.63%

Trend Assessment							
NFR Category Code	NFR Category	Pollutant	Base Year (1990) Estimate [kt] Ex,0	Latest Year (2023) Estimate [kt] Ex,t	Trend Assessment Lx,t	% Contribution to the trend	Cumulative Total of Lx,t
1A4bi	Residential: Stationary	benzo b fluoranthen	11.56	8.68	0.027	36.59%	36.6%
1B1b	Fugitive emission from solid fuels: Solid	benzo b	0.42	0.11	0.020	28.21%	64.8%

	fuel transformation	fluoranthen					
1A2e	Stationary combustion in manufacturing industries and construction: Food processing, beverages and tobacco	benzo b fluoranthen	0.26	0.09	0.009	12.17%	77.0%
1A2c	Stationary combustion in manufacturing industries and construction: Chemicals	benzo b fluoranthen	0.14	0.05	0.005	7.05%	84.0%

Table 32. Key Categories for Benzo k flouranthen emissions for the year 2023

Level Assessment					
NFR Category Code	**NFR Category**	**Pollutant**	**Year (2023) Estimate [t] Ex,t**	**Level Assessment Lx,t**	**Cumulative Total of Lx,t**
1A4bi	Residential: Stationary	benzo k fluoranten	3.7546	92.56%	92.56%

Trend Assessment							
NFR Category Code	**NFR Category**	**Pollutant**	**Base Year (1990) Estimate [kt] Ex,0**	**Latest Year (2023) Estimate [kt] Ex,t**	**Trend Assessment Lx,t**	**% Contribution to the trend**	**Cumulative Total of Lx,t**
1A4bi	Residential: Stationary	benzo k fluoranten	4.47	3.32	0.029	32.85%	32.8%
1B1b	Fugitive emission from solid fuels: Solid fuel transformation	benzo k fluoranten	0.21	0.06	0.026	29.38%	62.2%
1A2e	Stationary combustion in manufacturing industries and construction: Food processing, beverages and tobacco	benzo k fluoranten	0.10	0.03	0.011	12.58%	74.8%
1A3bi	Road transport: Passenger cars	benzo k fluoranten	0.00	0.02	0.005	5.63%	80.4%

Table 33. Key Categories for Indeno emissions for the year 2023

Level Assessment					
NFR Category Code	**NFR Category**	**Pollutant**	**Year (2023) Estimate [t] Ex,t**	**Level Assessment Lx,t**	**Cumulative Total of Lx,t**
1A4bi	Residential: Stationary	Indeno 1,2,3 pyren	5.2999	95.98%	95.98%

Trend Assessment							
NFR Category Code	**NFR Category**	**Pollutant**	**Base Year (1990) Estimate [kt] Ex,0**	**Latest Year (2023) Estimate [kt] Ex,t**	**Trend Assessment Lx,t**	**% Contribution to the trend**	**Cumulative Total of Lx,t**
1A4bi	Residential: Stationary	Indeno 1,2,3 pyren	5.52	4.93	0.026	38.80%	38.8%
1B1b	Fugitive emission from solid fuels: Solid fuel transformation	Indeno 1,2,3 pyren	0.15	0.04	0.018	27.05%	65.9%
1A2e	Stationary combustion in manufacturing industries and construction: Food processing, beverages and tobacco	Indeno 1,2,3 pyren	0.08	0.02	0.009	13.07%	78.9%
1A4ai	Commercial/institutional: Stationary	Indeno 1,2,3 pyren	0.09	0.02	0.005	7.11%	86.0%

Table 34. Key Categories for Total 1 – 4 PAH emissions for the year 2023

Level Assessment					
NFR Category Code	**NFR Category**	**Pollutant**	**Year (2023) Estimate [t] Ex,t**	**Level Assessment Lx,t**	**Cumulative Total of Lx,t**
1A4bi	Residential: Stationary	Total 1-4 PAH	28.2854	86.00%	86.00%

Trend Assessment							
NFR Category Code	**NFR Category**	**Pollutant**	**Base Year (1990) Estima**	**Latest Year (2023) Estimate [kt] Ex,t**	**Trend Assessment Lx,t**	**% Contribution to the trend**	**Cumulative Total of Lx,t**

			te [kt] Ex,0				
1A4bi	Residential: Stationary	Total 1-4 PAH	31.73	25.59	0.064	44.21%	44.2%
2C1	Iron and steel production	Total 1-4 PAH	5.79	3.33	0.043	29.47%	73.7%
1B1b	Fugitive emission from solid fuels: Solid fuel transformation	Total 1-4 PAH	1.12	0.29	0.017	11.54%	85.2%

Table 35. Key Categories for HCB emissions for the year 2023

Level Assessment					
NFR Category Code	**NFR Category**	**Pollutant**	**Year (2023) Estimate [kg] Ex,t**	**Level Assessment Lx,t**	**Cumulative Total of Lx,t**
1A1a	Public electricity and heat production	HCB	1.6846	78.28%	78.28%
1A4bi	Residential: Stationary	HCB	0.3052	14.18%	92.5%

Trend Assessment							
NFR Category Code	**NFR Category**	**Pollutant**	**Base Year (1990) Estimate [kt] Ex,0**	**Latest Year (2023) Estimate [kt] Ex,t**	**Trend Assessment Lx,t**	**% Contribution to the trend**	**Cumulative Total of Lx,t**
1A1a	Public electricity and heat production	HCB	2.56	1.72	0.082	49.59%	49.6%
1A4bi	Residential: Stationary	HCB	0.26	0.30	0.039	23.74%	73.3%
1A2gviii	Stationary combustion in manufacturing industries and construction: Other (please specify in the IIR)	HCB	0.03	0.04	0.019	11.52%	84.8%

Table 36. Key Categories for PCB emissions for the year 2023

Level Assessment					
NFR Category Code	**NFR Category**	**Pollutant**	**Year (2023) Estimate [kg] Ex,t**	**Level Assessment Lx,t**	**Cumulative Total of Lx,t**
2K	"Consumption of	PCB	660.5168	87.75%	87.75%

	POPs and heavy metals						
Trend Assessment							
NFR Category Code	**NFR Category**	**Pollutant**	**Base Year (1990) Estimate [kt] Ex,0**	**Latest Year (2023) Estimate [kt] Ex,t**	**Trend Assessment Lx,t**	**% Contribution to the trend**	**Cumulative Total of Lx,t**
2C7a	Copper production	PCB	0.00	75.28	0.098	67.02%	67.0%
2K	"Consumption of POPs and heavy metals						

2.4. Trend in total emissions

This chapter describes the trends and the drivers of air pollutant emissions which Serbia is obliged to report based on the following listed protocols.
From submissions 2018 onwards Serbia reports all mandatory pollutants in the NFR reporting format from 1990 to the latest inventory year.

2.4.1. Nitrogen oxides emission (NOx)

The amount of NOx emissions in 2023 was 139.0691 kt which is around 1.24% less than in 2022 and compared to the base year of 1990 saw an decrease of 22.99%.

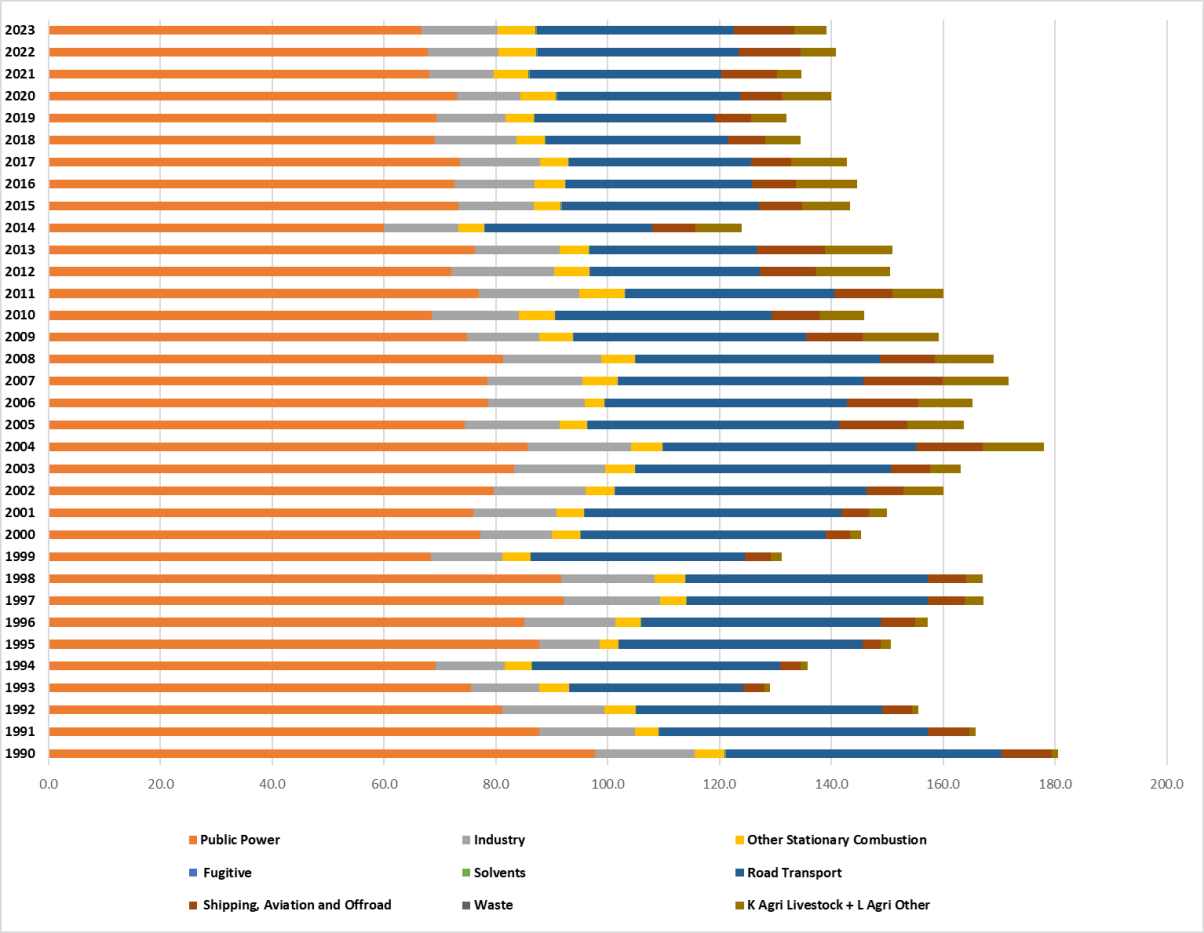

Figure 1. Distribution of NOx between sectors for period 1990 – 2023

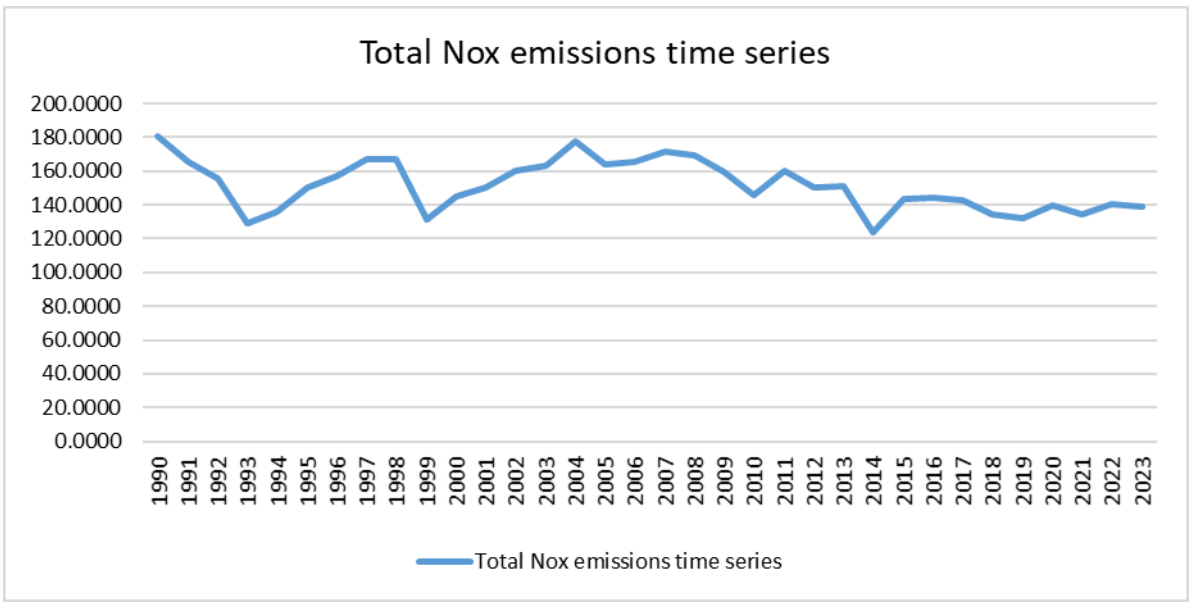

Figure 2. Total NOx emissions time series from 1990 to 2023.

Table 37. Total NOx emissions between sectors for years 1990 and 2023. Trends of dominant sources of NOx emissions compared to years 1990-2023 and 2022-2023. Share in National Total for years 1990 and 2023.

NFR Category	NOx Emission in [kt]		Trend		Share in National Total	
	1990	2023	1990 - 2023	2022 - 2023	1990	2023
A Public Power	97.6884	66.7075	-31.71%	-1.58%	54.10%	47.97%
B Industry	17.8099	13.5865	-23.71%	6.73%	9.86%	9.77%
C Other Stationary Combustion	5.4054	6.7819	25.47%	1.58%	2.99%	4.88%
D Fugitive	0.1673	0.1361	-18.67%	-6.12%	0.09%	0.10%
E Solvents	0.0263	0.0854	225.01%	3.12%	0.01%	0.06%
F Road Transport	49.3183	35.3169	-28.39%	-2.01%	27.31%	25.40%
G Shipping + H Aviation + I Offroad	8.9636	10.7259	19.66%	-2.15%	4.96%	7.71%
J Waste	0.0006	0.0028	372.52%	-4.86%	0.00%	0.00%
K Agri Livestock + L Agri Other	1.1997	5.7261	377.30%	-10.45%	0.66%	4.12%
Total	**180.5794**	**139.0691**	**-22.99%**	**-1.24%**	**100.00%**	**100.00%**

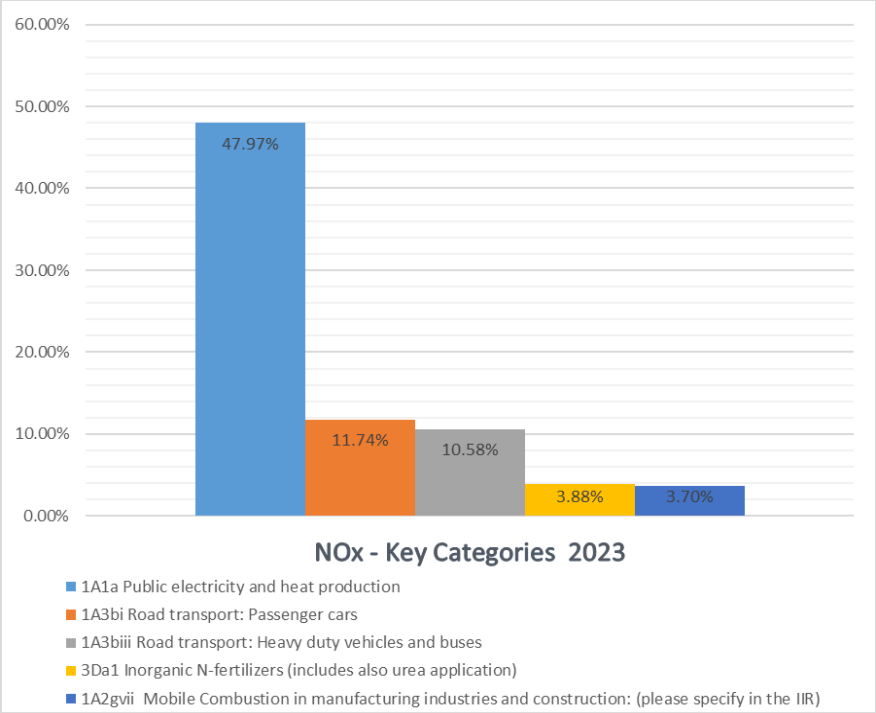

Figure 3. Key Categories assessments of NOx emissions for 2023

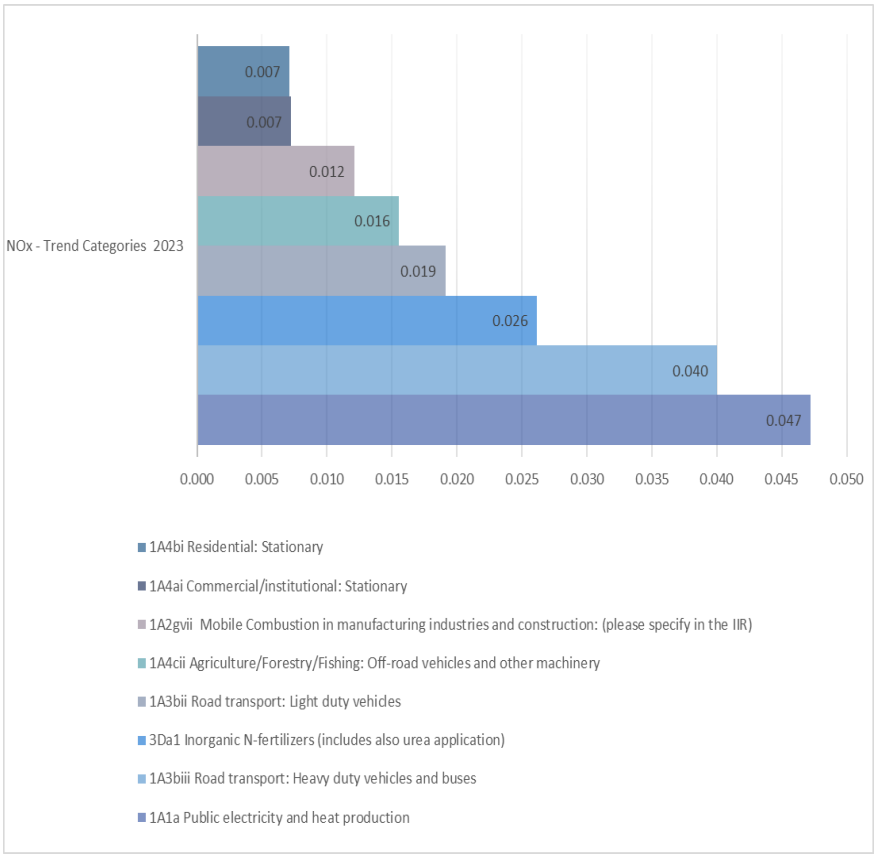

Figure 4. Trends assessments of NOx emissions for base year and 2023

2.4.2. Non-Methane Volatile Organic Compounds (NMVOC)

Anthropogenic NMVOC emissions in Serbia were 140.1054 kt in 2023, which is 2.39 % less than in 2022 compared to the base year of 1990 saw decrease of 29.65 %.

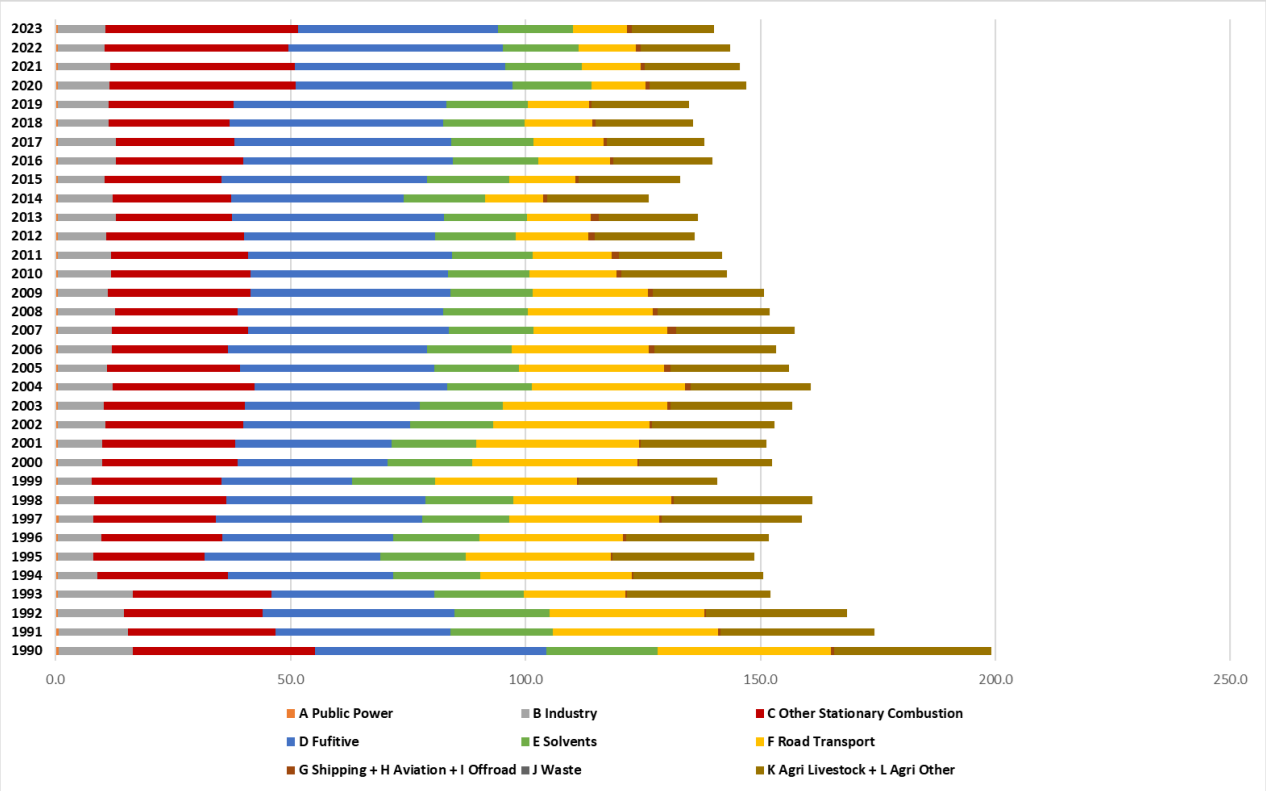

Figure 5. Distribution of NMVOC between sectors for period 1990 – 2023

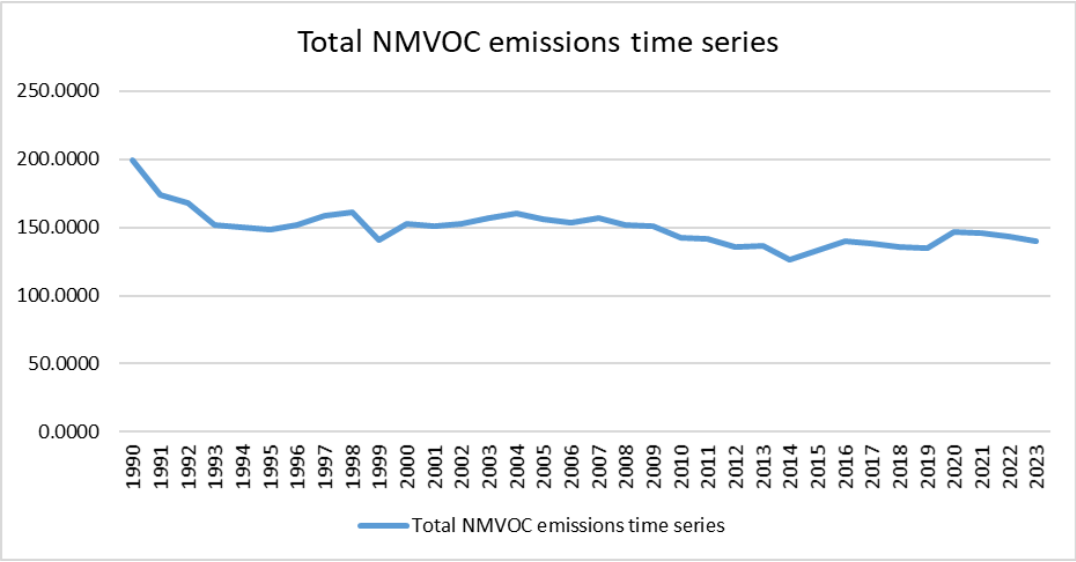

Figure 6.Total NMVOC emissions time series from 1990 to 2023.

Table 38. Total NMVOC emissions between sectors for years 1990 and 2023. Trends of dominant sources of NMVOC emissions compared to years 1990-2023 and 2022-2023. Share in National Total for years 1990 and 2023

NFR Category	NMVOC Emission in [kt]		Trend		Share in National Total	
	1990	2023	1990 - 2023	2022 - 2023	1990	2023
A Public Power	0.6139	0.4810	-21.66%	-1.37%	0.31%	0.34%
B Industry	15.8514	10.0875	-36.36%	0.65%	7.96%	7.20%
C Other Stationary Combustion	38.8170	41.1172	5.93%	5.33%	19.49%	29.35%
D Fugitive	49.2118	42.4957	-13.65%	-6.95%	24.71%	30.33%
E Solvents	23.6752	15.9956	-32.44%	-0.42%	11.89%	11.42%
F Road Transport	36.8884	11.4614	-68.93%	-5.99%	18.52%	8.18%
G Shipping + H Aviation + I Offroad	0.6932	1.0097	45.66%	-3.01%	0.35%	0.72%
J Waste	0.0001	0.0002	118.96%	-86.57%	0.00%	0.00%
K Agri Livestock + L Agri Other	33.3979	17.4572	-47.73%	-8.23%	16.77%	12.46%
Total	**199.1489**	**140.1054**	**-29.65%**	**-2.39%**	**100.00%**	**100.00%**

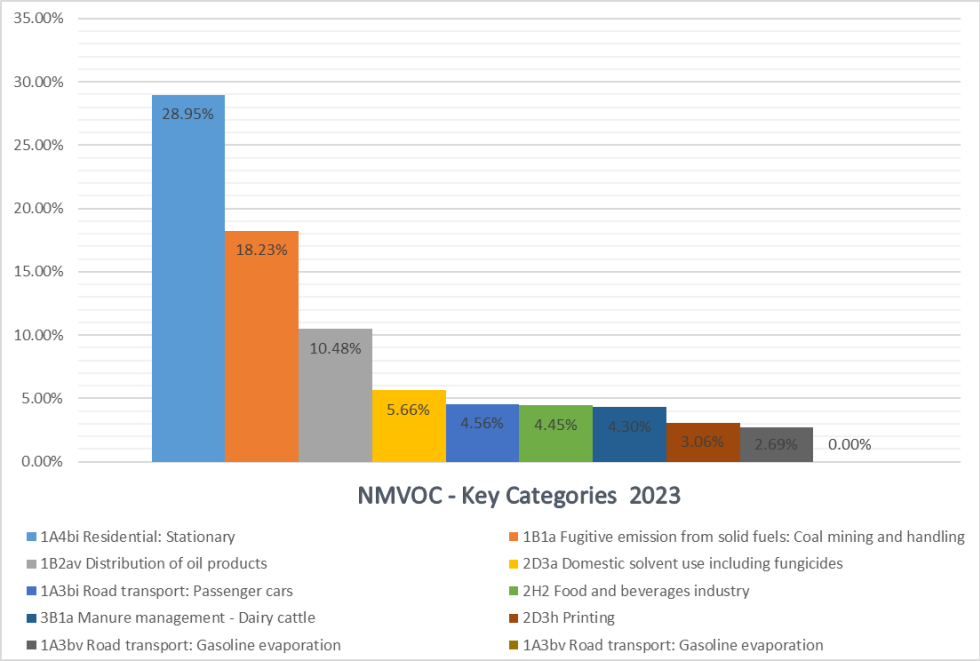

Figure 7. Key Categories assessments of NMVOC emissions for 2023

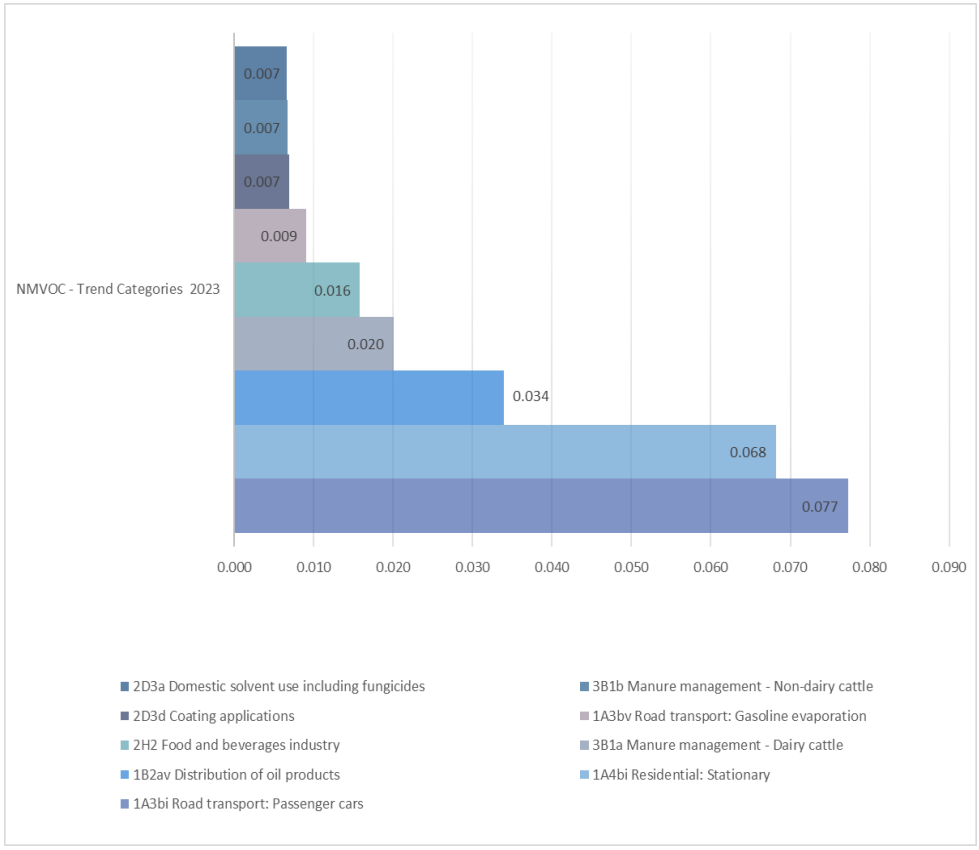

Figure 8. Trends assessments of NMVOC emissions for base year and 2023

2.4.3. Sulphur dioxide emission (SOX)

Total SOx emission in 2023 was 332.3640 kt which is 3.23 % more than in 2022. Compared to the base year of 1990, saw a decrease of 42.36%

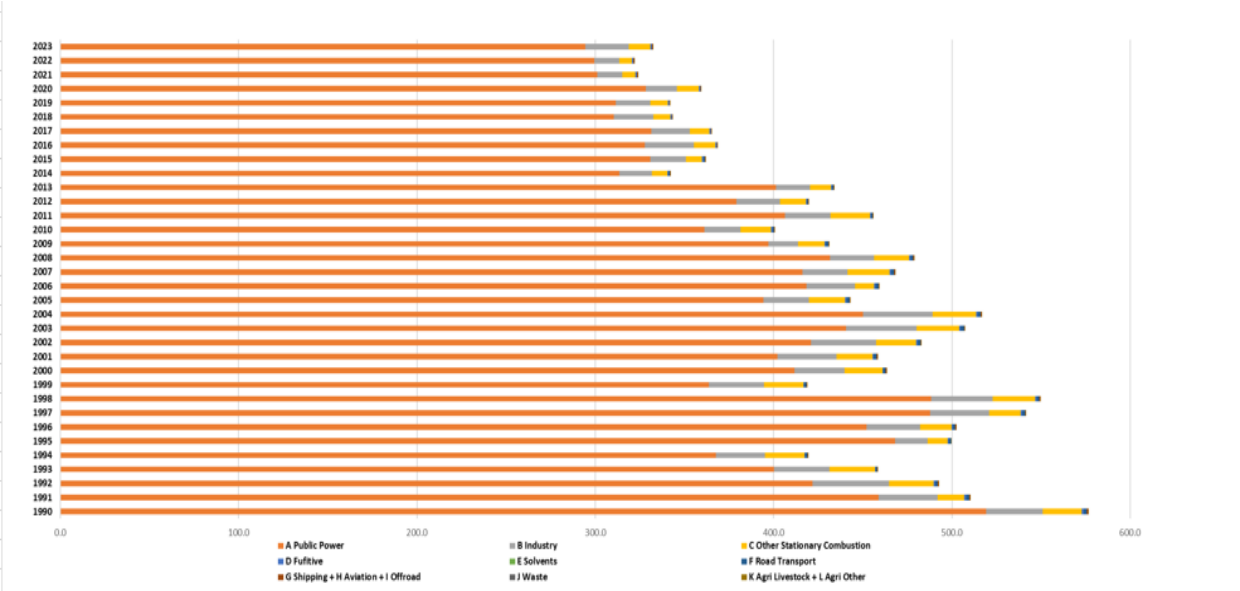

Figure 9. Distribution of SOx between sectors for period 1990 – 2023

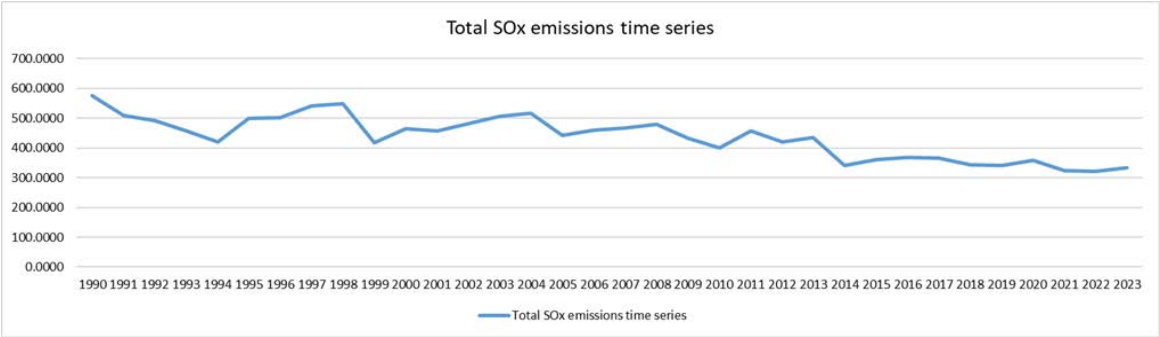

Figure 10. Total SOx emissions time series from 1990 to 2023.

Table 39. Total SOx emissions between sectors for years 1990 and 2023. Trends of dominant sources of SOx emissions compared to years 1990-2023 and 2022-2023. Share in National Total for years 1990 and 2023

NFR Category	SOx Emission in [kt]		Trend		Share in National Total	
	1990	2023	1990 - 2023	2022 - 2023	1990	2023
A Public Power	519.0912	294.3851	-43.29%	-1.66%	90.02%	88.57%
B Industry	31.7294	24.4748	-22.86%	73.72%	5.50%	7.36%
C Other Stationary Combustion	22.0086	12.0008	-45.47%	72.58%	3.82%	3.61%
D Fugitive	1.2020	0.9850	-18.05%	-6.17%	0.21%	0.30%
E Solvents	NA	NA	NA	NA	NA	NA
F Road Transport	1.7353	0.0001	-99.99%	5.76%	0.30%	0.00%
G Shipping + H Aviation + I Offroad	0.8420	0.5170	-38.60%	2.40%	0.15%	0.16%
J Waste	0.0001	0.0004	372.52%	-4.86%	0.00%	0.00%
K Agri Livestock + L Agri Other	0.0011	0.0008	-25.66%	-1.57%	0.00%	0.00%
Total	**576.6097**	**332.3640**	**-42.36%**	**3.23%**	**100.00%**	**100.00%**

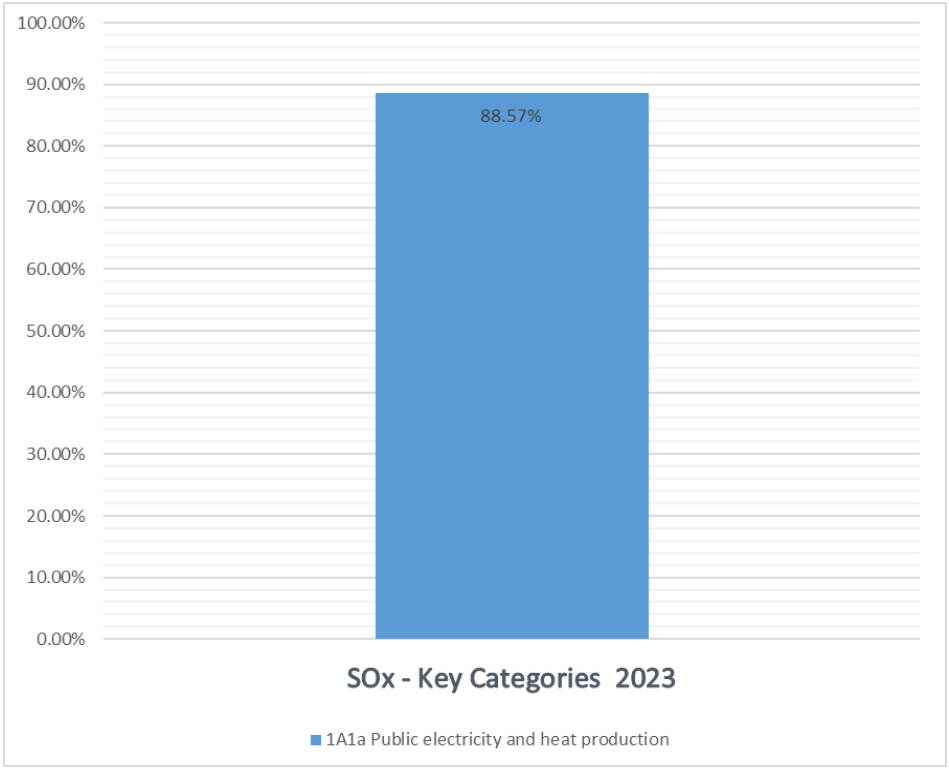

Figure 11. Key Categories assessments of SOx emissions for 2023.

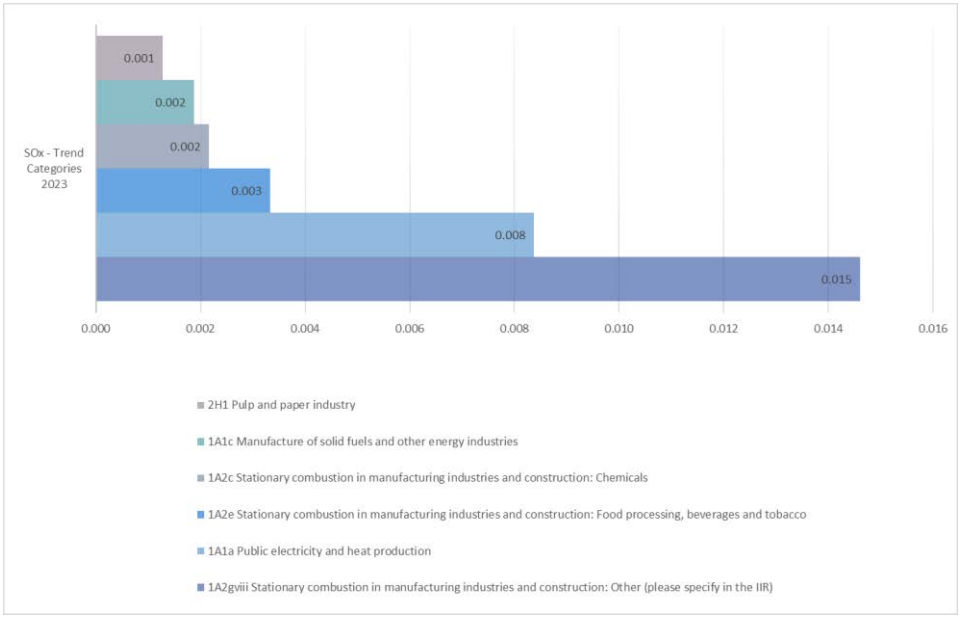

Figure 12. Trends assessments of SOx emissions for base year and 2023

2.4.4. Ammonia (NH3)

NH_3 emissions in 2023. was 58.7809 kt, which is 11.74 % decrease compared to 2022. Compared to the 1990 baseline emissions of NH_3 is 52.20 % lower.

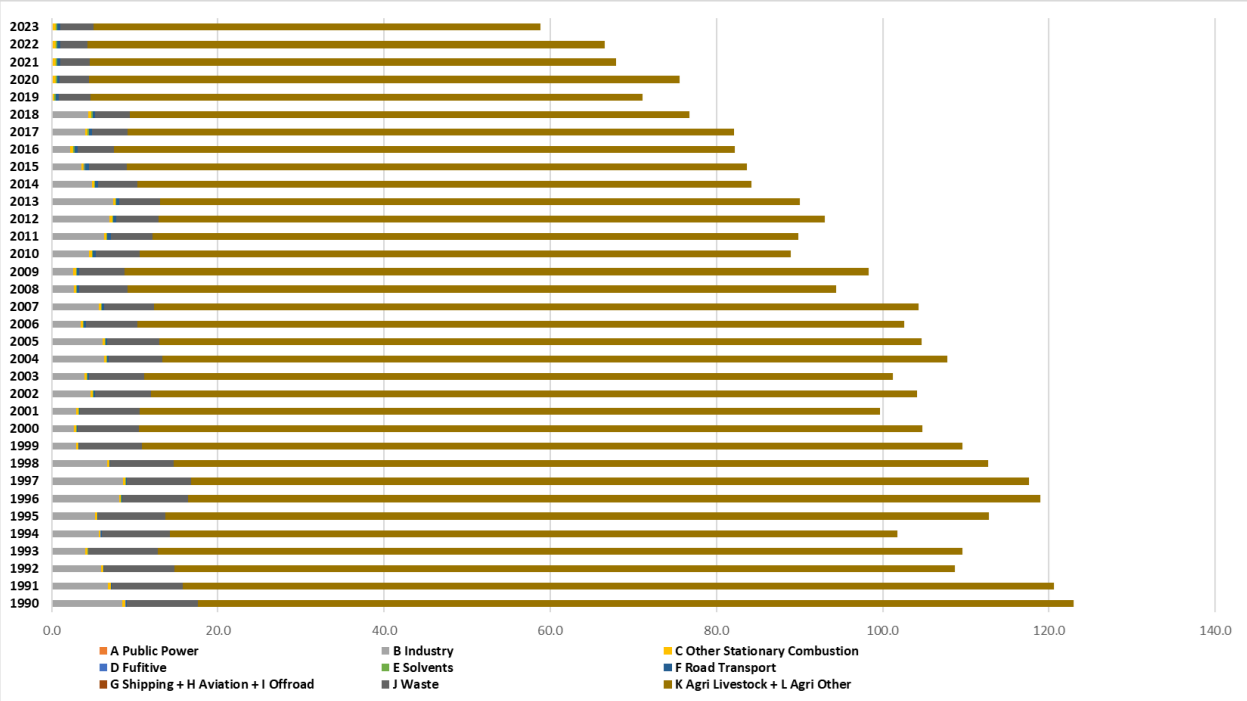

Figure 13. Distribution of NH_3 between sectors for period 1990 – 2023

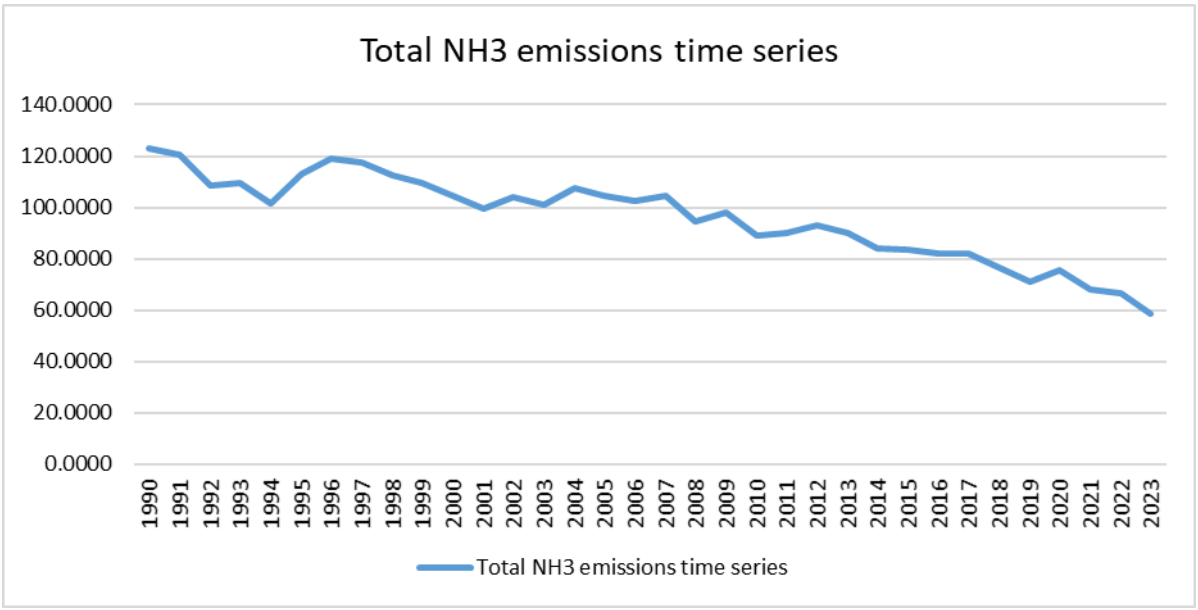

Figure 14.Total NH3 emissions time series from 1990 to 2023.

Table 40. Total NH_3 emissions between sectors for years 1990 and 2023. Trends of dominant sources of NH_3 emissions compared to years 1990-2023 and 2022-2023. Share in National Total for years 1990 and 2023

NFR Category	NH3 Emission in [kt]		Trend		Share in National Total	
	1990	2023	1990 - 2023	2022 - 2023	1990	2023
A Public Power	NE	NA	NA	NA	NA	NA
B Industry	8.5014	0.0054	-99.94%	-0.58%	6.91%	0.01%
C Other Stationary Combustion	0.3971	0.4818	21.33%	0.39%	0.32%	0.82%
D Fugitive	0.0130	0.0058	-55.34%	-0.13%	0.01%	0.01%
E Solvents	0.0631	0.1970	211.94%	3.12%	0.05%	0.34%
F Road Transport	0.0268	0.3552	1225.42%	1.01%	0.02%	0.60%
G Shipping + H Aviation + I Offroad	0.0008	0.0019	128.12%	-3.68%	0.00%	0.00%
J Waste	8.6285	4.0054	-53.58%	23.18%	7.02%	6.81%
K Agri Livestock + L Agri Other	105.3468	53.7284	-49.00%	-13.77%	85.66%	91.40%
Total	**122.9776**	**58.7809**	**-52.20%**	**-11.74%**	**100.00%**	**100.00%**

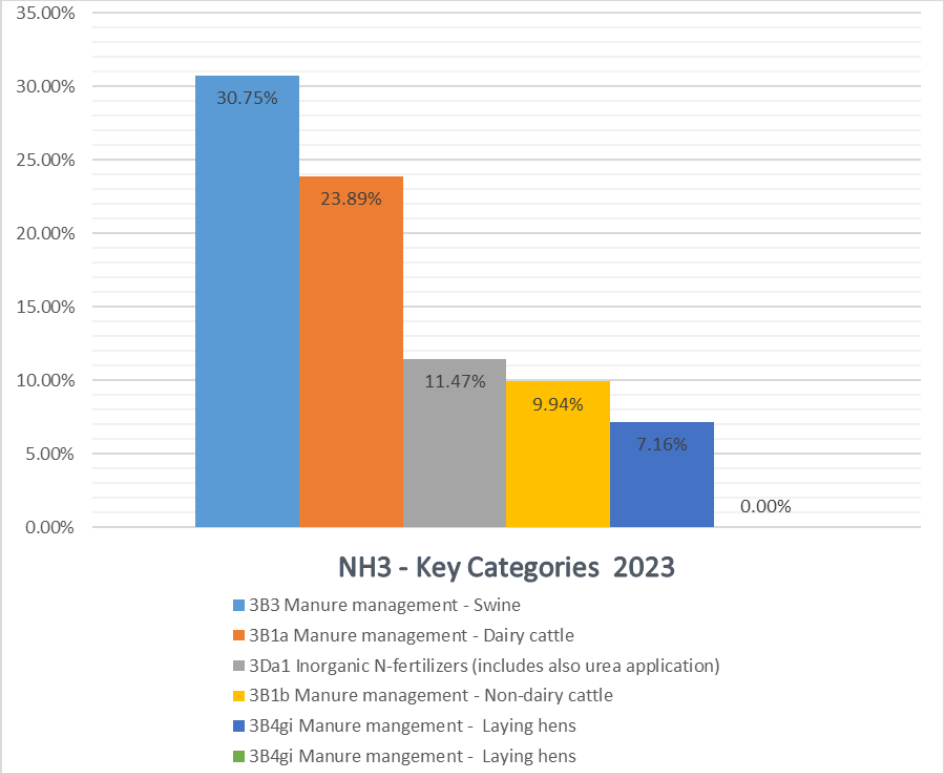

Figure 15. Key Categories assessments of NH3 emissions for 2023

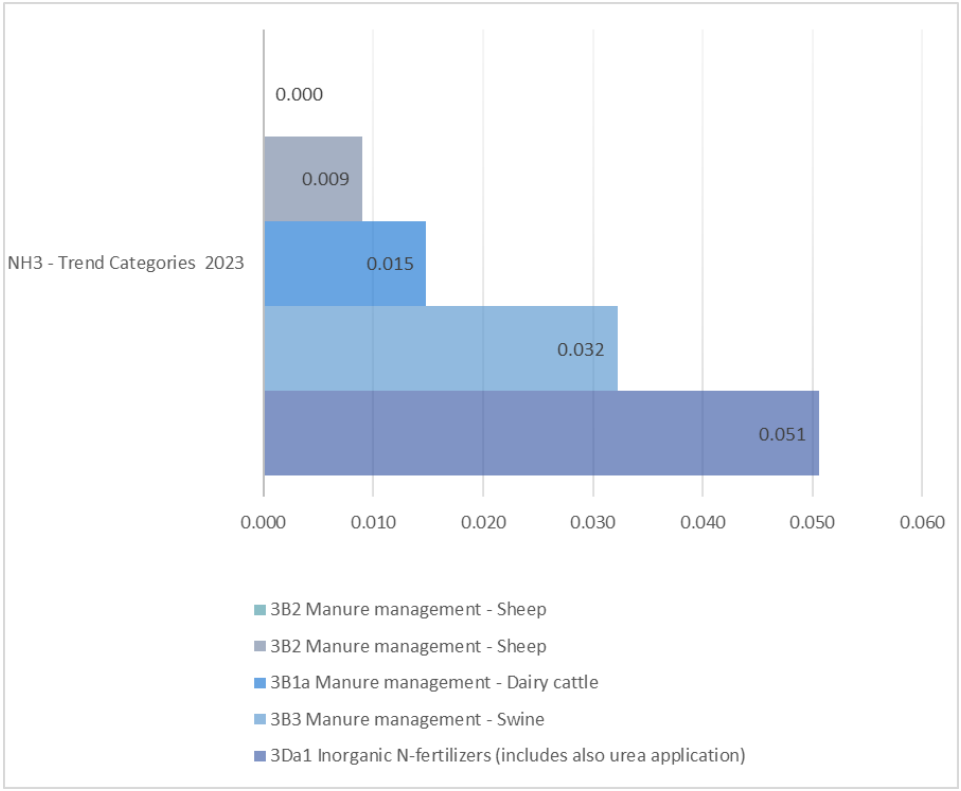

Figure 16. Trends assessments of NH3 emissions for base year and 2023

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2.4.5. PM 2.5 Emission

PM 2.5 emissions in 2023. was 58.1804 kt, which is 4.41 % increase compared to 2022. Compared to the 1990 baseline emissions of PM 2.5 is 6.20 % higher.

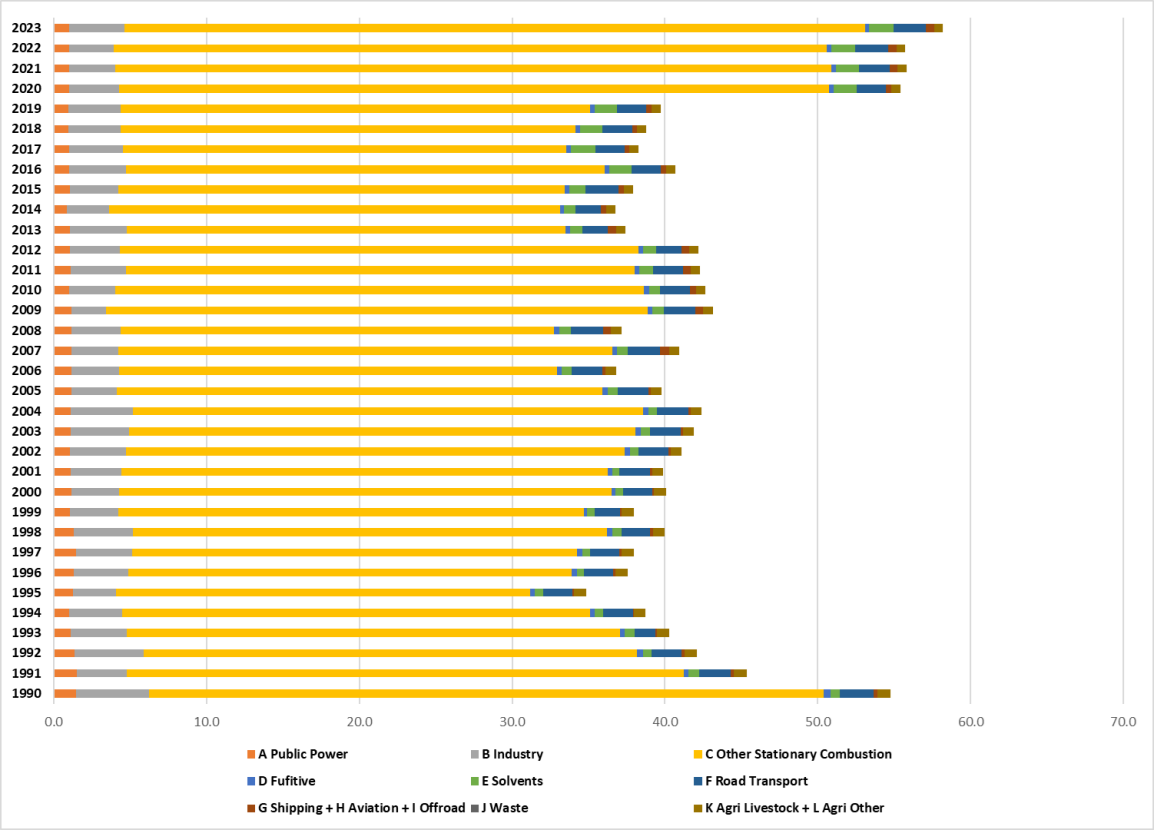


Figure 17. Distribution of PM2.5 between sectors for period 1990 – 2023

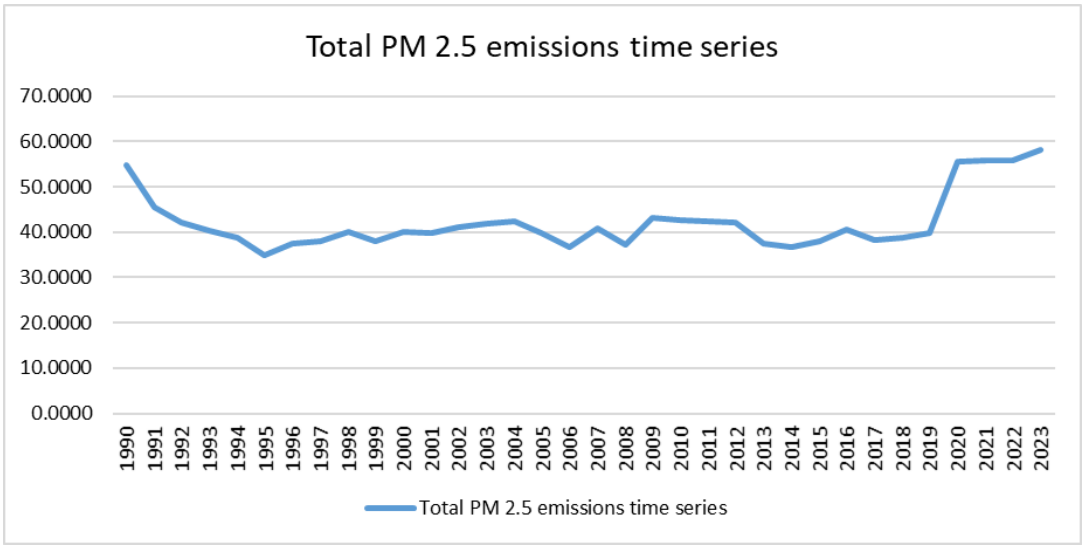


Figure 18.Total PM 2.5 emissions time series from 1990 to 2023.

Table 41. Total PM 2.5 emissions between sectors for years 1990 and 2023. Trends of dominant sources of PM 2.5 emissions compared to years 1990-2023 and 2022-2023. Share in National Total for years 1990 and 2023

NFR Category	PM2.5 Emission in [kt]		Trend		Share in National Total	
	1990	2023	1990 - 2023	2022 - 2023	1990	2023
A Public Power	1.4388	0.9877	-31.35%	-2.20%	2.63%	1.70%
B Industry	4.7792	3.6210	-24.23%	23.58%	8.72%	6.22%
C Other Stationary Combustion	44.1754	48.4841	9.75%	3.89%	80.64%	83.33%
D Fugitive	0.4514	0.2704	-40.11%	-5.60%	0.82%	0.46%
E Solvents	0.6197	1.6199	161.41%	3.20%	1.13%	2.78%
F Road Transport	2.1709	2.1048	-3.04%	-0.86%	3.96%	3.62%
G Shipping + H Aviation + I Offroad	0.2824	0.5591	97.97%	-1.89%	0.52%	0.96%
J Waste	0.0000	0.0001	372.52%	-4.86%	0.00%	0.00%
K Agri Livestock + L Agri Other	0.8658	0.5333	-38.40%	-5.19%	1.58%	0.92%
Total	**54.7837**	**58.1804**	**6.20%**	**4.41%**	**100.00%**	**100.00%**

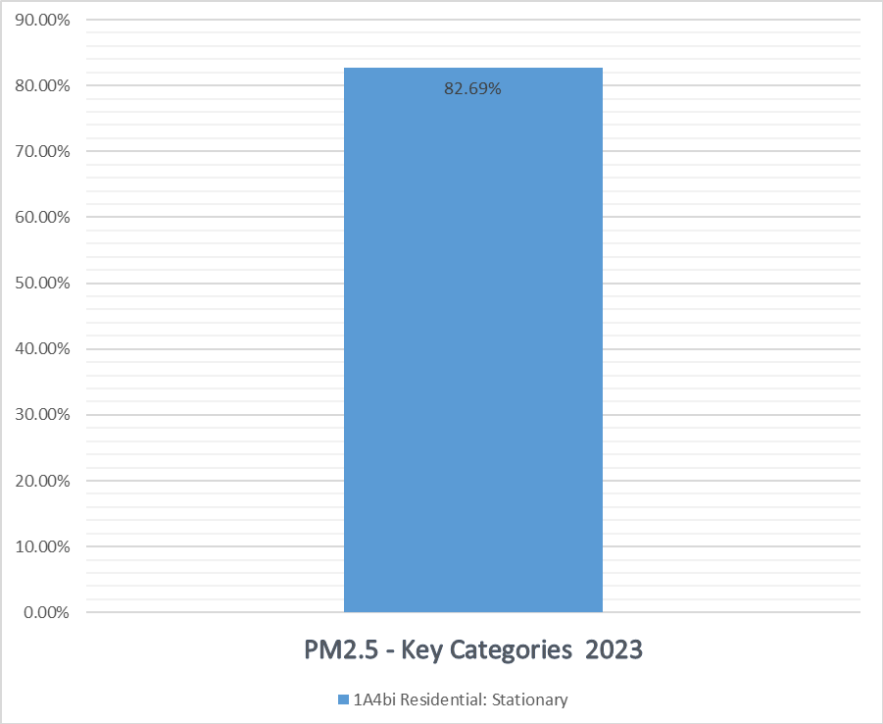


Figure 19. Key Categories assessments of PM 2.5 emissions for 2023.

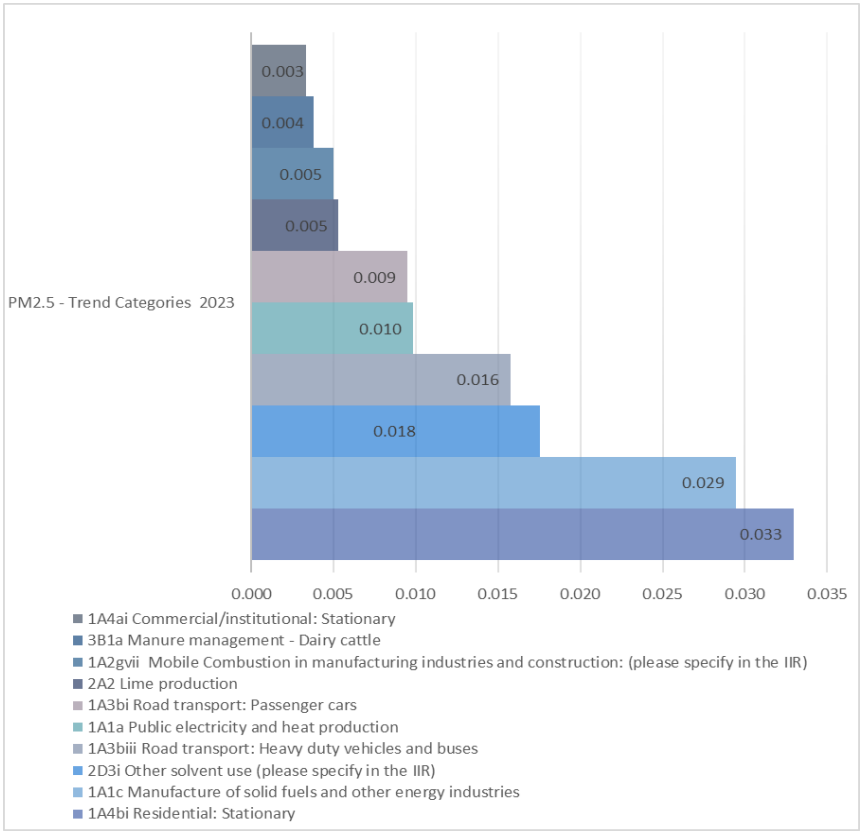


Figure 20. Trends assessments of PM 2.5 emissions for base year and 2023

2.4.6. PM_{10} Emission

PM 10 emissions in 2023. was 75.3198 kt, which is 4.23 % increase compared to 2022. Compared to the 1990 baseline emissions of PM 10 is 2.80 % higher.

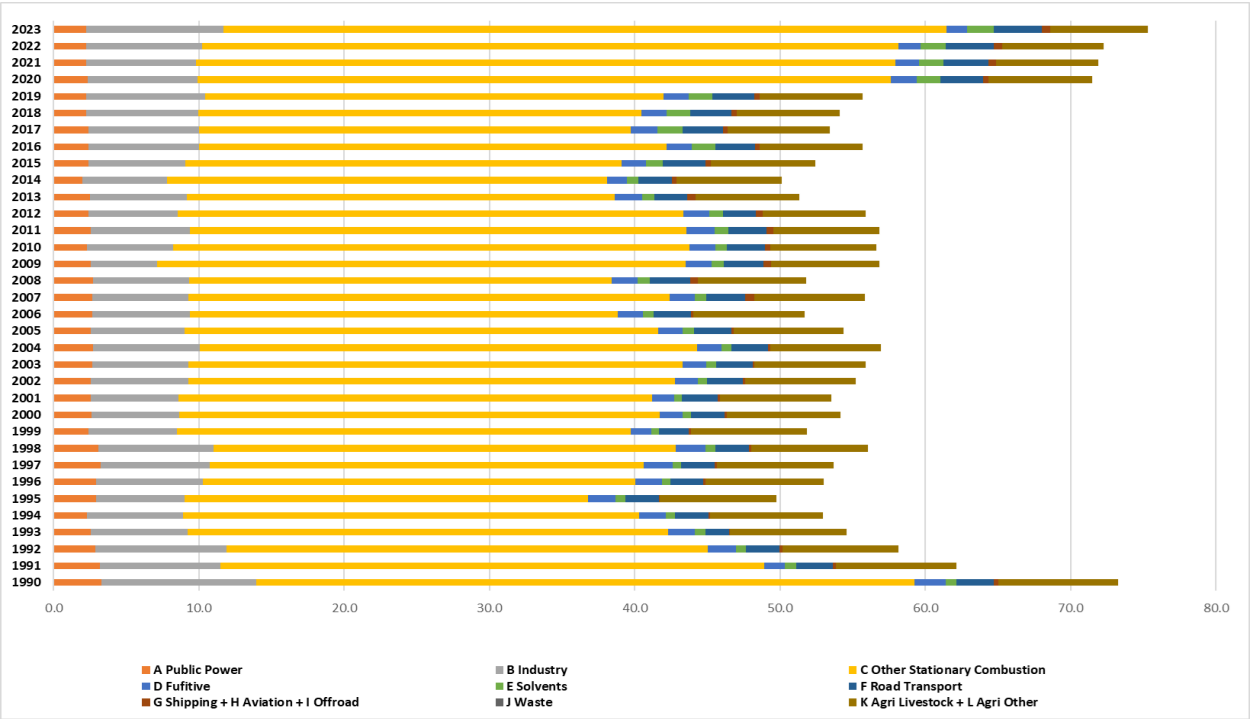


Figure 21. Distribution of PM10 between sectors for period 1990 – 2023.

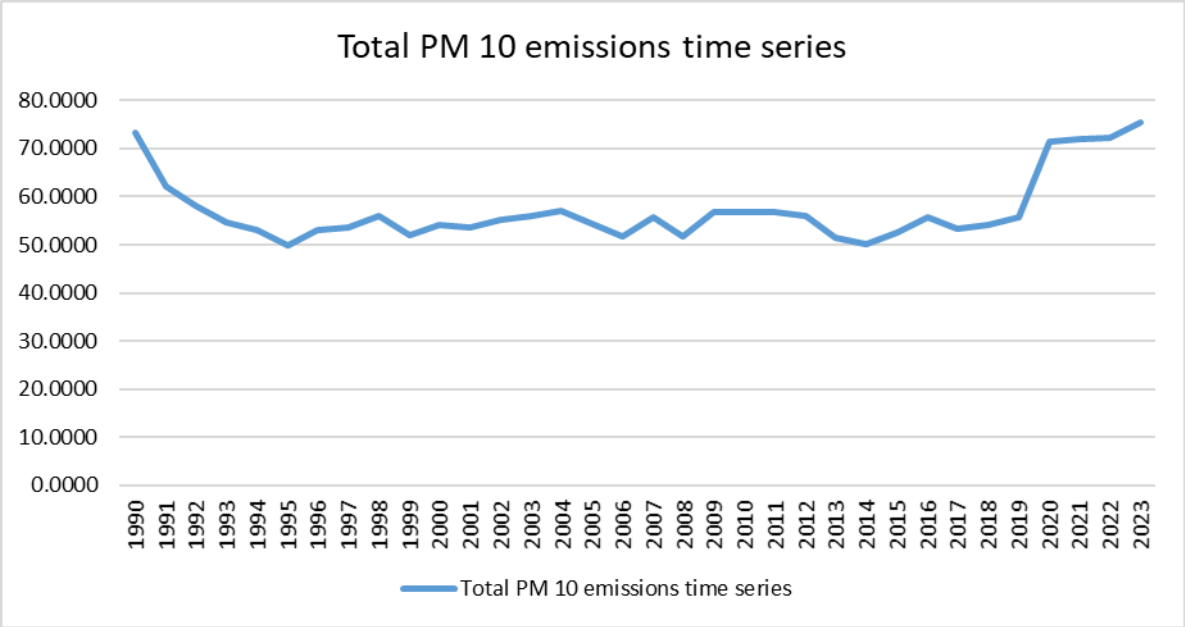
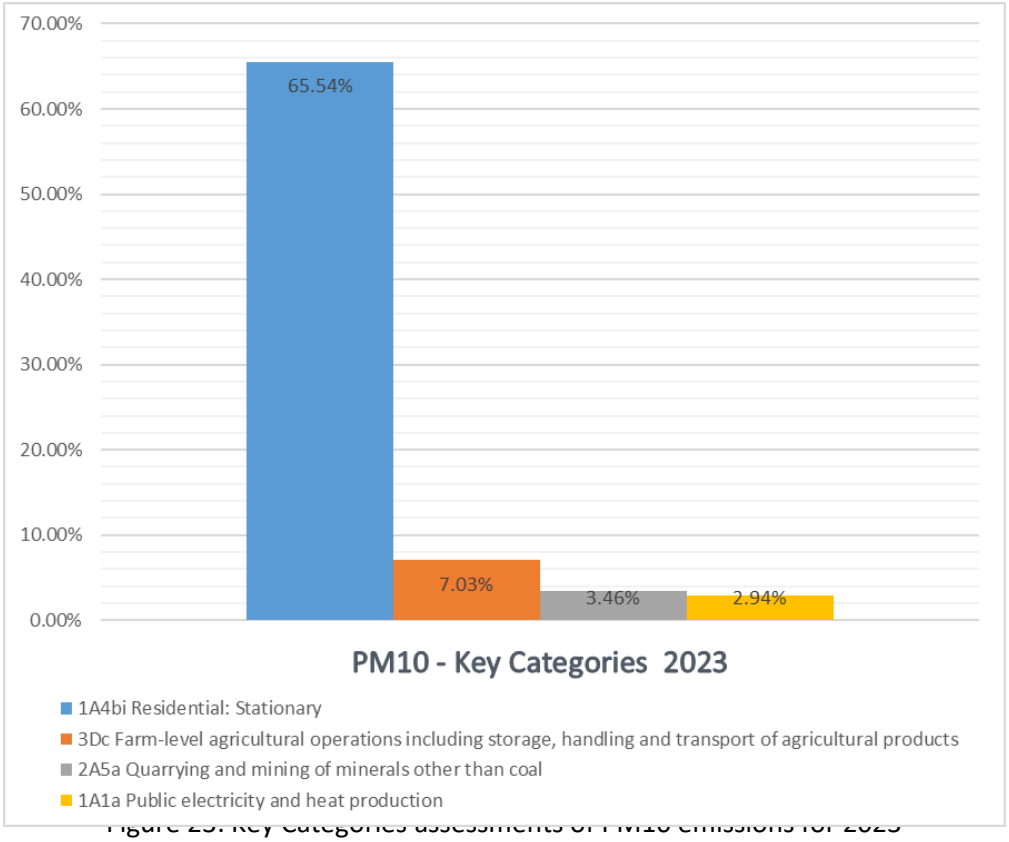


Figure 22.Total PM10 emissions time series from 1990 to 2023.

Table 42. Total PM10 emissions between sectors for years 1990 and 2023. Trends of dominant sources of PM10 emissions compared to years 1990-2023 and 2022-2023. Share in National Total for years 1990 and 2023

NFR Category	PM10 Emission in [kt]		Trend		Share in National Total	
	1990	2023	1990 - 2023	2022 - 2023	1990	2023
A Public Power	3.2981	2.2131	-32.90%	-1.95%	4.50%	2.94%
B Industry	10.6249	9.4932	-10.65%	19.39%	14.50%	12.60%
C Other Stationary Combustion	45.3133	49.7718	9.84%	3.86%	61.85%	66.08%
D Fugitive	2.1701	1.4214	-34.50%	-7.53%	2.96%	1.89%
E Solvents	0.7323	1.7890	144.29%	3.23%	1.00%	2.38%
F Road Transport	2.5770	3.3517	30.06%	0.56%	3.52%	4.45%
G Shipping + H Aviation + I Offroad	0.3085	0.5712	85.14%	-1.86%	0.42%	0.76%
J Waste	0.0000	0.0001	372.52%	-4.86%	0.00%	0.00%
K Agri Livestock + L Agri Other	8.2441	6.7082	-18.63%	-3.49%	11.25%	8.91%
Total	**73.2684**	**75.3198**	**2.80%**	**4.23%**	**100.00%**	**100.00%**



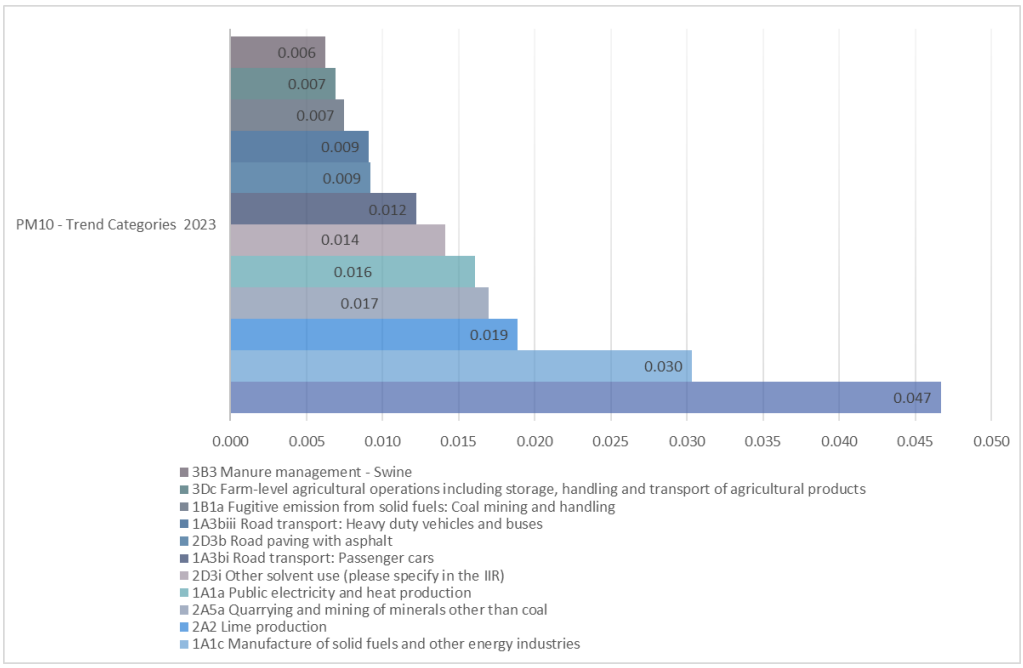


Figure 24. Trends assessments of PM10 emissions for base year and 2023

2.4.7. TSP Emission

TSP emissions in 2023. was 95.5130 kt, which is 3.10 % increase compared to 2022. Compared to the 1990 baseline emissions of TSP is 39.61 % lower.

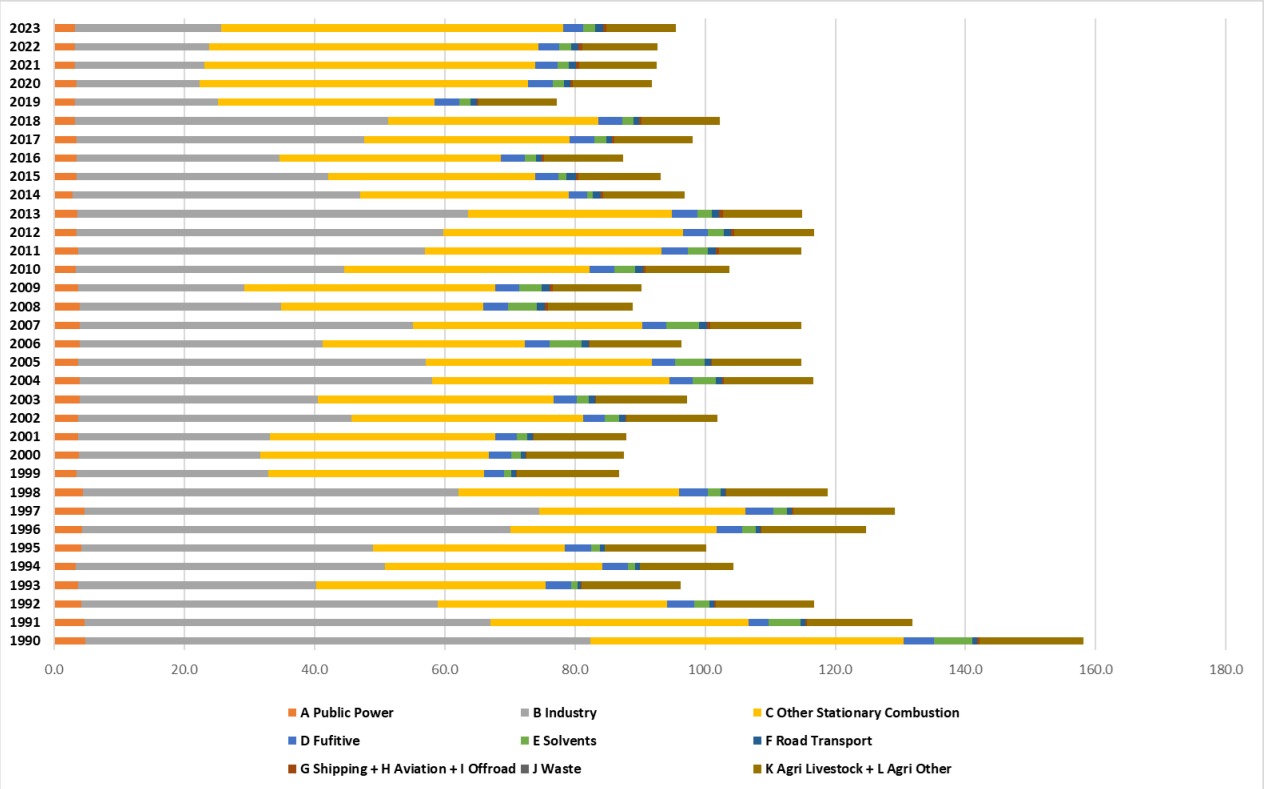


Figure 25.Distribution of TSP between sectors for period 1990 – 2023.

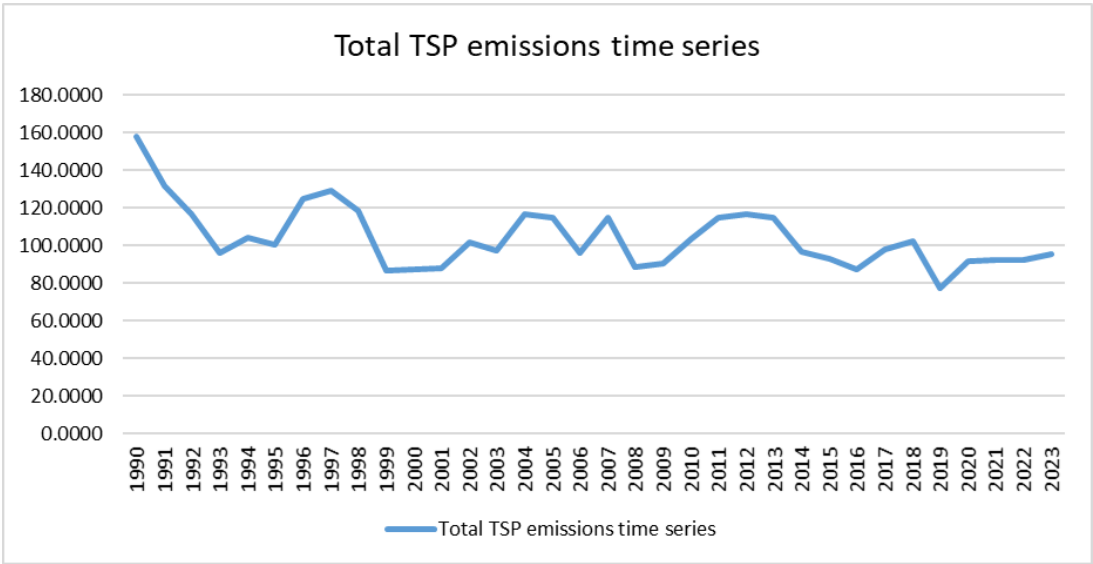


Figure 26. Total TSP emissions time series from 1990 to 2023.

Table 43. Total TSP emissions between sectors for years 1990 and 2023. Trends of dominant sources of TSP emissions compared to years 1990-2023 and 2022-2023. Share in National Total for years 1990 and 2023

NFR Category	TSP Emission in [kt]		Trend		Share in National Total	
	1990	2023	1990 - 2023	2022 - 2023	1990	2023
A Public Power	4.8620	3.2336	-33.49%	-1.94%	3.07%	3.39%
B Industry	77.5659	22.4308	-71.08%	9.27%	49.05%	23.48%
C Other Stationary Combustion	48.0503	52.5684	9.40%	4.01%	30.38%	55.04%
D Fugitive	4.6561	3.0099	-35.36%	-7.42%	2.94%	3.15%
E Solvents	5.8847	1.9018	-67.68%	3.25%	3.72%	1.99%
F Road Transport	0.7886	1.1556	46.54%	5.29%	0.50%	1.21%
G Shipping + H Aviation + I Offroad	0.3078	0.5657	83.81%	-2.10%	0.19%	0.59%
J Waste	0.0000	0.0001	372.52%	-4.86%	0.00%	0.00%
K Agri Livestock + L Agri Other	16.0326	10.6470	-33.59%	-7.49%	10.14%	11.15%
Total	**158.1481**	**95.5130**	**-39.61%**	**3.10%**	**100.00%**	**100.00%**

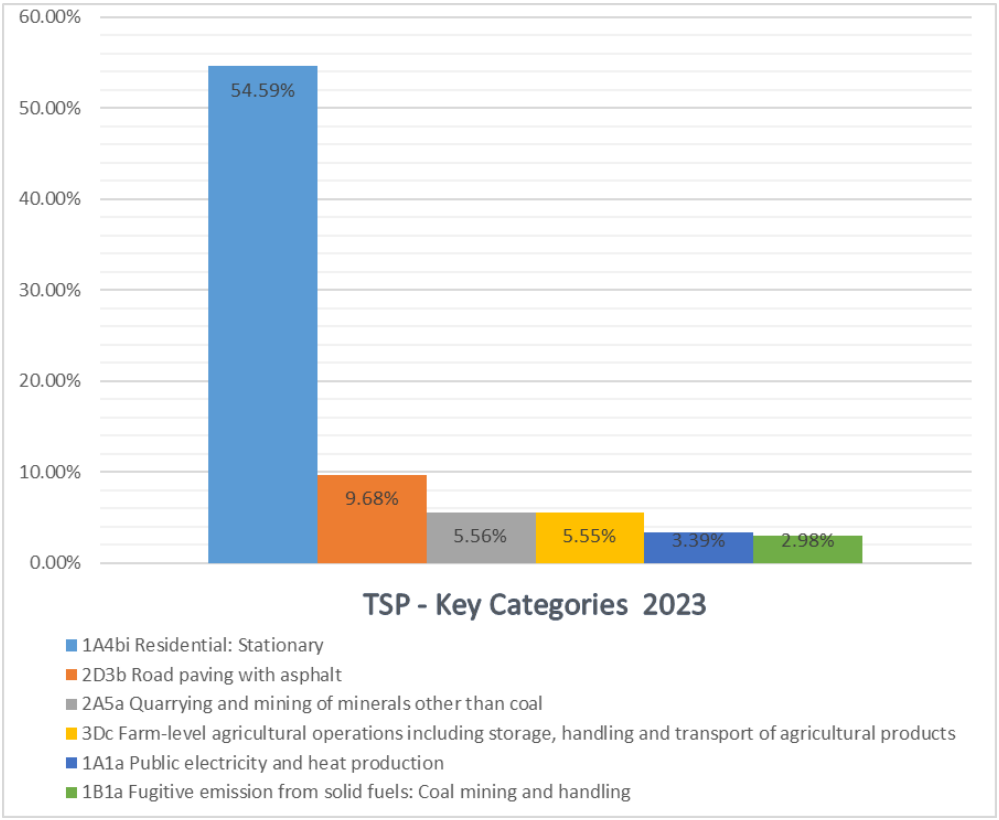


Figure 27. Key Categories assessments of TSP emissions for 2023

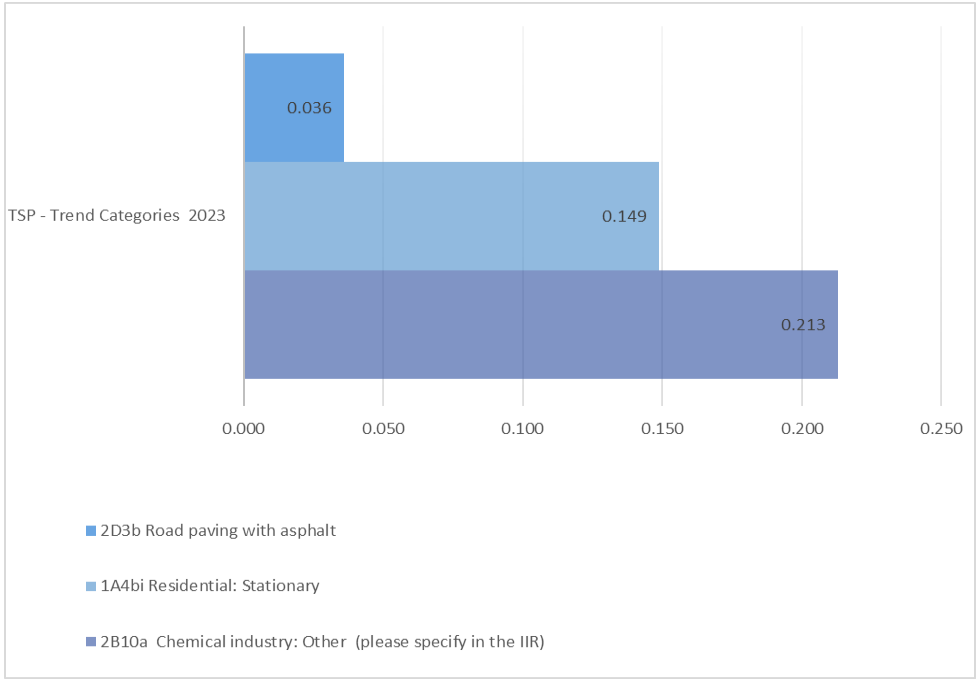


Figure 28. Trends assessments of TSP emissions for base year and 2023

2.4.8. Black Carbon (BC)

BC emissions in 2023. was 5.4338 kt, which is 2.16 % increase compared to 2022. Compared to the 1990 baseline emissions of BC is 23.85 % higher.

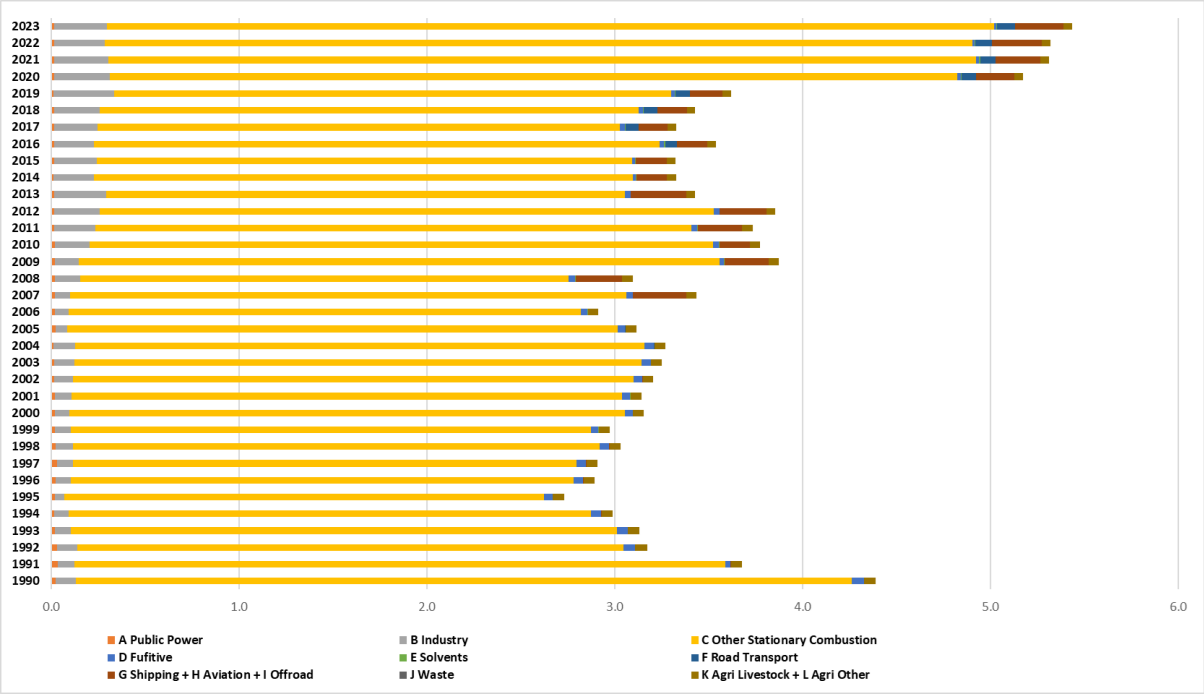


Figure 29. Distribution of BC between sectors for period 1990 – 2023.

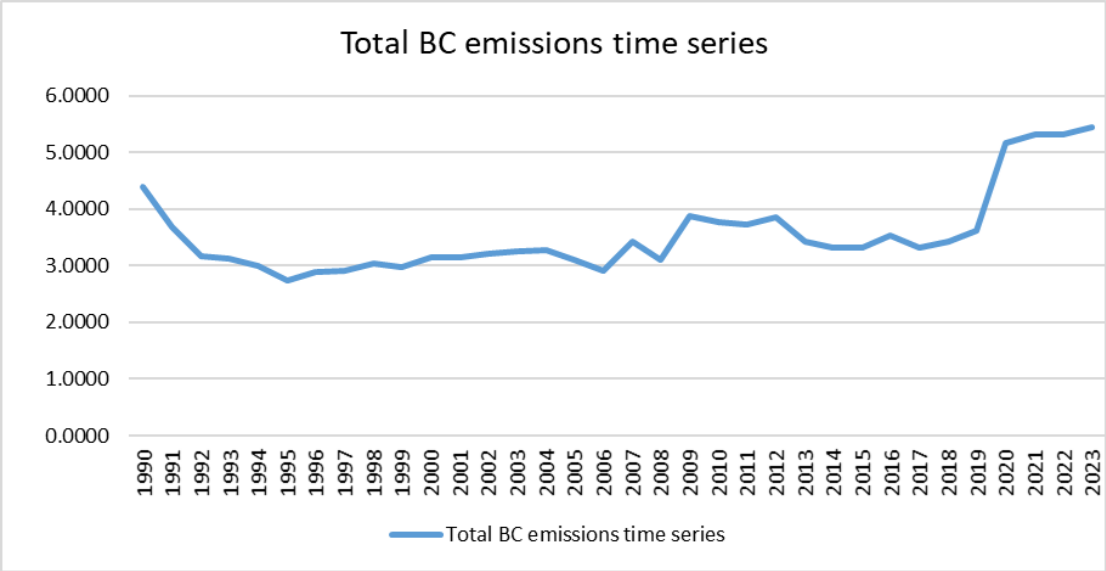


Table 44. Total BC emissions between sectors for years 1990 and 2023. Trends of dominant sources of BC emissions compared to years 1990-2023 and 2022-2023. Share in National Total for years 1990 and 2023

NFR Category	BC Emission in [kt]		Trend		Share in National Total	
	1990	2023	1990 - 2023	2022 - 2023	1990	2023
A Public Power	0.0243	0.0165	-32.17%	-3.62%	0.55%	0.30%
B Industry	0.1060	0.2791	163.24%	3.70%	2.42%	5.14%
C Other Stationary Combustion	4.1311	4.7217	14.30%	2.28%	94.15%	86.89%
D Fugitive	0.0630	0.0124	-80.24%	21.56%	1.44%	0.23%
E Solvents	0.0018	0.0058	225.01%	3.12%	0.04%	0.11%
F Road Transport	0.0002	0.0928	51877.30%	5.53%	0.00%	1.71%
G Shipping + H Aviation + I Offroad	0.0012	0.2610	20877.90%	-2.29%	0.03%	4.80%
J Waste	NA	NA	NA	NA	NA	NA
K Agri Livestock + L Agri Other	0.0600	0.0446	-25.66%	-1.57%	1.37%	0.82%
Total	**4.3876**	**5.4338**	**23.85%**	**2.16%**	**100.00%**	**100.00%**

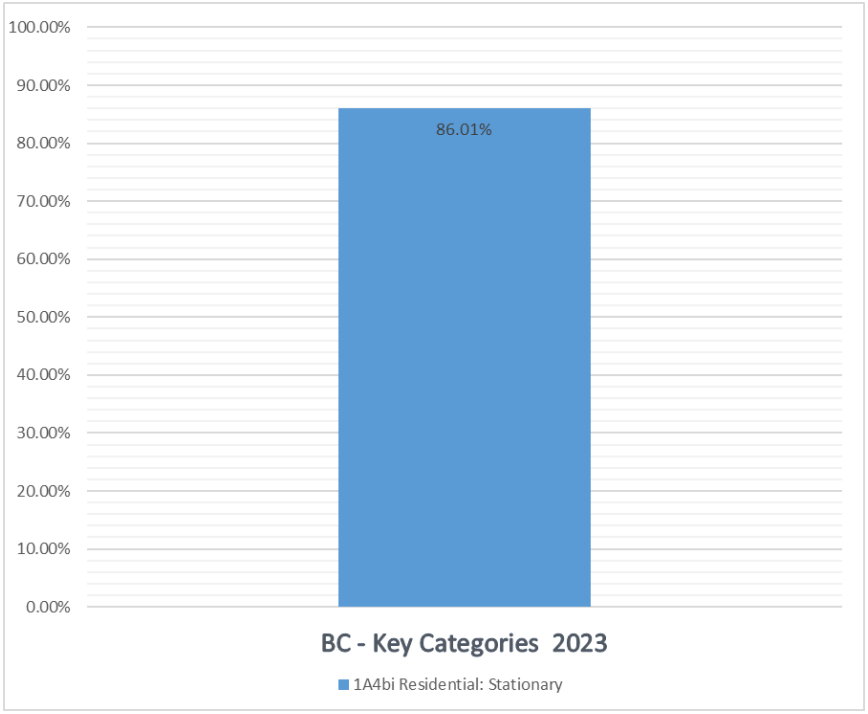


Figure 31. Key Categories assessments of BC emissions for 2023

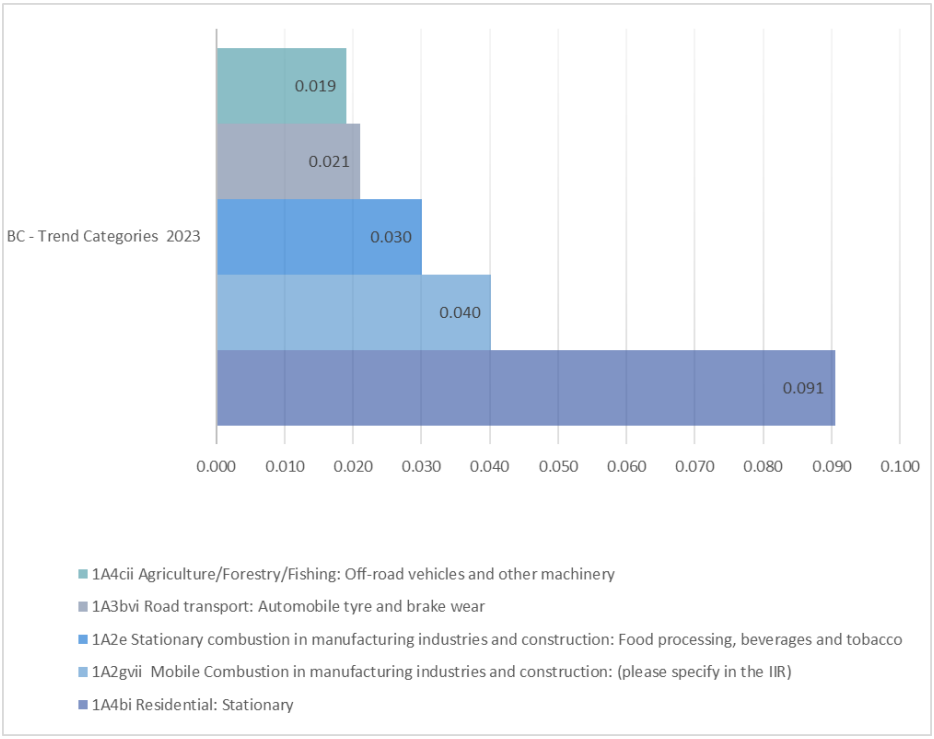


Figure 32. Trends assessments of BC emissions for base year and 2023

OTHER

2.4.9. Carbon Monoxide (CO)

Carbon monoxide (CO) emissions in 2023. was 377.4544kt, which is 5.47 % increase compared to 2022. Compared to the 1990 baseline emissions of CO is 27.08 % lower.

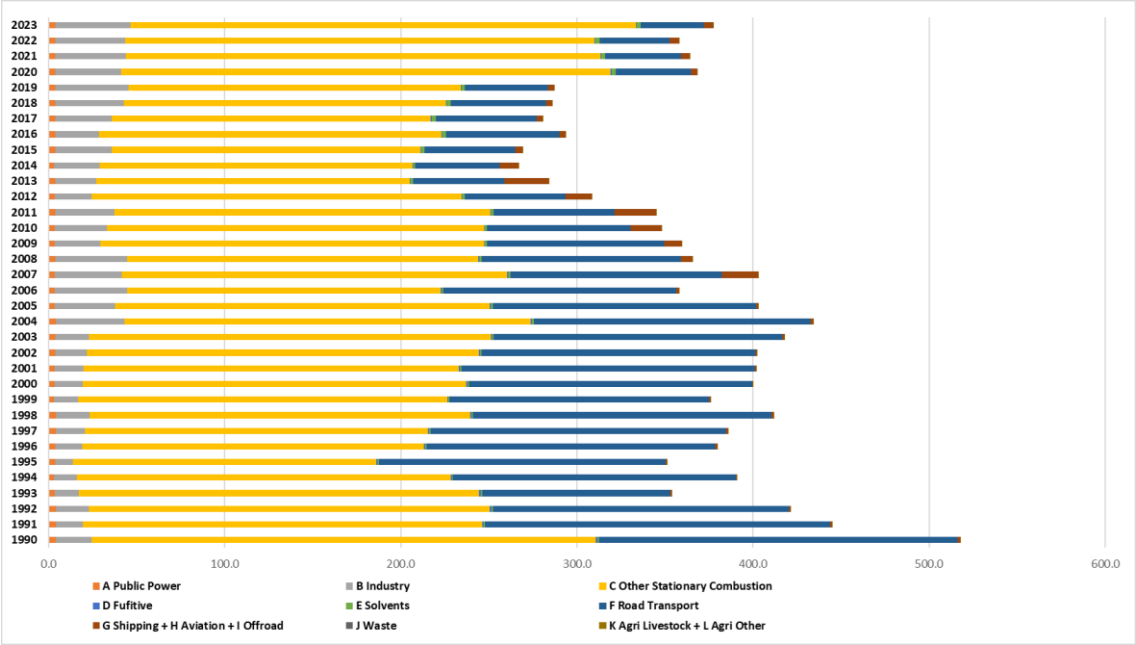


Figure 33. Distribution of CO between sectors for period 1990 – 2023

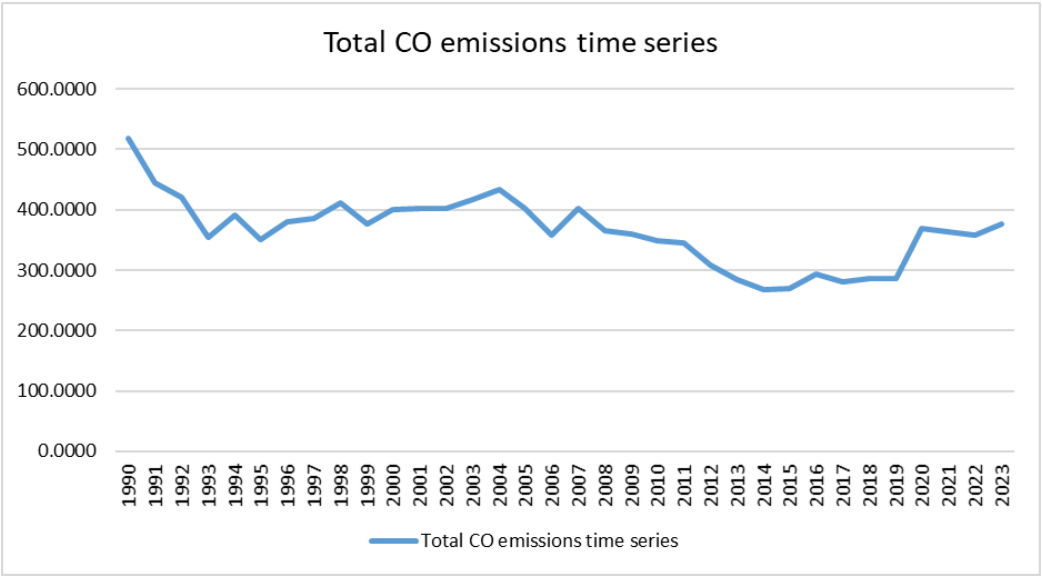


Figure 34. Total CO emissions time series from 1990 to 2023.

Table 45. Total CO emissions between sectors for years 1990 and 2023. Trends of dominant sources of CO emissions compared to years 1990-2023 and 2022-2023. Share in National Total for years 1990 and 2023

NFR Category	CO Emission in [kt]		Trend		Share in National Total	
	1990	2023	1990 - 2023	2022 - 2023	1990	2023
A Public Power	4.3209	4.0151	-7.08%	-0.99%	0.83%	1.06%
B Industry	20.1935	42.5369	110.65%	7.87%	3.90%	11.27%
C Other Stationary Combustion	286.0574	286.8554	0.28%	7.62%	55.26%	76.00%
D Fugitive	1.1634	0.3505	-69.87%	7.19%	0.22%	0.09%
E Solvents	0.8047	2.6153	225.01%	3.12%	0.16%	0.69%
F Road Transport	203.5089	35.5886	-82.51%	-10.16%	39.31%	9.43%
G Shipping + H Aviation + I Offroad	1.4480	5.3820	271.70%	2.11%	0.28%	1.43%
J Waste	0.0001	0.0005	372.52%	-4.86%	0.00%	0.00%
K Agri Livestock + L Agri Other	0.1482	0.1101	-25.66%	-1.57%	0.03%	0.03%
Total	**517.6450**	**377.4544**	**-27.08%**	**5.47%**	**100.00%**	**100.00%**

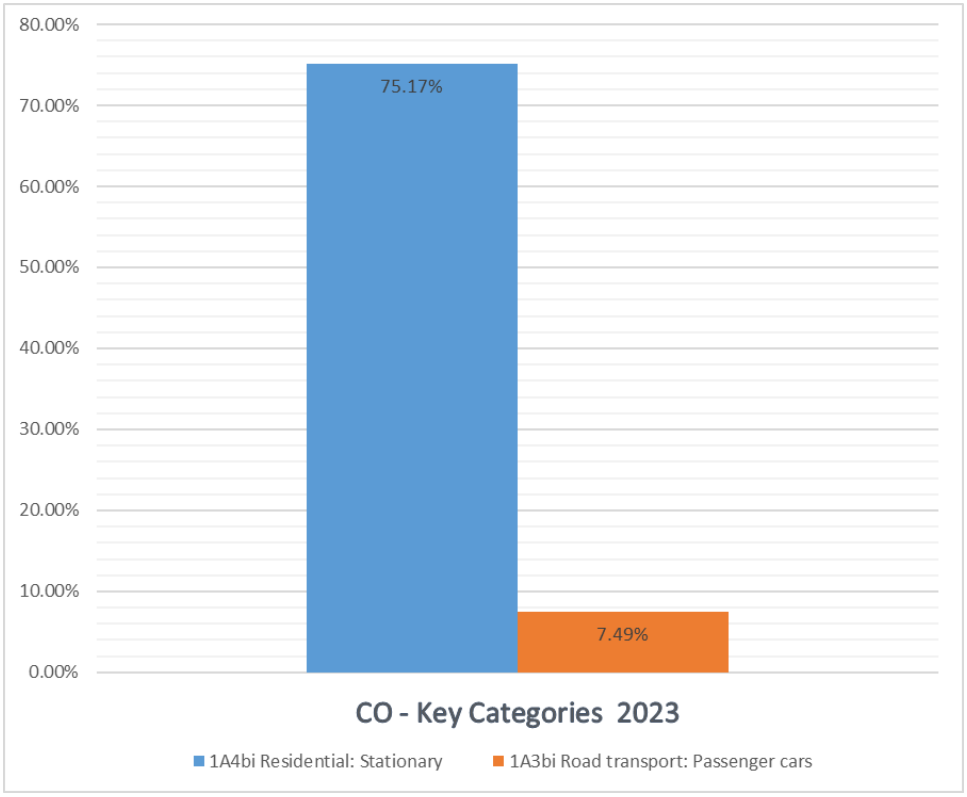


Figure 35. Key Categories assessments of CO emissions for 2023.

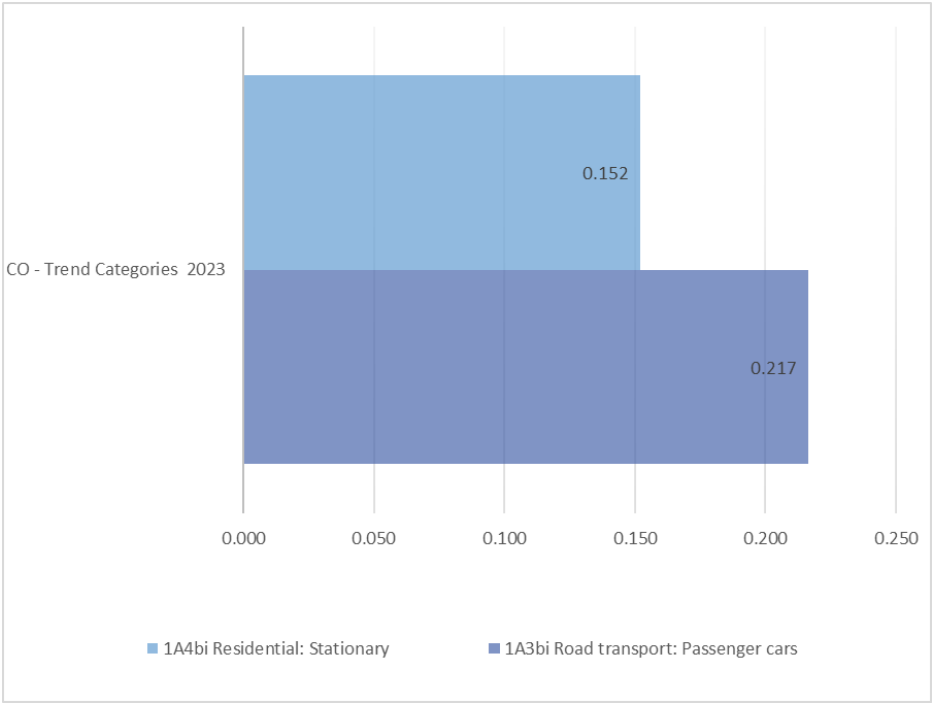


Figure 36. Trends assessments of CO emissions for base year and 2023

PRIORITY HEAVY METALS

2.4.10. Lead Emission (PB)

Lead (Pb) emissions in 2023. was 30.7837 kt, which is 9.36 % decrease compared to 2022. Compared to the 1990 baseline emissions of Pb is 91.73 % lower.

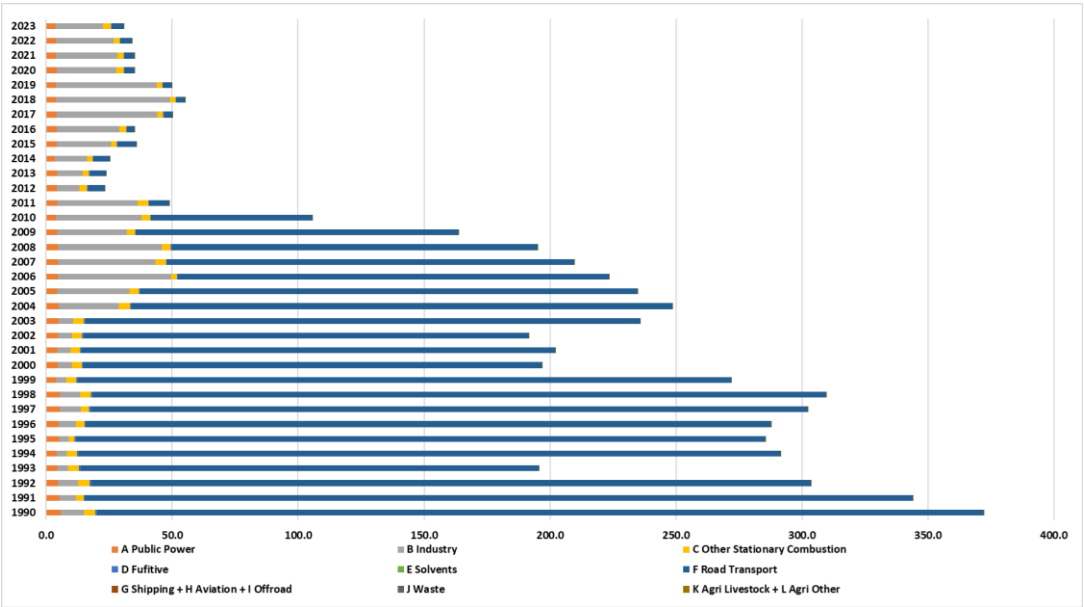


Figure 37. Distribution of Pb between sectors for period 1990 - 2023

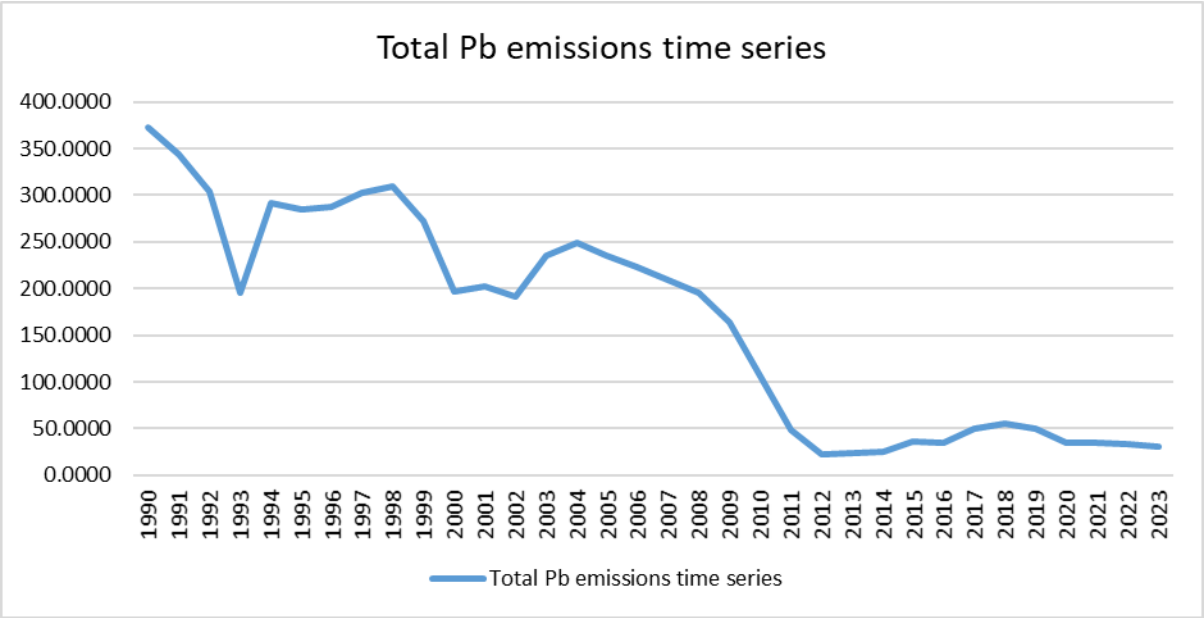


Figure 38. Total Pb emissions time series from 1990 to 2023.

Table 46. Total Pb emissions between sectors for years 1990 and 2023. Trends of dominant sources of Pb emissions compared to years 1990-2023 and 2022-2023. Share in National Total for years 1990 and 2023

NFR Category	Pb Emission in [kt]		Trend		Share in National Total	
	1990	2023	1990 - 2023	2022 - 2023	1990	2023
A Public Power	5.7495	3.8043	-33.83%	-1.63%	1.54%	12.36%
B Industry	9.3093	18.8383	102.36%	-17.44%	2.50%	61.20%
C Other Stationary Combustion	4.4439	3.2475	-26.92%	29.49%	1.19%	10.55%
D Fugitive	0.8152	0.1699	-79.16%	19.14%	0.22%	0.55%
E Solvents	NA	NA	NA	NA	NA	NA
F Road Transport	351.8605	4.7200	-98.66%	2.13%	94.54%	15.33%
G Shipping + H Aviation + I Offroad	0.0072	0.0034	-52.50%	0.00%	0.00%	0.01%
J Waste	0.0000	0.0001	372.52%	-4.86%	0.00%	0.00%
K Agri Livestock + L Agri Other	0.0002	0.0002	-25.66%	-1.57%	0.00%	0.00%
Total	**372.1859**	**30.7837**	**-91.73%**	**-9.36%**	**100.00%**	**100.00%**

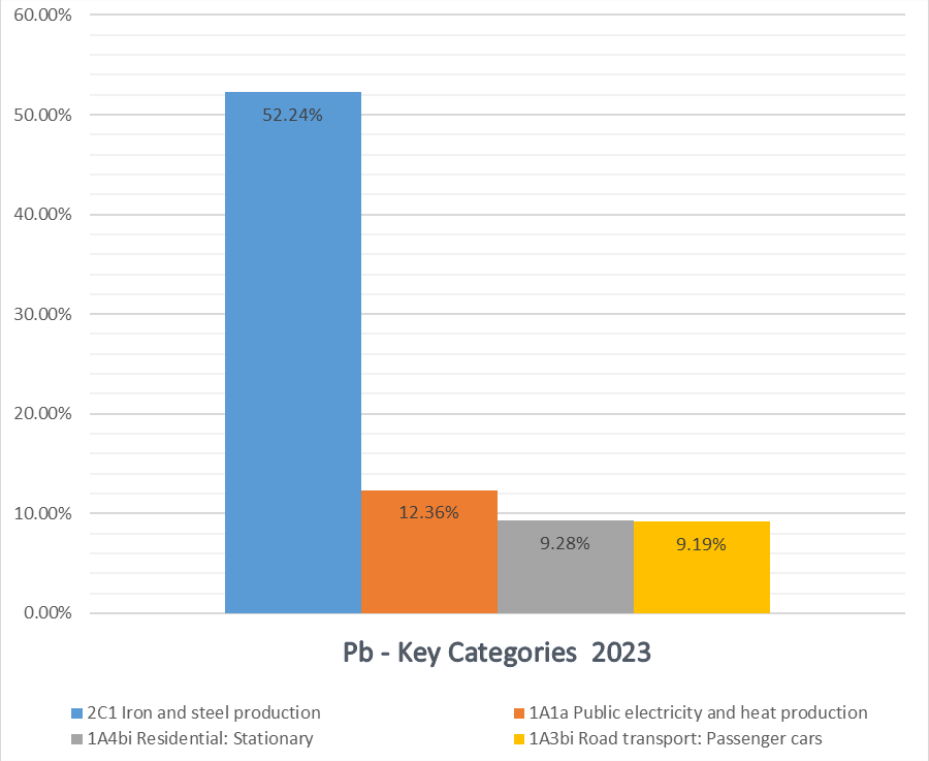


Figure 39. Key Categories assessments of Pb emissions for 2023.

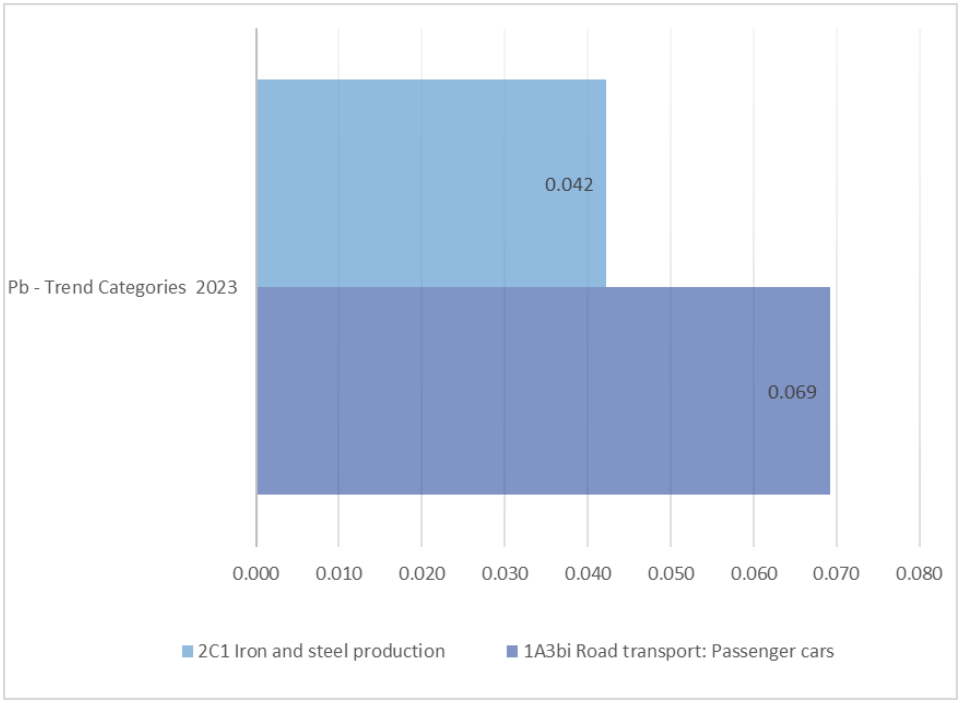


Figure 40. Trends assessments of Pb emissions for base year and 2023

2.4.11. Cadmium Emission (CD)

Cadmium (Cd) emissions in 2023. was 2.6509 t, which is 25.55 % increase compared to 2022. Compared to the 1990 baseline emissions of Cd is 33.20 % lower.

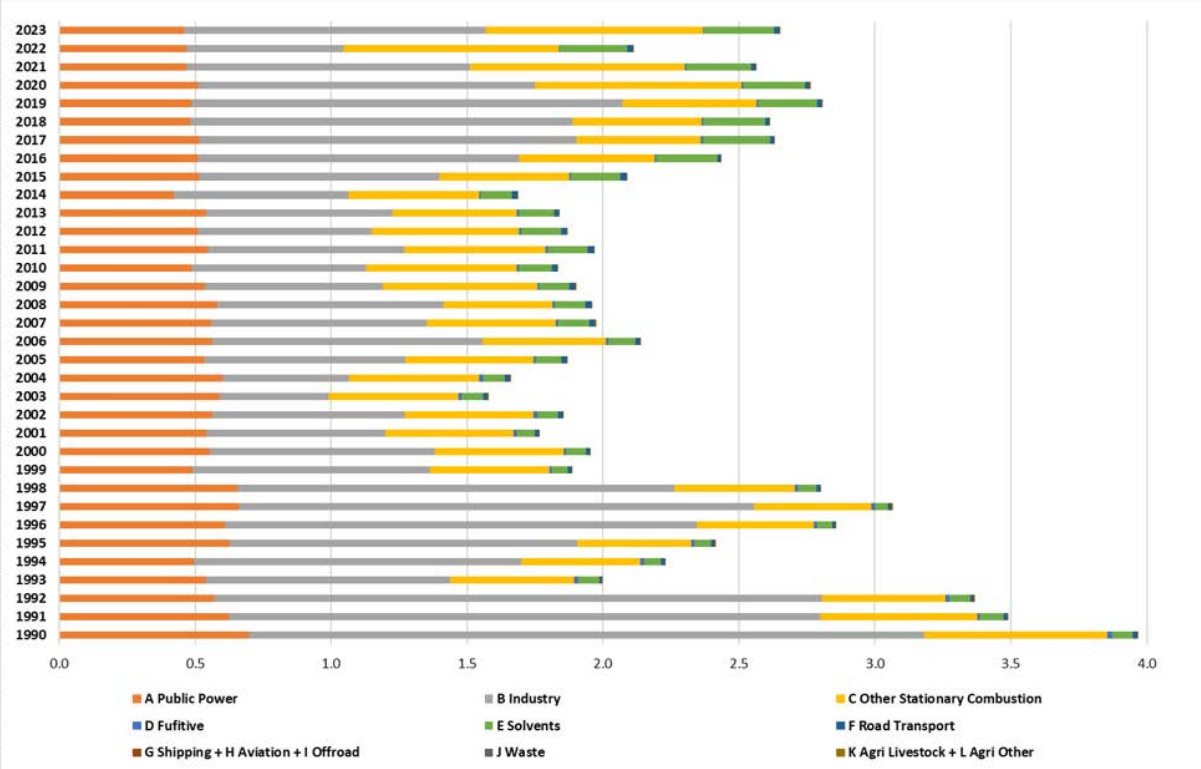


Figure 41. Distribution of Cd between sectors for period 1990 – 2023

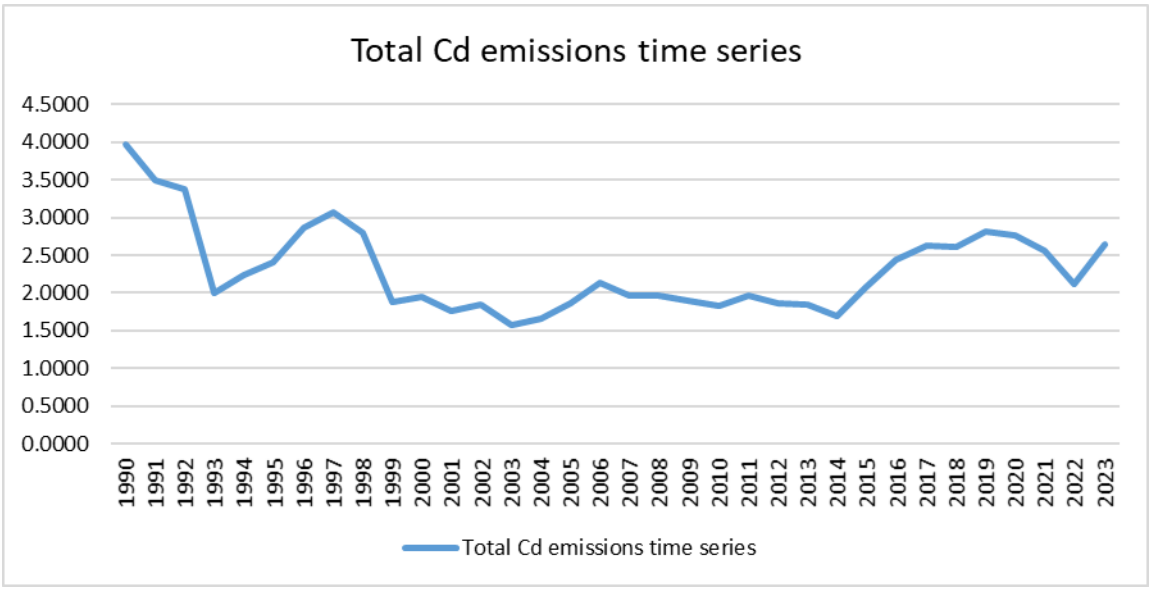


Figure 42.Total Cd emissions time series from 1990 to 2023.

Table 47. Total Cd emissions between sectors for years 1990 and 2023. Trends of dominant sources of Cd emissions compared to years 1990-2023 and 2022-2023. Share in National Total for years 1990

and 2023

NFR Category	Cd Emission in [kt]		Trend		Share in National Total	
	1990	2023	1990 - 2023	2022 - 2023	1990	2023
A Public Power	0.6972	0.4603	-33.98%	-1.66%	17.57%	17.36%
B Industry	2.4832	1.1070	-55.42%	91.69%	62.57%	41.76%
C Other Stationary Combustion	0.6736	0.8000	18.76%	1.14%	16.97%	30.18%
D Fugitive	0.0171	0.0049	-71.65%	8.72%	0.43%	0.18%
E Solvents	0.0789	0.2563	224.84%	3.12%	1.99%	9.67%
F Road Transport	0.0155	0.0205	32.31%	2.96%	0.39%	0.77%
G Shipping + H Aviation + I Offroad	0.0011	0.0005	-56.17%	-2.04%	0.03%	0.02%
J Waste	0.0000	0.0000	372.52%	-4.86%	0.00%	0.00%
K Agri Livestock + L Agri Other	0.0020	0.0015	-25.66%	-1.57%	0.05%	0.05%
Total	**3.9686**	**2.6509**	**-33.20%**	**25.55%**	**100.00%**	**100.00%**

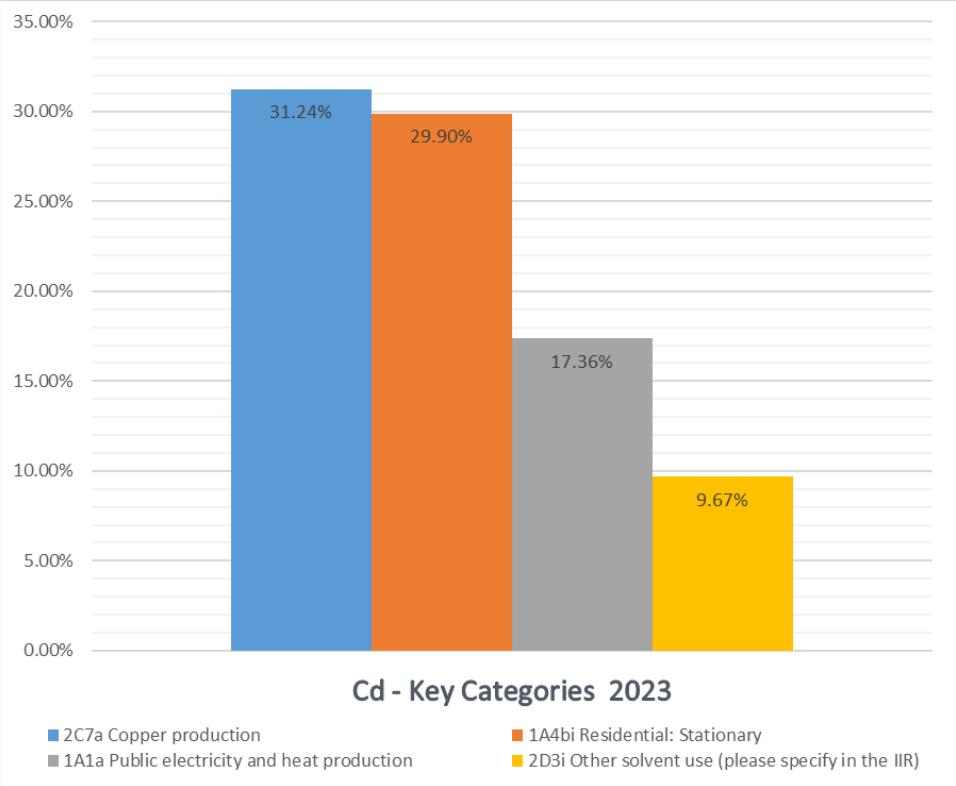


Figure 43. Key Categories assessments of Cd emissions for 2023.

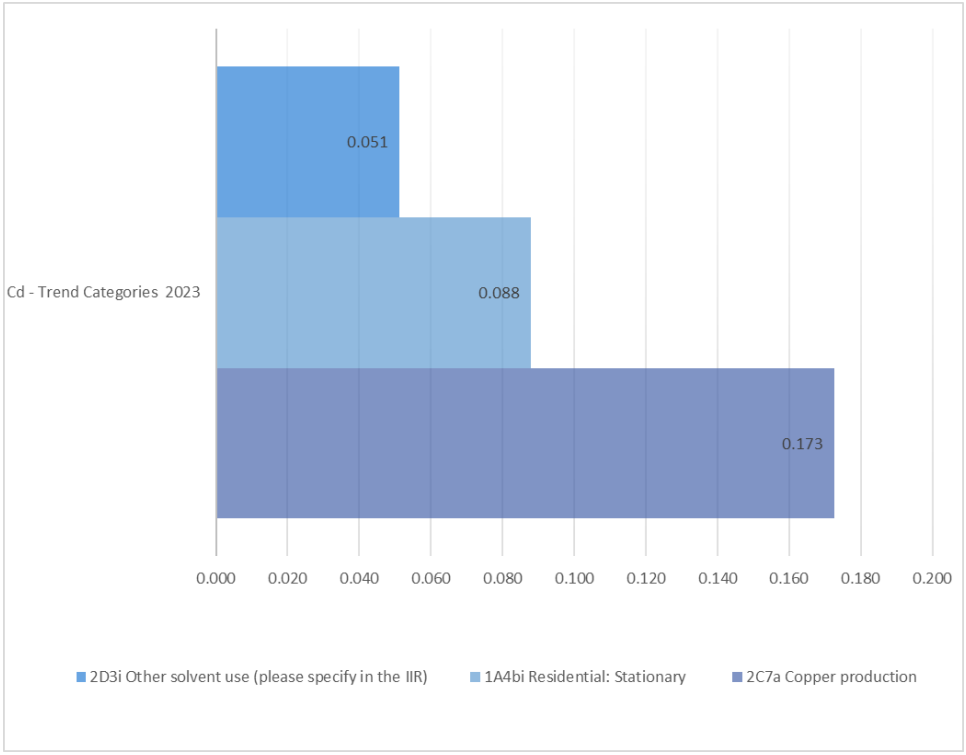


Figure 44. Trends assessments of Cd emissions for base year and 2023

2.4.12. Mercury Emission (HG)

Mercury (Hg) emissions in 2023. was 1.5528 t, which is 16.80 % increase compared to 2022. Compared to the 1990 baseline emissions of Cd is 43.45 % lower.

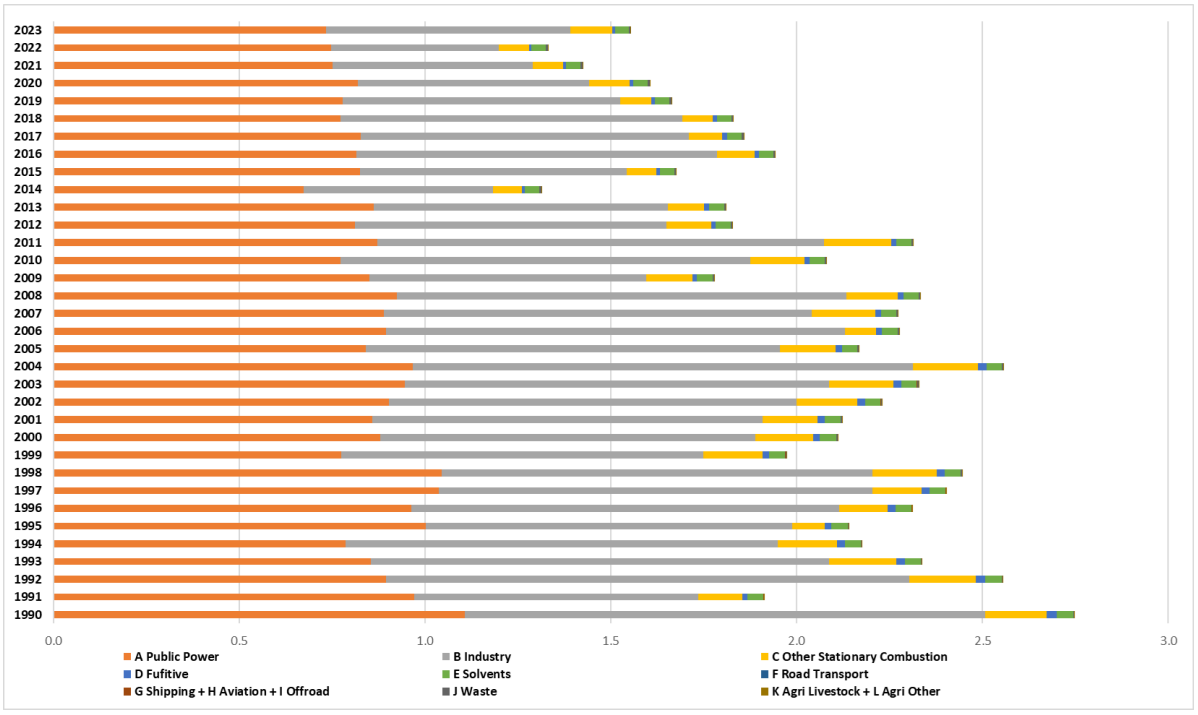


Figure 45. Distribution of Hg between sectors for period 1990 – 2023

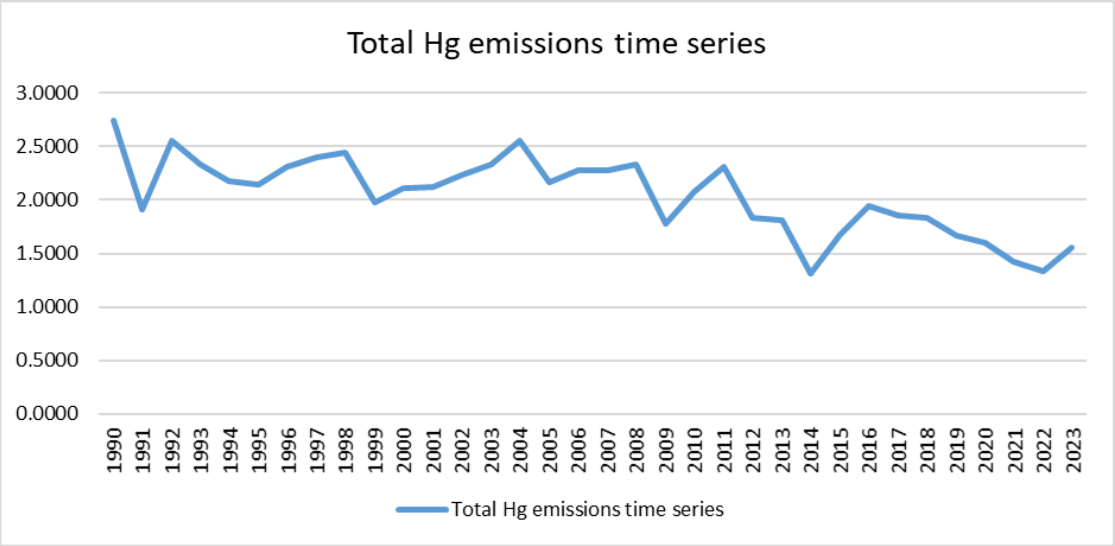


Figure 46. Total Hg emissions time series from 1990 to 2023.

Table 48. Total Hg emissions between sectors for years 1990 and 2023. Trends of dominant sources of Hg emissions compared to years 1990-2023 and 2022-2023. Share in National Total for years 1990 and 2023.

NFR Category	Hg Emission in [kt]		Trend		Share in National Total	
	1990	2023	1990 - 2023	2022 - 2023	1990	2023
A Public Power	1.1066	0.7338	-33.69%	-1.59%	40.30%	47.26%
B Industry	1.4013	0.6564	-53.16%	44.89%	51.03%	42.27%
C Other Stationary Combustion	0.1639	0.1127	-31.27%	38.99%	5.97%	7.26%
D Fugitive	0.0281	0.0073	-73.97%	11.12%	1.02%	0.47%
E Solvents	0.0438	0.0370	-15.61%	-0.54%	1.60%	2.38%
F Road Transport	NA	NA	NA	NA	NA	NA
G Shipping + H Aviation + I Offroad	0.0008	0.0004	-52.50%	0.00%	0.03%	0.02%
J Waste	0.0011	0.0050	372.52%	-4.86%	0.04%	0.33%
K Agri Livestock + L Agri Other	0.0003	0.0002	-25.66%	-1.57%	0.01%	0.01%
Total	**2.7460**	**1.5528**	**-43.45%**	**16.80%**	**100.00%**	**100.00%**

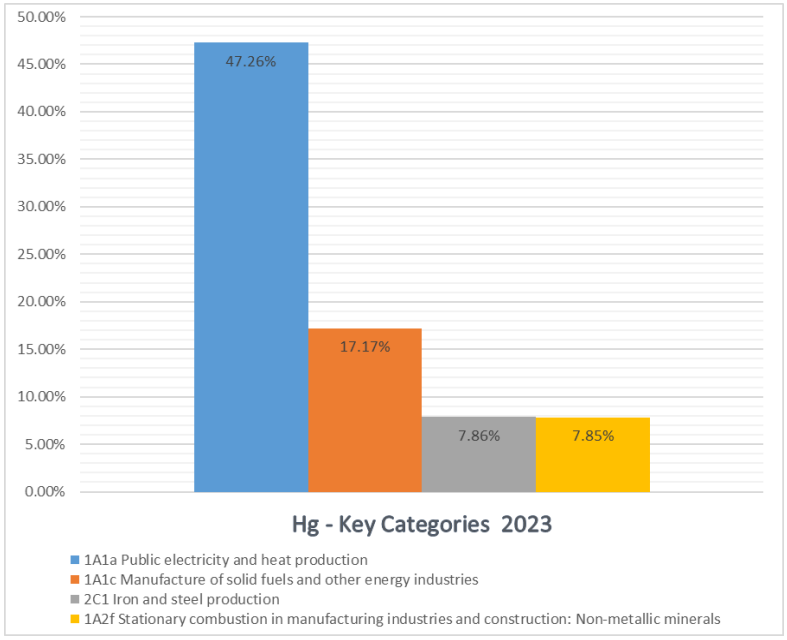


Figure 47. Key Categories assessments of Hg emissions for 2023.

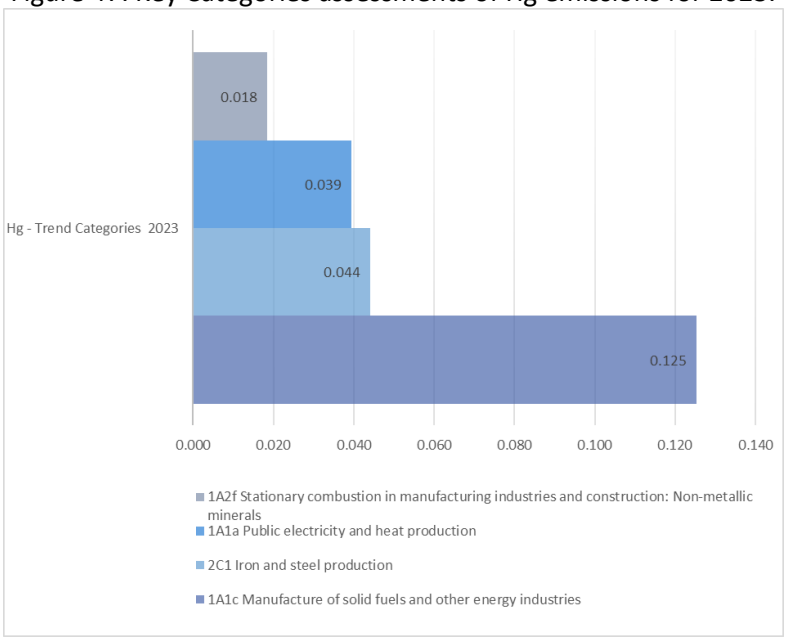


Figure 48. Trends assessments of Hg emissions for base year and 2023

Other Heavy Metals (AS, CR, CU, NI, SE AND ZN)

2.4.13. Arsenic emission (AS)

Arsenic (As) emissions in 2023. was 5.0871 t, which is 5.82 % increase compared to 2022. Compared to the 1990 baseline emissions of As is 34.23 % lower.

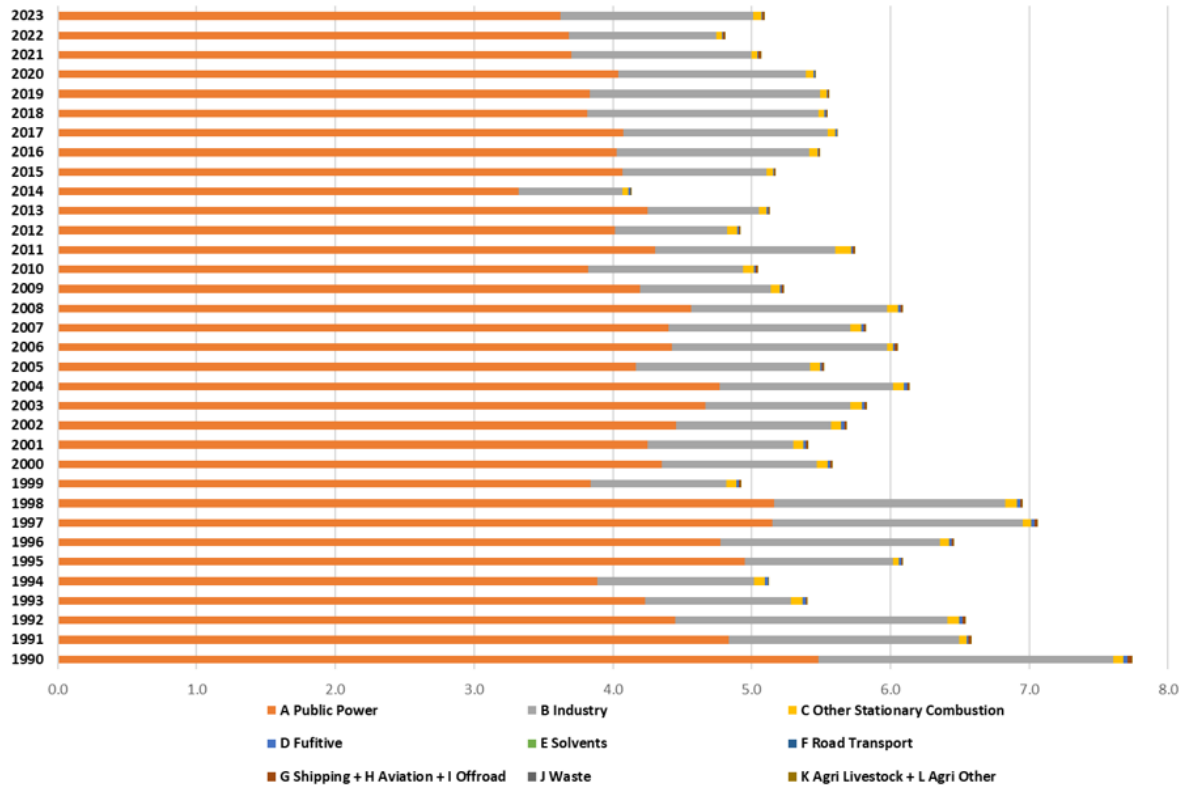


Figure 49. Distribution of As between sectors for period 1990 – 2023.

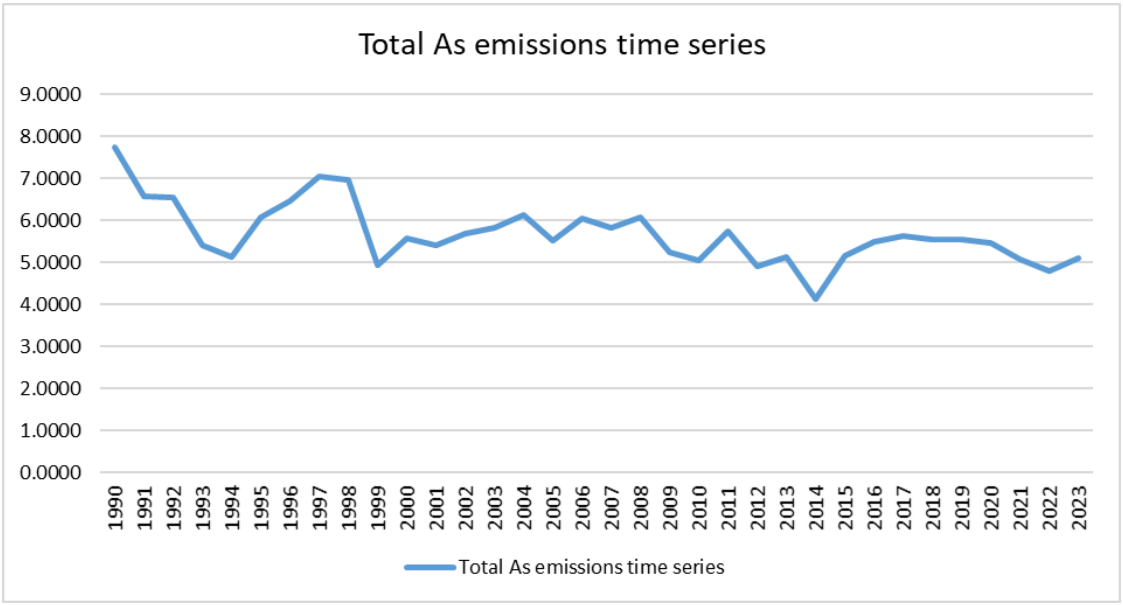


Figure 50.Total As emissions time series from 1990 to 2023.

Table 49. Total As emissions between sectors for years 1990 and 2023. Trends of dominant sources of As emissions compared to years 1990-2023 and 2022-2023. Share in National Total for years 1990 and 2023

NFR Category	As Emission in [kt]		Trend		Share in National Total	
	1990	2023	1990 - 2023	2022 - 2023	1990	2023
A Public Power	5.4803	3.6227	-33.90%	-1.63%	70.85%	71.21%
B Industry	2.1222	1.3879	-34.60%	31.02%	27.44%	27.28%
C Other Stationary Combustion	0.0769	0.0578	-24.89%	21.44%	0.99%	1.14%
D Fugitive	0.0279	0.0058	-79.19%	19.20%	0.36%	0.11%
E Solvents	0.0002	NA	NA	NA	0.00%	NA
F Road Transport	NA	NA	NA	NA	NA	NA
G Shipping + H Aviation + I Offroad	0.0272	0.0129	-52.50%	0.00%	0.35%	0.25%
J Waste	0.0000	0.0000	372.52%	-4.86%	0.00%	0.00%
K Agri Livestock + L Agri Other	0.0000	0.0000	-25.66%	-1.57%	0.00%	0.00%
Total	**7.7347**	**5.0871**	**-34.23%**	**5.82%**	**100.00%**	**100.00%**

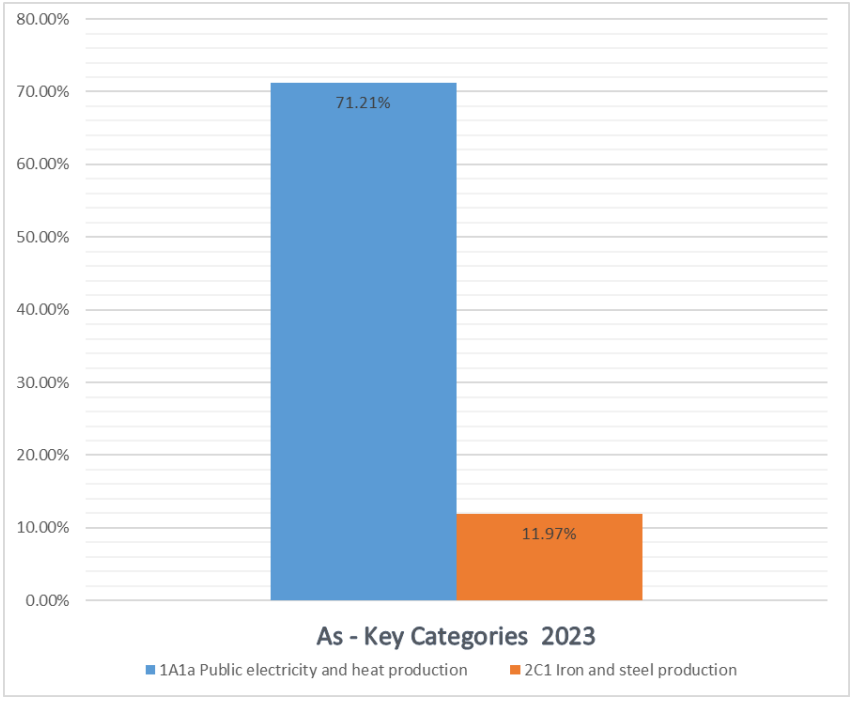


Figure 51. Key Categories assessments of As emissions for 2023

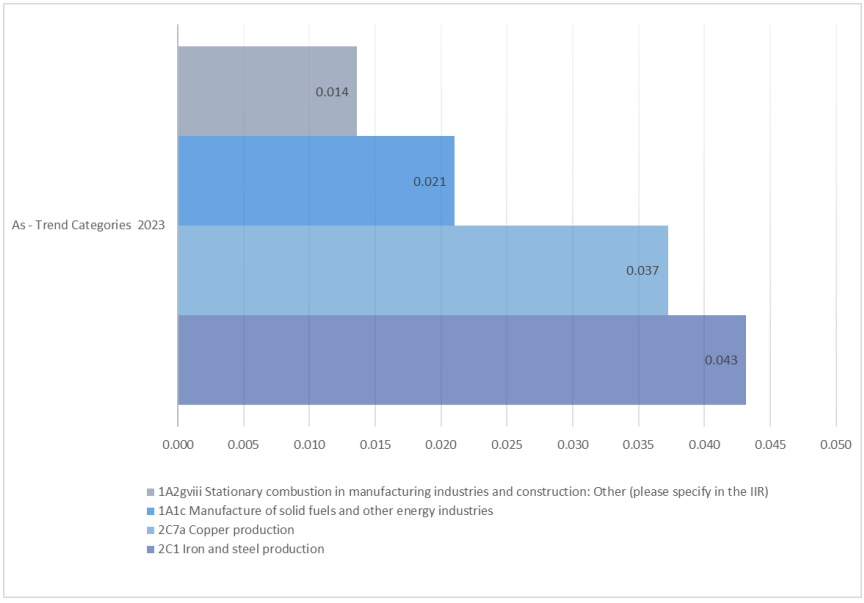


Figure 52. Trends assessments of As emissions for base year and 2023

2.4.14. Chromium emission (Cr)

Chromium (Cr) emissions in 2023. was 11.1939t, which is 0.98 % decrease compared to 2022. Compared to the 1990 baseline emissions of Cr is 3.49 % lower.

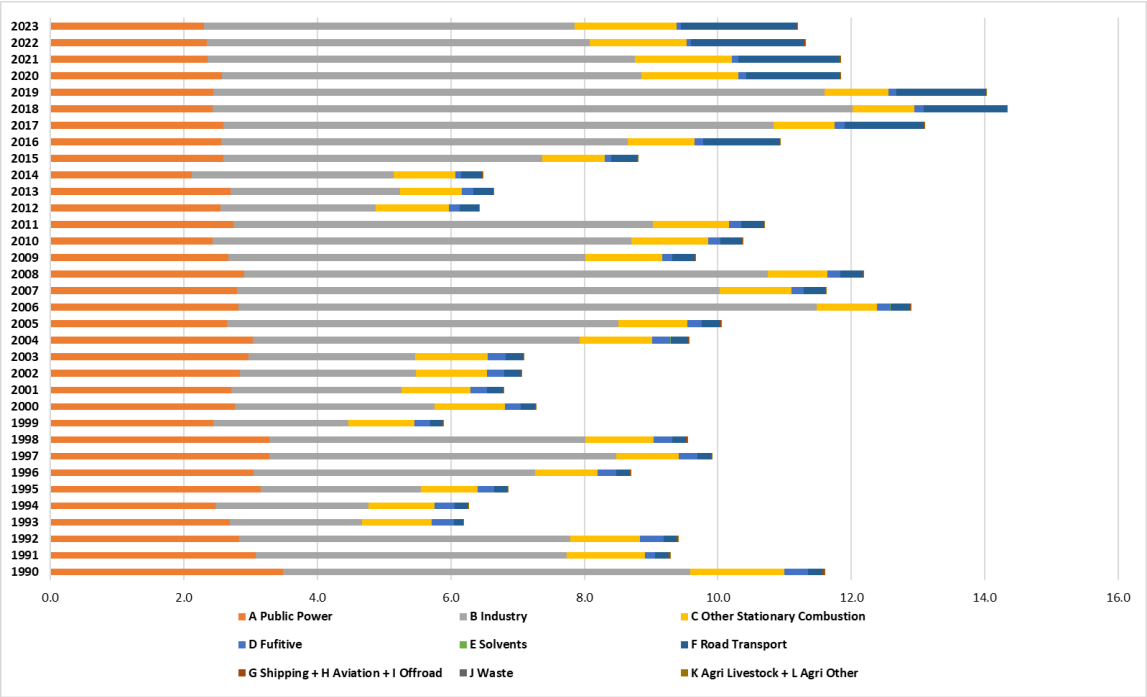


Figure 53. Distribution of Cr between sectors for period 1990 – 2023.

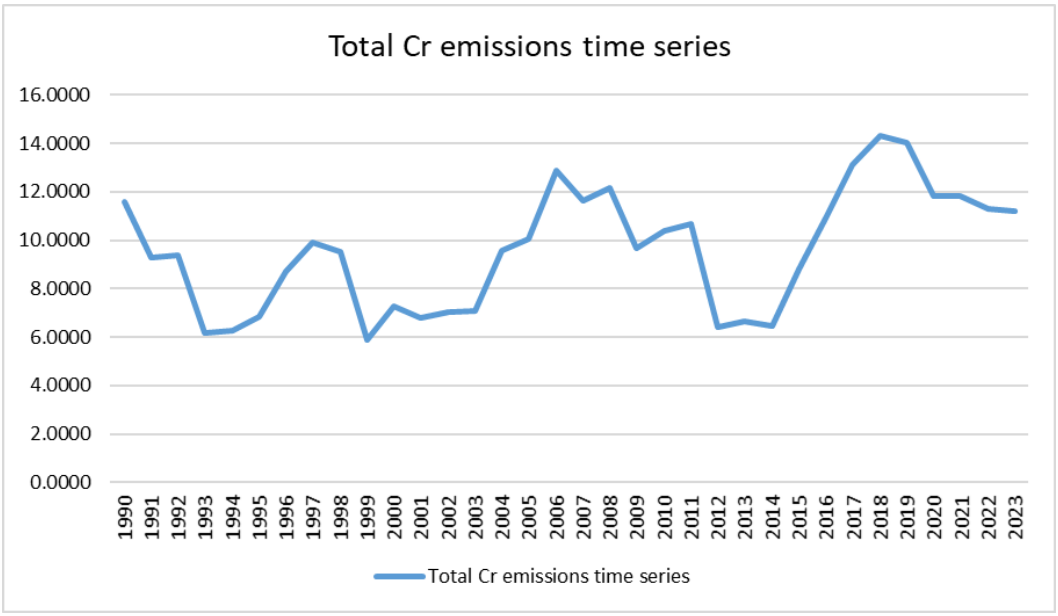


Figure 54. Total Cr emissions time series from 1990 to 2023.

Table 50. Total Cr emissions between sectors for years 1990 and 2023. Trends of dominant sources of Cr emissions compared to years 1990-2023 and 2022-2023. Share in National Total for years 1990 and 2023

NFR Category	Cr Emission in [kt]		Trend		Share in National Total	
	1990	2023	1990 - 2023	2022 - 2023	1990	2023
A Public Power	3.4859	2.3040	-33.91%	-1.63%	30.05%	20.58%
B Industry	6.1020	5.5477	-9.08%	-3.22%	52.61%	49.56%
C Other Stationary Combustion	1.4051	1.5274	8.71%	4.64%	12.11%	13.65%
D Fugitive	0.3588	0.0712	-80.16%	21.36%	3.09%	0.64%
E Solvents	0.0025	NA	NA	NA	0.02%	NA
F Road Transport	0.2136	1.7293	709.59%	1.89%	1.84%	15.45%
G Shipping + H Aviation + I Offroad	0.0303	0.0142	-53.17%	-0.35%	0.26%	0.13%
J Waste	0.0000	0.0000	372.52%	-4.86%	0.00%	0.00%
K Agri Livestock + L Agri Other	0.0002	0.0001	-25.66%	-1.57%	0.00%	0.00%
Total	**11.5985**	**11.1939**	**-3.49%**	**-0.98%**	**100.00%**	**100.00%**

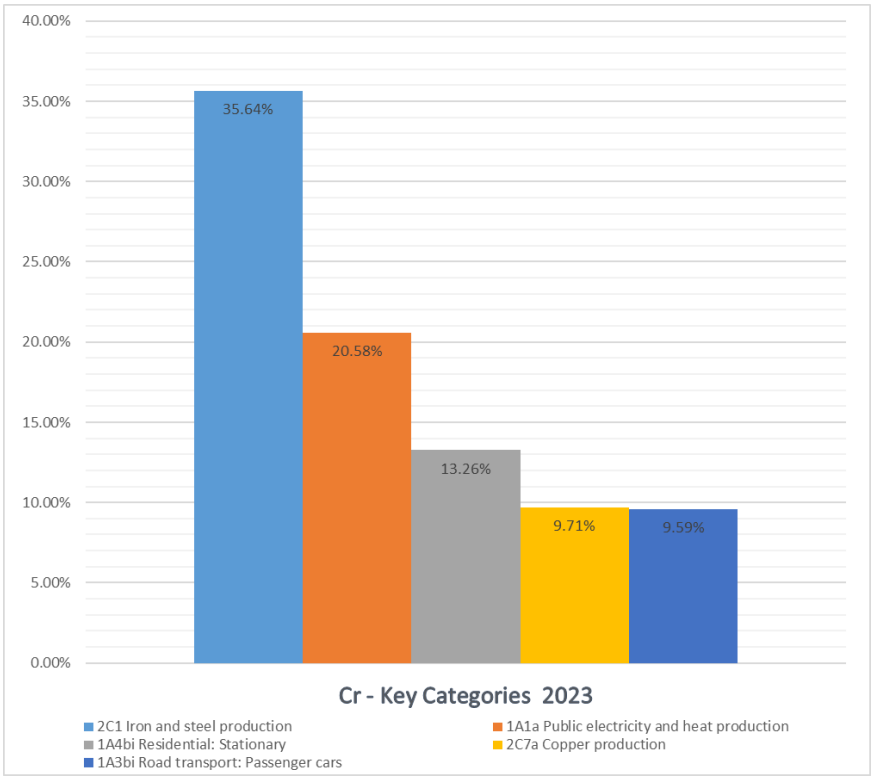


Figure 55. Key Categories assessments of Cr emissions for 2023.

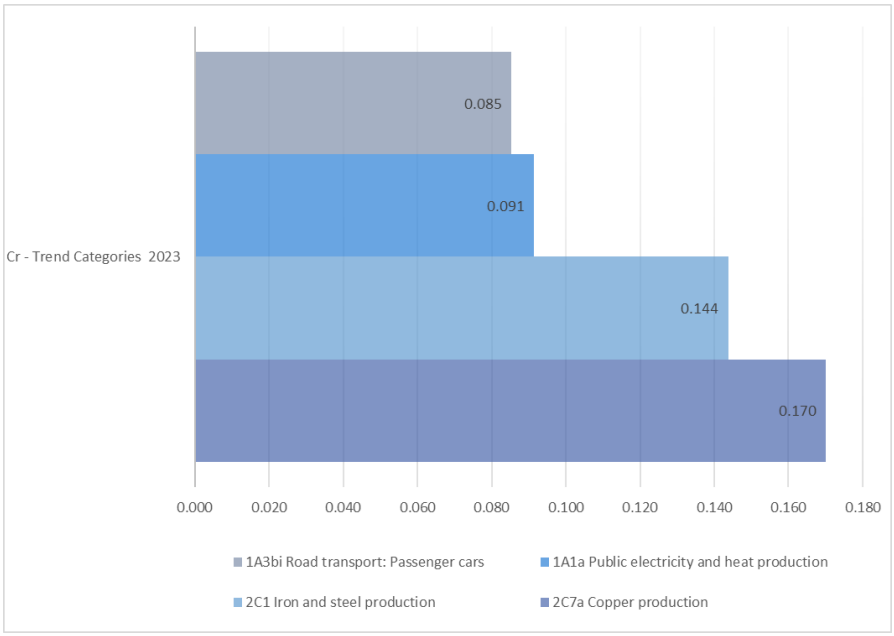


Figure 56. Trends assessments of Cr emissions for base year and 2023

2.4.15. Copper emission (Cu)

Copper (Cu) emissions in 2023. was 43.9763 t, which is 5.99 % increase compared to 2022. Compared to the 1990 baseline emissions of Cu is 30.64 % higher.

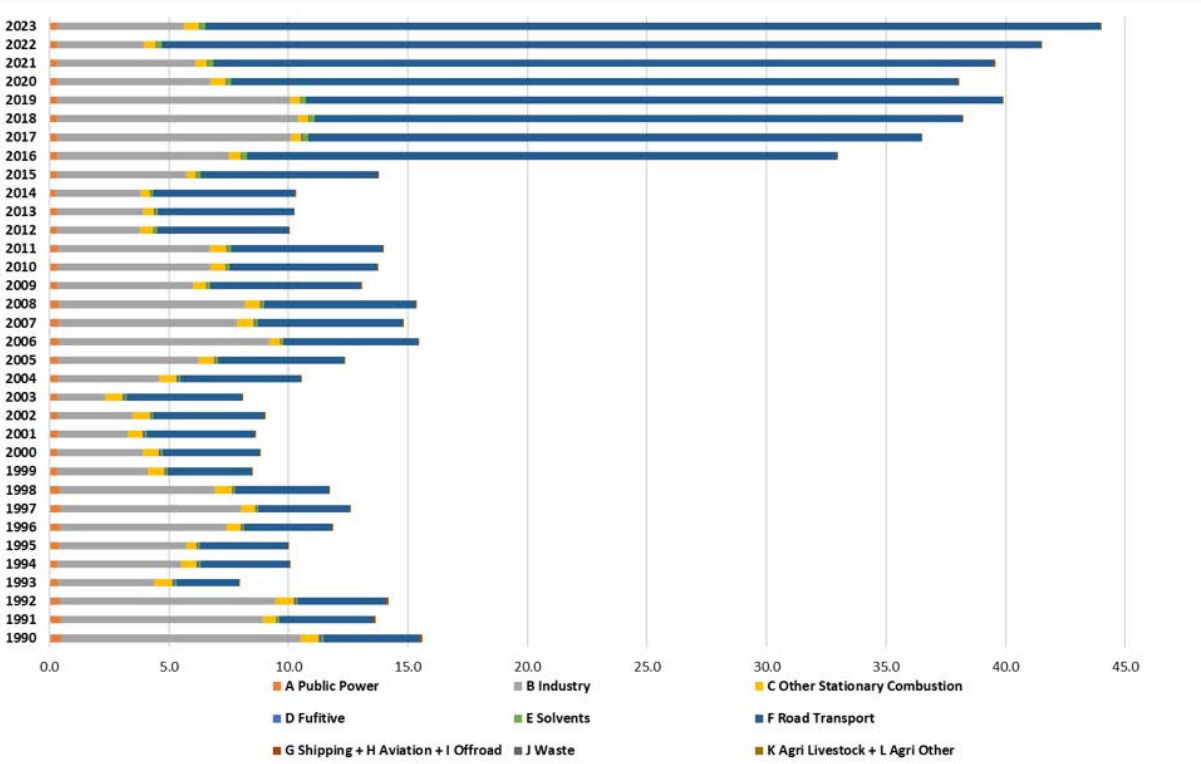


Figure 57. Distribution of Cu between sectors for period 1990 – 2023.

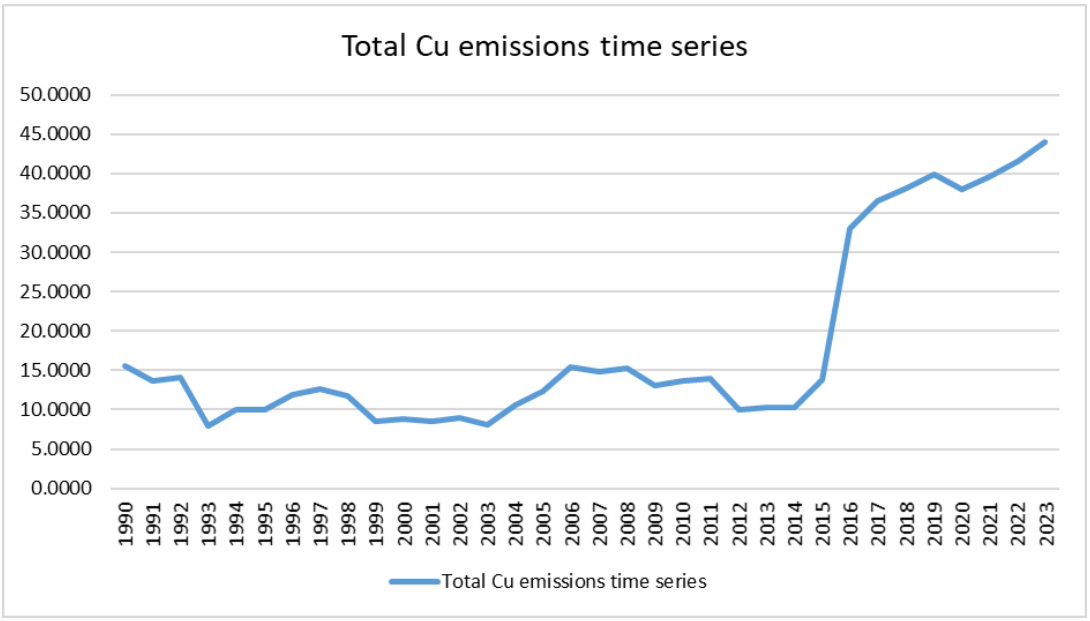


Figure 58.Total Cu emissions time series from 1990 to 2023.

Table 51. Total Cu emissions between sectors for years 1990 and 2023. Trends of dominant sources of Cu emissions compared to years 1990-2023 and 2022-2023. Share in National Total for years 1990 and 2023

NFR Category	Cu Emission in [kt]		Trend		Share in National Total	
	1990	2023	1990 - 2023	2022 - 2023	1990	2023
A Public Power	0.4700	0.2933	-37.60%	-2.11%	3.02%	0.67%
B Industry	10.0102	5.3288	-46.77%	46.56%	64.35%	12.12%
C Other Stationary Combustion	0.8002	0.6276	-21.56%	22.63%	5.14%	1.43%
D Fugitive	0.1069	0.0246	-76.94%	15.13%	0.69%	0.06%
E Solvents	0.0789	0.2563	225.01%	3.12%	0.51%	0.58%
F Road Transport	3.9889	37.4044	837.71%	1.84%	25.64%	85.06%
G Shipping + H Aviation + I Offroad	0.1010	0.0411	-59.30%	-3.99%	0.65%	0.09%
J Waste	0.0000	0.0000	372.52%	-4.86%	0.00%	0.00%
K Agri Livestock + L Agri Other	0.0002	0.0001	-25.66%	-1.57%	0.00%	0.00%
Total	**15.5562**	**43.9763**	**182.69%**	**5.99%**	**100.00%**	**100.00%**

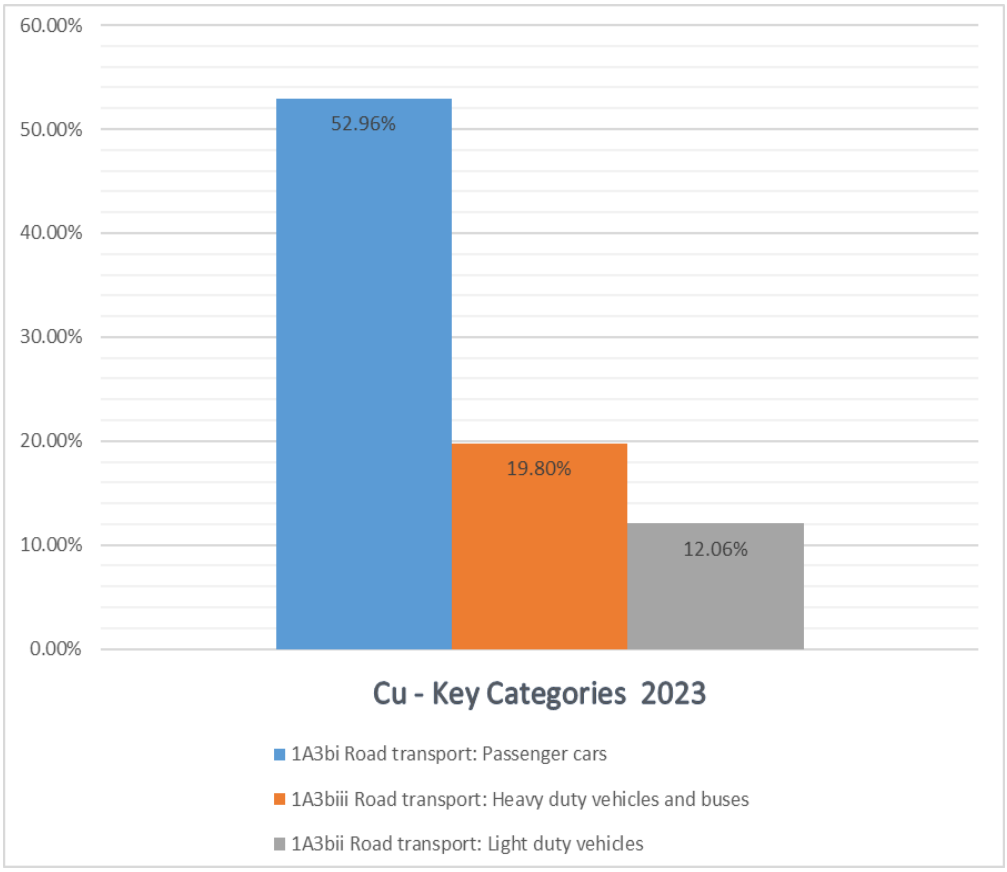


Figure 59. Key Categories assessments of Cu emissions for 2023

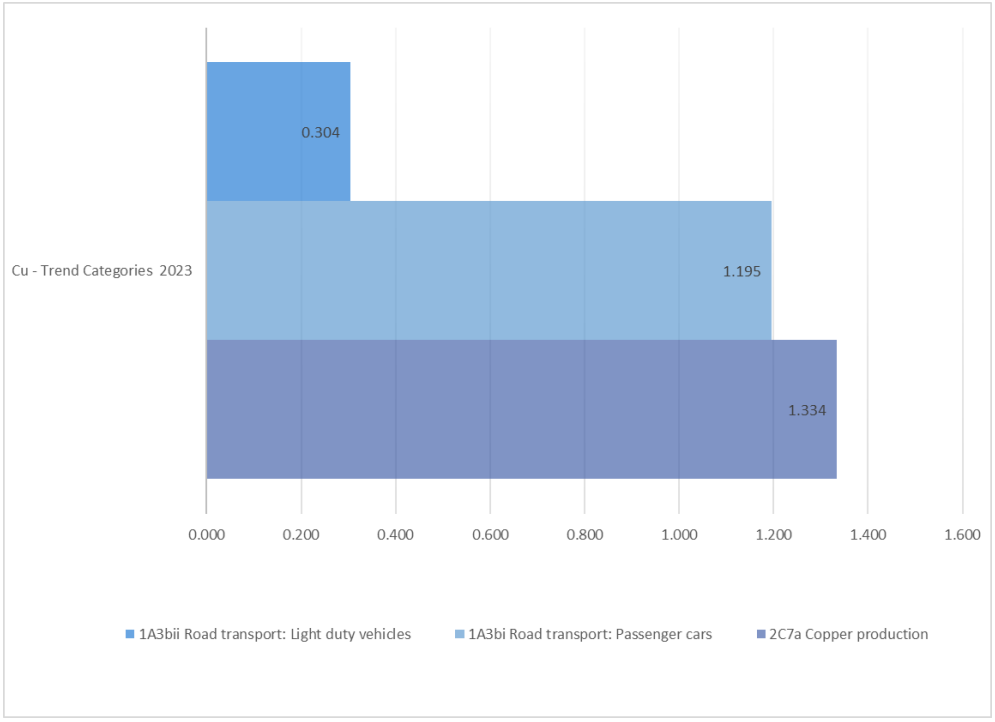


Figure 60. Trends assessments of Cu emissions for base year and 2023

2.4.16. Nickel emission (Ni)

Nickel (Ni) emissions in 2023. was 11.7281 t, which is 17.31 % decrease compared to 2022. Compared to the 1990 baseline emissions of Ni is 30.57 % lower.

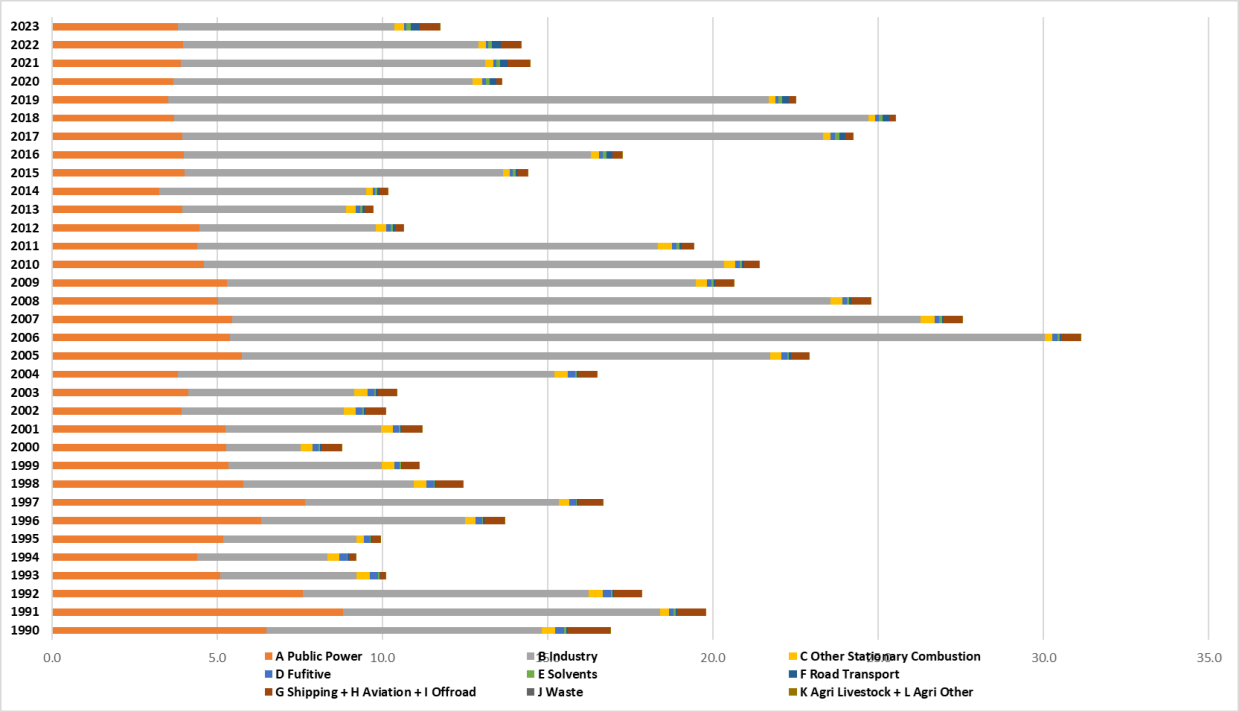


Figure 61. Distribution of Ni between sectors for period 1990 – 2023

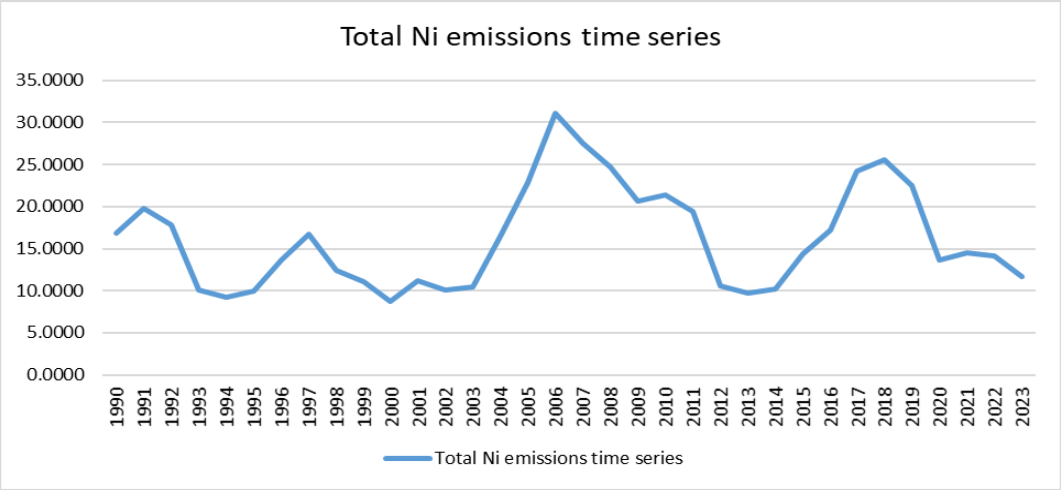


Figure 62.Total Ni emissions time series from 1990 to 2023.

Table 52. Total Ni emissions between sectors for years 1990 and 2023. Trends of dominant sources of Ni emissions compared to years 1990-2023 and 2022-2023. Share in National Total for years 1990 and 2023

NFR Category	Ni Emission in [kt]		Trend		Share in National Total	
	1990	2023	1990 - 2023	2022 - 2023	1990	2023
A Public Power	6.4871	3.8084	-41.29%	-4.08%		32.47%
B Industry	8.3378	6.5489	-21.46%	-26.67%	49.36%	55.84%
C Other Stationary Combustion	0.4024	0.3003	-25.38%	31.19%	2.38%	2.56%
D Fugitive	0.2780	0.0705	-74.63%	11.92%	1.65%	0.60%
E Solvents	0.0606	0.1282	111.53%	3.12%	0.36%	1.09%
F Road Transport	0.0430	0.2629	511.47%	2.20%	0.25%	2.24%
G Shipping + H Aviation + I Offroad	1.2821	0.6087	-52.52%	-0.01%	7.59%	5.19%
J Waste	0.0000	0.0001	372.52%	-4.86%	0.00%	0.00%
K Agri Livestock + L Agri Other	0.0001	0.0001	-25.66%	-1.57%	0.00%	0.00%
Total	**16.8912**	**11.7281**	**-30.57%**	**-17.31%**	**100.00%**	**100.00%**

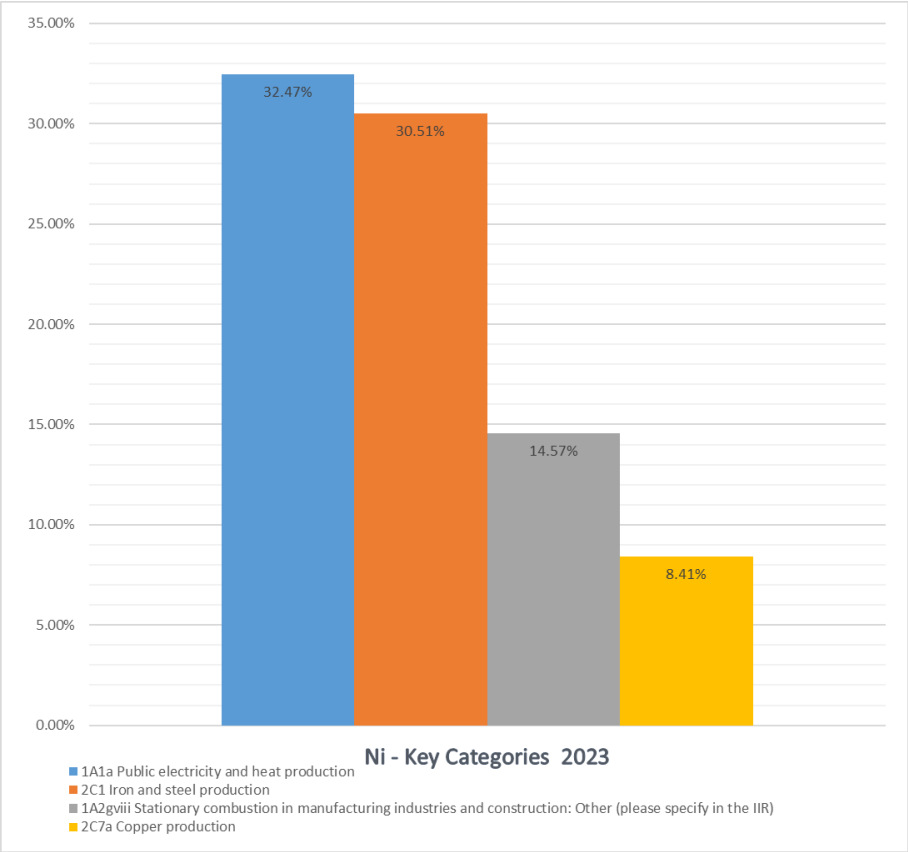


Figure 63. Key Categories assessments of Ni emissions for 2023

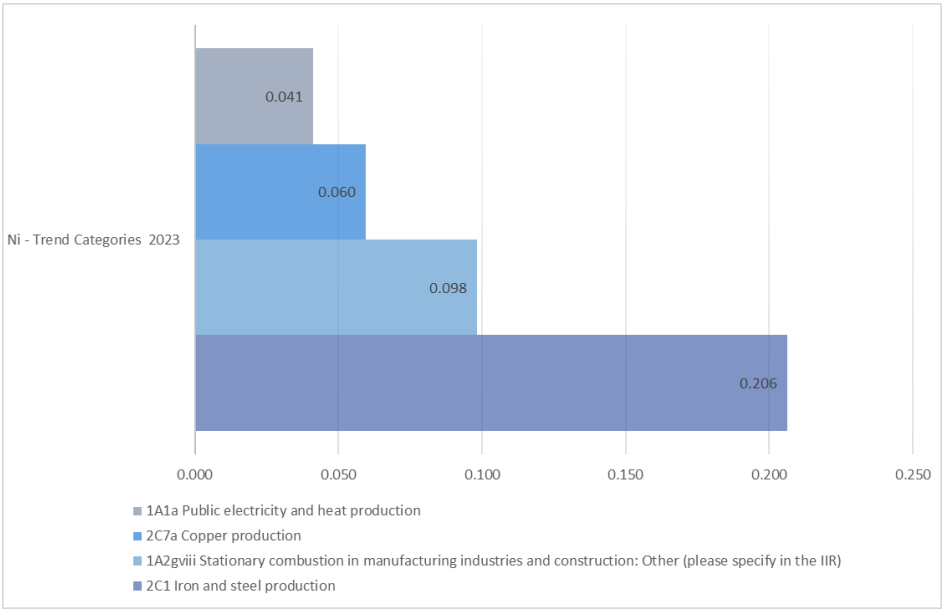


Figure 64. Trends assessments of Ni emissions for base year and 2023

2.4.17. Selenium emission (Se)

Selenium (Se) emissions in 2023. was 13.1635 t, which is 4.29 % increase compared to 2022. Compared to the 1990 baseline emissions of Se is 33.92 % lower.

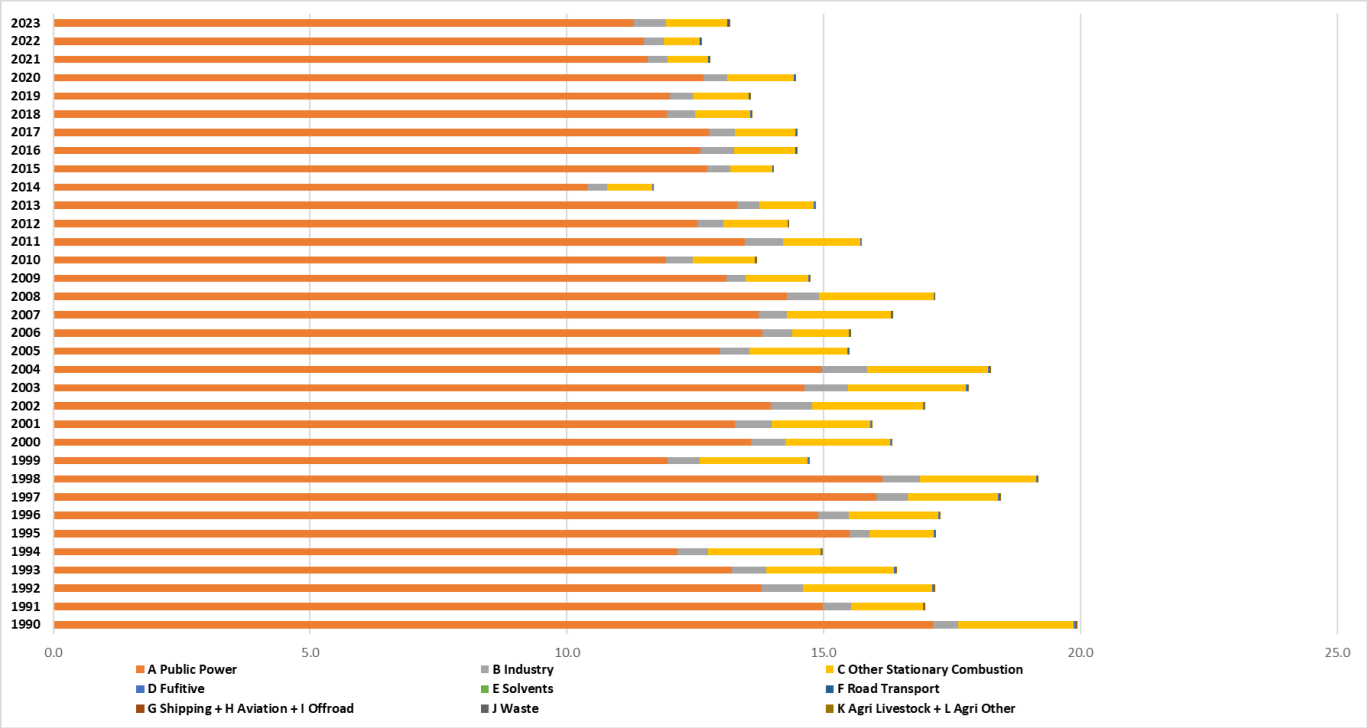


Figure 65. Distribution of Se between sectors for period 1990 – 2023.

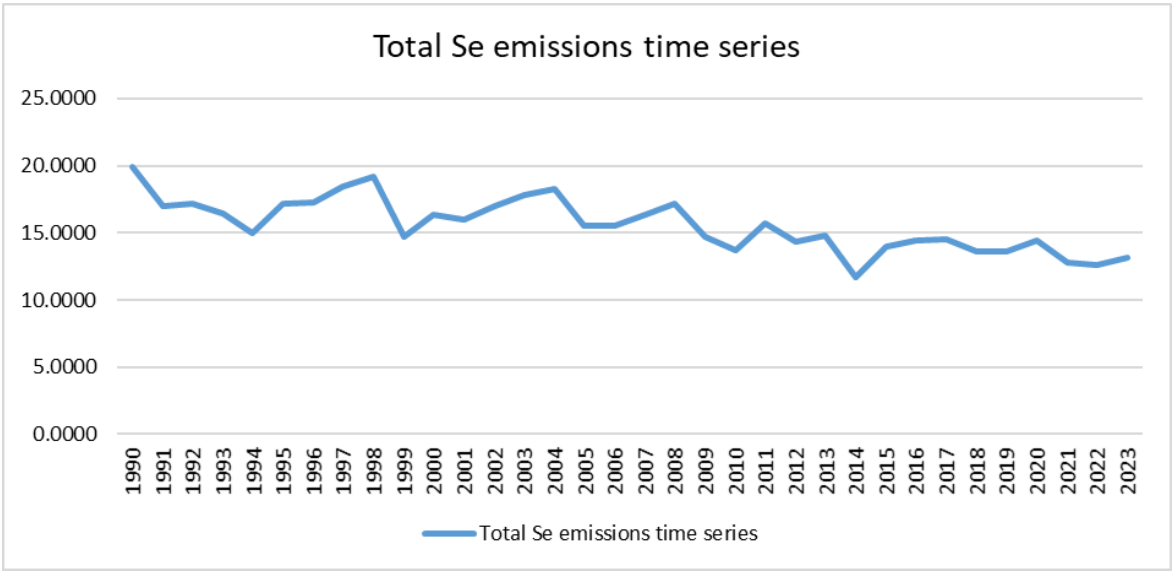


Figure 66.Total Se emissions time series from 1990 to 2023.

Table 53. Total Se emissions between sectors for years 1990 and 2023. Trends of dominant sources

of Se emissions compared to years 1990-2023 and 2022-2023. Share in National Total for years 1990 and 2023

NFR Category	Se Emission in [kt]		Trend		Share in National Total	
	1990	2023	1990 - 2023	2022 - 2023	1990	2023
A Public Power	17.1257	11.3131	-33.94%	-1.60%	85.97%	85.94%
B Industry	0.4881	0.6238	27.79%	61.69%	2.45%	4.74%
C Other Stationary Combustion	2.2604	1.1856	-47.55%	69.45%	11.35%	9.01%
D Fugitive	0.0342	0.0071	-79.38%	19.61%	0.17%	0.05%
E Solvents	0.0002	NA	NA	NA	0.00%	NA
F Road Transport	0.0038	0.0297	681.23%	3.64%	0.02%	0.23%
G Shipping + H Aviation + I Offroad	0.0087	0.0041	-52.96%	-0.24%	0.04%	0.03%
J Waste	0.0000	0.0001	372.52%	-4.86%	0.00%	0.00%
K Agri Livestock + L Agri Other	0.0000	0.0000	-25.66%	-1.57%	0.00%	0.00%
Total	**19.9212**	**13.1635**	**-33.92%**	**4.29%**	**100.00%**	**100.00%**

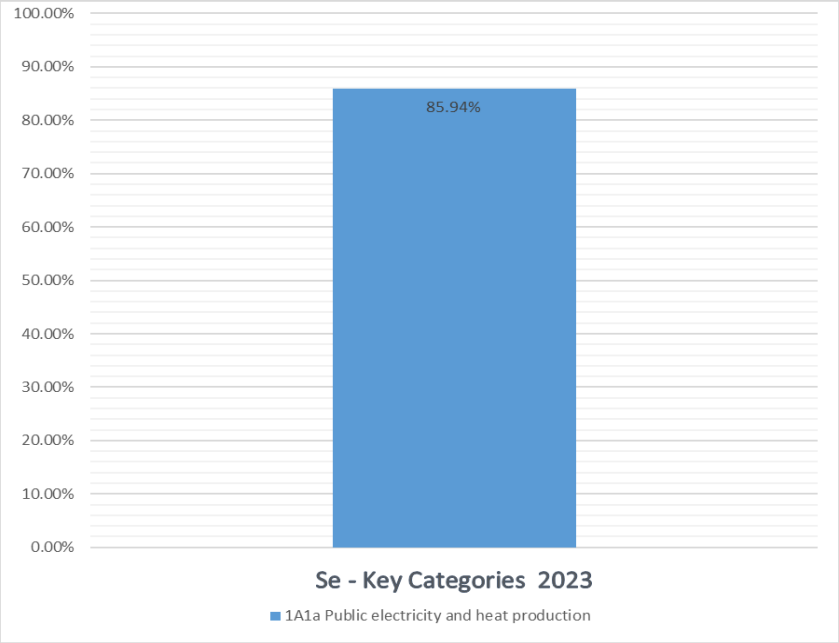


Figure 67. Key Categories assessments of Se emissions for 2023.

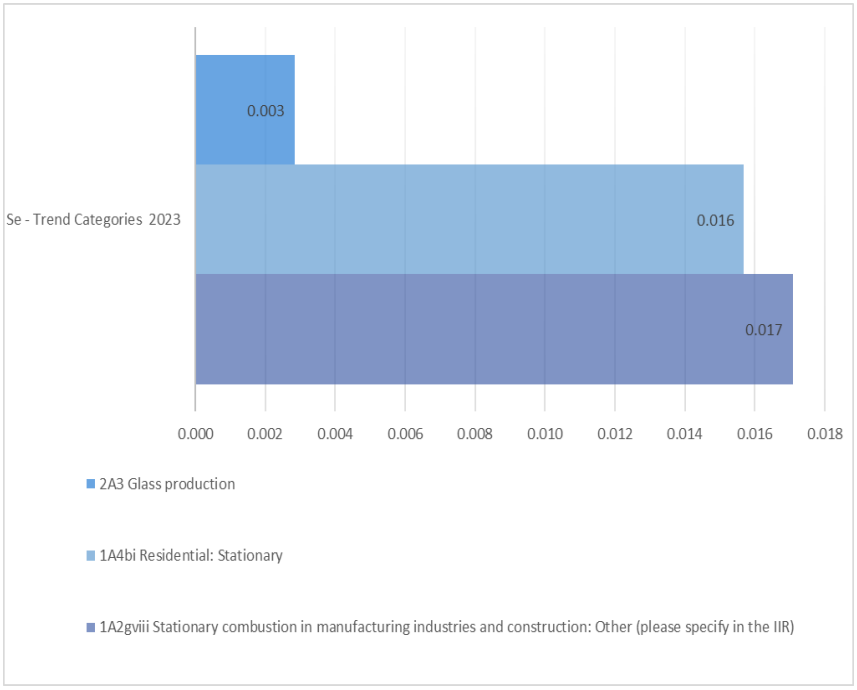


Figure 68. Trends assessments of Se emissions for base year and 2023

2.4.18. Zinc emission (Zn)

Zinc (Zn) emissions in 2023. was 65.2208 t, which is 3.81 % decrease compared to 2022. Compared to the 1990 baseline emissions of Zn is 30.90 % higher.

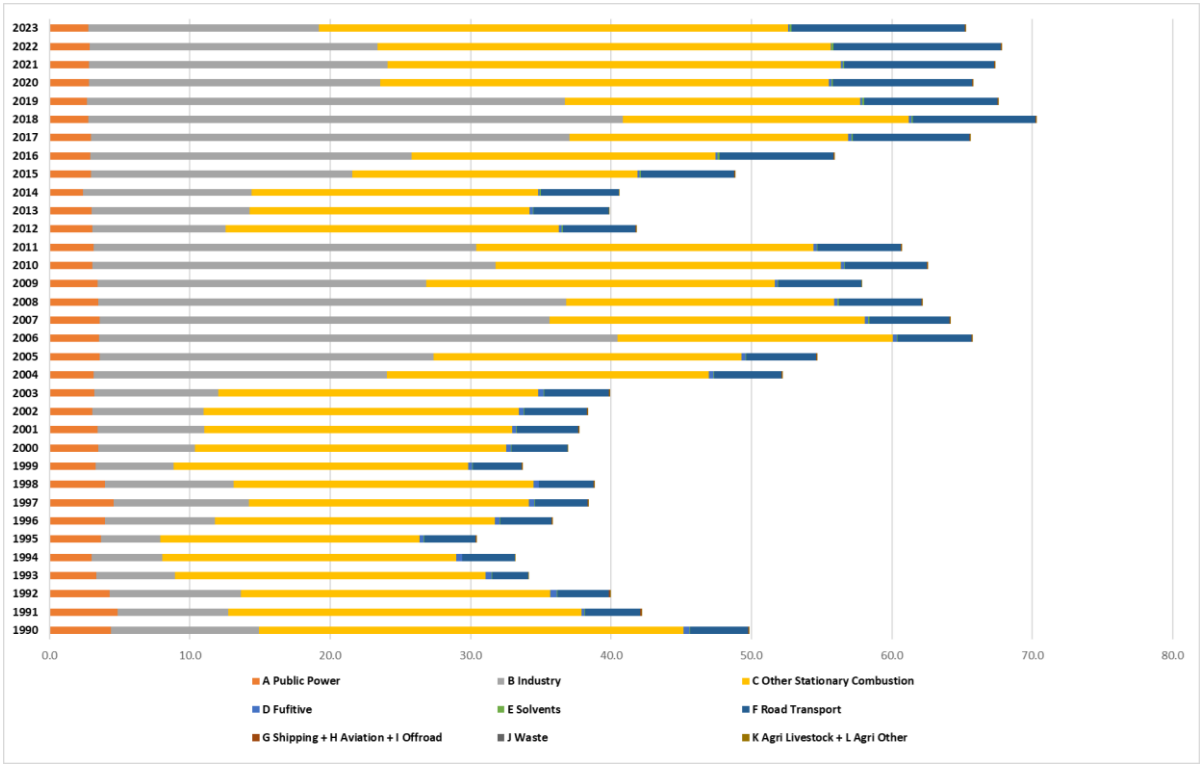


Figure 69. Distribution of Zn between sectors for period 1990 - 2023

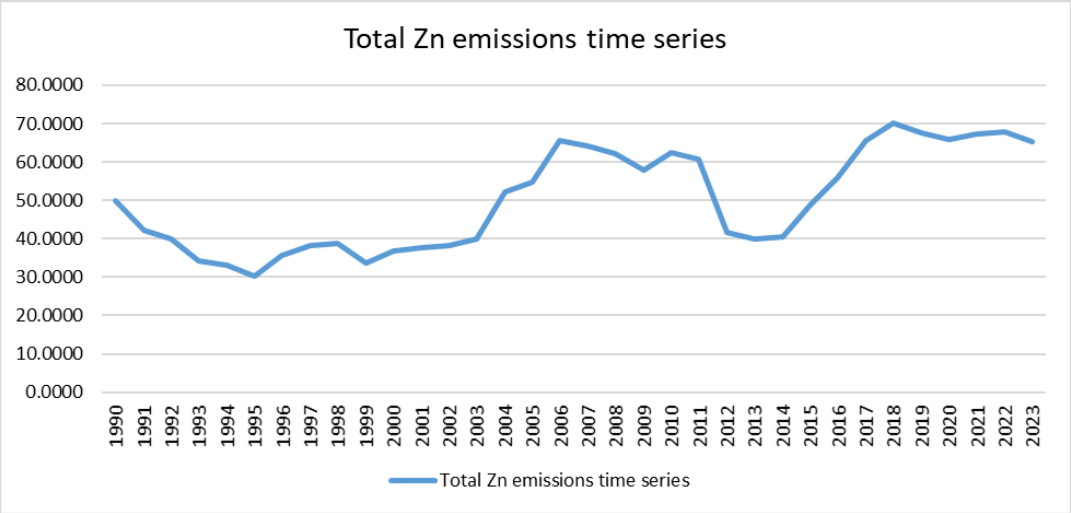


Figure 70.Total Zn emissions time series from 1990 to 2023.

Table 54. Total Zn emissions between sectors for years 1990 and 2023. Trends of dominant sources of Zn emissions compared to years 1990-2023 and 2022-2023. Share in National Total for years 1990 and 2023

NFR Category	Zn Emission in [kt]		Trend		Share in National Total	
	1990	2023	1990 - 2023	2022 - 2023	1990	2023
A Public Power	4.3718	2.7816	-36.37%	-2.72%	8.77%	4.26%
B Industry	10.5630	16.4023	55.28%	-20.05%	21.20%	25.15%
C Other Stationary Combustion	30.2015	33.4505	10.76%	3.70%	60.61%	51.29%
D Fugitive	0.4685	0.0955	-79.62%	20.11%	0.94%	0.15%
E Solvents	0.0394	0.1282	225.01%	3.12%	0.08%	0.20%
F Road Transport	4.1025	12.3283	200.51%	3.30%	8.23%	18.90%
G Shipping + H Aviation + I Offroad	0.0780	0.0330	-57.68%	-2.95%	0.16%	0.05%
J Waste	0.0001	0.0005	372.52%	-4.86%	0.00%	0.00%
K Agri Livestock + L Agri Other	0.0012	0.0009	-25.66%	-1.57%	0.00%	0.00%
Total	**49.8261**	**65.2208**	**30.90%**	**-3.81%**	**100.00%**	**100.00%**

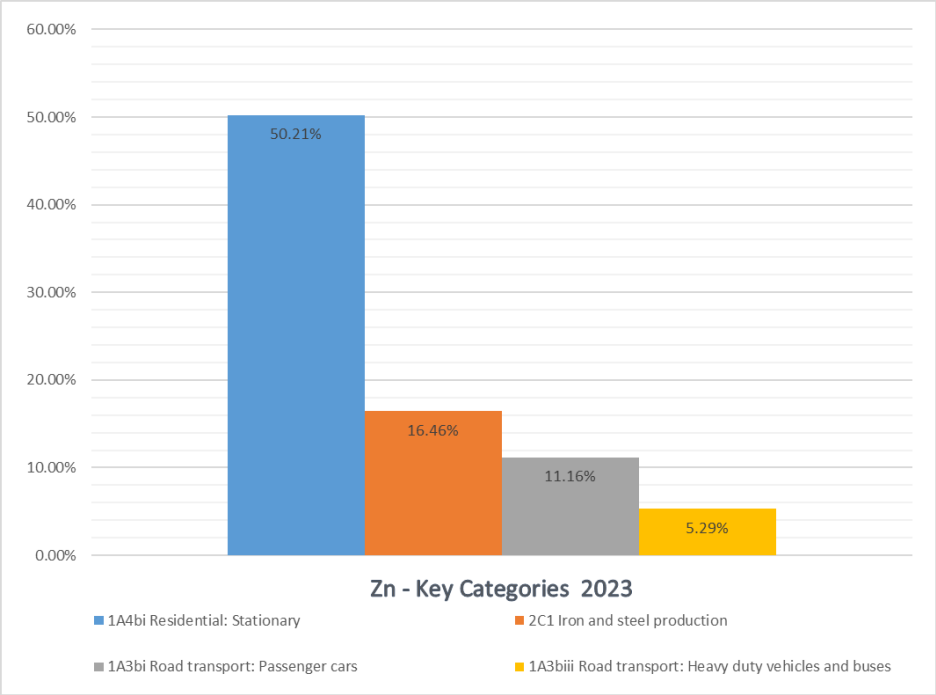


Figure 71. Key Categories assessments of Zn emissions for 2023

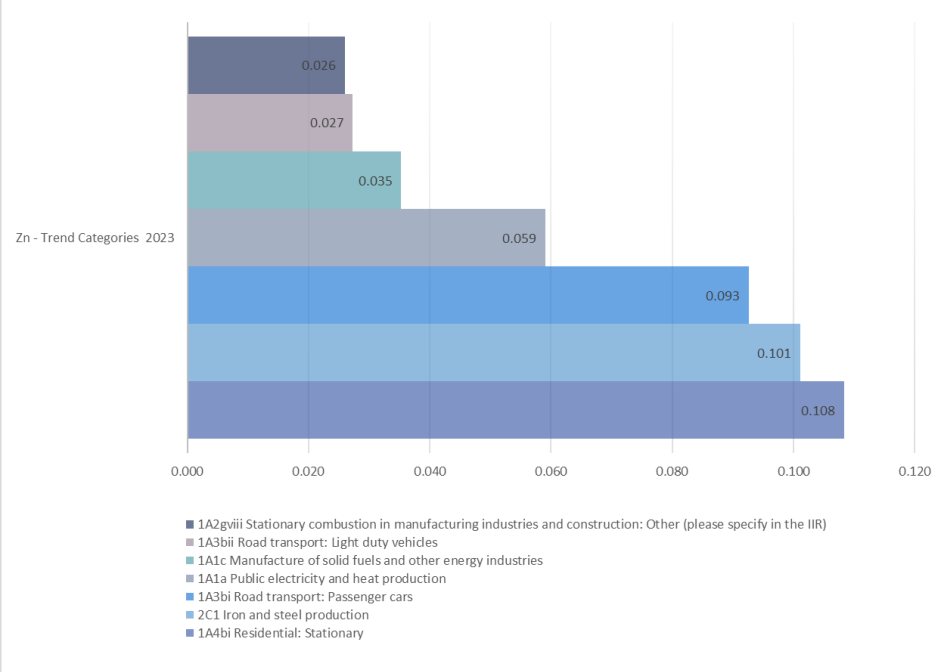


Figure 72. Trends assessments of Zn emissions for base year and 2023

PERSISTENT ORGANIC POLLUTANTS EMISSION (POP s)

2.4.19. DIOXINS AND FURANS EMISSION (PCDD/PCDF)

Dioxins and furans (PCDD/PCDF) emissions in 2023. was 74.9430 g I-TEQ, which is 8.50 % increase compared to 2022. Compared to the 1990 baseline emissions of PCDD/PCDF is 6.41 % higher.

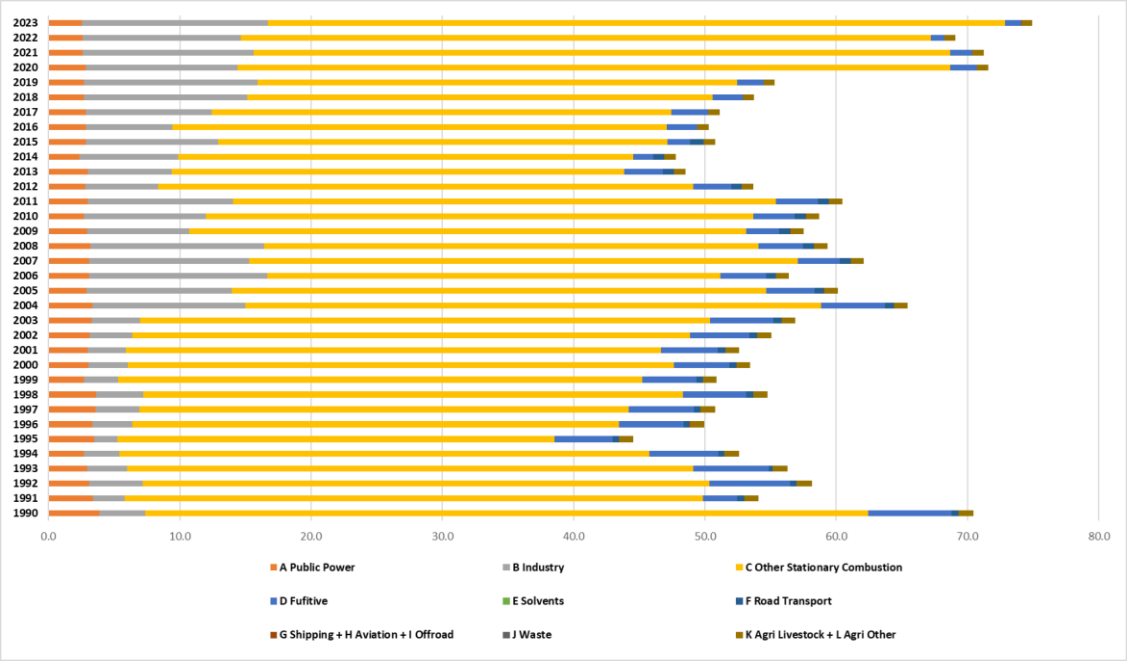


Figure 73. Distribution of PCDD/PCDF between sectors for period 1990 – 2023

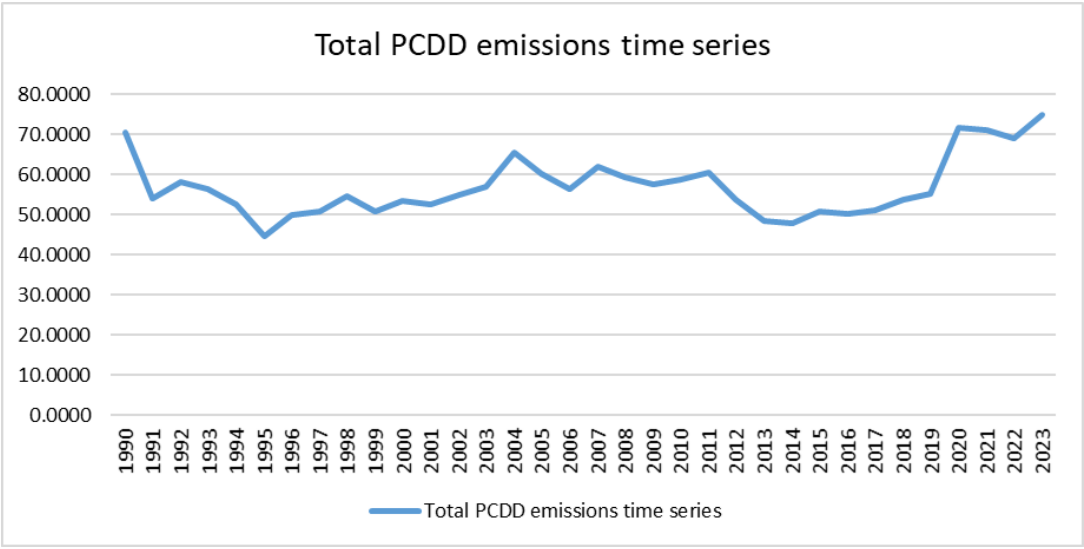


Figure 74. Total PCDD/PCDF emissions time series from 1990 to 2023.

Table 55. Total PCDD/PCDF emissions between sectors for years 1990 and 2023. Trends of dominant sources of PCDD emissions compared to years 1990-2023 and 2022-2023. Share in National Total for years 1990 and 2023

NFR Category	PCDD/PCDF Emission in [kt]		Trend		Share in National Total	
	1990	2023	1990 - 2023	2022 - 2023	1990	2023
A Public Power	3.8493	2.5519	-33.70%	-1.62%	5.47%	3.41%
B Industry	3.5140	14.1496	302.66%	17.23%	4.99%	18.88%
C Other Stationary Combustion	55.0742	56.1481	1.95%	6.90%	78.20%	74.92%
D Fugitive	6.3297	1.2540	-80.19%	21.42%	8.99%	1.67%
E Solvents	0.0015	0.0047	225.01%	3.12%	0.00%	0.01%
F Road Transport	0.5326	0.0000	-100.00%	-1.38%	0.76%	0.00%
G Shipping + H Aviation + I Offroad	0.0188	0.0089	-52.50%	0.00%	0.03%	0.01%
J Waste	0.0000	0.0001	372.52%	-4.86%	0.00%	0.00%
K Agri Livestock + L Agri Other	1.1106	0.8257	-25.66%	-1.57%	1.58%	1.10%
Total	**70.4307**	**74.9430**	**6.41%**	**8.50%**	**100.00%**	**100.00%**

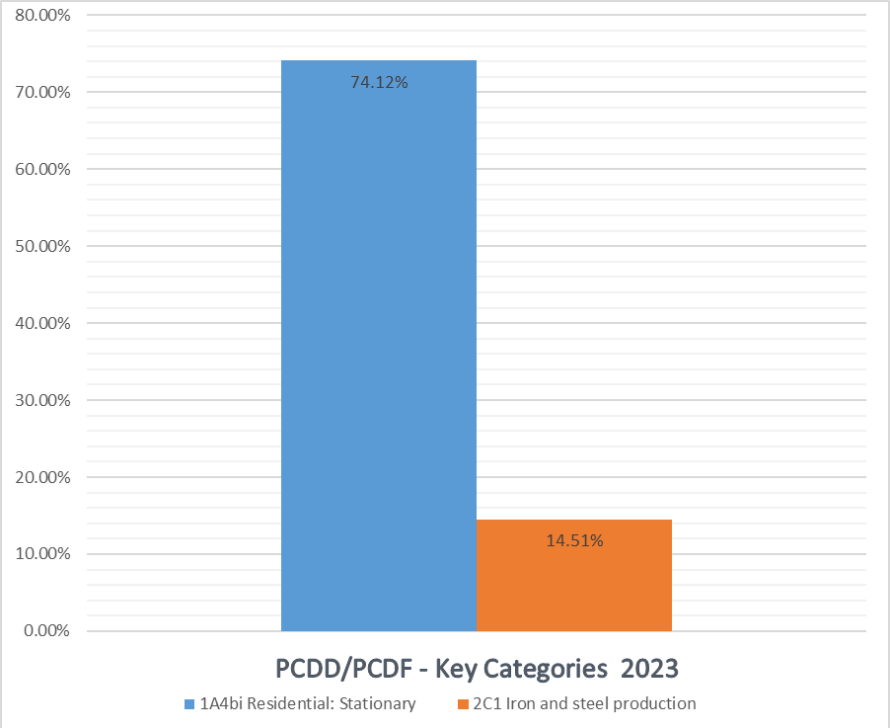


Figure 75. Key Categories assessments of PCDD/PCDF emissions for 2023.

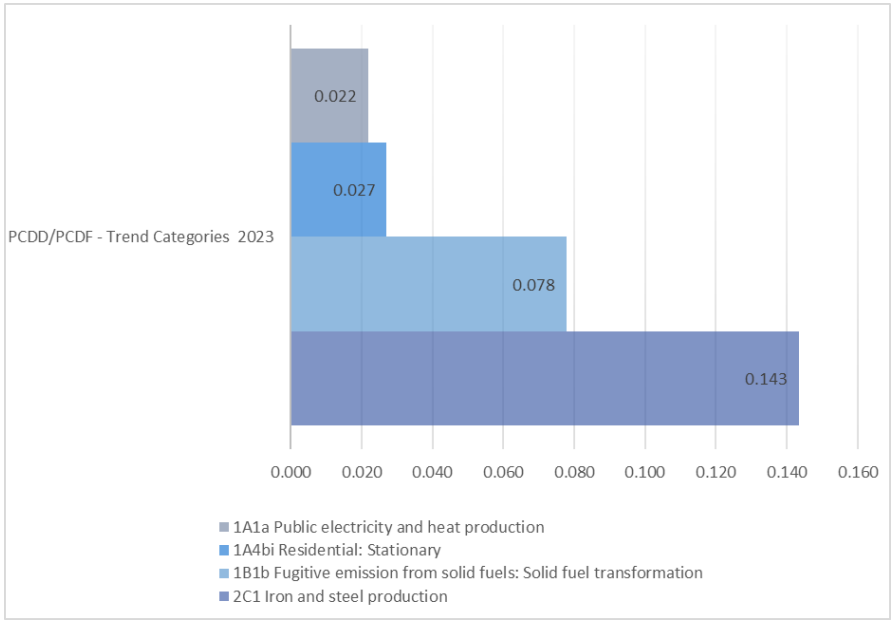


Figure 76. Trends assessments of PCDD/PCDF emissions for base year and 2023

POLYCYCLIC AROMATIC HYDROCARBON (PAH) EMISSION

2.4.20. PAHs – Benzo (a) pyrene

Benzo (a) pyrene emissions in 2023. was 9.9119 t, which is 13.22 % increase compared to 2022. Compared to the 1990 baseline emissions of Benzo (a) pyrene is 11.02 % lower.

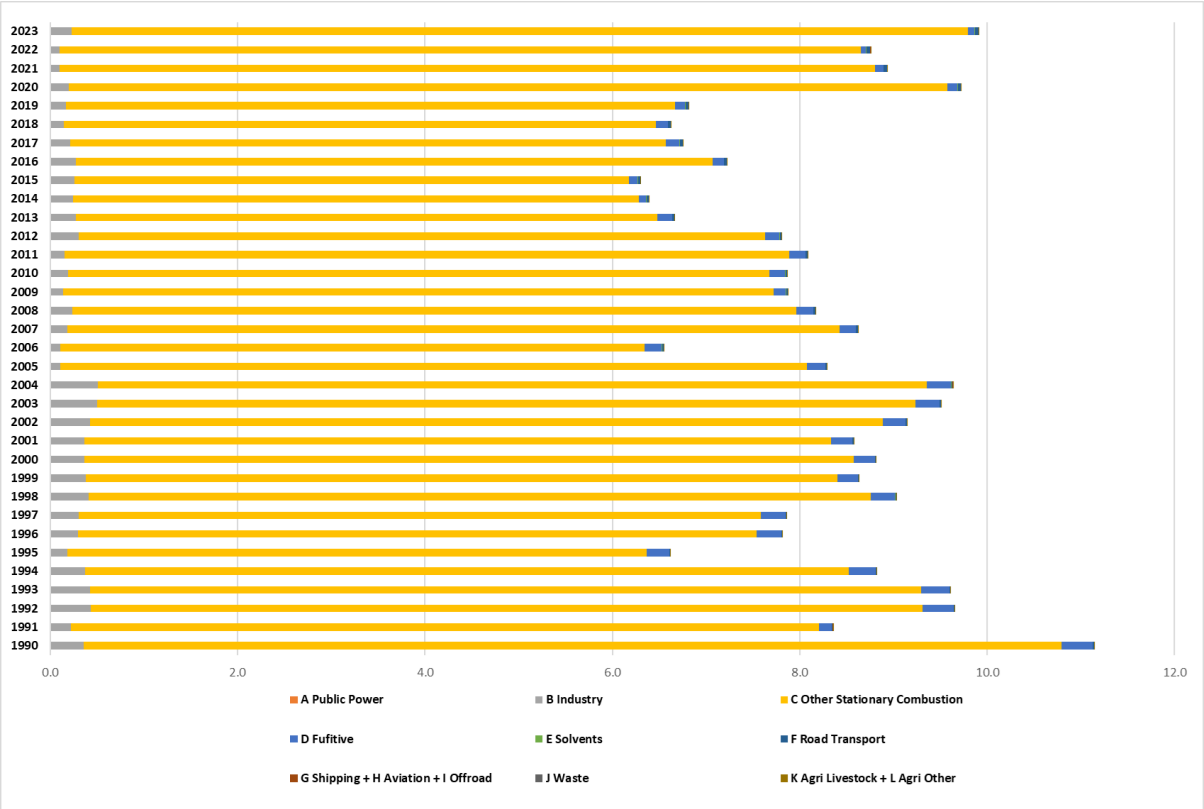


Figure 77. Distribution of Benzo (a) pyrene between sectors for period 1990 – 2023.

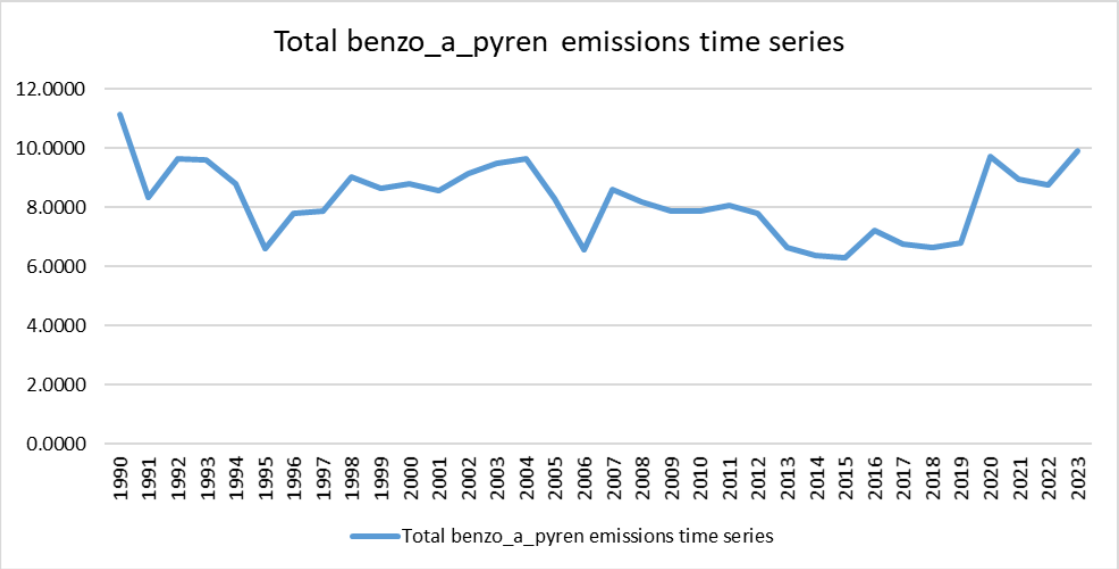


Figure 78.Total benzo a pyren emissions time series from 1990 to 2023.

Table 56. Total benzo (a) pyren emissions between sectors for years 1990 and 2023. Trends of dominant sources of benzo (a) pyren emissions compared to years 1990-2023 and 2022-2023. Share in National Total for years 1990 and 2023.

NFR Category	benzo a pyren Emission in [kt]		Trend		Share in National Total	
	1990	2023	1990 - 2023	2022 - 2023	1990	2023
A Public Power	0.0005	0.0010	93.17%	-0.48%	0.00%	0.01%
B Industry	0.3588	0.2256	-37.12%	134.53%	3.22%	2.28%
C Other Stationary Combustion	10.4307	9.5685	-8.27%	11.86%	93.63%	96.54%
D Fugitive	0.3373	0.0666	-80.24%	21.56%	3.03%	0.67%
E Solvents	0.0016	0.0053	225.01%	3.12%	0.01%	0.05%
F Road Transport	0.0092	0.0440	377.40%	4.83%	0.08%	0.44%
G Shipping + H Aviation + I Offroad	0.0009	0.0003	-65.95%	-8.96%	0.01%	0.00%
J Waste	0.0000	0.0000	372.52%	-4.86%	0.00%	0.00%
K Agri Livestock + L Agri Other	0.0009	0.0006	-25.66%	-1.57%	0.01%	0.01%
Total	**11.1399**	**9.9119**	**-11.02%**	**13.22%**	**100.00%**	**100.00%**

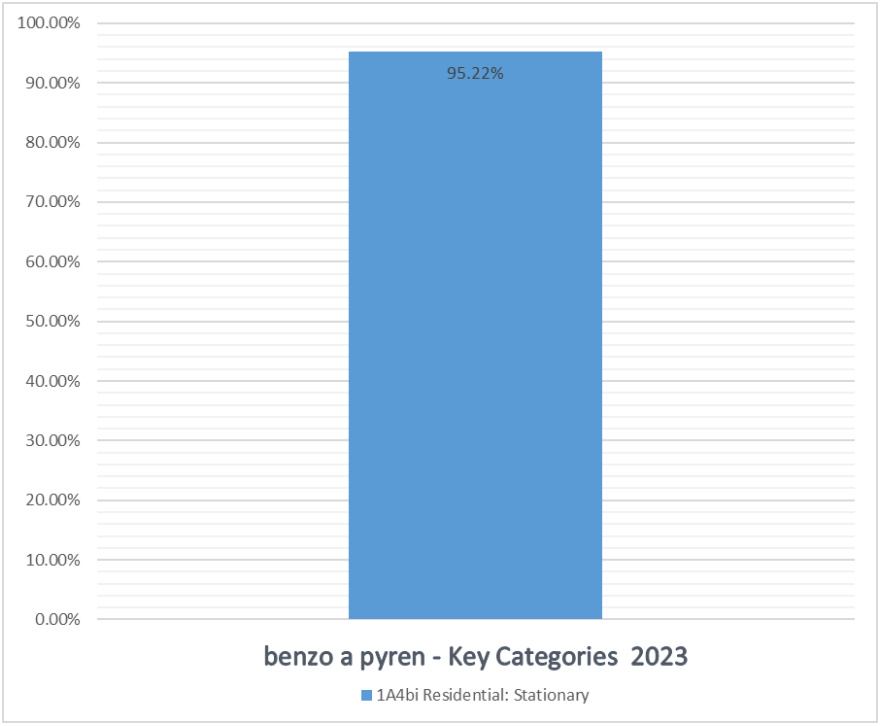


Figure 79. Key Categories assessments of benzo a pyren emissions for 2023.

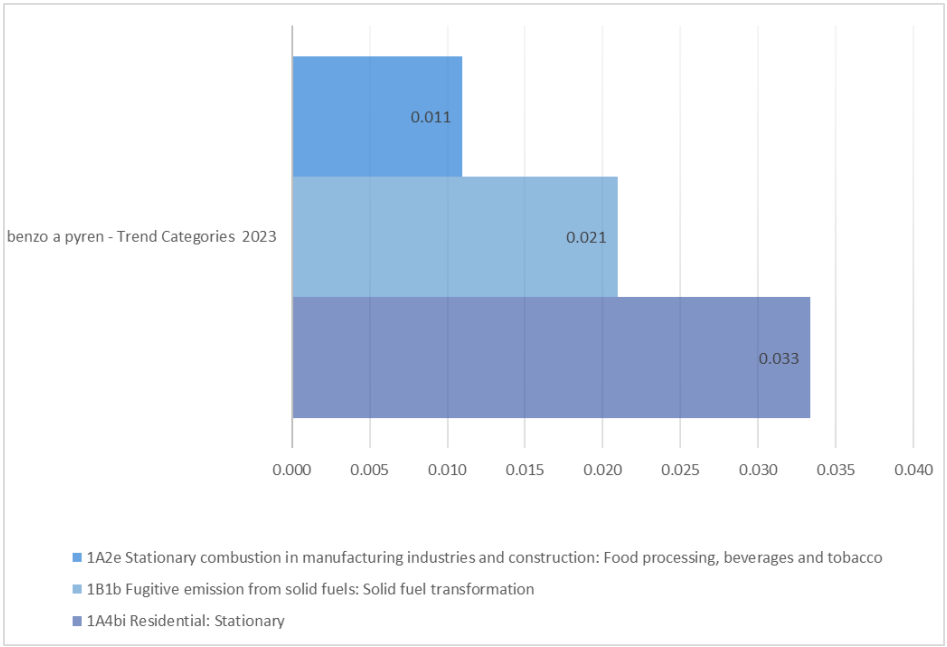


Figure 80. Trends assessments of Benzo a pyren emissions for base year and 2023

2.4.21. PAHs – Benzo (b) fluoranthene

Benzo (b) fluoranthene emissions in 2023. was 10.4592 t, which is 18.28 % increase compared to 2022. Compared to the 1990 baseline emissions of Benzo (b) fluoranthene is 18.19% lower.

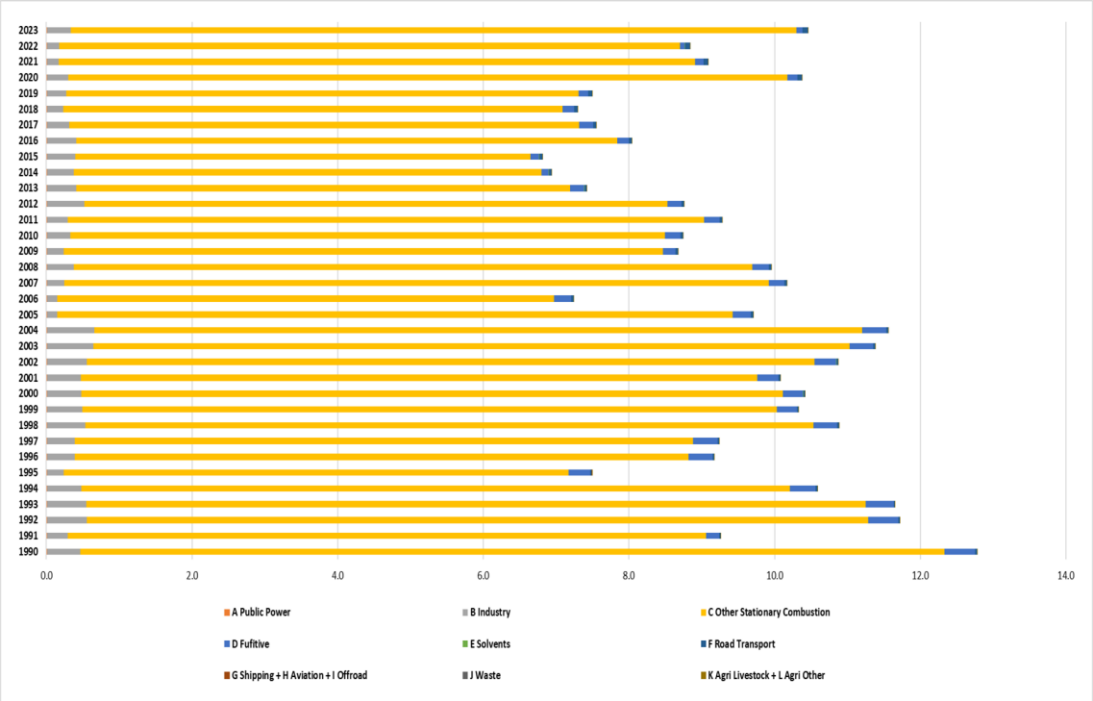


Figure 81. Distribution of benzo (b) fluoranthen between sectors for period 1990 – 2023.

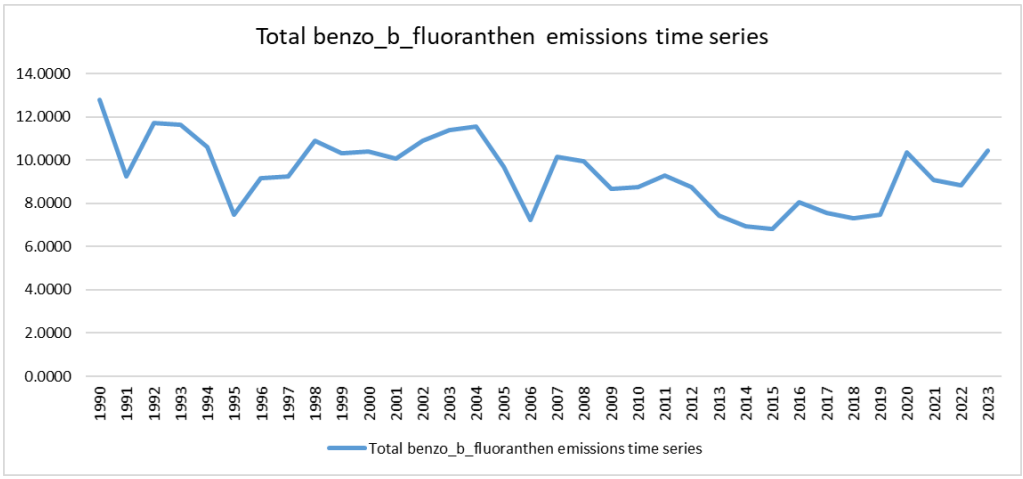


Figure 82. Total benzo b fluoranthen emissions time series from 1990 to 2023.

Table 57. Total benzo (b) fluoranthen emissions between sectors for years 1990 and 2023.

Trends of dominant sources of benzo (b) fluoranthen emissions compared to years 1990-2023 and 2022-2023. Share in National Total for years 1990 and 2023

NFR Category	benzo b fluoranthen Emission in [kt]		Trend		Share in National Total	
	1990	2023	1990 - 2023	2022 - 2023	1990	2023
A Public Power	0.0142	0.0094	-34.04%	-1.61%	0.11%	0.09%
B Industry	0.4517	0.3269	-27.64%	98.08%	3.53%	3.13%
C Other Stationary Combustion	11.8677	9.9628	-16.05%	16.89%	92.83%	95.25%
D Fugitive	0.4216	0.0833	-80.24%	21.56%	3.30%	0.80%
E Solvents	0.0007	0.0021	225.01%	3.12%	0.01%	0.02%
F Road Transport	0.0243	0.0725	197.77%	-0.13%	0.19%	0.69%
G Shipping + H Aviation + I Offroad	0.0015	0.0005	-65.96%	-8.96%	0.01%	0.00%
J Waste	0.0000	0.0000	372.52%	-4.86%	0.00%	0.00%
K Agri Livestock + L Agri Other	0.0024	0.0018	-25.66%	-1.57%	0.02%	0.02%
Total	**12.7841**	**10.4592**	**-18.19%**	**18.28%**	**100.00%**	**100.00%**

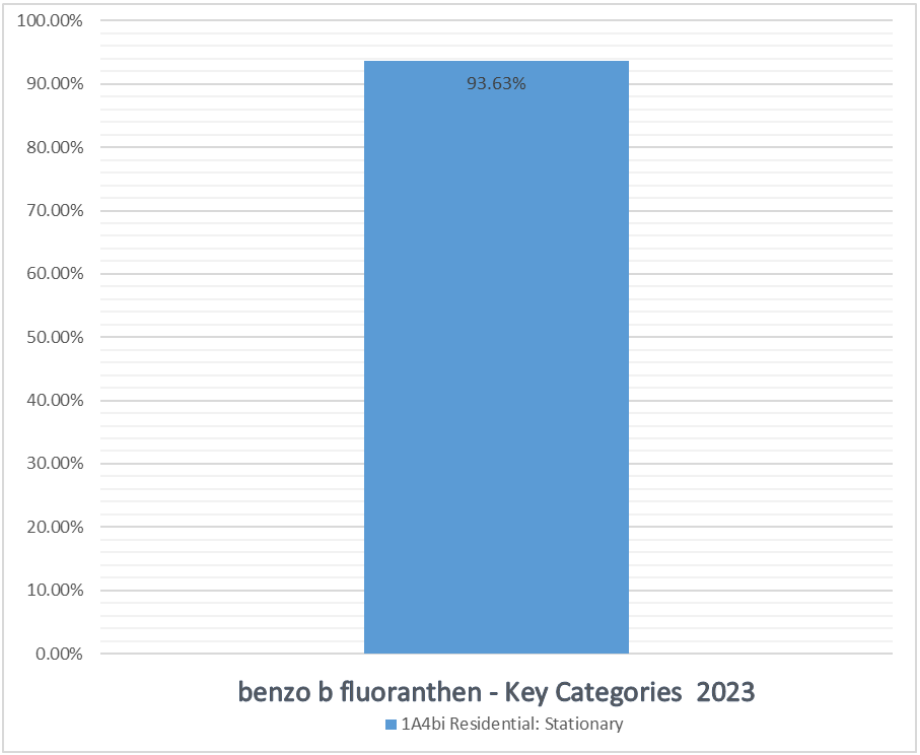


Figure 83. Key Categories assessments of benzo b fluoranthen emissions for 2023.

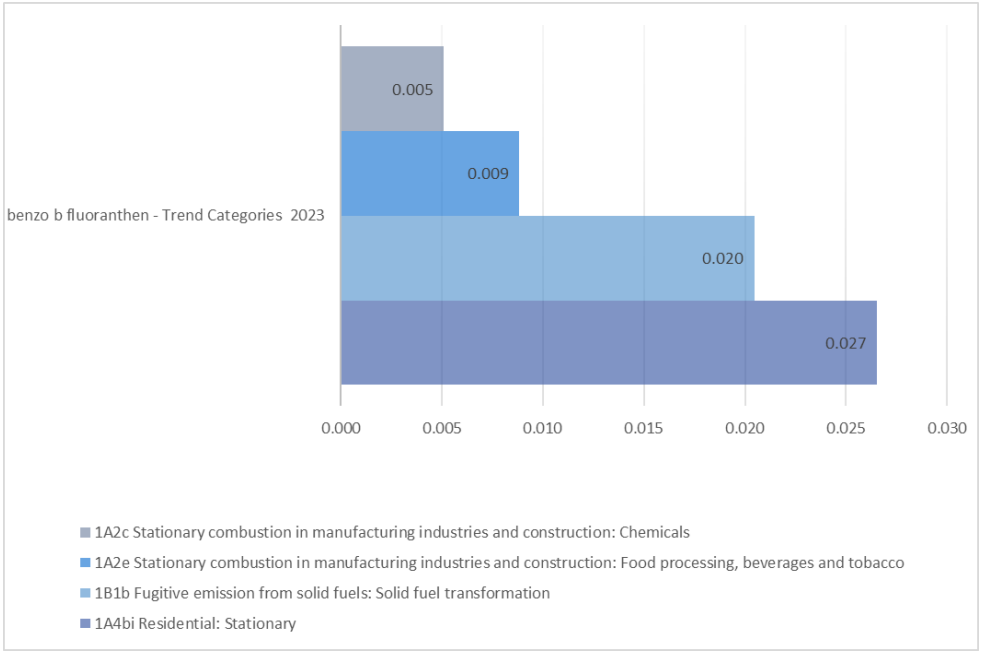


Figure 84. Trends assessments of benzo b fluoranthen emissions for base year and 2023

2.4.22. PAHs – Benzo (k) fluoranthene

Benzo (k) fluoranthene emissions in 2023. was 4.0563 t, which is 18.75 % increase compared to 2022. Compared to the 1990 baseline emissions of Benzo (k) fluoranthene is 19.18 % lower.

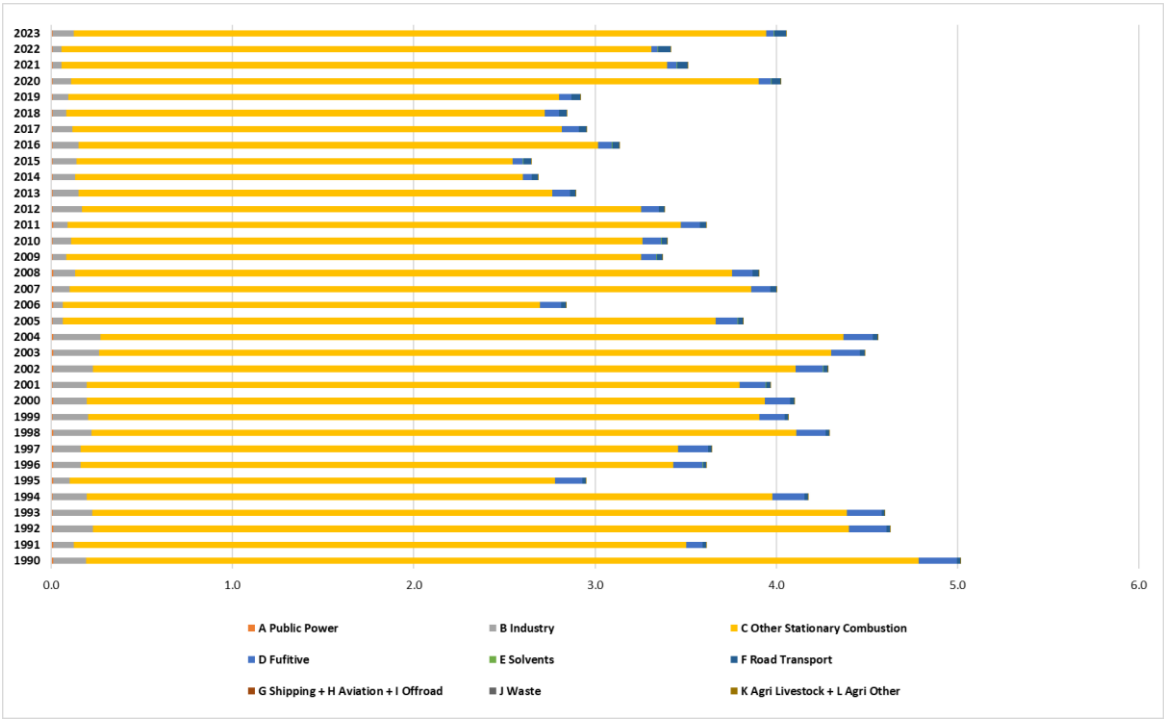


Figure 85. Distribution of benzo (k) fluoranthen between sectors for period 1990 – 2023.

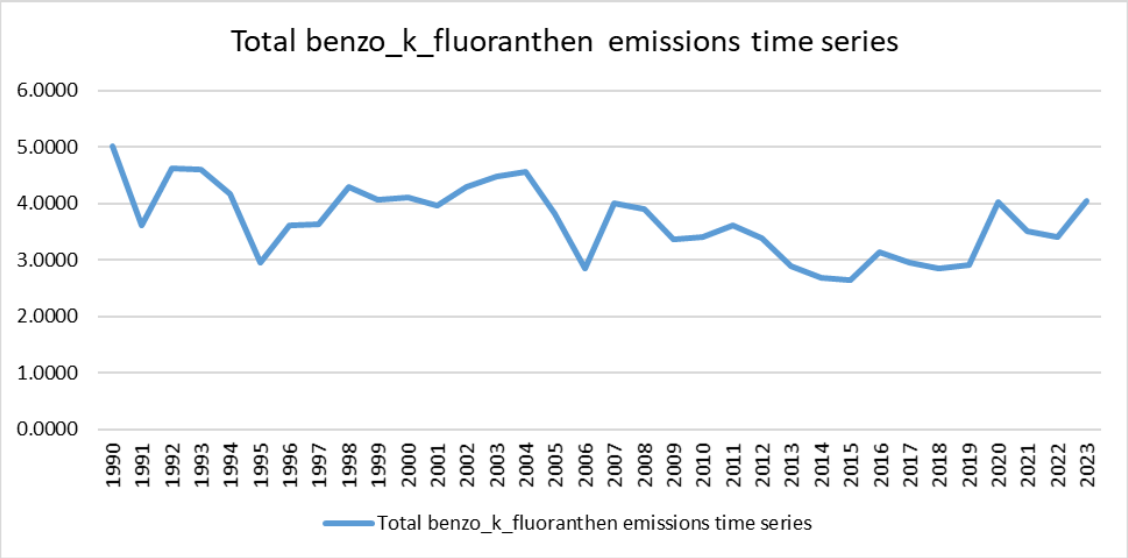


Figure 86.Total benzo k fluoranthen emissions time series from 1990 to 2023.

Table 58. Total benzo k fluoranthen emissions between sectors for years 1990 and 2023. Trends of dominant sources of benzo k fluoranthen x emissions compared to years 1990-2023 and 2022-2023. Share in National Total for years 1990 and 2023

NFR Category	benzo k fluoranten Emission in [kt]		Trend		Share in National Total	
	1990	2023	1990 - 2023	2022 - 2023	1990	2023
A Public Power	0.0112	0.0073	-34.10%	-1.61%	0.22%	0.18%
B Industry	0.1818	0.1161	-36.15%	134.03%	3.62%	2.86%
C Other Stationary Combustion	4.5932	3.8227	-16.77%	17.45%	91.52%	94.24%
D Fugitive	0.2108	0.0416	-80.24%	21.56%	4.20%	1.03%
E Solvents	0.0007	0.0021	225.01%	3.12%	0.01%	0.05%
F Road Transport	0.0202	0.0656	224.47%	-1.73%	0.40%	1.62%
G Shipping + H Aviation + I Offroad	NA	NA	NA	NA	NA	NA
J Waste	0.0000	0.0000	372.52%	-4.86%	0.00%	0.00%
K Agri Livestock + L Agri Other	0.0010	0.0008	-25.66%	-1.57%	0.02%	0.02%
Total	**5.0189**	**4.0563**	**-19.18%**	**18.75%**	**100.00%**	**100.00%**

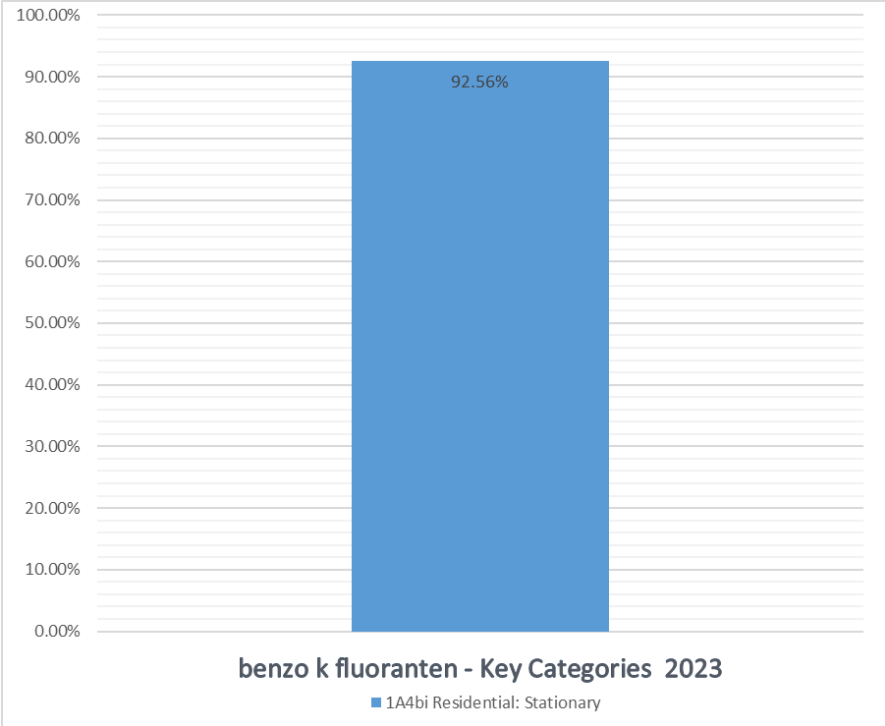


Figure 87. Key Categories assessments of benzo k fluoranthen emissions for 2023.

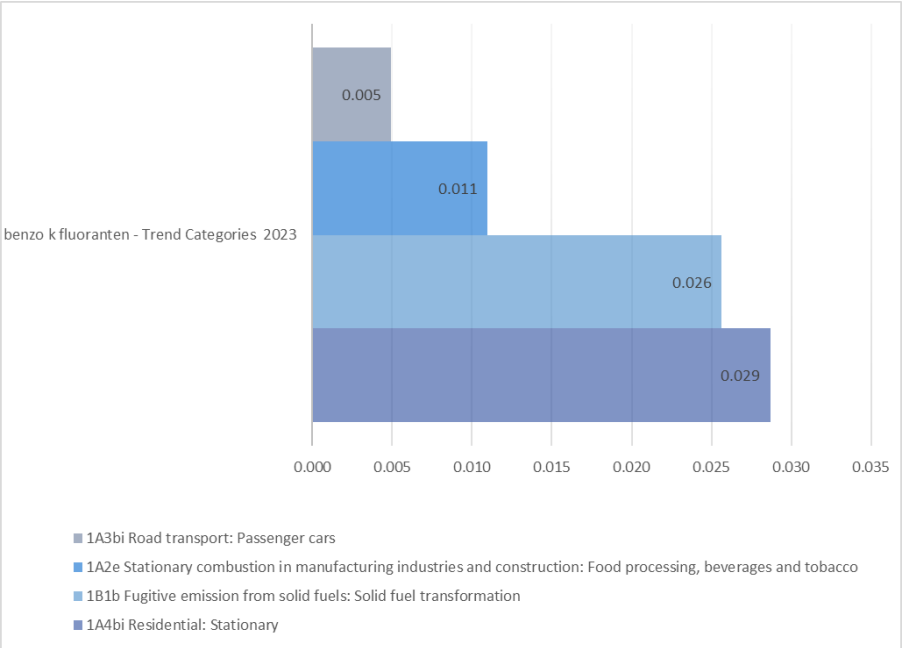


Figure 88. Trends assessments of benzo k fluoranthen emissions for base year and 2023

2.4.23. PAHs - Indeno (1,2,3-cd) pyrene

Indeno (1,2,3-cd) pyrene emissions in 2023. was 5.221 t, which is 10.53 % increase compared to 2022. Compared to the 1990 baseline emissions of Indeno (1,2,3-cd) pyrene is 6.74 % lower.

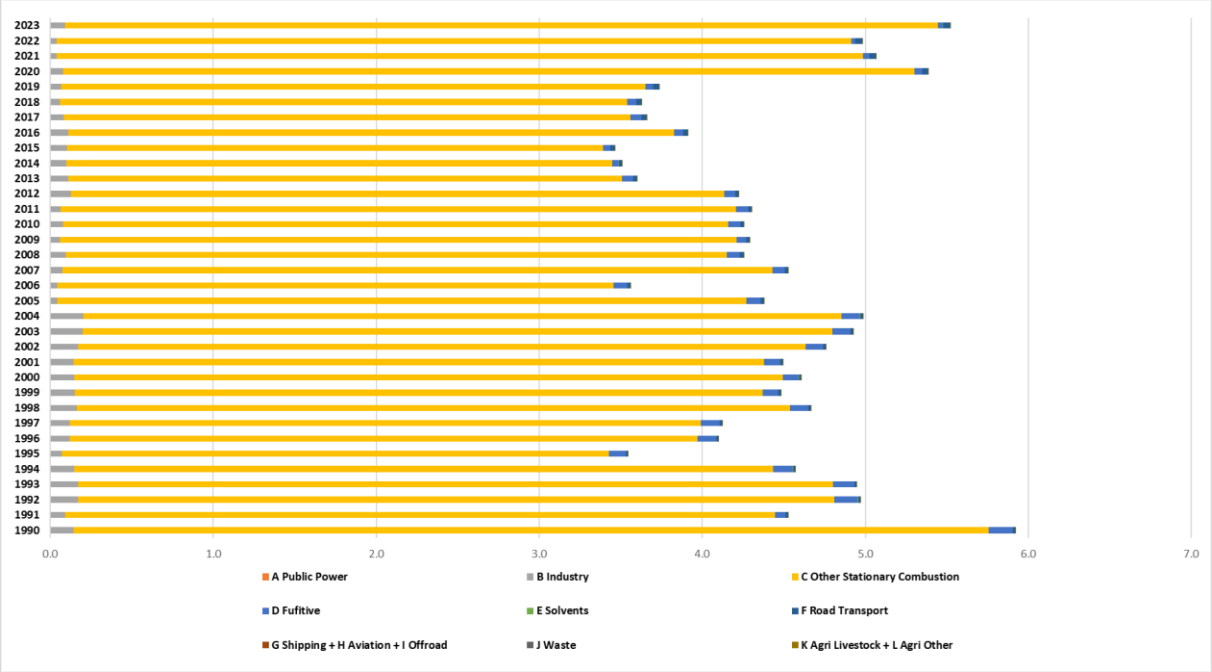


Figure 89. Distribution of Indeno (1,2,3-cd) pyrene between sectors for period 1990 – 2023.

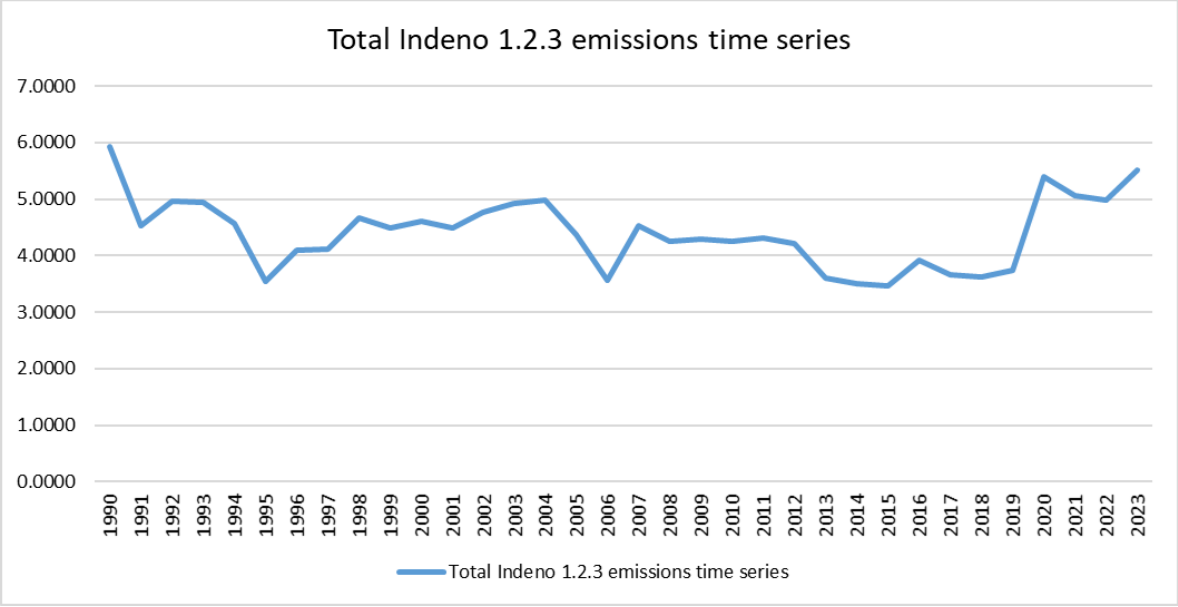


Figure 90. Total Indeno 1,2,3 pyren emissions time series from 1990 to 2023.

Table 59. Total Indeno 1,2,3 pyren emissions between sectors for years 1990 and 2023. Trends of dominant sources of Indeno 1,2,3 pyren emissions compared to years 1990-2023 and 2022-2023. Share in National Total for years 1990 and 2023

NFR Category	Indeno 1,2,3 pyren Emission in [kt]		Trend		Share in National Total	
	1990	2023	1990 - 2023	2022 - 2023	1990	2023
A Public Power	0.0009	0.0006	-29.76%	-1.75%	0.02%	0.01%
B Industry	0.1419	0.0913	-35.69%	130.74%	2.40%	1.65%
C Other Stationary Combustion	5.6140	5.3530	-4.65%	9.87%	94.82%	96.94%
D Fugitive	0.1476	0.0292	-80.24%	21.56%	2.49%	0.53%
E Solvents	0.0007	0.0021	225.01%	3.12%	0.01%	0.04%
F Road Transport	0.0152	0.0453	197.57%	4.07%	0.26%	0.82%
G Shipping + H Aviation + I Offroad	NA	NA	NA	NA	NA	NA
J Waste	0.0000	0.0000	372.52%	-4.86%	0.00%	0.00%
K Agri Livestock + L Agri Other	0.0007	0.0006	-25.66%	-1.57%	0.01%	0.01%
Total	**5.9210**	**5.5221**	**-6.74%**	**10.83%**	**100.00%**	**100.00%**

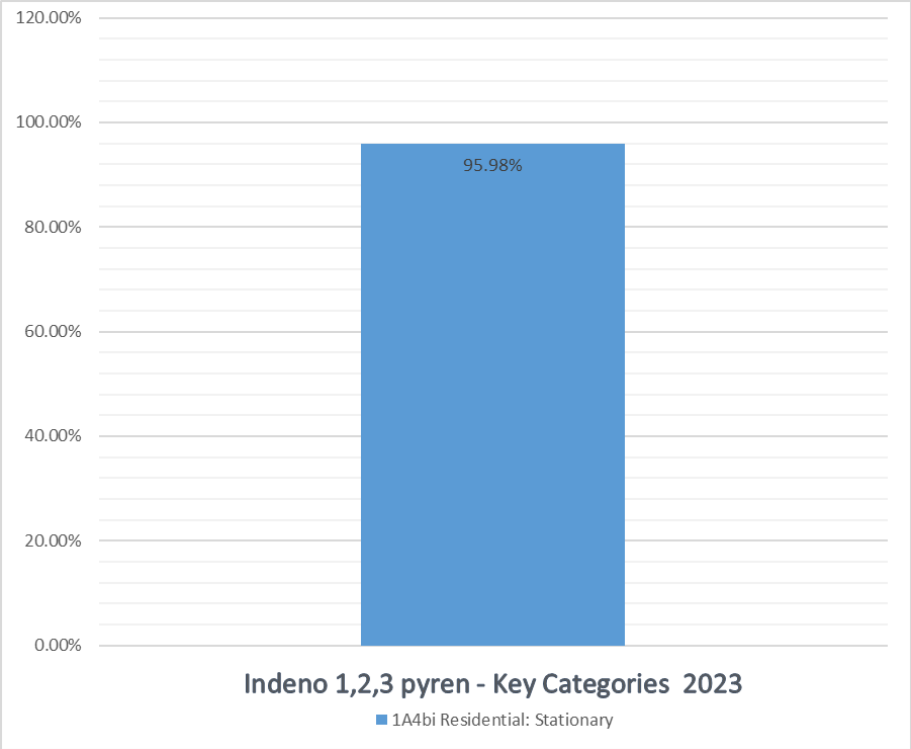


Figure 91. Key Categories assessments of Indeno 1,2,3 pyren emissions for 2023.

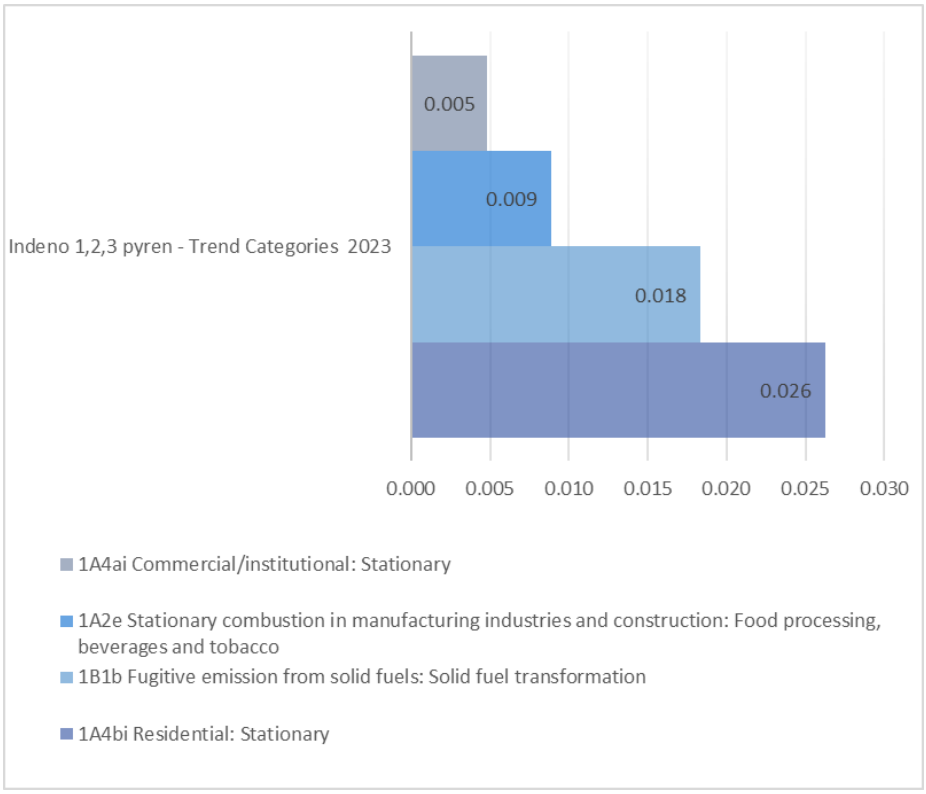


Figure 92. Trends assessments of Indeno 1,2,3 pyren emissions for base year and 2023

2.4.24. PAHs - Total 1-4 PAHs

Total 1-4 PAHs emissions in 2023. was 32.8919 t, which is 12.84 % increase compared to 2022. Compared to the 1990 baseline emissions of Total 1-4 PAHs is 19.10 % lower.

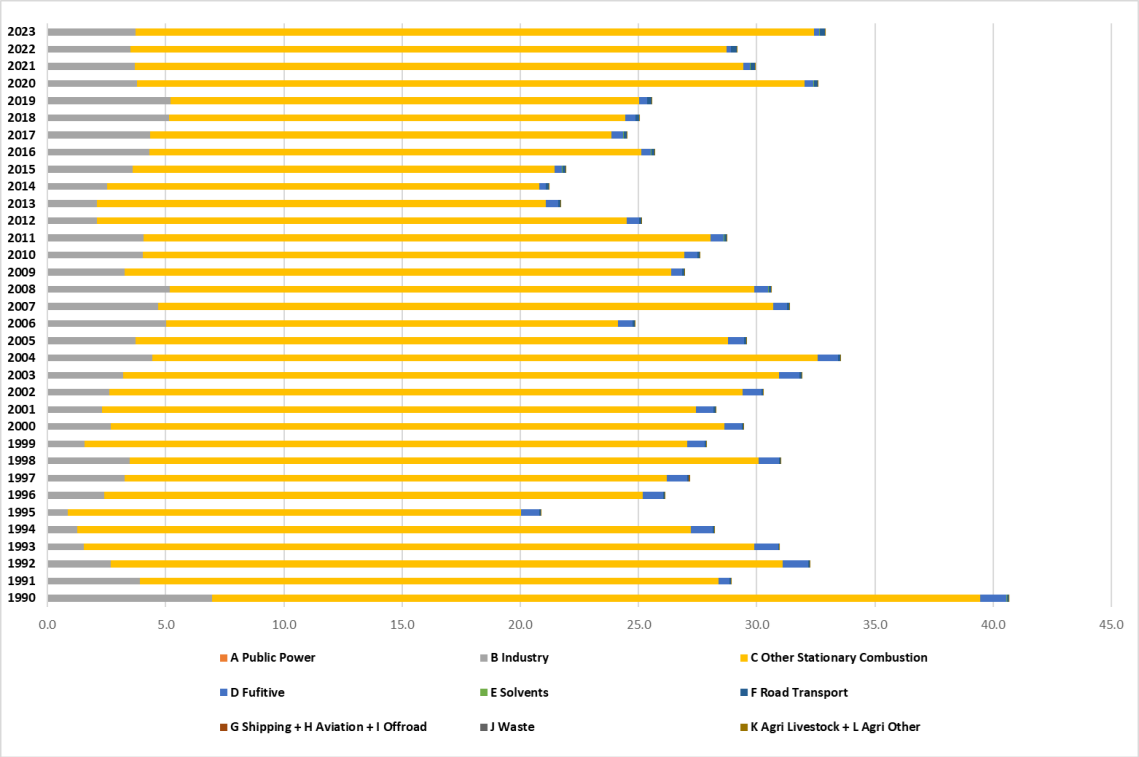


Figure 93. Distribution of Total 1-4 PAH between sectors for period 1990 – 2023.

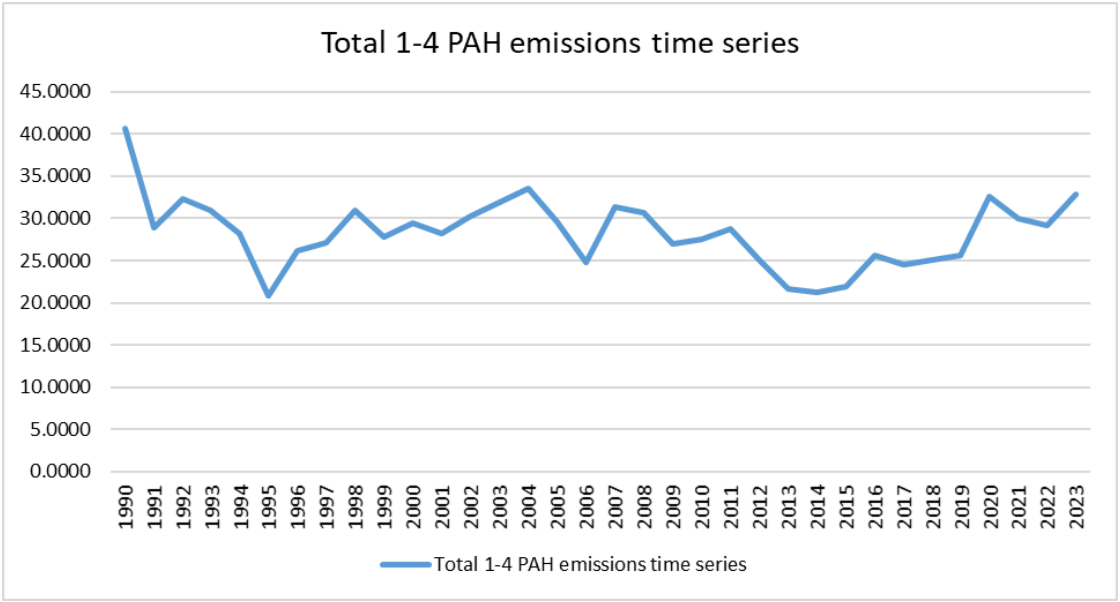


figure 94. Total 1-4 PAH emissions time series from 1990 to 2023.

Table 60. Total 1-4 PAH emissions between sectors for years 1990 and 2023. Trends of dominant sources of Total 1-4 PAH emissions compared to years 1990-2023 and 2022-2023. Share in National Total for years 1990 and 2023

NFR Category	Total 1-4 PAH Emission in [kt]		Trend		Share in National Total	
	1990	2023	1990 - 2023	2022 - 2023	1990	2023
A Public Power	0.0268	0.0183	-31.51%	-1.56%	0.07%	0.06%
B Industry	6.9271	3.7022	-46.56%	5.68%	17.04%	11.26%
C Other Stationary Combustion	32.5056	28.7070	-11.69%	13.90%	79.95%	87.28%
D Fugitive	1.1172	0.2207	-80.24%	21.56%	2.75%	0.67%
E Solvents	0.0036	0.0117	225.01%	3.12%	0.01%	0.04%
F Road Transport	0.0690	0.2274	229.54%	1.14%	0.17%	0.69%
G Shipping + H Aviation + I Offroad	0.0024	0.0008	-65.96%	-8.96%	0.01%	0.00%
J Waste	0.0000	0.0000	372.52%	-4.86%	0.00%	0.00%
K Agri Livestock + L Agri Other	0.0051	0.0038	-25.66%	-1.57%	0.01%	0.01%
Total	**40.6568**	**32.8919**	**-19.10%**	**12.84%**	**100.00%**	**100.00%**

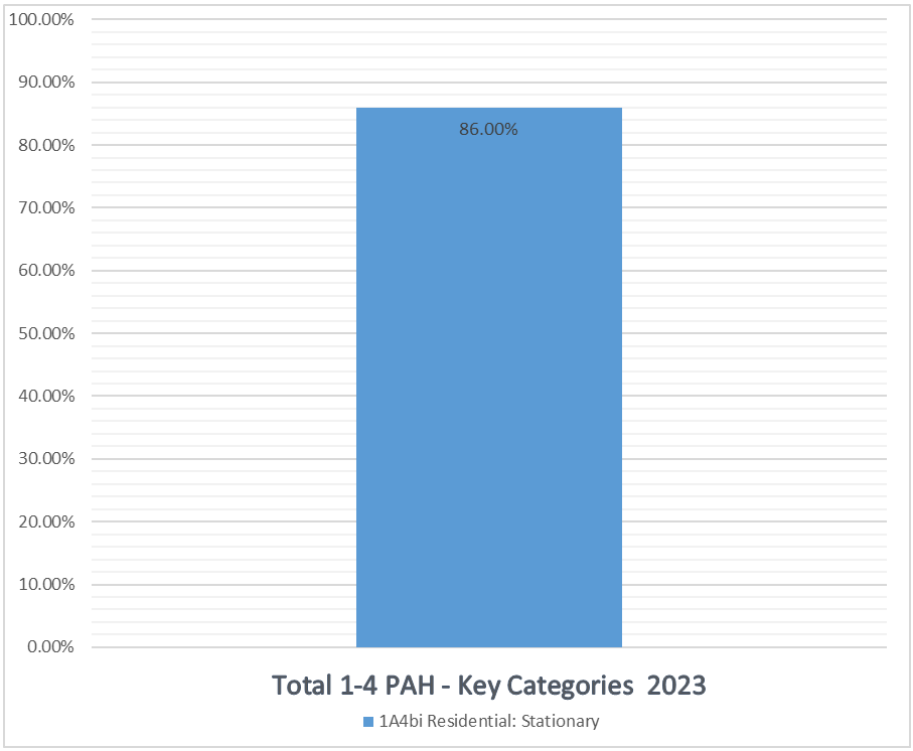


Figure 95. Key Categories assessments of Total 1-4 PAH emissions for 2023.

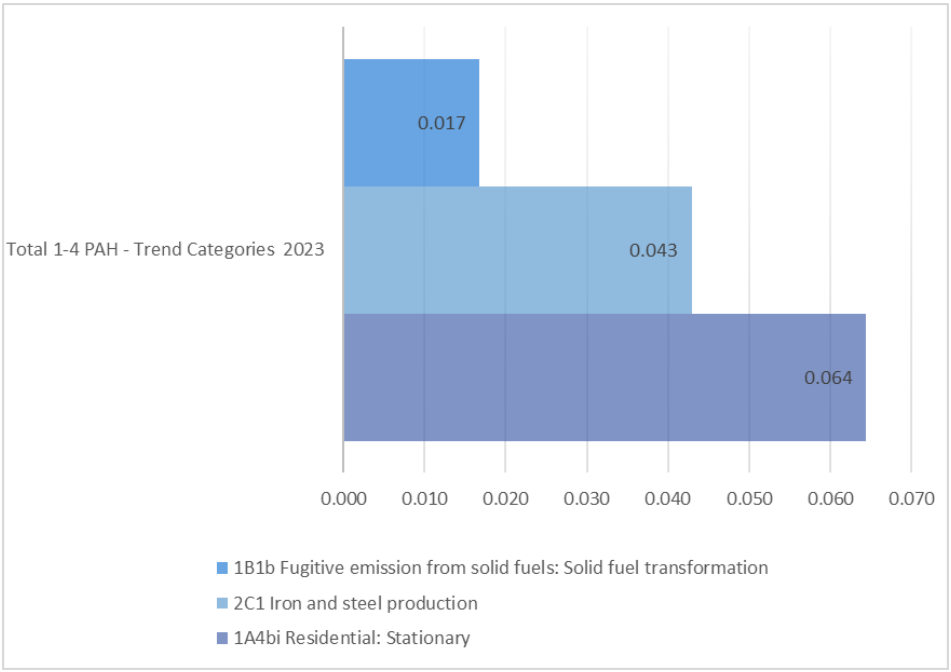


Figure 96. Trends assessments of Total 1-4 PAH emissions for base year and 2023

2.4.25. Emissions HCBs

HCBs emissions in 2023. was 2.1520 kg, which is 0.41 % increase compared to 2022. Compared to the 1990 baseline emissions of HCBs is 24.99 % lower.

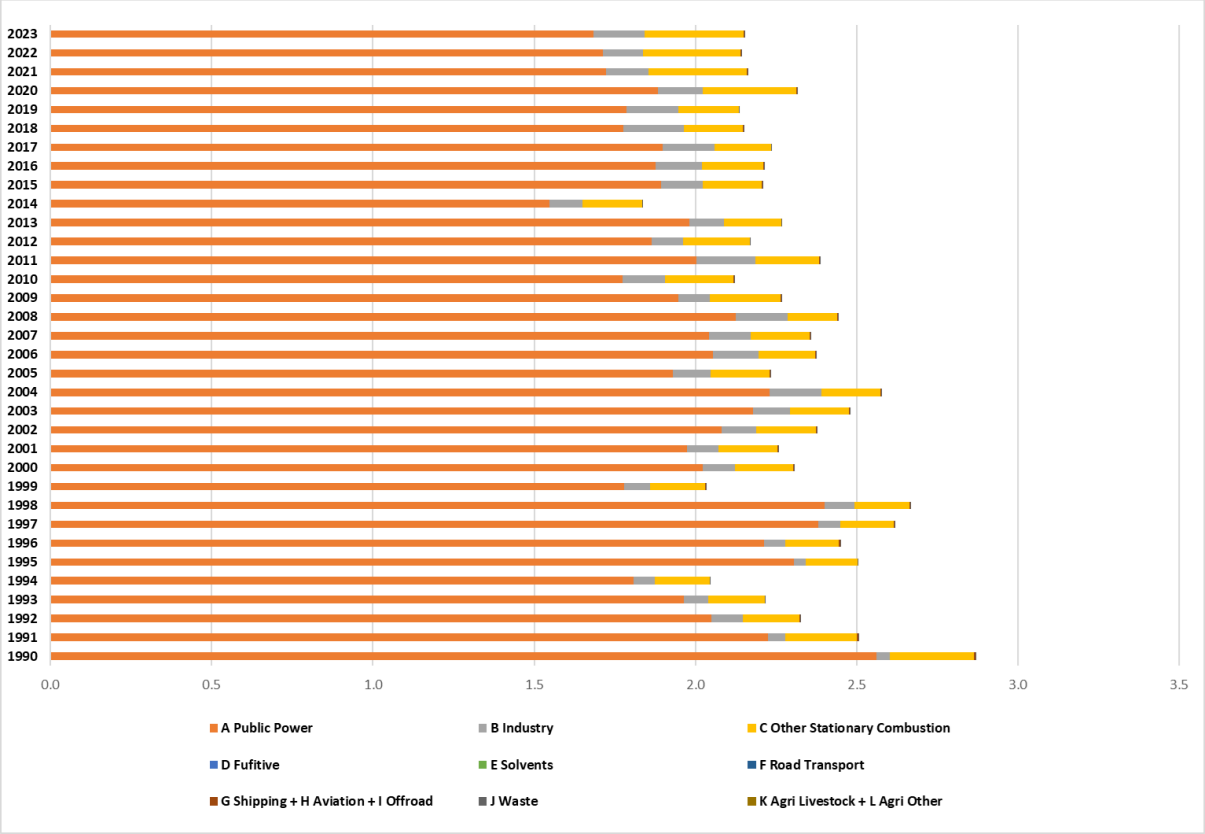


Figure 97. Distribution of HCB between sectors for period 1990 – 2023.

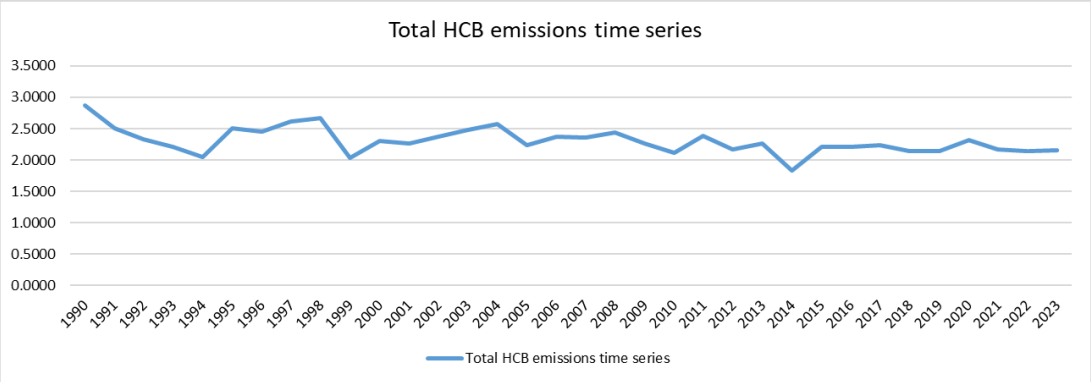


Figure 98.Total HCB emissions time series from 1990 to 2023.

Table 61. Total HCB emissions between sectors for years 1990 and 2023. Trends of dominant sources of HCB emissions compared to years 1990-2023 and 2022-2023. Share in National Total for years 1990 and 2023

NFR Category	HCB Emission in [kt]		Trend		Share in National Total	
	1990	2023	1990 - 2023	2022 - 2023	1990	2023
A Public Power	2.5606	1.6846	-34.21%	-1.60%	89.25%	78.28%
B Industry	0.0431	0.1568	264.06%	25.88%	1.50%	7.29%
C Other Stationary Combustion	0.2595	0.3074	18.44%	1.27%	9.05%	14.28%
D Fugitive	NA	NA	NA	NA	NA	NA
E Solvents	NA	NA	NA	NA	NA	NA
F Road Transport	NA	NA	NA	NA	NA	NA
G Shipping + H Aviation + I Offroad	0.0056	0.0027	-52.50%	0.00%	0.20%	0.12%
J Waste	0.0001	0.0005	372.52%	-4.86%	0.00%	0.02%
K Agri Livestock + L Agri Other	NA	NA	NA	NA	NA	NA
Total	**2.8689**	**2.1520**	**-24.99%**	**0.41%**	**100.00%**	**100.00%**

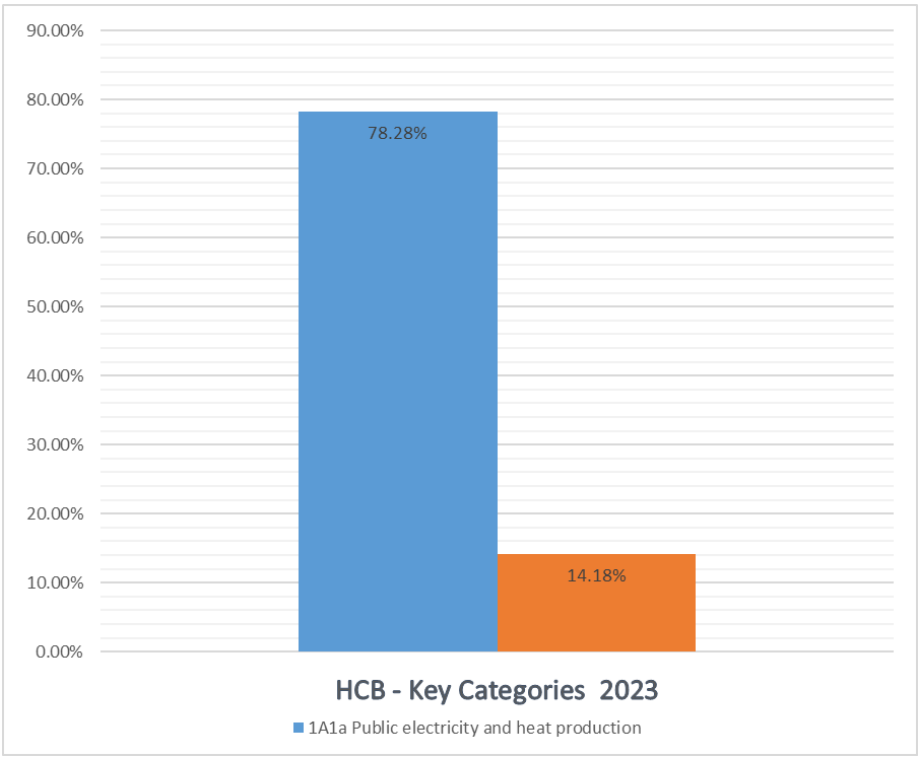


Figure 99. Key Categories assessments of HCB emissions for 2023.

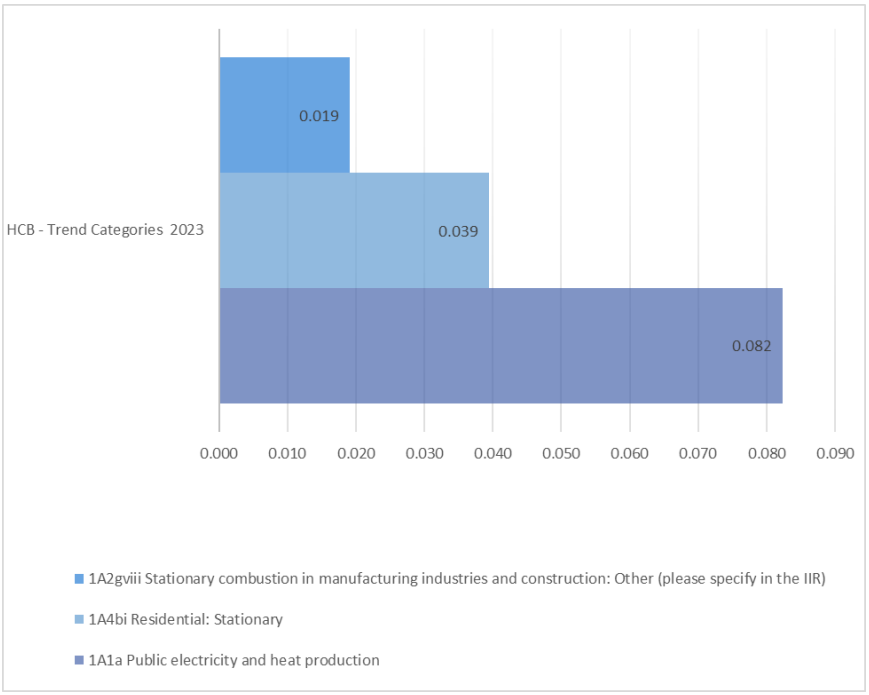


Figure 100. Trends assessments of HCB emissions for base year and 2023

2.4.26. Emissions PCBs

PCBs emissions in 2023. Was 752.7077 kg, which is 7.40 % increase compared to 2022. Compared to the 1990 baseline emissions of PCBs is 10.84 % lower.

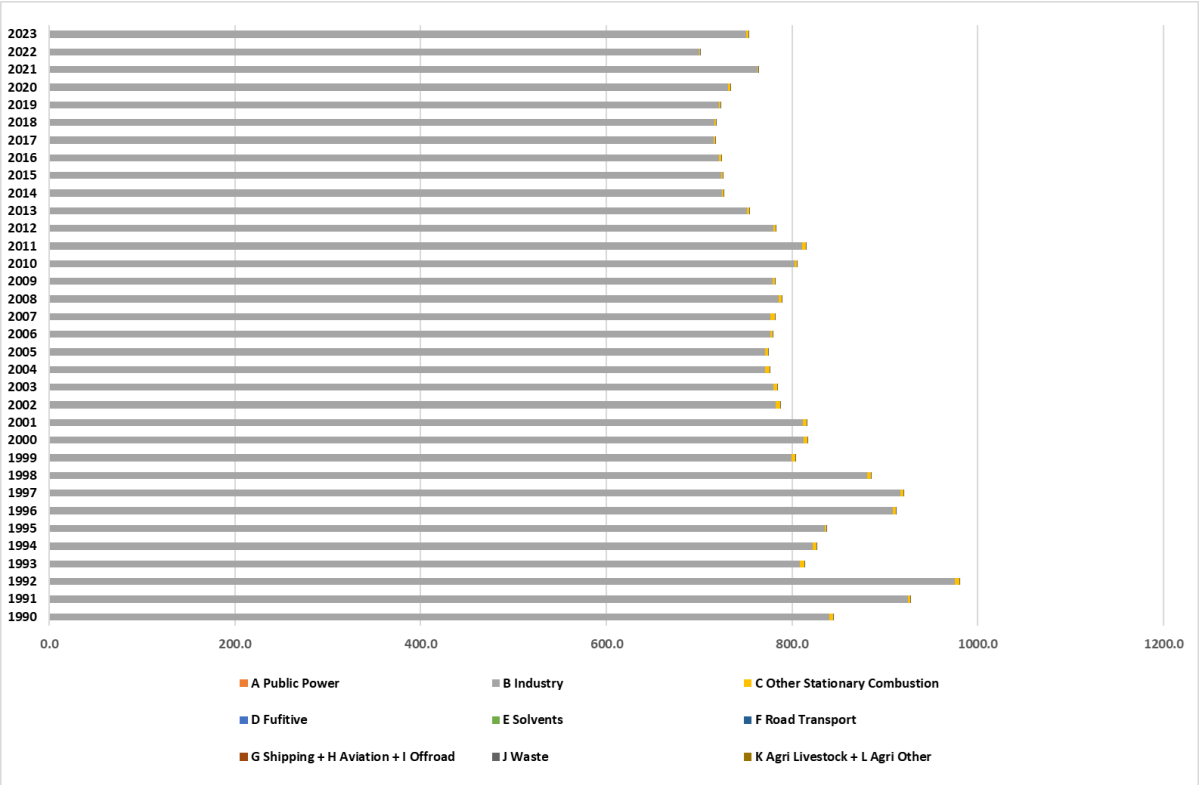


Figure 101. Distribution of PCB between sectors for period 1990 – 2023.

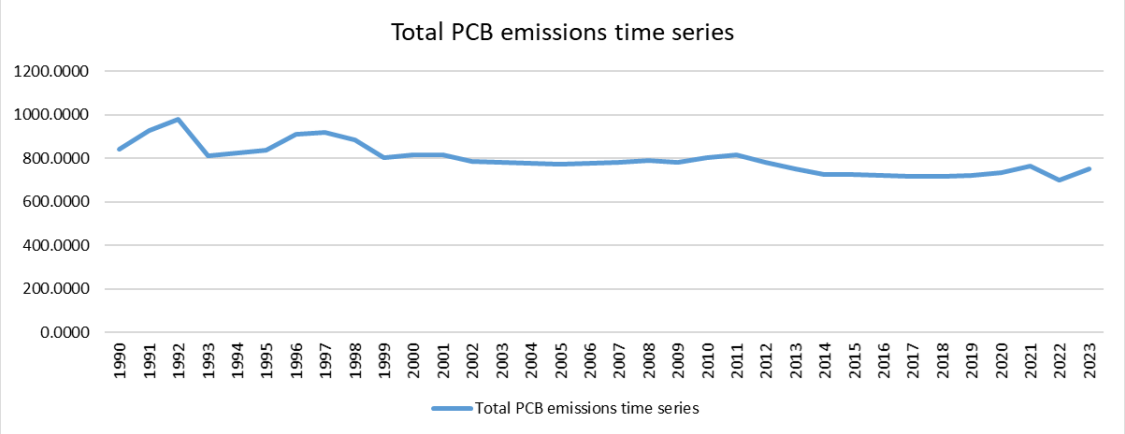


Figure 102.Total PCB emissions time series from 1990 to 2023.

Table 62. Total PCB emissions between sectors for years 1990 and 2023. Trends of dominant sources of PCB emissions compared to years 1990-2023 and 2022-2023. Share in National Total for years 1990 and 2023

NFR Category	PCB Emission in [kt]		Trend		Share in National Total	
	1990	2023	1990 - 2023	2022 - 2023	1990	2023
A Public Power	0.0013	0.0028	121.08%	-0.41%	0.00%	0.00%
B Industry	840.1327	750.5813	-10.66%	7.27%	99.52%	99.72%
C Other Stationary Combustion	4.0584	2.1114	-47.98%	83.41%	0.48%	0.28%
D Fugitive	NA	NA	NA	NA	NA	NA
E Solvents	NA	NA	NA	NA	NA	NA
F Road Transport	NA	NA	NA	NA	NA	NA
G Shipping + H Aviation + I Offroad	0.0228	0.0108	-52.50%	0.00%	0.00%	0.00%
J Waste	0.0003	0.0014	372.52%	-4.86%	0.00%	0.00%
K Agri Livestock + L Agri Other	NA	NA	NA	NA	NA	NA
Total	**844.2155**	**752.7077**	**-10.84%**	**7.40%**	**100.00%**	**100.00%**

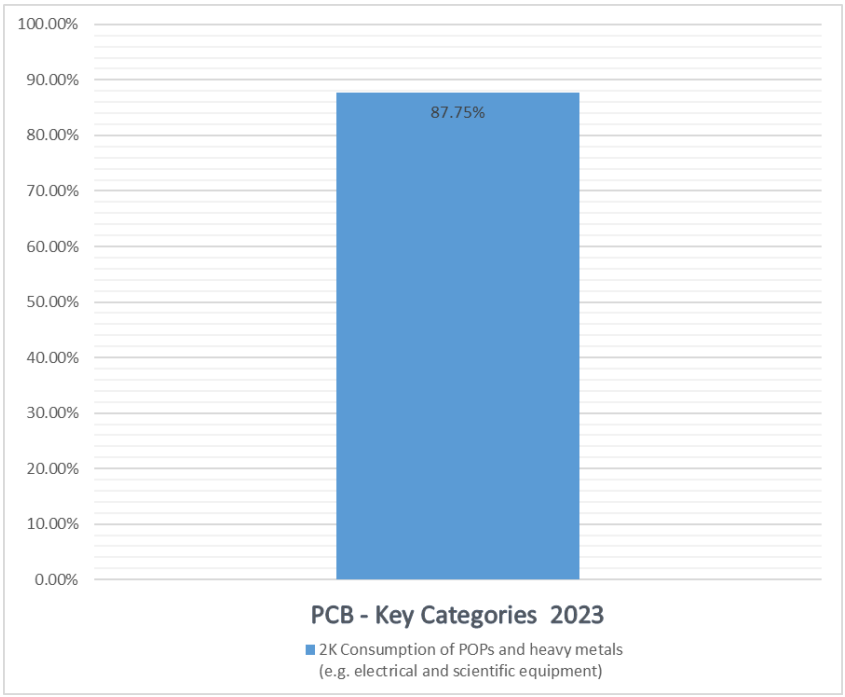


Figure 103. Key Categories assessments of PCB emissions for 2023.

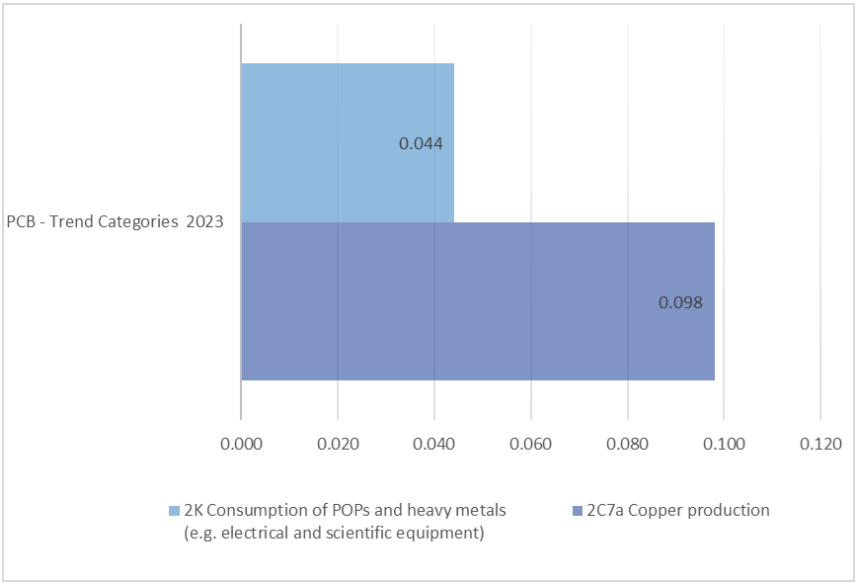


Figure 104. Trends assessments of PCB emissions for base year and 2023

SECTORAL METODOLOGIES

During 2015 SEPA implement project which have a very large impact on reporting for CLRTAP convention.

The aim of the project was to determine the national emission factors for most used fuels in Serbia. In this project, data were collected, primarily, for coal (lignite) mined in Serbia whose annual volume exceeding 30 million tons each year.

3. ENERGY (NFR 1)

This chapter gives an overview of category 1 A Stationary Fuel Combustion Activities. It includes information on completeness, methodologies, activity data, emission factors, recalculations and planned improvements.

Sector 1.Energy considers emissions originating from fuel combustion activities, as well as fugitive emissions from fuels:

1.A	**Fuel Combustion Activities**
1.A.1.a	Public electricity and heat production
1.A.1.b	Petroleum refining
1.A.1.c	Manufacture of solid fuels and other energy industries
1.A.2.a	Stationary combustion in manufacturing industries and construction: Chemicals: Iron and steel
1.A.2.b	Stationary combustion in manufacturing industries and construction: Non-ferrous metals
1 A 2 c	Stationary combustion in manufacturing industries and construction: Chemicals
1 A 2 d	Stationary combustion in manufacturing industries and construction: Pulp, Paper and Print
1 A 2 e	Stationary combustion in manufacturing industries and construction: Food processing, beverages and tobacco
1 A 2 f	Stationary combustion in manufacturing industries and construction: Non-metallic minerals
1A2gvii	Mobile Combustion in manufacturing industries and construction: (please specify in the IIR)
1A2gviii	Stationary combustion in manufacturing industries and construction: Other (please specify in the IIR)
1A3ai(i)	International aviation LTO (civil)
1A3aii(i)	Domestic aviation LTO (civil)
1A3aii(ii)	Domestic aviation cruise (civil)
1A3bi	Road transport: Passenger cars
1A3bii	Road transport: Light duty vehicles
1A3biii	Road transport: Heavy duty vehicles and buses
1A3biv	Road transport: Mopeds & motorcycles
1A3bv	Road transport: Gasoline evaporation
1A3bvi	Road transport: Automobile tyre and brake wear
1A3bvii	Road transport: Automobile road abrasion
1A3c	Railways
1A3dii	National navigation (Shipping)
1A4ai	Commercial / institutional: Stationary
1A4bi	Residential: Stationary
1A4ci	Agriculture/Forestry/Fishing: Stationary
1.B	**Fugitive emissions**
1B1a	Fugitive emissions from solid fuels: Coal mining and handling
1B2ai	Fugitive emissions oil: Exploration, production, transport
1B2aiv	Fugitive emissions oil: Refining / storage
1B2av	Distribution of oil products
1B2b	Fugitive emissions from natural gas (exploration, production, processing, transmission, storage, distribution and other)
1B2c	Venting and flaring (oil, gas, combined oil and gas)

1 A Fuel Combustion Activities

1 A 1 Energy Industries

1 A 1 a Public electricity and heat production

Methodology

The methodology used in this inventory for the emission calculation for category 1 A 1 a Public electricity and heat production is in accordance with the EMEP/EEA Emission Inventory Guidebook 2023

Emissions are calculated by multiplying fuel consumption (in TJ) by emission factors. Fuel amounts related to direct emissions were subtracted from the amount of fuel from an energy balance based on fuel type and activities.

Emission factors

Emission factors used in emission calculation are from EMEP/EEA Inventory Guidebook 2023 except for lignite (brown coal). Based on the obtained data for the period 2000 - 2013 years on the sulfur content in coal and net calorific value is determined by the emission factor for sulfur in lignite. Applying equation for calculation emission factor from percentage of sulphur and net calorific value calculate mean value 1350 g/GJ for SOx in lignite which the main coal in Serbia. This number was applied for period 1990 – 2014.

During 2016 a detailed analysis of available data concerning the use of coal (lignite) in electricity and heat production, as well as the technical characteristics for coal has been carried out. It was found that the amount of sulfur in lignite is around 0.5%, but net calorific value is rather low, ranging between 6,000 - 7,000 kJ/kg of fuel.

Based on the available data, national emission factor for lignite was calculated and average value is 1350 g/GJ. Default value for this type of fuel in EMEP/EEA emission inventory guidebook 2023 is 1680 g/GJ.

Also new elementary lignite analysis was performed for the period 2015 – 2023 based on which a new national emission factor for this period was calculated and average value is 1162 g/GJ.

For all other fuels emissions were calculated on the base of methodology (Tier 1), which implies multiplication with appropriate default emission factors.

During the preparation of the inventory, it was determined that there are two types of fuel oil - with share of 1% sulfur content and sulfur content with a share of 3%. Based on these data, the emission factor for fuel oil with 3% sulfur content and the amount of emitted sulfur dioxide were calculated.

Activity data

Sectors 1.A.1 Energy Industries include combustion of fuels in stationary sources.

Activity data for the Energy sector is the amount of consumed fuel by individual sector and are taken from the Serbian report to International Energy Agency for period.

Table 63. Activity data for sector-1 A 1 a

Year	Hard coal	Brown coal	Gaseous fuels	Heavy Fuel Oil	Light oil-gas oil	Biomass
1990	4338476	377845784	21282561	10983200	0	0
1991	753504	331459896	29057850	21920000	0	0
1992	0	305741340	33957900	18160000	0	0
1993	0	293166638	21164400	8840000	0	0
1994	0	269866978	17667000	7000000	0	0
1995	0	344167993	19253700	7280000	0	0
1996	0	330392736	19978200	12240000	0	0
1997	0	355346494	22080600	16560000	0	0
1998	0	358361221	20568600	9120000	0	0
1999	0	265411585	14650200	10840000	0	0
2000	614878	301241482	15642000	9200000	0	0
2001	485610	294260477	20018700	9400000	0	0
2002	485610	310125589	26410500	3600000	0	0
2003	372439	324736788	27617400	3840000	0	0
2004	486360	332384768	35074800	2280000	0	0
2005	908900	287235007	18828900	11640000	298200	0
2006	655325	306070381	17169300	9480000	724200	0
2007	615300	304362925	19562400	9840000	681600	12000
2008	453822	316644158	20820600	7621767	911589	22000
2009	535054	290230650	18141300	9719896	1582596	62000
2010	0	264634947	22064400	7948898	306075	84000
2011	0	298973696	25830000	5848412	174900	90000
2012	0	278334248	26262000	6960434	131175	73000
2013	0	295731558	28786500	4242158	87450	157000
2014	0	230783508	27446400	3953856	131175	168000
2015	0	282610048	30999600	5012614	299964	191000
2016	0	279888609	30778200	4971527	171408	188000
2017	0	283332225	32997120	4712145	166437	176285
2018	0	265143199	33003094	4411653	194001	207783
2019	0	266638018	33251800	3623119	246316	180693
2020	0	281098518	34658726	3687974	285763	183839
2021	0	256833405	42793421	5471502	544748	324507
2022	0	255104816	43256642	5831587	639247	559449
2023	0	251019757	43280654	5351247	744921	559990

Recalculations and other changes

From 2019, category 1A1a includes data used in calculations in category 1Bc Venting and Flaring.

A decrease of around -20% for all pollutants in 2013-2014 can be observed, due to large floods that hit the Republic of Serbia during 2014. This is the cause of reduced activity due to coal mining for energy production, that directly influences emissions.
In subcategory Brown coal activity data have been changed in 2015 because of changed data in Energy Balance.

Emission factor have been changed according to Metodology EMEP/EEA 2023 in subcategory Brown Coal for SOx for 2015, 2016, 2017, 2018, 2019, 2020, 2021,2022 and.
According to available information from thermal power plants, experts from the Faculty of Mechanical Engineering were able to calculate the Contry - specific emission factor for these eight years for SOx.

In subcategory Gaseous fuels emission factors have been changed according to Metodology EMEP/EEA 2023 for following pollutants: SOx, NH3, BC, PM2.5, PM10, TSP, Hg, and PCDD/PCDF

Planned improvements

In the future, SEPA planned to report on higher Tier level.

1 A 1 b Petroleum refining

Sub-sector 1.A.1.b Petroleum refining takes into account consumptions of fossil fuels from two LCPs Oil refineries owned by legal entity NIS- Oil industry.

Methodology

The methodology used in this inventory for the emission calculation for category 1 A 1 b Petroleum refining is in accordance with the EMEP/EEA Emission Inventory Guidebook 2023

Emission factors

Emission factors used in emission calculation for this category are Tier 1 emission factors attained from EMEP/EEA Inventory Guidebook 2023.

National emission factors have not been developed.

1.A.1.b	
Petroleum refining	
2000	512550
2001	3410718
2002	3621717
2003	3955657
2004	4508524
2005	3368386
2006	2717382
2007	2406119
2008	2463834
2009	2764820
2010	3089182
2011	2307484
2012	1790029
2013	2266534
2014	1738913
2015	2744436
2016	3119682
2017	2528778
2018	2839464
2019	2664555
2020	2920809
2021	3227090
2022	4070858
2023	5103156

Table 64. Activity data for sector-1 A 1 b Petroleum refining

Activity data

The activity data source for this category is Petroleum Industry of Serbia and Serbian report to International Energy Agency.

For now, all activity data for period 1990 – 1999 are not available.

Recalculations and other changes

Emission factors have been changed according to Metodology EMEP/EEA 2023 for following pollutants: NMVOC, SOx, Pb, Cd, Hg, As, Cr, Cu, Ni, Se and Zn.

Planned improvements

No planned improvements in the next period.

1.A.1.c Manufacture of solid fuels and other energy industries

Methodology

The methodology used in this inventory for the emission calculation for category 1 A 1 c Manufacture of solid fuels and other energy industries is in accordance with the EMEP/EEA Emission Inventory Guidebook 2023

Emission factors

Emission factors used in emission calculation for this category are national emission factors for lignite (brown coal)

Activity data

The activity data for this category are obtained from Serbian report to International Energy Agency for period 1990 – 2023. (Table 9.2.)

Table 65. Activity data for category 1.A 1 c

Year	GJ	Year	GJ
1990	36000424	2007	18256382
1991	15028640	2008	19246906
1992	35163602	2009	9518455
1993	32653136	2010	19512496
1994	30057280	2011	23119740
1995	25377908	2012	17774367
1996	27922530	2013	16508402
1997	28400714	2014	6552194
1998	27615126	2015	10848032
1999	23635952	2016	18052608
2000	23977512	2017	10808676
2001	24421540	2018	10715939
2002	25787780	2019	6912207
2003	27222332	2020	7125591
2004	27871296	2021	4471771
2005	21057174	2022	1830392
2006	19827558	2023	8888960

Recalculations and other changes

Activity data of solid fuels in subcategory 1A1c show a sharp decrease of -60% between 2013-2014, between 2014-2016 activity data increased by +66% each year, from 2016-2017 show a decrease of -40%. During 2014, large floods hit the Republic of Serbia, especially in the areas where the mines are located. This is the cause of reduced activity due to coal mining for energy production, that directly influences emissions. Also, the use of steam locomotives in 2017 has been reduced. This is the cause of the reduction of emissions between 2016 and 2017.

Planned improvements

No planned improvements in the next period.

1.A.2 Manufacturing Industries and Construction

1.A.2.a	Iron and steel
1.A.2.b	Non-ferrous metals
1 A 2 c	1 A 2 c Stationary combustion in manufacturing industries and construction: Chemicals
1 A 2 d	1 A 2 d Stationary combustion in manufacturing industries and construction: Pulp, Paper and Print
1 A 2 e	1 A 2 e Stationary combustion in manufacturing industries and construction: Food processing, beverages and tobacco
1.A.2.f.i	Stationary combustion in manufacturing industries and construction: Other

1.A.2.a Stationary combustion in manufacturing industries and construction: Iron and steel

Methodology

The methodology used in this inventory for the emission calculation for category 1 A 2 a Stationary combustion in manufacturing industries and construction: Iron and steel is in accordance with the EMEP/EEA Emission Inventory Guidebook 2023

Table 66. Activity data for category 1.A.2.a.

Year	Sinter (t)	Pellet (t)	Blast furnace (t)
1990	0	0	2313000
1991	0	0	1266000
1992	0	0	511000
1993	0	0	62000
1994	0	0	22000
1995	0	0	108000
1996	0	0	565000
1997	0	0	907000
1998	0	0	850000
1999	0	0	139000
2000	0	0	598000
2001	0	0	456000
2002	0	0	485000
2003	0	0	635000
2004	941349	641095	1003135
2005	1094502	889273	1208118
2006	1341834	1542287	1698446
2007	1137976	1338261	1485126
2008	1215427	1393685	1582118
2009	690020	973477	1007986
2010	773848	1208049	1234633
2011	967194	1058133	1258181
2012	336994	207266	312000
2013	413968	235919	365000
2014	624035	327470	550000
2015	884550	623097	904000
2016	384081	802219	1154000
2017	773232	1431960	1341326
2018	1113352	1552507	1708153
2019	1203368	1265650	1681527
2020	1011079	581744	1106761
2021	1153480	580834	1186098
2022	1131824	544795	1118428
2023	1229778	298037	1023459

Emission factors

Emission factors used in emission calculation for this category are Tier 2 emission factors attained from EMEP/EEA Inventory Guidebook 2023.

National emission factors have not been developed.

Activity data

The sources for these data are World Steel Association for the period 1990 – 2003 and Iron and steel factory in Smederevo. (Table 9.2.)

Recalculations and other changes

For the years 2011-2017, CO-emissions from category 1.A.2.b show steep increases and decreases (2011-2012: -65%, 2013-2014: +51%, 2015-2016: -56%, 2016-2017:+101%). Reduced production due to the global crisis in steel production and the change in ownership structure influenced the significant reduction in emissions for the period 2011-2012. In this period, factory in Smederevo worked quietly with significantly reduced production. In the period from 2012 to 2016, we had the production of steel that was intended for domestic customers. During 2016, there was a change in the ownership structure, after which factory in Smederevo completely started operating since 2017.

There are no recalculations.

Planned improvements

No planned improvements in the next period.

1.A.2.b Stationary Combustion in manufacturing industries and construction: Non-ferrous metals

Secondary aluminium is mainly used by two companies which uses scrap as raw materials.

Methodology

The methodology used in this inventory for the emission calculation for this category is in accordance with the EMEP/EEA Emission Inventory Guidebook 2023

Table 67. Activity data for category 1.A.2.b. in tones

Year	Primary copper production	Secondary copper production	Primary lead production	Secondary lead production	Secondary aluminium	Magnesium production
1990	151000	0	6000	0	0	5788
1991	134000	0	51000	0	0	5360
1992	135000	0	78000	0	0	4055
1993	51000	0	8000	0	0	0
1994	72000	0	13000	0	0	0
1995	78000	0	19000	0	0	2560
1996	104000	0	44000	0	0	3090
1997	113000	0	42000	0	0	3742
1998	94000	0	36000	0	0	3965
1999	50000	0	4000	0	0	1203
2000	44900	720	5000	5146	494	0
2001	32300	50	5000	5144	526	0
2002	34900	970	5000	5272	487	0
2003	13500	560	5000	4893	603	0
2004	11200	820	0	5395	514	0
2005	29300	1990	0	4666	269	523
2006	38900	2520	0	6435	3293	181
2007	28800	2490	0	8107	10298	1649
2008	31100	2640	0	12001	10601	1478
2009	26300	1140	0	14036	9013	1341
2010	21200	950	0	24033	13867	933
2011	25740	2708	0	26148	12104	1582
2012	32166	2536	0	18383	12888	1387
2013	32408	3432	0	0	13529	2026
2014	31255	1921	0	0	13436	1800
2015	42439	2207	0	0	11941	3894
2016	59078	2231	0	0	13864	4131
2017	67752	1469	0	0	13989	4202
2018	65189	2219	0	0	15284	4123
2019	78091	5092	0	0	12989	3045
2020	60976	9935	0	0	10869	1287
2021	45649	20346	0	0	16560	1895
2022	17543	7573	0	0	15098	1819
2023	51777	22386	0	0	13637	0

Emission factors

Emission factors used in emission calculation for this category are Tier 2 emission factors attained from EMEP/EEA Inventory Guidebook 2023.

National emission factors have not been developed.

Activity data

Activity data are also given in chapter Industry.

Recalculations and other changes

An extrapolation of the data for secondary aluminum in 2021 , 2022 and 2023 was made because production exists, but the plants did not provide us with the data.

Emission factors for SOx have been changed according to Metodology EMEP/EEA 2023 in following cubcategories: Primary Copper production, Secondary Copper production, Primary Lead production, Secondardy Lead production, Primary Zink production, Secondary Zink production.

Planned improvements

No planned improvements in the next period.

1.A.2.c. Stationary combustion in manufacturing industries and construction: Chemicals

Methodology

The methodology used in this inventory for the emission calculation for this category is in accordance with the EMEP/EEA Emission Inventory Guidebook 2023

Table 68. Activity data for category 1.A.2.c. in tones

Year	Combustion in industry using solid fuels	Combustion in industry using gaseous fuels	Combustion in industry using liquid fuels	Combustion in industry using biomass
1990	2353133	4931497	0	0
1991	1225224	4700142	138000	0
1992	2632761	5409440	138000	0
1993	2459916	3371448	0	0
1994	2194662	2814481	0	0
1995	1474444	3323980	0	0
1996	1770122	5488191	0	0
1997	1826578	6065559	0	0
1998	2119257	5650180	0	0
1999	2007672	4106724	0	0
2000	2038082	4332911	0	0
2001	1901222	4357665	0	0
2002	2279899	4382555	0	0
2003	2693978	4582900	0	0
2004	2730277	5820331	0	0
2005	769484	4873692	0	0
2006	798083	5014464	0	0
2007	886553	5821963	0	0
2008	1011639	6342614	1095321	25000
2009	670796	3121459	984870	3000
2010	823024	1025100	658976	5000
2011	1023475	2727900	3220978	96000
2012	921217	4479300	3809715	202000
2013	735871	2915100	756582	141000
2014	763593	2344500	1583326	184000
2015	1008128	3554100	1950198	178000
2016	3642821	5337900	1038694	140000
2017	2331206	6605275	785268	238772
2018	1505562	3956144	855289	230628
2019	1048305	3138256	777690	1310724
2020	1802068	2554517	481031	1007881
2021	407335	3682896	522964	863052
2022	550949	3764051	807012	896184
2023	2684302	3711046	878444	468206

Emission factors

Emissions were calculated on the base of methodology (Tier 1), which implies multiplication with appropriate default emission factors.

During the preparation of the inventory, it was determined that there are two types of fuel oil - with share of 1% sulfur content and sulfur content with a share of 3%. Based on these data, the emission factor for fuel oil with 3% sulfur content and the amount of emitted sulfur dioxide were calculated.

Activity data

The activity data for category Stationary combustion in manufacturing industries and construction: Chemicals are obtained from Serbian report to International Energy Agency for period 1990 – 2023.

Recalculations and other changes

In subcategory gaseous fuels activity data have been changed in 2022 because of changed data in Energy Balance.
In subcategory Biomass activity data have been changed in 2021 and 2022 because of changed data in Energy Balance.
Emission factors have been changed according to Metodology EMEP/EEA 2023 for following subcategories and pollutants:
Combustion in industry using solid fuels – NH3
Combustion in industry using gaseous fuels – NH3, PCDD/PCDF, Benzo(a)pyren, Benzo(b)fluoranthen, Benzo(k)fluoranthen, Indeno 123 pyren, TOTAL 1-4 and HCB
Combustion in industry using liquid fuels – NH3
Combustion in industry using biomass – NH3

Planned improvements

No planed improvements in the next period.

1.A.2.d Stationary combustion in manufacturing industries and construction: Pulp, Paper and Print

Methodology

The methodology used in this inventory for the emission calculation for this category is in accordance with the EMEP/EEA Emission Inventory Guidebook 2023

Table 69. Activity data for category 1.A.2.d. in tones

Year	Combustion in industry using solid fuels	Combustion in industry using gaseous fuels	Combustion in industry using liquid fuels	Combustion in industry using biomass
1990	967858	1593333	0	0
1991	277045	1518583	0	0
1992	550711	1747753	0	0
1993	548029	1089291	0	0
1994	481104	909339	0	0
1995	269146	1073955	0	0
1996	381399	1773197	0	0
1997	386005	1959740	0	0
1998	499242	1825534	0	0
1999	464538	1326854	0	0
2000	448505	1399934	0	0
2001	434866	1407932	0	0
2002	520148	1415973	0	0
2003	614978	1480703	0	0
2004	629267	1880509	0	0

2005	145649	1574656	0	0
2006	147387	1620139	0	0
2007	164785	1881036	0	0
2008	252888	2049255	88960	1000
2009	128455	1008522	215558	1000
2010	259672	154800	312802	4000
2011	239470	777600	531872	0
2012	110058	2215800	252194	47000
2013	33622	1218600	174482	1111000
2014	0	1126800	47311	403000
2015	260652	1004400	129485	1097000
2016	730482	929700	170572	111000
2017	720752	1150421	110008	227479
2018	346236	1826111	88850	136766
2019	874707	1412527	94553	49003
2020	899886	1131331	61840	54445
2021	353760	773885	86377	67781
2022	344178	1358313	75977	84197
2023	834053	1317021	42991	81818

Emission factors

Emissions were calculated on the base of methodology (Tier 1), which implies multiplication with appropriate default emission factors.

During the preparation of the inventory, it was determined that there are two types of fuel oil - with share of 1% sulfur content and sulfur content with a share of 3%. Based on these data, the emission factor for fuel oil with 3% sulfur content and the amount of emitted sulfur dioxide were calculated.

Activity data

The activity data for this category are obtained from National Energy balance for period 1990 – 2011. Data for period 2012 -2022 were obtained from Statistical Office of Serbia, which is now responsible for development of National energy balances.

Recalculations and other changes

In subcategory gaseous fuels activity data have been changed in 2022 because of changed data in Energy Balance.
In subcategory Biomass activity data have been changed in 2021 and 2022 because of changed data in Energy Balance.

Emission factors have been changed according to Metodology EMEP/EEA 2023 for following subcategories and pollutants:

Combustion in industry using solid fuels – NH3

Combustion in industry using gaseous fuels – NH3, PCDD/PCDF, Benzo(a)pyren, Benzo(b)fluoranthen, Benzo(k)fluoranthen, Indeno 123 pyren, TOTAL 1-4 and HCB

Combustion in industry using liquid fuels – NH3

Combustion in industry using biomass – NH3

Planned improvements

No planned improvements in the next period.

1.A.2.e Stationary combustion in manufacturing industries and construction: Food processing, beverages and tobacco

Methodology

The methodology used in this inventory for the emission calculation for this category is in accordance with the EMEP/EEA Emission Inventory Guidebook 2023

Table 70. Activity data for category 1.A.2.e. in tones

Year	Combustion in industry using solid fuels	Combustion in industry using gaseous fuels	Combustion in industry using liquid fuels	Combustion in industry using biomass
1990	4330424	12077834	0	0
1991	3254546	11511217	0	0
1992	5997220	13248376	0	0
1993	6116690	8257084	0	0
1994	5224474	6893006	0	0
1995	2110814	8140829	0	0
1996	4207758	13441245	0	0
1997	4205642	14855289	0	0
1998	6224613	13837977	0	0
1999	5667548	10057866	0	0
2000	5388432	10611825	0	0
2001	5456354	10672451	0	0
2002	6417352	10733410	0	0
2003	7428800	11224078	0	0
2004	7578427	14254695	0	0
2005	1355797	11936263	0	0
2006	1339835	12281030	0	0
2007	2890492	14258693	0	0
2008	3445916	15533830	4216126	96000
2009	1860972	7644831	2918629	629000
2010	2395701	7976700	4899765	1697000
2011	1156735	14656500	3361199	1946000
2012	4713364	9702000	6186638	1007000
2013	4008234	10125900	2757374	2783000
2014	3699072	7252200	2884699	1661000
2015	3438472	5489100	2223381	1251000
2016	873442	3821400	2397363	1886000
2017	649214	4728750	1833569	2397599
2018	311006	4700498	1732381	3134711
2019	364430	3692066	1647377	4178472
2020	369642	3047218	1161753	4153897
2021	80641	3853547	1240335	4313077
2022	55675	3695197	1492410	3542581
2023	257172	4004401	1167103	3946753

Emission factors

Emission factors used in emission calculation for this category are Tier 1 emission factors attained from EMEP/EEA Inventory Guidebook 2023. National emission factors have not been developed.

During the preparation of the inventory, it was determined that there are two types of fuel oil - with share of 1% sulfur content and sulfur content with a share of 3%. Based on these data, the emission factor for fuel oil with 3% sulfur content and the amount of emitted sulfur dioxide were calculated.

Activity data

The activity data for this category are obtained from National Energy balance for period 1990 – 2023. Data from 2015 were obtained from Statistical Office of Serbia, which is now responsible for development of National energy balances.

Recalculations and other changes

In subcategory gaseous fuels activity data have been changed in 2022 because of changed data in Energy Balance.
In subcategory Biomass activity data have been changed in 2021 and 2022 because of changed data in Energy Balance.

Emission factors have been changed according to Metodology EMEP/EEA 2023 for following subcategories and pollutants:

Combustion in industry using solid fuels – NH3

Combustion in industry using gaseous fuels – NH3, PCDD/PCDF, Benzo(a)pyren, Benzo(b)fluoranthen, Benzo(k)fluoranthen, Indeno 123 pyren, TOTAL 1-4 and HCB

Combustion in industry using liquid fuels – NH3

Combustion in industry using biomass – NH3

Planned improvements

No planned improvements in the next period.

1.A.2.f

Methodology

The methodology used in this inventory for the emission calculation for this category is in accordance with the EMEP/EEA Emission Inventory Guidebook 2023

Emission factors

Emission factors used in emission calculation for this category are Tier 1 emission factors attained from EMEP/EEA Inventory Guidebook 2019. National emission factors have not been developed.

Activity data

The activity data for this category are obtained from Statistical Office of Serbia.

This category included:

- Plaster (gysum) manufacture
- Lime production
- Cement production
- Roadstone coating (asphalt) plants
- Glass (flat, container, domestic, special, cont. filament glass fibre)
- Bricks and tiles
- Fine ceramic materials

Table 71. Activity data for category 1.A.2.f

Year	Plaster (gysum) manufacture	Lime production	Cement production	Roadstone coating (asphalt) plants	Glas	Bricks and tiles	Fine ceramic materials
1990	45541	636238	2577423	423104	141477	3193365	63199
1991	42595	649870	2290216	335604	157140	3270294	60386
1992	47865	542949	1933946	135259	134077	2871888	51402
1993	0	318252	1034010	17935	91220	1791977	32029
1994	40411	365523	1531852	0	76007	1937574	34495
1995	40342	410296	1611584	47537	88256	2088974	34041

1996	44257	447224	2094644	122470	85439	2581626	43240
1997	32124	453131	1910761	118360	70542	2779457	38304
1998	27788	577465	2140018	98481	72605	2959464	53815
1999	33962	371991	1496184	40911	44391	2147548	41723
2000	46651	365900	2011150	73082	63000	2952348	51729
2001	58045	324600	2297100	86538	64000	3083479	55247
2002	54937	394900	2276200	124560	62000	2880620	56251
2003	42261	345000	1971250	92486	47000	2391945	53599
2004	0	330300	2128000	233153	50200	2562275	58472
2005	0	372000	2162200	308943	47900	2333121	46320
2006	0	377000	2436750	345565	48900	2351458	56632
2007	0	320200	2542200	350634	64700	2221684	53688
2008	0	292300	2700850	291890	54500	2131829	57434
2009	0	251100	2111850	204734	42400	1739740	58816
2010	0	239500	2023500	197325	42200	1526172	73343
2011	0	273715	1989854	172005	35565	1377029	52120
2012	0	238556	1739175	123824	26361	1285843	90281
2013	0	279122	1512117	107243	33937	1309191	58001
2014	0	215050	1525164	300462	48992	1249377	62926
2015	0	189350	1571701	456629	49287	1674200	69800
2016	0	205472	1710807	489080	44151	1754000	0
2017	0	206624	1812305	610384	49837	1783500	0
2018	0	210700	1987876	703727	48726	1748700	0
2019	0	195444	2043898	920430	55169	1731300	0
2020	0	177764	2245788	721637	61181	1847300	0
2021	0	136745	2479676	778643	53233	2218500	0
2022	0	208708	2493376	730666	54973	2160500	0
2023	0	259328	2486998	660229	22919	1815400	0

Recalculations and other changes

No recalculations were performed.

Planned improvements

No planned improvements in the next period.

1.A.2.gv ii Mobile Combustion in manufacturing industries and construction:

Methodology

The methodology used in this inventory for the emission calculation for this category is in accordance with the EMEP/EEA Emission Inventory Guidebook 2023

Table 72. Activity data for category 1.A.2.gv ii. in tones

Year	Diesel	LPG	Gasoline: four-stroke	Gasoline: two-stroke
1990	0	63000	0	0
1991	0	48000	0	0
1992	0	18000	0	0
1993	0	40000	0	0
1994	0	39000	0	0
1995	0	25000	0	0
1996	0	59000	0	0
1997	0	60000	0	0
1998	0	62000	0	0
1999	0	43000	0	0
2000	0	36000	0	0

2001	0	43000	0	0
2002	0	69000	0	0
2003	0	76000	0	0
2004	0	157000	0	0
2005	0	162000	0	0
2006	0	167000	0	0
2007	169000	69000	18000	0
2008	152000	14000	4000	0
2009	121000	17000	8000	0
2010	84000	32000	16000	0
2011	134000	29000	24000	0
2012	93000	20000	14000	0
2013	123000	35000	28000	0
2014	90000	25000	11000	0
2015	90000	24000	2000	0
2016	79000	27000	1000	0
2017	71015	17504	1300	0
2018	77074	10994	1154	0
2019	95590	9379	1249	0
2020	106110	9447	1345	0
2021	124263	11652	2090	0
2022	138927	14260	2211	0
2023	135532	11616	2190	0

Emission factors

Emission factors used in emission calculation for this category are Tier 2 emission factors attained from EMEP/EEA Inventory Guidebook 2023. National emission factors have not been developed.

Activity data

The activity data for this category are obtained from National Energy balance for period 1990 – 2023.

Recalculations and other changes

No recalculations were performed.

Planned improvements

No planned improvements in the next period.

1 A 2 gv iii Stationary combustion in manufacturing industries and construction: Other

Methodology

The methodology used in this inventory for the emission calculation for this category is in accordance with the EMEP/EEA Emission Inventory Guidebook 2023

Table 73. Activity data for category 1.A.2.gv iii. Stationary combustion in manufacturing industries and construction in tones

Year	Hard coal	Brown coal	Gaseous fuels	Heavy Fuel Oil	Light oil-gas oil	Biomass
1990	3165746	0	3801600	11561480	0	0
1991	0	0	0	0	0	0
1992	0	0	0	0	0	0
1993	0	0	0	0	0	0

1994	0	0	0	0	0	0
1995	0	0	0	0	0	0
1996	0	0	0	0	0	0
1997	0	0	0	0	0	0
1998	0	0	0	0	0	0
1999	0	0	0	0	0	0
2000	0	0	0	0	0	0
2001	0	0	0	0	0	0
2002	0	0	0	0	0	0
2003	0	0	0	0	0	0
2004	0	0	0	0	0	0
2005	253552	3228159	10856700	8320000	255600	0
2006	136528	2125427	7657200	13440000	340800	55000
2007	138229	1920888	8695800	11160000	766800	110000
2008	0	1938674	2213100	2457291	1172043	0
2009	164556	1860300	3174300	6713318	791298	0
2010	68397	2111751	6797700	1029650	787050	0
2011	0	1736448	6142500	494232	961950	0
2012	0	1686081	4405500	164744	393525	0
2013	139812	2215305	6860700	82372	1617825	0
2014	0	1849968	7213500	82372	1049400	0
2015	0	1792469	5500800	205435	942744	0
2016	0	1609641	4822200	451957	1114152	0
2017	0	1917481	4972701	279638	1189957	0
2018	0	1759188	4993353	260629	1031554	0
2019	0	1681916	5537393	176721	1020783	0
2020	0	1304715	6465517	573513	723093	0
2021	0	1334992	6587062	347833	728632	0
2022	0	1477302	12228394	73514	664012	0
2023	0	1461614	5740595	51998	424218	0

Table 74. Activity data for category 1.A.2.gv iii. Stationary combustion in manufacturing industries and construction: Other in tones

Year	Hard coal	Brown coal	Gaseous fuels	Heavy Fuel Oil	Light oil-gas oil	Biomass
1990	255957	530592	9622834	7337480	6730800	0
1991	1537368	4339506	11310912	25760000	4813800	0
1992	4705510	7830455	11339342	21280000	3663600	0
1993	1655642	8150482	8534569	10360000	4387800	0
1994	1307086	6938465	7382620	8200000	4260000	0
1995	1198162	2615195	7750313	8520000	4089600	0
1996	2287401	5548152	13611714	14360000	7242000	0
1997	2832020	5511710	14804174	19400000	8008800	0
1998	3093437	8358410	14071371	10680000	6730800	0
1999	2897374	7585657	10132583	12760000	4004400	0
2000	5602979	7111880	10259715	3360000	3493200	0
2001	5040073	7262044	10630868	13800000	7029000	0
2002	5257921	8546133	11876291	14160000	8562600	0
2003	4755663	9911629	12596109	16120000	9372000	0
2004	4202839	10142661	18779233	13000000	8903400	0
2005	1717749	1653505	17129525	11280000	9372000	0
2006	2370168	1644871	17639050	11000000	10181400	0
2007	1913554	1876111	14734474	7912000	8094000	0
2008	3344267	4112119	12641624	4826947	2821585	808000
2009	782844	1355563	6612175	3046604	3780646	1026000
2010	2072798	3207484	12869222	4623952	3366825	484000
2011	3303390	7404204	3768231	3797510	4328775	3468000
2012	1475608	4870357	7412621	7570228	3017025	1527000
2013	640800	2635538	14632543	4899510	4722300	4006000
2014	1362735	2510845	4478743	6293230	2011350	3000000
2015	2217630	2723384	4929399	5348958	2785380	2958000

2016	2049353	6816676	4949977	6364741	2871084	3322000
2017	816233	4051734	5946648	6416445	2336934	4710170
2018	3925595	3462837	6896681	7465083	2341096	3645115
2019	280734	3098111	5159770	8004748	2722046	2436839
2020	200412	4417619	4234985	2878990	2703872	2310051
2021	1654000	1880626	5794450	4984052	3236985	2019416
2022	804626	1989364	8653827	7767169	3791246	2199550
2023	837495	7462471	5324458	6168185	3710408	1866941

Emission factors

Emission factors used in emission calculation for this category are Tier 2 emission factors attained from EMEP/EEA Inventory Guidebook 2023. National emission factors have not been developed.

Activity data

This category included:

- Non-Metallic Minerals
- Transport equipment
- Machinery
- Mining and Quarrying
- Wood and wood Products
- Textiles and leather
- Non-specified (industry).
- Autoproducers

The activity data for this category are obtained from National Energy balance for period 1990 – 2023.

Recalculations and other changes

No recalculations were performed.

Planned improvements

No planned improvements in the next period.

1.A.3 Transport

This category include:

- 1 A 3 a i (i) International aviation (LTO)
- 1.A.3.b.i Passenger cars
- 1.A.3.b.ii Light-duty trucks
- 1.A.3.b.iii Heavy-duty vehicles including buses
- 1.A.3.b.iv Motorcycles
- 1 A 3 b v Road transport: Gasoline evaporation
- 1.A.3.b.vi Road vehicle tire and brake wear
- 1.A.3.b.vii Road surface wear
- 1.A.3.c Railways
- 1 A 3 d ii National navigation (Shipping)

Fuels consumption in sector 1.A.3 takes into account fuels consumption in sub-sectors: 1.A.3.a Air transport (1.A.3.a.i (i) International LTO and 1.A.3.a.ii (i) Domestic LTO) (data for period 1990-1999 are not available), 1.A.3.c Railways, 1.A.3.d.ii National navigation.

The emissions for Air transport were calculated using Tier 1 approach based on data provided by Airport "Nikola Tesla"in Belgrade, airport "Konstantin Veliki" in Nis and airport "Morava" in Kraljevo.

For calculation of emissions of pollutants for Road transport was done using COPERT 5 version 5.2.2 (Tier 3 method), which requires a very detailed set of data (contained in the vehicle base) on type of vehicles (passenger cars, light duty vehicles, heavy duty vehicles, buses, mopeds, motorcycles)

1.A.3.a Aviation

1.A.3.a ii (i) Civil aviation (Domestic, LTO) and 1.A.3.a i (i) International aviation (LTO)

Civil aviation		
1.A.3 a	(Domestic, LTO)	(International, LTO)
1990	19822	24848
1991	16872	21870
1992	9488	7714
1993	8534	0
1994	5446	1372
1995	17672	13204
1996	8314	17212
1997	9212	18886
1998	10996	17826
1999	6052	4168
2000	8790	10890
2001	8170	16172
2002	8660	20212
2003	9062	23422
2004	8710	27706
2005	8220	29394
2006	4838	37522
2007	736	42712
2008	232	44222
2009	64	40600
2010	92	44068
2011	82	46023
2012	83	46468
2013	85	47737
2014	105	59132
2015	106	59453
2016	107	59970
2017	102	57408
2018	125	70171
2019	129	72355
2020	67	37474
2021	95	53083
2022	128	71659
2023	158	88970

Table 75. The activity data for sector 1.A.3.a ii (i) Domestic aviation and 1.A.3.a i (i) International aviation

Methodology

The methodology used in this inventory for the emission calculation for this category is in accordance with the EMEP/EEA Emission Inventory Guidebook 2023

Emission factors

Emission factors used in emission calculation for this category are Tier 1 emission factors attained from EMEP/EEA Inventory Guidebook 2023.

National emission factors have not been developed.

Activity data

Activity data are taken from airport "Nikola Tesla"in Belgrade, airport "Konstantin Veliki" in Nis and airport "Morava" in Kraljevo. Consumption of fuel was taken from Statistical Office of the Republic of Serbia (SORS).

Recalculations and other changes

No recalculations were performed.

Planned improvements

Improvements in terms of obtaining precise data are planned in the next submission.

1.A.3.a ii (ii) Domestic aviation cruise (civil)

Domestic aviation cruise (civil)			
1.A.3 a	(Domestic, LTO)	1.A.3 a	(Domestic, LTO)
1990	363147	2007	43448
1991	-4962	2008	44454
1992	67808	2009	40664
1993	-41	2010	44160
1994	4375	2011	46105
1995	22527	2012	46551
1996	54941	2013	47822
1997	56819	2014	59237
1998	52222	2015	59559
1999	18569	2016	60077
2000	47764	2017	57510
2001	40918	2018	70296
2002	28872	2019	72484
2003	32484	2020	37541
2004	36416	2021	53178
2005	37614	2022	71787
2006	42360	2023	89128

Table 76. The activity data for sector 1.A.3.a ii (ii) Domestic aviation cruise (civil)

Methodology

The methodology used in this inventory for the emission calculation for this category is in accordance with the EMEP/EEA Emission Inventory Guidebook 2023

Emission factors

Emission factors used in emission calculation for this category are Tier 1 emission factors attained from EMEP/EEA Inventory Guidebook 2023.

National emission factors have not been developed.

Activity data

Activity data are taken from airport “Nikola Tesla”in Belgrade, airport “Konstantin Veliki” in Nis and airport “Morava” in Kraljevo. Consumption of fuel was taken from Statistical Office of the Republic of Serbia (SORS).

Recalculations and other changes

No recalculations were performed.

Planned improvements

No planned improvements in the next period.

1.A.3.b Road transport

This category includes:

- 1.A.3.b.i Passenger cars
- 1.A.3.b.ii Light-duty trucks
- 1.A.3.b.iii Heavy-duty vehicles including buses
- 1.A.3.b.iv Motorcycles
- 1 A 3 b v Road transport: Gasoline evaporation
- 1.A.3.b.vi Road vehicle tyre and brake wear
- 1.A.3.b.vii Road surface wear

1.A.3.b (i-v) Road transport

Methodology

The COPERT 5 version 5.5 was used for air emission calculation from sub-sectors 1 A 3 b (i-v) Road transport for the period 2016-2023. For the previous period (1990-2015) the COPERT 5 version 5.2.2e was used. The COPERT calculates emission factors according to driving conditions data (the average speed per vehicle type and per road).

The existing fuel database in Serbia recognizes significantly more types of fuel than requirements of the COPERT 5 model. During the application of the COPERT 5 model, it was necessary to connect fuel types from the existing database with the requirements of the COPERT 5 model. As additional information, leaded gasoline was phased out in Serbia in 2010. Since then, only unleaded petrol has been used.

The COPERT 5 model also requires the entry of traffic data, which implies that for each category of vehicle is determined:

- % participation in peak hours;
- % participation outside peak hours;
- % participation in open roads;
- % of participation on highways;
- Average speed at peak time;
- Average speed outside peak hours;
- Average speed on open roads;
- Average speed on the highway.

For the needs of the COPERT 5 model, an assessment of participation in traffic flow, while the average speed is taken from the website of the Agency for traffic Safety of the Republic of Serbia.

Emission factors

In a case of road transport, COPERT program contains all necessary emission factors, the methodology and calculation algorithm to estimate total road-transport emissions on a national, regional or urban level at a year to daylong time resolution.

The COPERT calculates emission factors according to driving conditions data (the average speed per vehicle type and per road), fuel variables and climate conditions (average monthly temperatures data).

Activity data

Activity data were obtained from the Ministry of Internal Affairs of the Republic of Serbia, Traffic Police from 1990 to 2023 (Confidential data).

Recalculations and other changes

Recalculation was made for period 2016-2023. Previously, extrapolation was made for these years due to lack of activity data.

Planned improvements

There is no planned improvement.

1 A 3 b v Road transport: Gasoline evaporation

Methodology

The COPERT 5 version 5.5 was used for the emission calculation for this category for the period 2016-2023. The methodology used for the emission calculation for this category is in accordance with the EMEP/EEA Emission Inventory Guidebook 2023 for the previous period (1990-2015).

Emission factors

Emission factors used in emission calculation for this category are Tier 1 emission factors attained from EMEP/EEA Inventory Guidebook 2023, as well as COPERT emission factors.

National emission factors have not been developed.

Activity data

Activity data were obtained from the Ministry of Internal Affairs of the Republic of Serbia, Traffic Police from 1990 to 2023 (Confidential data).

Recalculations and other changes

Recalculation was made for period 2016-2023. Previously, extrapolation was made for these years due to lack of activity data.

Planned improvements

No planned improvements in the next period.

1.A.3.b.vi Road vehicle tire and brake wear

Methodology

The COPERT 5 version 5.5 was used for the emission calculation for this category for the period 2016-2023. The methodology used for the emission calculation for this category is in accordance with the EMEP/EEA Emission Inventory Guidebook 2023 for the previous period (1990-2015).

Emission factors

Emission factors used in emission calculation for this category are Tier 1 emission factors attained from EMEP/EEA Inventory Guidebook 2023, as well as COPERT emission factors.

National emission factors have not been developed.

Activity data

Activity data were obtained from the Ministry of Internal Affairs of the Republic of Serbia, Traffic Police from 1990 to 2023 (Confidential data).

Recalculations and other changes

Recalculation was made for period 2016-2023. Previously, extrapolation was made for these years due to lack of activity data.

Emission factors have been changed according to Metodology EMEP/EEA 2023 for subcategories passenger cars and light duty trucks for pollutants : PM2.5, PM10 and TSP.

Planned improvements

No planned improvements in the next period.

1.A.3.b.vii Road surface wear

Methodology

The COPERT 5 version 5.5 was used for the emission calculation for this category for the period 2016-2023. The methodology used for the emission calculation for this category is in accordance with the EMEP/EEA Emission Inventory Guidebook 2019 for the previous period (1990-2015).

Emission factors

Emission factors used in emission calculation for this category are Tier 1 emission factors attained from EMEP/EEA Inventory Guidebook 2023, as well as COPERT emission factors.

National emission factors have not been developed.

Activity data

Activity data were obtained from the Ministry of Internal Affairs of the Republic of Serbia, Traffic Police from 1990 to 2023 (Confidential data).

Recalculations and other changes

Emission factors have been changed according to Metodology EMEP/EEA 2023 for subcategories passenger cars and light duty trucks for pollutants: PM2.5, PM10 and TSP.

Planned improvements

No planned improvements in the next period.

1.A.3.c Railways

Methodology

The methodology used in this inventory for the emission calculation for category 1 A 3 c Railways is in accordance with the EMEP/EEA Emission Inventory Guidebook 2023

Emission factors

Emission factors used in emission calculation for this category are Tier 1 emission factors attained from EMEP/EEA Inventory Guidebook 2023.

National emission factors have not been developed.

1.A.3.c Railways			
year	tone fuel	year	tone fuel
1990	30000	2007	12000
1991	39000	2008	11000
1992	39000	2013	10000
1993	17000	2010	11000
1994	14000	2011	10000
1995	15000	2012	8500
1996	18000	2013	8700
1997	17000	2014	9000
1998	16000	2015	10000
1999	13000	2016	10000
2000	11000	2017	10000
2001	12000	2018	11000
2002	13000	2019	12000
2003	13000	2020	10000
2004	14000	2021	12000
2005	13000	2022	11000
2006	13000	2023	10000

Table 77. Total amount of fuel consumption in railway sector in Serbia in time period 1990 – 2023.

Activity data

For the calculation, activity data were obtained from the Statistical office of Serbia from 1990 to 2023.

Recalculations and other changes

No recalculations were performed.

Planned improvements

No planned improvements in the next period

1.A.3.d. Navigation

1 A 3 d ii National navigation (Shipping)

Methodology

The methodology used in this inventory for the emission calculation for this category is in accordance with the EMEP/EEA Emission Inventory Guidebook 2023

Emission factors

Emission factors used in emission calculation for this category are Tier 1 emission factors attained from EMEP/EEA Inventory Guidebook 2023.

National emission factors have not been developed.

Activity data

The main source for activity data concerning total amount of fuel consumption (t) is SORS.

1.A.3.d. ii National navigation - using bunker fuel oil			
year	tone fuel	year	tone fuel
1990	40000	2007	17000
1991	27000	2008	18000
1992	26000	2009	17000
1993	5000	2010	14000
1994	6000	2011	11000
1995	8000	2012	7600
1996	19000	2013	8000
1997	23000	2014	8000
1998	25000	2015	9000
1999	16000	2016	9000
2000	19000	2017	7000
2001	19000	2018	6000
2002	19000	2019	6000
2003	18000	2020	5000
2004	17000	2021	21000
2005	17000	2022	19000
2006	18000	2023	19000

Table 78. Activity data for category 1 A 3 d ii National navigation(Shipping) in Serbia in time period 1990 - 2023

Recalculations and other changes

No recalculations were performed.

Planned improvements

No planned improvements in the next period.

1.A.4 Other Sectors (commercial and residential)

This category comprise:

1.A.4. a i Commercial / institutional: Stationary

1.A.4. b i Residential: Stationary plants

1.A.4. c i Agriculture/Forestry/Fishing: Stationary

Fuels consumptions in sector 1.A.4 takes into account fuels consumption in following sub-sectors 1.A.4.a.i Commercial/Institutional (stationary), 1.A.4.b.i Residential (stationary), 1.A.4.c.i Agriculture/Forestry/Fishing (stationary).

1.A.4. a i Commercial / institutional: Stationary

Methodology

The methodology used in this inventory for the emission calculation for this category is in accordance with the EMEP/EEA Emission Inventory Guidebook 2023

Table 79. Activity data for category 1A4ai in Serbia in time period 1990 - 2023

Year	Hard coal and brown coal	Gaseous fuels	Liquid fuels	Biomass
1990	4713666	0	0	0
1991	4363087	0	0	0
1992	6293203	0	0	0
1993	6701697	0	0	0
1994	5596909	0	0	0
1995	1592200	0	0	0
1996	4517991	0	0	0
1997	4431350	0	0	0
1998	7234824	0	0	0
1999	6495828	0	0	0
2000	5996369	0	0	0
2001	5811272	0	0	0
2002	6301388	0	0	0
2003	6586793	0	0	0

2004	6734592	0	0	0
2005	6354117	0	0	0
2006	2450180	0	0	0
2007	8223934	0	0	0
2008	3010814	3677400	3978748	0
2009	6068205	4001400	2901709	0
2010	8611398	3626100	3364637	0
2011	11598147	3673800	6576247	0
2012	5171633	4137300	4334193	0
2013	3827843	4051800	2484931	0
2014	2008915	4760100	2853314	0
2015	2714110	5648400	3056733	0
2016	3236131	6553800	3091596	0
2017	1840365	7818381	2806491	0
2018	1315456	8338817	2693744	0
2019	1530134	7803046	2443072	0
2020	2294031	8009440	2228029	0
2021	944931	11639026	2215026	0
2022	1259009	12140327	3717856	0
2023	2853855	10150993	2264138	0

Emission factors

Emissions was calculated on the base of methodology (Tier 1), which implies multiplication with appropriate default emission factors.

Activity data

The activity data for this category are obtained from National Energy balance for period 1990 – 2023. Data from 2011 were obtained from Statistical Office of Serbia, which is now responsible for development of National energy balances.

Recalculations and other changes

No recalculations were performed.

Planned improvements

No planned improvements in the next period.

1.A.4. a ii Commercial / institutional: Mobile

This category is included in 1 A 3.

1.A.4. b i Residential: Stationary plants

Methodology

The methodology used in this inventory for the emission calculation for this category is in accordance with the EMEP/EEA Emission Inventory Guidebook 2023

Table 80. Activity data for category 1A4bi in Serbia in time period 1990 - 2023

Year	Hard coal and brown coal	Gaseous fuels	Liquid fuels	Biomass
1990	18553189	0	0	48944000
1991	11465533	0	0	42418000
1992	20683613	9743400	0	31518000
1993	20542559	6072300	0	31518000
1994	18054333	5068800	0	30800000
1995	10286789	5986800	0	30800000

1996	14317591	9884700	0	30800000
1997	14502567	10924200	0	30800000
1998	18582747	10176300	0	30800000
1999	17311076	7396200	0	30800000
2000	16752704	7803900	0	33600000
2001	15744762	7824600	0	33600000
2002	17765718	7845300	0	33600000
2003	18910501	8204400	0	33600000
2004	19360836	10420200	0	33600000
2005	15688035	8725500	0	33600000
2006	8961894	8977500	0	33545000
2007	16577278	3418200	11533200	33490000
2008	18292445	7657200	1415428	27960000
2009	9843531	8331300	89961	41634000
2010	9668466	9015300	1321122	40195000
2011	12099960	8889300	2890943	36546000
2012	10031483	8142300	3863808	39513000
2013	8569051	7285500	3105643	33536000
2014	7099813	5967900	1828246	35649000
2015	6536386	6327900	2554794	35470000
2016	9642943	7023600	2744038	36556000
2017	9569283	8001439	1994774	33641000
2018	8692366	8133823	1579005	35208783
2019	8768176	8506640	1982993	36473526
2020	10417406	10100753	1091796	56774876
2021	6195102	12390294	1282223	59793018
2022	5489744	12578118	1477144	59779809
2023	9541485	12170498	1460443	59859880

Emission factors

Emission factors used in emission calculation for this category are Tier 1 emission factors attained from EMEP/EEA Inventory Guidebook 2023.

National emission factors have not been developed.

Activity data

The activity data for this category are obtained from National Energy balance for period 1990 – 2023. Data from 2011 were obtained from Statistical Office of Serbia, which is now responsible for development of National energy balances.

Recalculations and other changes

According to Metodology EMEP/EEA 2023 emission factor have been changed In subcategory Hard Coal and Brown Coal for Se. In subcategory gaseous fuels emission factor have been changed for Hg and As. In subcategory Biomass emission factor have been changed for NOx and NH3.

Planned improvements

No planned improvements in the next period.

1.A.4.b ii Residential: Household and gardening (mobile)

This category is included in 1 A 3.

1.A.4.c i Agriculture/Forestry/Fishing: Stationary

Methodology

The methodology used in this inventory for the emission calculation for this category is in accordance with the EMEP/EEA Emission Inventory Guidebook 2023

Table 81. Activity data for category 1A4ci in Serbia in time period 1990 - 2023

Year	Hard coal and brown coal	Gaseous fuels	Liquid fuels	Biomass
1990	588895	0	0	0
1991	248829	0	0	0
1992	572234	0	0	0
1993	533195	0	0	0
1994	490957	0	0	0
1995	402510	0	0	0
1996	388818	0	0	0
1997	408633	0	0	0
1998	394679	0	0	0
1999	393097	0	0	0
2000	412027	0	0	0
2001	412016	0	0	0
2002	432594	0	0	0
2003	493206	0	0	0
2004	513522	0	0	0
2005	12660	0	0	0
2006	4300	0	0	0
2007	34199	7357500	366000	0
2008	43861	444600	172258	12000
2009	9561	484200	460000	26000
2010	73554	611100	183119	25000
2011	14751	581400	460860	94000
2012	13101	689400	407424	129000
2013	0	651600	524857	98000
2014	0	1073700	141933	149000
2015	0	690300	141933	107000
2016	0	965700	189244	82000
2017	5625	752234	122015	76636
2018	1567	783449	79482	71337
2019	1862	816376	65573	78232
2020	2869	695493	133180	76786
2021	1131	858682	148462	79867
2022	1583	846547	171313	82476
2023	3367	724049	168474	75382

Emission factors

Emissions for this category were calculated on the base of methodology (Tier 1), which implies multiplication with appropriate default emission factors.

Activity data

The activity data for this category are obtained from National Energy balance for period 1990 – 2023. Data from 2011 were obtained from Statistical Office of Serbia, which is now responsible for development of National energy balances.

Recalculations and other changes

According to Metodology EMEP/EEA 2023 in subcategory Gaseous fuels emission factor have been changed for following pollutants: NH3, Hg and PCCD/PCCF. In subcategory Liquid fuels EF have been changed for pollutants: Hg, NH3, PCCD/PCCF, NOx, SOx, CO, Pb,, cd, Hg, As, Cr, Cu, Ni, Se, Zn.

Also in subcategory Biomass EF for NH3 have been changed.

Planned improvements

No planned improvements.

1.A.4.c ii Agriculture/Forestry/Fishing: Off-road vehicles and other machinery

Methodology

The methodology used in this inventory for the emission calculation for this category is in accordance with the EMEP/EEA Emission Inventory Guidebook 2023

Table 82. Activity data for category 1A4cii in Serbia in time period 1990 - 2023

Year	Diesel-Agriculture	Diesel-Forestry	LPG	Gasoline: four-stroke	Gasoline: two-stroke
1990	0	0	0	0	0
1991	0	0	0	0	0
1992	0	0	0	0	0
1993	0	0	0	0	0
1994	0	0	0	0	0
1995	0	0	0	0	0
1996	0	0	0	0	0
1997	0	0	0	0	0
1998	0	0	0	0	0
1999	0	0	0	0	0
2000	0	0	0	0	0
2001	0	0	0	0	0
2002	0	0	0	0	0
2003	0	0	0	0	0
2004	0	0	0	0	0
2005	0	0	0	0	0
2006	0	0	0	0	0
2007	55000	0	1000	4000	0
2008	44000	0	1000	1000	0
2009	67000	0	10000	1000	0
2010	45000	0	3000	4000	0
2011	53000	0	8000	3000	0
2012	113000	0	6000	1000	0
2013	119000	0	5000	0	0
2014	41000	0	3000	0	0
2015	41000	0	3000	0	0
2016	50000	0	4000	0	0
2017	56089	0	2579	0	0
2018	52424	0	1680	0	0
2019	44751	0	1386	0	0
2020	58440	0	2815	0	0
2021	67258	0	3138	0	0
2022	76671	0	3621	0	0
2023	75176	0	3561	0	0

Emission factors

Emissions for this category were calculated on the base of methodology (Tier 1), which implies multiplication with appropriate default emission factors.

Activity data

The activity data for this category are obtained from National Energy balance which were available starting from 2007.

Recalculations and other changes

No recalculations were performed.

Planned improvements

No planned improvements.

1.A.4.c iii Agriculture/Forestry/Fishing: National fishing

This category is included in 1 A 3.

1.A.5.a Other stationary (including military)

This category is included in 1 A 4 a i.

1.A.5.b Other, Mobile (including military, land based and recreational boats)

This category is included in 1 A 3.

1.B Fugitive emission

1.B.1.a Fugitive emission from solid fuels: Coal mining and handling

Methodology

The methodology used in this inventory for the emission calculation for fugitive emissions from coal mining and handling is in accordance with the EMEP/EEA Emission Inventory Guidebook 2023

1.B.1.a			
Coal mining and handling			
kg/Mg			
1990	43778000	2007	37065000
1991	30221000	2008	38585000
1992	38385000	2013	38350000
1993	35982000	2010	37864000
1994	37121000	2011	41574000
1995	39715000	2012	38728000
1996	37008000	2013	40842000
1997	41618000	2014	30118000
1998	42480000	2015	38141000
1999	29000000	2016	38849000
2000	32557000	2017	39774000
2001	31049000	2018	37631000
2002	31622000	2019	38878000
2003	33356000	2020	39666000
2004	34177000	2021	36415000
2005	34993000	2022	34917000
2006	36785000	2023	31934000

Table 83. Total amount of coal mined in Serbia in the time period 1990 – 2023.

Emission factors

Emission factors used in emission calculation from coal mining and handling are Tier 1 emission factors attained from EMEP/EEA Inventory Guidebook 2023, Table 3-1. (Table 3-1 Tier 1 emission factors for source category 1.B.1.a Coal mining and handling). National emission factors have not been developed.

Activity data

The source for activity data concerning coal mining and handling is SORS.

Recalculations and other changes

No recalculations were performed.

Planned improvements

In the catagory 1B1a (Coal mining and handling) for the input data we use the Energy Balance. We have no official data for open cast mining and underground mining. This issue is a part of the National CLRTAP Improvement plan.

1.B.1.b Fugitive emission from solid fuels: Solid fuel transformation

Methodology

The methodology used in this inventory for the emission calculation for fugitive emissions from coal mining and handling is in accordance with the EMEP/EEA Emission Inventory Guidebook 2023

Table 84. Total amount of Solid fuel transformation in Serbia in the time period 1990 – 2023.

1.B.1.a			
Solid fuel transformation			
kg/Mg			
1990	2108000	2007	1069000
1991	880000	2008	1127000
1992	2059000	2013	839000
1993	1912000	2010	1052000
1994	1760000	2011	1062000
1995	1486000	2012	969000
1996	1635000	2013	982000
1997	1663000	2014	506000
1998	1617000	2015	586000
1999	1384000	2016	768000
2000	1404000	2017	936627
2001	1430000	2018	779188
2002	1510000	2019	666110
2003	1594000	2020	684302
2004	1632000	2021	554679
2005	1233000	2022	342590
2006	1161000	2023	416436

Emission factors

Emission factors used in emission calculation of Solid fuel transformation are Tier 1 emission factors attained from EMEP/EEA Inventory Guidebook 2023,

Activity data

The source for activity data concerning coal mining and handling is SORS.

Recalculations and other changes

No recalculations were performed.

Planned improvements

No planned improvements in the next period.

1.B.1. c Other fugitive emissions from solid fuels

This category does not occurred in Serbia.

1.B.2 Oil and natural gas

This category comprises:

1.B.2.a.i	Oil – Exploration, production, transport
1.B.2.a.iv	Refining/storage
1.B.2.a.v	Distribution of oil products
1.B.2.b	Natural gas
1.B.2.c	Venting and flaring
1.B.2.a.i	Exploration, production, transport

Methodology

The methodology used in this inventory for the emission calculation for fugitive emissions from oil exploration, production and transport is in accordance with the EMEP/EEA Emission Inventory

1.B.2.ai			
Exploration, production, transport			
Mg oil			
1990	1063000	2007	640000
1991	1100000	2008	636000
1992	1165000	2013	663000
1993	1148000	2010	856000
1994	1078000	2011	1020490
1995	1066000	2012	1124794
1996	1030000	2013	1163988
1997	979000	2014	1112303
1998	913000	2015	1026686
1999	705000	2016	933884
2000	805000	2017	893000
2001	746000	2018	880000
2002	682000	2019	854000
2003	671000	2020	831000
2004	653000	2021	811000
2005	648000	2022	801000
2006	654000	2023	810000

Table 85. Total amount of oil explored, product and transport in Serbia in the time period 1990 – 2023.

Emission factors

Emission factors used in emission calculation from oil exploration, production and transport are Tier 1 emission factors attained from EMEP/EEA Inventory Guidebook 2023, Table 3-1. (Table 3-1 Tier 1 emission factors for source category 1.B.2.a.i Exploration, production).

National emission factors have not been developed.

Activity data

The source for activity data concerning oil exploration, production and transport is SORS.

Recalculations and other changes

According to Metodology EMEP/EEA 2023 in subcategory Fugitive emissions oil: Exploration, production, transport emission factor have been changed for NMVOC .

Planned improvements

No planned improvements in the next period.

1.B.2.a.iv Refining / storage

Methodology

The methodology used for calculation of emissions for this category is in accordance with the EMEP/EEA Emission Inventory Guidebook 2023

1.B.2.a.iv			
Refining/storage			
kg/Mg crude oil			
1990	4725651	2007	3248923
1991	3485539	2008	3157293
1992	2362331	2013	2880184
1993	1090288	2010	2856846
1994	1326861	2011	2359000
1995	1201986	2012	2142308
1996	2369108	2013	2747370
1997	3197544	2014	2613246
1998	3033429	2015	2935549
1999	816661	2016	3103762
2000	999341	2017	3332749
2001	2577170	2018	3557471
2002	3274015	2019	3138713
2003	3762698	2020	3320449
2004	3920610	2021	3584986
2005	3113136	2022	4131974
2006	3132000	2023	3876668

Table 86. Activity data for category 1.B.2.a.iv Refining / storage in Serbia in time period 1990 - 2023

Emission factors

Emission factors used in emission calculation for this category are Tier 1 emission factors attained from EMEP/EEA Inventory Guidebook 2023.

Activity data

The activity data for this category are obtained from National Energy balance for period 1990 - 2023.

Recalculations and other changes

According to Metodology EMEP/EEA 2023 in subcategory Fugitive emissions oil: Refining / storage emission factor have been changed for following pollutants: NOx, SOx, NH3, PM2.5, PM10, TSP, BC, CO, Pb, Cd, Hg, As, Cr, Cu, Ni,

Se, Zn, PCCD/PCCF, Benzo(a) pyren, benzo(b) fluoranthen, benzo(k) fluoranthen, Indeno (1,2,3) pyren, HCB, PCB.

Planned improvements

No planned improvements.

1.B.2.a.v Distribution of oil products

Methodology

The methodology used in this inventory for the emission calculation for fugitive emissions from coal mining and handling is in accordance with the EMEP/EEA Emission Inventory Guidebook 2023

1.B.2.a.v			
Distribution of oil products			
kg/Mg			
1990	2500000	2007	2481000
1991	2296000	2008	2444000
1992	1646000	2013	2209000
1993	768000	2010	2114000
1994	716000	2011	1717000
1995	740000	2012	1616000
1996	936000	2013	2165000
1997	1826000	2014	2239000
1998	1340000	2015	2393902
1999	682000	2016	2482231
2000	913000	2017	2658813
2001	1446000	2018	2874262
2002	1829000	2019	2678192
2003	1919000	2020	2705027
2004	2591000	2021	2959652
2005	2551000	2022	3428015
2006	2469000	2023	3261471

Table 87. Activity data for category 1.B.2.a.v Distribution of oil products in Serbia in time period 1990 - 2023

Emission factors

Emission factors used in emission calculation for this category are Tier 1 emission factors attained from EMEP/EEA Inventory Guidebook 2023.

Activity data

Activity data for this category is provided by Oil Industry Serbia.

Recalculations and other changes

According to Metodology EMEP/EEA 2023 for subcategory Distribution of oil products emission factor have been changed for NMVOC.

Planned improvements

No planned improvements in the next period.

1.B.2.b Natural gas

Methodology

The methodology used in this inventory for the emission calculation for fugitive emissions from natural gas exploration, production and transport is in accordance with the EMEP/EEA Emission Inventory Guidebook 2023

Emission factors

Emission factors used in emission calculation from natural gas exploration, production and transport are Tier 1 emission factors attained from EMEP/EEA Inventory Guidebook 2023.

Activity data

The source for activity data concerning natural gas exploration, production and transport is SORS.

1.B.2.b			
Natural gas			
m3 gas			
1990	646000000	2007	270000000
1991	749000000	2008	275000000
1992	846000000	2013	279000000

1993	962000000	2010	424000000
1994	823000000	2011	616381000
1995	907000000	2012	672137000
1996	670000000	2013	660406000
1997	688000000	2014	630868000
1998	731000000	2015	626118000
1999	679000000	2016	595346000
2000	729000000	2017	548000000
2001	507000000	2018	506000000
2002	400000000	2019	477000000
2003	364000000	2020	448000000
2004	317000000	2021	401000000
2005	282000000	2022	373000000
2006	280000000	2023	353000000

Table 88. Total amount of natural gas explored, product and transport in Serbia in the period 1990 – 2023

Recalculations and other changes

According to Metodology EMEP/EEA 2023 emission factor have been changed for NMVOC in subcategory Fugitive emissions from natural gas (exploration, production, processing, transmission, storage, distribution and other).

Planned improvements

No planned improvements in the next period.

1.B.2.c Venting and flaring

Methodology

The methodology used in this inventory for the emission calculation for fugitive emissions from coal mining and handling is in accordance with the EMEP/EEA Emission Inventory Guidebook 2023

1.B.2.c	
Venting and flaring	
m3 refinery feed	
2000	10842
2001	14659
2002	23015
2003	17612
2004	20045
2005	24188
2006	26392
2007	22279
2008	29430
2013	21456
2010	16770
2011	6998
2012	3974
2013	3696
2014	5247
2015	5114
2016	4914
2017	7357
2018	7590
2019	0
2020	0
2021	0
2022	0
2023	0

Table 89. Activity data for category Venting and flaring (m_3)

Emission factors

Emission factors used in emission calculation for this category are Tier 1 emission factors attained from EMEP/EEA Inventory Guidebook 2023.

Activity data

The activity data were obtained by Oil Industry Serbia. For this reporting year the data for period 1990 – 2000 were not available.

Recalculations and other changes

From 2019, these data are included in category 1Aa Public electricity and heat production.

According to Metodology EMEP/EEA 2023 for category Flaring in oil and gas extraction emission factor have been changed for following pollutants: Cd, Hg, As, Cr, Cu, Ni, Se and Zn.

Planned improvements

No planned improvements in the next period.

1.B.2.d Other fugitive emissions from geothermal energy production , peat and other energy extraction not included in 1.B.2.d

This category in not estimated.

4. INDUSTRIAL PROCESSES AND PRODUCTS USE (NFR 2)

This category comprises:

2.A.1	Cement production
2.A.2	Lime production
2.A.3	Glass production
2.A.5.a	Quarrying and mining of minerals other than coal
2.A.5.b	Construction and demolition
2.A.5.c	Storage, handling and transport of mineral products
2.B.1	Ammonia production
2.B.2	Nitric acid production
2.B.10a	Other chemical industry
2.C.1	Iron and steel production
2.C.3	Aluminium production
2.C.4	Magnesium production
2.C.5	Lead production
2.C.6	Zinc production
2.C.7.a	Copper production
2.D.3.a	Domestic solvent use including fungicides
2.D.3.b	Road paving with asphalt
2.D.3.c	Asphalt roofing
2.D.3.d	Coating applications
2.D.3.e	Degreasing
2.D.3.f	Dry cleaning
2.D.3.g	Chemical products
2.D.3.h	Printing
2.D.3.i	Other solvent use
2.H.1	Pulp and paper industry
2.H.2	Food and beverages industry
2.I	Wood processing
2.K	Consumption of POPs and heavy metals (e.g. electrical and scientific equipment)

2.A Mineral industry

2.A.1 Cement production

Methodology

The methodology used in this inventory for the emission calculation for cement production is in accordance with the EMEP/EEA Emission Inventory Guidebook 2023

2.A.1			
Clinker production			
1990	2577423	2007	2542200
1991	2290216	2008	2700850
1992	1933946	2013	2111850
1993	1034010	2010	2023500
1994	1531852	2011	1989854
1995	1611584	2012	1739175
1996	2094644	2013	1512117
1997	1910761	2014	1525164
1998	2140018	2015	1571701
1999	1496184	2016	1710807
2000	2011150	2017	1812305
2001	2297100	2018	1987876

2002	2276200	2019	2043898
2003	1971250	2020	2245788
2004	2128000	2021	2479676
2005	2162200	2022	2493376
2006	2436750	2023	2486998

Table 90.Total amount of clinker production in Serbia in the time period 1990 – 2023.

Emission factors

Emission factors used in emission calculation from clinker production are Tier 1 emission factors attained from EMEP/EEA Inventory Guidebook 2023.

National emission factors have not been developed.

Activity data

The activity data on clinker production are calculated according to cement production from Annual Statistical Reports.

Recalculations and other changes

No recalculations were performed.

Planned improvements

No planned improvements in the next period.

2.A.2 Lime production

Methodology

The methodology used in this inventory for this category is in accordance with the EMEP/EEA Emission Inventory Guidebook 2023

2.A.2			
Lime production (Mg)			
1990	636238	2007	320200
1991	649870	2008	292300
1992	542949	2013	251100
1993	318252	2010	239500
1994	365523	2011	273715
1995	410296	2012	238556
1996	447224	2013	279122
1997	453131	2014	215050
1998	577465	2015	189350
1999	371991	2016	205472
2000	365900	2017	206624
2001	324600	2018	210700
2002	394900	2019	195444
2003	345000	2020	177764
2004	330300	2021	136745
2005	372000	2022	208708
2006	377000	2023	259328

Table 91. Total amount of lime production in Serbia in the time period 1990– 2023

Emission factors

Emission factors used in emission calculation for this category are Tier 1 emission factors attained from EMEP/EEA Inventory Guidebook 2023.

Activity data

The activity data on lime production are collected from Annual Statistical Reports.

Recalculations and other changes

No recalculations were performed.

Planned improvements

No planned improvements in the next period.

2.A.3 Glass production

Methodology

The methodology used in this inventory for this category is in accordance with the EMEP/EEA Emission Inventory Guidebook 2023

Emission factors

Emission factors used in emission calculation for this category are Tier 1 emission factors attained from EMEP/EEA Inventory Guidebook 2023.

Activity data

The activity data on lime production are collected from Annual Statistical Reports.

Recalculations and other changes

No recalculations were performed.

2.A.3 Glass production (t)			
1990	141477	2007	64700
1991	157140	2008	54500
1992	134077	2013	42400
1993	91220	2010	42200
1994	76007	2011	35565
1995	88256	2012	26361
1996	85439	2013	33937
1997	70542	2014	48992
1998	72605	2015	49286
1999	44391	2016	44151
2000	63000	2017	49837
2001	64000	2018	48726
2002	62000	2019	55169
2003	47000	2020	61181
2004	50200	2021	53233
2005	47900	2022	54973
2006	48900	2023	22919

Table 92. Total amount of glass production in Serbia in the time period 1990– 2023

Planned improvements

No planned improvements in the next period.

2.A.4 Soda ash production and use

This category does not occurred in Serbia.

2.A.5 a Quarrying and mining of minerals other than coal

Methodology

The methodology used in this inventory for this category is in accordance with the EMEP/EEA Emission Inventory Guidebook 2023

Emission factors

Emission factors used in emission calculation for this category are Tier 1 emission factors attained from EMEP/EEA Inventory Guidebook 2023.

2.A.5 a Quarrying and mining of minerals other than coal (t)			
1990	26483000	2007	12165978
1991	25758000	2008	14404154
1992	23085000	2013	4455598
1993	18189000	2010	14538052
1994	17935000	2011	16480621
1995	21038657	2012	18604862
1996	21286987	2013	20525373
1997	21878747	2014	20799735
1998	21545986	2015	21252026
1999	16591350	2016	22171687
2000	14057685	2017	21747781
2001	8046340	2018	19977040
2002	8652308	2019	20719494
2003	6253038	2020	22631000
2004	8609540	2021	27797000
2005	10661013	2022	37767000
2006	11061591	2023	52049000

Table 93. Total amount of quarrying and mining of minerals other tan coal in Serbia in the time period 1990– 2023

Activity data

The source for activity data for this category is SORS.

Recalculations and other changes

No recalculations were performed.

Planned improvements

No planned improvements in the next period.

2.A.5 b Construction and demolition

2.A.5 b Construction and demolition (Mg asphalt)			
1990	3204702	2007	1422055
1991	2156830	2008	1554431
1992	1860111	2013	1405891
1993	1365006	2010	1333653
1994	1260746	2011	1266883
1995	1055803	2012	1038503
1996	1082499	2013	935175
1997	1049590	2014	810301
1998	908380	2015	749064
1999	922431	2016	782841
2000	853719	2017	1018066
2001	865515	2018	1336000
2002	896002	2019	1962000
2003	1185141	2020	1858000
2004	1299132	2021	2161000
2005	1319767	2022	2144000
2006	1393052	2023	2691000

Methodology

The methodology used in this inventory for this category is in accordance with the EMEP/EEA Emission Inventory Guidebook 2023

Table 83. Total amount of asphalt for road paving in Serbia in the time period 1990 – 2023

Emission factors

Emission factors used in emission calculation for this category are Tier 1 emission factors attained from EMEP/EEA Inventory Guidebook 2023. The emission factor for PM2.5 is 0.0086, for PM 10 0.086 and for TSP 0.29.

Activity data

The source for activity data for this category is SORS.

Recalculations and other changes

No recalculations were performed.

Planned improvements

For now we do not have activity data about construction of houses (detached single family, detached two family and single family terraced), construction of apartments (all types), non-residential construction. When we obtain these data we will calculate the emissions for all activities.

2 A 5 c Storage, handling and transport of mineral products

Methodology

The methodology used in this inventory for this category is in accordance with the EMEP/EEA Emission Inventory Guidebook 2023

2.A.5 c Storage, handling and transport of mineral products (t)			
1990	4150544	2007	2923542
1991	3990420	2008	3688837
1992	4054776	2013	4030042
1993	1554452	2010	4436775
1994	1980214	2011	3170220
1995	1939669	2012	1867001
1996	1730000	2013	1193438
1997	1723000	2014	2035192
1998	1523000	2015	1908022
1999	999000	2016	6778890
2000	1249000	2017	1880000
2001	1061635	2018	2169000
2002	1997211	2019	2794000
2003	2039896	2020	3882000
2004	1756374	2021	7514000
2005	2479159	2022	5524000
2006	2684449	2023	6990000

Table 94. Total amount of Storage, handling and transport of mineral products in the time period 1990 – 2023

Emission factors

Emission factors used in emission calculation for this category are Tier 2 emission factors attained from EMEP/EEA Inventory Guidebook 2023.

Activity data

The source for activity data for this category is SORS.

Recalculations and other changes

No recalculations were performed.

Planned improvements

No planned improvements.

2.B Chemical industry

This category comprises:

2.B.1 Ammonia production
2.B.2 Nitric acid production
2.B.5.a Other chemical industry

2.B.1			
Ammonia production (t NH3)			
1990	178745	2007	104000
1991	170237	2008	57000
1992	147748	2013	64000
1993	99897	2010	102000
1994	158518	2011	161000
1995	135401	2012	170000
1996	235070	2013	202000
1997	235183	2014	109000
1998	171640	2015	89000
1999	56645	2016	73000
2000	70000	2017	207990
2001	80000	2018	108911
2002	140000	2019	0
2003	74000	2020	0
2004	167000	2021	0
2005	135000	2022	0
2006	97000	2023	0

2.B.1 Ammonia production

Table 95. The ammonia production in Serbia in the time period 1990 –2023

Methodology

The methodology used in this inventory for the emission calculation for category 2 B 1 Ammonia production is in accordance with the EMEP/EEA Emission Inventory Guidebook 2023

Emission factors

Emission factors used in NOx, CO and NH_3 emission calculation are Tier 1 emission factors attained from EMEP/EEA Inventory Guidebook 2023. National emission factors have not been developed.

Activity data

The source for activity data concerning ammonia production is SORS.

Recalculations and other changes

In 2019, 2020, 2021, 2022 and 2023, there is no production of ammonia in Serbia

Planned improvements

No planned improvements in the next period.

2.B.2 Nitric acid production

Methodology

The methodology used in this inventory for the emission calculation for category 2 B 2 Nitric acid production is in accordance with the EMEP/EEA Emission Inventory Guidebook 2023

2.B.2			
Nitric acid production (Mg prod., 100% Acid)			
1990	236245	2007	152000
1991	188775	2008	72000
1992	167742	2013	69000

1993	116010	2010	126000
1994	156192	2011	171000
1995	148795	2012	188000
1996	229379	2013	202000
1997	240292	2014	133000
1998	185374	2015	98000
1999	79039	2016	81000
2000	76000	2017	137075
2001	81000	2018	119735
2002	133000	2019	0.008
2003	87000	2020	0
2004	173000	2021	0
2005	171000	2022	0
2006	95000	2023	0

Table 96. Total amount of nitric acid production in Serbia in the time period 1990 – 2023.

Emission factors

Emission factors used in NOx emission calculation are Tier 1 emission factors attained from EMEP/EEA Inventory Guidebook 2023.

National emission factors have not been developed.

Activity data

The source for activity data concerning nitric acid production is SORS.

Recalculations and other changes

In 2019, the production of nitric acid was significantly reduced. In 2020, 2021, 2022 and 2023, there are no production of nitric acid in Serbia.

Planned improvements

No planned improvements in the next period.

2.B.3 Adipic acid production, 2.B.5 Carbide production, 2.B.6 Titanium dioxide production and 2.B.7 Soda ash production

These categories does not occurred in Serbia.

2.B.10.a Other chemical industry

In this IIR report category 2 B 10 a Other chemical industry included:

- **Sulphuric acid**

Methodology

The methodology used in this inventory for the emission calculation for this category is in accordance with the EMEP/EEA Emission Inventory Guidebook 2023

2.B.10.a			
Sulphuric acid production (Mg)			
1990	874246	2007	71900
1991	579097	2008	75900
1992	289045	2013	49800
1993	75034	2010	77300
1994	22856	2011	77679
1995	84953	2012	95000
1996	230514	2013	99000
1997	177271	2014	83365
1998	211309	2015	192000
1999	30486	2016	298000
2000	79900	2017	319000
2001	52000	2018	298000
2002	73700	2019	360498
2003	23100	2020	0
2004	53900	2021	0
2005	98500	2022	0
2006	76900	2023	0

Table 97. Total amount of sulphuric acid production in Serbia in the time period 1990 – 2023.

Emission factors

Emission factors used in this category is Tier 2 emission factors attained from EMEP/EEA Inventory Guidebook 2023. National emission factors have not been developed.

Activity data

The source for activity data for this category is SORS.

Recalculations and other changes

In 2020, 2021, 2022 and 2023, there are no production of Sulphuric acid in Serbia.

Planned improvements

No planned improvements in the next period.

- **Ammonium nitrate**

Methodology

The methodology used in this inventory for the emission calculation for this category is in accordance with the EMEP/EEA Emission Inventory Guidebook 2023

Emission factors

Emission factors used in this category is Tier 2 emission factors attained from EMEP/EEA Inventory Guidebook 2023. National emission factors have not been developed.

Activity data

The source for activity data for this category is SORS.

2.B.10.a			
Ammonium nitrate (ton)			
1990	278637	2007	186200
1991	220627	2008	88600
1992	193297	2013	81200
1993	130835	2010	150400
1994	183943	2011	205043
1995	170276	2012	227492
1996	263429	2013	242623
1997	281778	2014	158399
1998	217236	2015	118314
1999	96130	2016	73000
2000	87700	2017	131495
2001	97300	2018	144714
2002	152100	2019	0
2003	129800	2020	0
2004	204600	2021	0
2005	199600	2022	0
2006	115000	2023	0

Table 98. Total amount of ammonium nitrate production in Serbia in the time period 1990 – 2023

Recalculations and other changes

In 2019, 2020, 2021, 2022 and 2023 there is no production of ammonium nitrate in Serbia

Planned improvements

No planned improvements in the next period.

- **Urea**

Methodology

The methodology used in this inventory for the emission calculation for this category is in accordance with the EMEP/EEA Emission Inventory Guidebook 2023

2.B.10.a			
Urea (ton)			
1990	56195	2007	31200
1991	53120	2008	12100
1992	51780	2009	51652
1993	39155	2010	0
1994	50000	2011	53185
1995	40000	2012	50442
1996	72235	2013	51652
1997	66390	2014	30975
1998	57529	2015	22827
1999	16761	2016	25315
2000	21600	2017	34287
2001	16100	2018	35622
2002	45100	2019	0
2003	28600	2020	0
2004	63600	2021	0
2005	46800	2022	0
2006	24500	2023	0

Table 99. Total amount of urea production in Serbia in the time period 1990 – 2023

Emission factors

Emission factors used in this category is Tier 2 emission factors attained from EMEP/EEA Inventory Guidebook 2023.

National emission factors have not been developed.

Activity data

The source for activity data for this category is SORS. There was no urea production in 2010 in Serbia.

Recalculations and other changes

In 2019,2020, 2021, 2022 and 2023 there is no production of Urea in Serbia.

Planned improvements

No planned improvements in the next period.

- **Phosphate fertilizers**

Methodology

The methodology used in this inventory for the emission calculation for this category is in accordance with the EMEP/EEA Emission Inventory Guidebook 2023

Emission factors

Emission factors used in this category is Tier 2 emission factors attained from EMEP/EEA Inventory Guidebook 2023. National emission factors have not been developed.

Activity data

The source for activity data for this category is SORS.

2.B.10.a			
Phosphate fertilizers (ton produced)			
1990	210860	2007	46400
1991	169616	2008	24100
1992	121751	2013	5200
1993	38473	2010	6900
1994	19115	2011	5703
1995	16616	2012	9435
1996	101606	2013	51687
1997	72255	2014	51755
1998	56211	2015	34741
1999	21589	2016	44638
2000	25000	2017	43116
2001	35000	2018	41594
2002	9000	2019	62373
2003	13500	2020	53657
2004	7300	2021	53799
2005	8100	2022	87296
2006	2200	2023	182774

Table 100. Total amount of phosphate fertilizers production in Serbia in the time period 1990 – 2023

Recalculations and other changes

The data on phosphate fertilizers were taken from the Statistical Office of the Republic Serbia.

Since 2017, the methodology of data collection at the Statistical Office of the Republic Serbia has changed, so we took the data for 2018 and interpolated for 2017.

Planned improvements

No planned improvements in the next period.

Ethylene and propylene

Methodology

The methodology used in this inventory for the emission calculation for this category is in accordance with the EMEP/EEA Emission Inventory Guidebook 2023

2.B.10.a			
Ethylene (kton produced)			
1990	258	2007	266
1991	210	2008	229
1992	110	2013	156
1993	0	2010	191
1994	0	2011	227
1995	0	2012	71
1996	101	2013	231
1997	243	2014	166
1998	242	2015	113
1999	85	2016	212

2000	132	2017	158
2001	120	2018	144
2002	174	2019	0
2003	162	2020	148
2004	243	2021	143
2005	251	2022	150
2006	254	2023	122

Table 101. Total amount of ethylene and propylene production in Serbia in the time period 1990 – 2023.

Emission factors

Emission factors used in this category is Tier 2 emission factors attained from EMEP/EEA Inventory Guidebook 2023. National emission factors have not been developed.

Activity data

The source for activity data for this category is SORS. In the period 1993-1995 there was no Ethylene production in Serbia.

Recalculations and other changes

In direct communication with the Statistical Office of the Republic of Serbia, data for 2022 was entered, which was not in the previous submission.

Planned improvements

No planned improvements in the next period

- **Polyethylene Low Density**

Methodology

The methodology used in this inventory for the emission calculation for this category is in accordance with the EMEP/EEA Emission Inventory Guidebook 2023

Emission factors

Emission factors used in this category is Tier 2 emission factors attained from EMEP/EEA Inventory Guidebook 2023. National emission factors have not been developed.

2.B.10.a Polyethylene low density (ton produced)			
1990	48555	2007	55200
1991	38292	2008	52700
1992	24271	2013	41000
1993	0	2010	58700
1994	0	2011	58030
1995	0	2012	21611
1996	27224	2013	61489
1997	52427	2014	47573
1998	49624	2015	40062
1999	21339	2016	50661
2000	38600	2017	58000
2001	48800	2018	50777
2002	52400	2019	44900
2003	45700	2020	55112
2004	56900	2021	49517
2005	52400	2022	54917
2006	57200	2023	45367

Table 102.Total amount of polyethylene low density production in Serbia in the time period 1990 – 2023.

Activity data

The source for activity data for this category is SORS. In the period 1993-1995 there was no polyethylene low density production in Serbia.

Recalculations and other changes

No recalculations were performed.

Planned improvements

No planned improvements in the next period.

- **Polyethylene High Density**

Methodology

The methodology used in this inventory for the emission calculation for this category is in accordance with the EMEP/EEA Emission Inventory Guidebook 2023

2.B.10.a Polyethylene high density (ton produced)			
1990	60778	2007	89000
1991	44302	2008	88300
1992	23774	2013	62400
1993	0	2010	68000
1994	0	2011	67963
1995	0	2012	21325
1996	28944	2013	94622
1997	57799	2014	51892
1998	63378	2015	70118
1999	25033	2016	86035
2000	54500	2017	88740
2001	70600	2018	83071
2002	73500	2019	70778
2003	64000	2020	90784
2004	90300	2021	90242
2005	80400	2022	88645
2006	88700	2023	72962

Table 103. Total amount of polyethylene high density production in Serbia in the time period 1990 – 2023.

Emission factors

Emission factors used in this category is Tier 2 emission factors attained from EMEP/EEA Inventory Guidebook 2023.

National emission factors have not been developed.

Activity data

The source for activity data for this category is SORS. In the period 1993-1995 there was no polyethylene high density production in Serbia.

Recalculations and other changes

No recalculations were performed.

Planned improvements

No planned improvements in the next period.

- **Polypropylene**

Methodology

The methodology used in this inventory for the emission calculation for this category is in accordance with the EMEP/EEA Emission Inventory Guidebook 2023

Emission factors

Emission factors used in this category is Tier 2 emission factors attained from EMEP/EEA Inventory Guidebook 2023. National emission factors have not been developed.

2.B.10.a Polypropylene (ton produced)			
1990	31122	2007	32700
1991	33292	2008	30000
1992	21077	2013	11000
1993	163	2010	25600
1994	1431	2011	32224
1995	437	2012	17217
1996	16004	2013	34719
1997	31270	2014	29881
1998	34267	2015	32229
1999	13208	2016	34119

2000	21200	2017	31860
2001	31000	2018	45015
2002	28900	2019	0
2003	28700	2020	39616
2004	32200	2021	31502
2005	32100	2022	19032
2006	30600	2023	28064

Table 104. Total amount of polypropylene production in Serbia in the time period 1990 – 2023.

Activity data

The source for activity data for this category is SORS.

Recalculations and other changes

In direct communication with the Statistical Office of the Republic of Serbia, data from 2020 was entered, which were not in the previous submission.

Planned improvements

No planned improvements in the next period.

- **Styrene-butadiene rubber (SBR)**

Methodology

The methodology used in this inventory for the emission calculation for this category is in accordance with the EMEP/EEA Emission Inventory Guidebook 2023

2.B.10.a	
Styrene	
(ton produced)	
2000	15200
2001	24500
2002	24600
2003	21700
2004	30400
2005	31400
2006	32000
2007	34300
2008	35000
2013	18000
2010	23800
2011	24387
2012	9518
2013	20683
2014	0
2015	0
2016	0
2017	0
2018	0
2019	0
2020	0
2021	0
2022	0
2023	0

Table 105. Total amount of styrene-butadiene rubber (SBR) production in period 1990 – 2023.

Emission factors

Emission factors used in this category is Tier 2 emission factors attained from EMEP/EEA Inventory Guidebook 2023.

National emission factors have not been developed.

Activity data

The source for activity data for this category is petrochemical industry. The data were not available for the period 1990 -1999. After 2013. there was no Styrene production in Serbia.

Recalculations and other changes

No recalculations were performed.

Planned improvements

In the next period, SEPA will try to collect all missing data and recalculate the amount of emissions for whole period.

Production of: Ammonium sulphate, Ammonium phosphate, NPK fertilisers, Carbon black, Titanium dioxide, Graphite, Chlorine production, 1,2 dichloroethane + vinylchloride (balanced), Polyvinylchloride, Styrene, Polystyrene, Styrene butadiene, Styrene-butadiene latex, Acrylonitrile Butadiene Styrene (ABS) resins, Ethylene oxide, Formaldehyde, Ethylbenzene, Phtalic anhydride, Acrylonitrile, Glyoxylic acid, Pesticide - Serbia does not have information on these activities. Serbia will put in an improvement plan and calculate emissions when once data become available.

2.C Metal industry

This category includes:

2.C.1 Iron and steel production
2.C.3 Aluminium production
2.C.5.a Copper production
2.C.5.b Lead production
2.C.5.e Other metal production (Magnesium production)

2.C.1 Iron and steel production

2.C.1		2.C.1	2.C.1
Sinter production		Pellet production.	Steel making, Basic oxygen furnace
g/Mg sinter		g/Mg pellet	g/Mg steel
1990	0	0	1046000
1991	0	0	631000
1992	0	0	667000
1993	0	0	181000
1994	0	0	139000
1995	0	0	182000
1996	0	0	689000
1997	0	0	1025000
1998	0	0	980000
1999	0	0	230000
2000	0	0	696000
2001	0	0	595000
2002	0	0	591000
2003	0	0	711000
2004	941349	641095	1175000
2005	1094502	889273	1292000
2006	1341834	1542287	1823000
2007	1137976	1338261	1478000
2008	1215427	1393685	1662000
2013	690020	973477	1061000
2010	773848	1208049	1254000
2011	967194	1058133	1324000
2012	336994	207266	346000
2013	413968	235919	396000
2014	624035	327470	583000
2015	884550	623097	955000
2016	384081	802219	1173000
2017	773232	1431960	1477000
2018	1113352	1552507	1973000
2019	1203368	1265650	1929000
2020	1011079	581744	1456000
2021	1153480	580834	1667000
2022	1131824	544795	1674000
2023	1229778	298037	1454000

Table 106. Total amount of sinter and pellet production in period 1990 – 2023.

Methodology

The methodology used in this inventory for the emission calculation for category 2 C 1 Iron and steel production is in accordance with the EMEP/EEA Emission Inventory Guidebook 2023

Emission factors

Emission factors used in emissions calculation for this category are Tier 2 emission factors attained from EMEP/EEA Inventory Guidebook 2023.

National emission factors have not been developed.

Activity data

The data for the emission calculation in category 2C1: Iron and steel, is derived from operator for sinter and pellet. For pellet and sinter there was no productions before 2003. The operator who provides us with data on the production of sinter and pellets is the only one on the territory of the Republic of Serbia. There is no information on other possible activities included in the scope of source categories 2C1, such as Blast furnace charging, Pig iron tapping, Open hearth furnace steel plant, Basic oxygen furnace steel plant, Electric furnace steel plant and Rolling mills.

Due to the increased production of iron and steel there was an increase in emissions.

2.C.1			
Pig iron production.			
1990	2313000	2007	1485126
1991	1266000	2008	1582118
1992	511000	2013	1007986

1993	62000	2010	1234633
1994	22000	2011	1258181
1995	108000	2012	346107
1996	565000	2013	402026
1997	907000	2014	595549
1998	850000	2015	969831
1999	139000	2016	1296634
2000	598000	2017	1341326
2001	456000	2018	1708153
2002	485000	2019	1681527
2003	635000	2020	1106761
2004	1003135	2021	1186098
2005	1208118	2022	1118428
2006	1698446	2023	1023459

Table 107. Total amount of pig iron production in period 1990 – 2023.

Recalculations and other changes

No recalculations were performed.

Planned improvements

No planned improvements in the next period.

2.C.2 Ferroalloys production

The production of ferroalloys does not occurred in Serbia.

2.C.3 Aluminum production

Methodology

The methodology used in this inventory for the emission calculation for category 2 C 3 Aluminum production is in accordance with the EMEP/EEA Emission Inventory Guidebook 2023

2.C.3 Aluminium production (Mg)			
1990	342	2007	10298
1991	178	2008	10601
1992	80	2009	9013
1993	36	2010	13867
1994	115	2011	12104
1995	86	2012	12888
1996	51	2013	13529
1997	2	2014	13436
1998	0	2015	11941
1999	0	2016	13864
2000	494	2017	13989
2001	526	2018	15284
2002	487	2019	12989
2003	603	2020	10869
2004	514	2021	16560
2005	269	2022	15098
2006	3293	2023	13637

Table 108. Total amount of Al production in Serbia in the period 1990 – 2023

Emission factors

Emission factors used in emissions calculation for this category are Tier 2 emission factors attained from EMEP/EEA Inventory Guidebook 2023.

National emission factors have not been developed.

Activity data

The source for activity data for this category is company which produced Aluminium. There was no production of aluminium in 1998 and 1999.

Recalculations and other changes

From 2021 the extrapolation has been done due to lack of data.

According to Metedology EMEP/EEA 2023 emission factor for SOx have been changed.

Planned improvements

No planned improvements in the next period.

2.C.4 Magnesium production

Methodology

The methodology used in this inventory for the emission calculation for this category is in accordance with the EMEP/EEA Emission Inventory Guidebook 2023

Emission factors

Emissions was calculated on the base of methodology (Tier 2), which implies multiplication with appropriate default emission factors.

Activity data

The source for activity data concerning this category is company which produced magnesium. This category covers magnesium production. There was no production of magnesium in 1993-1994, in 2000, 2002-2004 amd 2023.

2.C.4 Magnesium production (ton produced)			
1990	5788	2007	1649
1991	5360	2008	1478
1992	4055	2013	1341
1993	0	2010	933
1994	0	2011	1582
1995	2560	2012	1387
1996	3090	2013	2026
1997	3742	2014	1800
1998	3965	2015	3894
1999	1203	2016	4131
2000	0	2017	4202
2001	203	2018	4123
2002	0	2019	3045
2003	0	2020	1287
2004	0	2021	1895
2005	523	2022	1819
2006	181	2023	0

Table 109. Total amount of Mg production in Serbia in the period 1990 – 2023

Recalculations and other changes

No recalculations were performed.

Planned improvements

No planned improvements in the next period.

2.C.5. Lead production

Methodology

The methodology used in this inventory for the emission calculation for lead production is in accordance with the EMEP/EEA Emission Inventory Guidebook 2023

Emission factors

Emission factors used in emission calculation for lead production is Tier 2 emission factors attained from EMEP/EEA Inventory Guidebook 2023.

Table 110. Total amount of lead production in Serbia in the period 1990 – 2023

Year	Secondary lead	Primary lead	Year	Secondary lead	Primary lead
	Mg lead			Mg lead	
1990	5565	6000	2007	8106	0
1991	1629	51000	2008	12000	0
1992	475	78000	2009	14036	0
1993	284	8000	2010	24032	0
1994	2748	13000	2011	26148	0
1995	2415	19000	2012	18383	0
1996	3488	44000	2013	7546	0
1997	5025	42000	2014	0	0
1998	4845	36000	2015	0	0
1999	4077	4000	2016	0	0
2000	5145	5000	2017	0	0
2001	5143	5000	2018	0	0
2002	5272	5000	2019	0	0
2003	4893	5000	2020	0	0

2004	5395	0	2021	0	0
2005	4666	0	2022	0	0
2006	6434	0	2023	0	0

Activity data

The source for activity data concerning this category is operator for lead production. From 2014. Category 2 C 5 Lead production does not exist.

Recalculations and other changes

According to Metedology EMEP/EEA 2023 in subcutegories Primary Lead production and Secondary Lead production emission factors for SOx have been changed.

Planned improvements

No planned improvements in the next period.

2.C.6. Zinc production

Methodology

The methodology used in this inventory for the emission calculation for this category is in accordance with the EMEP/EEA Emission Inventory Guidebook 2023

Table 111. Total amount of zinc production in Serbia in the period 1990 – 2004

2.C.6	
Primary zinc production	
(Mg Zinc)	
1990	24000
1991	39000
1992	42000
1993	7000
1994	4000
1995	6000
1996	30000
1997	39000
1998	14000
1999	1000
2000	8000
2001	13000
2002	1500
2003	2000
2004	100

Emission factors

Emissions was calculated on the base of methodology (Tier 2), which implies multiplication with appropriate default emission factors.

Activity data

The source for activity data concerning this category is Serbian Statistical Office After 2004 Zink production does not occurred in Serbia.

Recalculations and other changes

According to Metedology EMEP/EEA 2023 in subcutegories Primary Zink production and Secondary Zink production emission factors for SOx have been changed

Planned improvements

No planned improvements in the next period.

2.C.7 a Copper production

Methodology

The methodology used in this inventory for the emission calculation for copper production is in accordance with the EMEP/EEA Emission Inventory Guidebook 2023

Table 112. Total amount of copper production in Serbia in the period 1990 – 2023

Year	Secondary copper	Primary copper	Yera	Secondary copper	Primary copper
	Mg			Mg	
1990	0	151000	2007	2490	28800
1991	0	134000	2008	2640	31100
1992	0	135000	2009	1140	26300
1993	0	51000	2010	950	21200
1994	0	72000	2011	2708	25740
1995	0	78000	2012	2536	32166
1996	0	104000	2013	3432	32408
1997	0	113000	2014	1921	31255
1998	0	94000	2015	2207	42439
1999	0	50000	2016	2231	59078
2000	720	44900	2017	1469	67752
2001	50	32300	2018	2219	65189
2002	970	34900	2019	5092	78091
2003	560	13500	2020	9935	60976
2004	820	11200	2021	20346	45649
2005	1990	29300	2022	7573	17543
2006	2520	38900	2023	22386	51777

Emission factors

Emission factors used in emission calculation for copper production is Tier 2 emission factors attained from EMEP/EEA Inventory Guidebook 2023, Table 3.2 Tier 2 emission factors for source category 2.C.5.a Copper production, primary copper and Table 8.5 Tier 2 emission factors for source category 2.C.5.a Copper production, secondary copper

National emission factors have not been developed.

Activity data

The source for activity data for this category is operator for copper production for the period 2000 – 2012 and for previous period (1990 – 1999) data source was Serbian Statistical Office. There were no data for secondary copper before 2000.

Recalculations and other changes

According to Metedology EMEP/EEA 2023 in subcutegories Primary Copper production and Secondary Copper production emission factors for SOx have been changed

Planned improvements

No planned improvements in the next period.

2C7b Nickel production, 2C7c Other metal production and 2C7d Storage, handling and transport of metal products

These categories does not occure in Serbia.

2 D Solvents

This category comprises:

2 D3a Domestic solvent use including fungicides

2D3b Road paving with asphalt

2D3c Asphalt roofing

2D3d Coating applications

2D3e Degreasing

2D3f Dry cleaning

2D3g Chemical products

2D3h Printing

2D3i Other solvent use

2 D 3 a Domestic solvent use including fungicides

Methodology

The methodology used in this inventory for the emission calculation for this category is in accordance with the EMEP/EEA Emission Inventory Guidebook 2023

Table 113. Domestic solvent use including fungicides in Serbia in the period 1990 – 2023

2 D 3 a			
Domestic solvent use including fungicides			
Year	kg/capita	Year	kg/capita
1990	7827000	2007	7381575
1991	7825000	2008	7350220
1992	7832000	2013	7320805
1993	7841000	2010	7291435
1994	7849000	2011	7258753
1995	7856000	2012	7199077
1996	7844000	2013	7164132
1997	7828000	2014	7131787
1998	7807000	2015	7095383
1999	7781000	2016	7058322
2000	7747000	2017	7020858
2001	7727000	2018	6982604
2002	7500030	2019	6926705
2003	7480590	2020	6871547
2004	7463155	2021	6797105
2005	7440765	2022	6641197
2006	7411565	2023	6605168

Emission factors

Emissions was calculated on the base of methodology (Tier 1), which implies multiplication with appropriate default emission factors.

Activity data

The source for activity data concerning this category is Serbian Statistical Office.

Recalculations and other changes

No recalculations were performed.

Planned improvements

No planned improvements in the next period.

2 D 3 b Road paving with asphalt

Methodology

The methodology used in this inventory for the emission calculation for this category is in accordance with the EMEP/EEA Emission Inventory Guidebook 2023

Emission factors

Emissions were calculated on the base of methodology (Tier 2), which implies multiplication with appropriate default emission factors.

Activity data

The source for activity data concerning this category is Serbian Statistical Office.

2 D 3 b			
Road paving with asphalt			
Year	Mg asphalt	Year	Mg asphalt
1990	423104	2007	350634
1991	335604	2008	291890
1992	135259	2013	204734
1993	17935	2010	197325
1994	32736	2011	172005
1995	47537	2012	123824
1996	122470	2013	107243
1997	118360	2014	300462
1998	98481	2015	456629
1999	40911	2016	489080
2000	73082	2017	610384
2001	86538	2018	703727
2002	124560	2019	920430
2003	92486	2020	721637
2004	233153	2021	778643
2005	308943	2022	730666
2006	345565	2023	660229

Table 114. Total amount of asphalt for road paving in Serbia in the period 1990 – 2023

Recalculations and other changes

Recalculations have been made since 2017. Previously, only heated asphalt was used, but now cold asphalt has also been added.

Planned improvements

No planned improvements in the next period.

2 D 3 c Asphalt roofing

Methodology

The methodology used in this inventory for the emission calculation for this category is in accordance with the EMEP/EEA Emission Inventory Guidebook 2023

Emission factors

Emissions were calculated on the base of methodology (Tier 1), which implies multiplication with appropriate default emission factors.

Activity data

The source for activity data concerning this category is Serbian Statistical Office. Acording of Serbian Statistical Office data there are no production of roofing cards - shingles (activity data for calculating emissions for asphalt roofing).Because of that number in 2017, 2018,2019, 2020, 2021, 2022 and 2023 is 0.

2 D 3 c			
Asphalt roofing			
Year	Mg shingle	Year	Mg shingle
1990	13793	2007	4655
1991	15709	2008	5284
1992	11292	2013	6866
1993	8230	2010	8848
1994	5664	2011	9131
1995	6834	2012	6678
1996	8726	2013	5733
1997	11894	2014	5185
1998	11093	2015	4072
1999	5830	2016	4015
2000	7431	2017	0
2001	6019	2018	0
2002	5224	2019	0
2003	5848	2020	0
2004	6338	2021	0
2005	6179	2022	0
2006	4840	2023	0

Table 115. Total amount of asphalt for asphalt roofing in Serbia in the period 1990 – 2023

Recalculations and other changes

No recalculations were performed.

Planned improvements

No planned improvements in the next period.

2 D 3 d Coating applications/Paint application

Methodology

The methodology used in this inventory for the emission calculation for this category is in accordance with the EMEP/EEA Emission Inventory Guidebook 2023

Emission factors

Emissions were calculated on the base of methodology (Tier 2), which implies multiplication with appropriate default emission factors.

Table 116. Total amount of products for category 2.D.3.d in Serbia in the period 1990 – 2023

2.D.3.d.					
Year	Construction and buildings	Leather finishing	Bus coating	Truck/van coating	Car coating
	kg paint	kg leather	No bus	No vehicles	No cars
1990	6982520	0	509	8421	141000
1991	4653500	0	365	8508	75000
1992	4029250	0	294	4252	23000
1993	4426500	0	36	278	8000
1994	2776210	0	102	696	8000
1995	2301780	0	90	693	8000
1996	2361597	0	147	826	10000
1997	2281071	0	104	1269	10000
1998	1937963	0	146	1144	10000
1999	1996551	0	59	425	8000
2000	1611963	2520	159	718	12000
2001	1938262	5520	182	590	7000
2002	2420932	7680	263	595	11000
2003	2710250	14280	180	466	11370
2004	2989606	15000	183	647	14549
2005	3237976	18600	352	501	15666
2006	2997677	30480	154	441	11016
2007	3062177	41760	101	473	9403
2008	3205233	118440	324	348	7748
2009	2641732	145920	97	155	16512
2010	2161301	195720	44	200	14955
2011	2310758	84630	163	245	10593
2012	2100244	67920	95	124	22459
2013	1567497	52800	49	38	113710
2014	1289444	63720	12	40	103332
2015	1875955	62520	74	15	91747
2016	1830178	0	60	11	84410
2017	2021396	0	53	28	72829
2018	2148449	0	8	32	56312
2019	2713048	0	0	9	34923
2020	2649074	0	0	10	23278
2021	2773826	0	0	17	21112
2022	2505340	0	0	7	4358
2023	3334652	0	0	24	0

Activity data

The source for activity data concerning this category is Serbian Statistical Office.

Recalculations and other changes

No recalculations were performed.

Planned improvements

Data on other possible coating application in country such as: wire coating, truck cabin coating, wood coating, coil coating, car repairing, domestic use of paint, other non industrial paint application (i.e. the application of high performance protective anti corrosive and/or fire resistant coatings to buildings and other large metallic structures, as well as coatings for concrete, road marking, etc.) currently are not available. Once they become available will be included in the

emissions estimation.

2 D 3 e Degreasing and 2 D 3 f Dry cleaning

Methodology

The methodology used in this inventory for the emission calculation for this category is in accordance with the EMEP/EEA Emission Inventory Guidebook 2013.

Table 117. 2.D.3.e Degreasing in period 1990 – 2023

2D3e			
Degreasing			
Year	g/person	Year	g/person
1990	7827000	2007	7381575
1991	7825000	2008	7350220
1992	7832000	2013	7320805
1993	7841000	2010	7291435
1994	7849000	2011	7258753
1995	7856000	2012	7199077
1996	7844000	2013	7164132
1997	7828000	2014	7131787
1998	7807000	2015	7095383
1999	7781000	2016	7058322
2000	7747000	2017	7020858
2001	7727000	2018	6982604
2002	7500030	2019	6926705
2003	7480590	2020	6871547
2004	7463155	2021	6797105
2005	7440765	2022	6641197
2006	7411565	2023	6605168

Table 118. 2.D.3.f Dry cleaning in period 1990 – 2023

2D3f			
Dry cleaning			
Year	g/person	Year	g/person
1990	7827000	2007	7381575
1991	7825000	2008	7350220
1992	7832000	2013	7320805
1993	7841000	2010	7291435
1994	7849000	2011	7258753
1995	7856000	2012	7199077
1996	7844000	2013	7164132
1997	7828000	2014	7131787
1998	7807000	2015	7095383
1999	7781000	2016	7058322
2000	7747000	2017	7020858
2001	7727000	2018	6982604
2002	7500030	2019	6926705
2003	7480590	2020	6871547
2004	7463155	2021	6797105
2005	7440765	2022	6641197
2006	7411565	2023	6605168

Emission factors

Emissions were calculated on the base of methodology (Tier 2), which implies multiplication with appropriate default emission factors.

Activity data

The source for activity data concerning this category is Serbian Statistical Office.

Recalculations and other changes

No recalculations were performed.

Planned improvements

No planned improvements in the next period.

2 D 3 g Chemical products

Methodology

The methodology used in this inventory for the emission calculation for this category is in accordance with the EMEP/EEA Emission Inventory Guidebook 2013.

Table 119. Total amount of products for category 2.D.3.g in Serbia in the period 1990 – 2023

2 D 3 g					
Chemical products					
Year	Rubber	Asphalt	Shoes	Leather tanning	Paints, inks and glues
	kg	Mg	pairs	kg	kg
1990	35892500	423104	24752000	3735000	27704214
1991	29477000	335604	17212000	2265000	23687179
1992	30296000	135259	15396000	1785000	20674467
1993	5751000	17935	10020000	1035000	10590140
1994	7547000	28500	8582000	1067000	14484491
1995	7262000	47537	5847000	1042000	12105359
1996	9597000	122470	6265000	1213000	14545318
1997	11726000	118360	6656000	1124000	14502884
1998	13919000	98481	6976000	907000	13601495
1999	7553000	40911	3847000	944000	7462612
2000	12074000	73082	3806000	1200000	37355812
2001	12940000	86538	4184000	1550000	34889071
2002	13651000	124560	2876000	1880000	34787163
2003	12423000	92486	2310000	2030000	34167227
2004	11751000	233153	2775000	2153000	31395258
2005	11696000	308943	3143000	2207000	25450906
2006	10637000	345565	3679000	3033000	36687533
2007	12708000	350634	3481000	2873000	36860757
2008	14731000	291890	3327000	2993000	39252037
2013	7924000	204734	2225000	2308000	38264000
2010	10772000	197325	2250000	2190000	39562000
2011	7333000	172005	2480000	1421000	43782000
2012	6631000	123824	2379000	765000	47250000
2013	5314000	107243	2424000	816000	43832000
2014	7013000	0	3859000	866000	47999000
2015	5558000	0	4852000	1060000	48749000
2016	5168000	0	4518000	930000	95152000
2017	9362113	0	5408000	0	17418362
2018	16962231	0	6402000	0	20981870
2019	11274731	0	6343000	0	17186131
2020	8353015	0	4766720	0	19739106
2021	7549224	0	4356149	0	16942556
2022	7144799	0	4822315	0	17075670
2023	6812968	0	2883528	0	18859602

Emission factors

Emissions were calculated on the base of methodology (Tier 2), which implies multiplication with appropriate default emission factors.

Activity data

The source for activity data concerning this category is Serbian Statistical Office.

Recalculations and other changes

In subcategory rubber recalculations were made for the year 2022, data on vulcanised rubber was added, which was not collected in the last submission.

Planned improvements

In the inventory are not included all activities that fall in source category 2D3g like Polyester processing, Polyurethane foam processing, Polystyrene foam processing, Tyre production, Pharmaceutical products manufacturing and Adhesive, magnetic tapes, films and photographs manufacturing. Once the activity data for calculating emissions from these activities becomes available, we will include them in the Inventory.

2 D 3 h Printing

Methodology

The methodology used in this inventory for the emission calculation for this category is in accordance with the EMEP/EEA Emission Inventory Guidebook 2013.

Table 120. 2.D.3.h Printing 1990 – 2023

2D3h Printing			
Year	kg/person/year	Year	kg/person/year
1990	7827000	2007	7381575
1991	7825000	2008	7350220
1992	7832000	2013	7320805
1993	7841000	2010	7291435
1994	7849000	2011	7258753
1995	7856000	2012	7199077
1996	7844000	2013	7164132
1997	7828000	2014	7131787
1998	7807000	2015	7095383
1999	7781000	2016	7058322
2000	7747000	2017	7020858
2001	7727000	2018	6982604
2002	7500030	2019	6926705
2003	7480590	2020	6871547
2004	7463155	2021	6797105
2005	7440765	2022	6641197
2006	7411565	2023	6605168

Emission factors

Emissions were calculated on the base of methodology (Tier 2), which implies multiplication with appropriate default emission factors.

Activity data

The source for activity data concerning this category is Serbian Statistical Office.

Recalculations and other changes

No recalculations were performed.

Planned improvements

No planned improvements in the next period.

2 D 3 i Other solvent and product use

Methodology

The methodology used in this inventory for the emission calculation for this category is in accordance with the EMEP/EEA Emission Inventory Guidebook 2023

Table 121. Total amount of products for category 2.D.3.i in Serbia in the period 1990 – 2023

2 D 3 i Other solvent and product use					
Year	Fat, edible and non-edible oil extraction	Wood preservation, Creosote preservative type	Treatment of vehicles	Tobacco combustion	Use of Shoes
	kg seed	kg	person	Mg	pair
1990	375593400	0	7827000	14604	24752000
1991	429253500	0	7825000	16336	17212000

1992	365289600	0	7832000	13903	15396000
1993	365375400	0	7841000	14797	10020000
1994	364661700	0	7849000	11549	8582000
1995	396516900	0	7856000	11217	5847000
1996	342345900	0	7844000	10052	6265000
1997	392191800	0	7828000	8506	6656000
1998	398447400	2151340	7807000	12234	6976000
1999	294645000	1203170	7781000	10645	3847000
2000	239866000	1078920	7747000	13264	3806000
2001	203855000	878980	7727000	12539	4184000
2002	298055000	515000	7500030	14247	2876000
2003	331489000	549400	7480590	14375	2310000
2004	302671000	1009730	7463155	15107	2775000
2005	323647000	577440	7440765	17324	3143000
2006	276803891	475680	7411565	18267	3679000
2007	229948151	366790	7381575	21304	3481000
2008	307228359	695830	7350220	20873	3327000
2009	345421300	260510	7320805	20482	2225000
2010	257666000	470460	7291435	21906	2250000
2011	229012001	596770	7258753	27326	2480000
2012	247708518	437450	7199077	27161	2379000
2013	236567000	652269	7164132	23832	3933000
2014	262232000	700950	7131787	21081	3859000
2015	274342000	533640	7095383	33378	4852000
2016	535374000	0	7058322	41582	4518000
2017	558161000	0	7020858	45971	5408000
2018	563288000	0	6982604	42374	6402000
2019	629254000	0	6926705	40084	6343000
2020	562635178	0	6871547	42228	4766720
2021	500244569	0	6797105	44151	4356149
2022	544772421	0	6641197	46029	4822315
2023	563874288	0	6605168	47465	2883528

Emission factors

Emissions were calculated on the base of methodology (Tier 2), which implies multiplication with appropriate default emission factors.

Activity data

The source for activity data concerning this category is Serbian Statistical Office.

Emission factors

Emissions were calculated on the base of methodology (Tier 2), which implies multiplication with appropriate default emission factors.

Activity data

The source for activity data concerning this category is Serbian Statistical Office.

Recalculations and other changes

In the subcategory Use of Shoes recalculations were made for the year 2022, data on footwear production was added, which was not collected in the last submission.

Planned improvements

In the inventory are not included all activities that fall in source category 2D3i like Glass wool and Mineral wool enduction, Application of glues and adhesives, Use of Fireworks, Tabacco combustion, Other (Concrete additive, Cooling lubricant, Lubricant, Pesticide, Aeroplane de-icing Agent). Once

the activity data for calculating emissions from these activities becomes available, we will include them in the Inventory.

Also, activities such as: Glass wool enduction, Mineral wool enduction, Fat, edible and non edible oil extraction, Application of glues and adhesives, Preservation of wood, Underseal treatment and conservation of vehicles and Vehicles dewaxing fall into NFR 2D3i and activities such as: Use of fireworks, Use of tobacco, Use of shoes and Barbeque fall under 2G. For the next submission we will stratify all the activities that are currently in 2D3i into 2D3i and 2G by using a mapping table.

2.G. Other product use

This category does not occured in Serbia.

2.H.1 Pulp and paper

Methodology

The methodology used in this inventory for the emission calculation for this category is in accordance with the EMEP/EEA Emission Inventory Guidebook 2023

Emission factors

Emission factors used in this category is Tier 1 emission factors attained from EMEP/EEA Inventory Guidebook 2023. National emission factors have not been developed.

Activity data

The source for activity data for this category is SORS.

2.H.1 Pulp and paper (Mg air dried pulp)			
1990	348813	2007	270700
1991	308214	2008	293900
1992	253020	2009	275300
1993	128813	2010	329200
1994	137085	2011	383567
1995	163245	2012	404331
1996	148718	2013	444577
1997	139463	2014	429944
1998	169907	2015	444271
1999	136006	2016	484665
2000	182900	2017	470027
2001	190400	2018	464753
2002	185700	2019	502080
2003	149000	2020	538566
2004	233400	2021	645398
2005	231500	2022	607053
2006	224300	2023	568151

Table 122. Total amount of pulp and paper production in Serbia in the time period 1990 – 2023.

Recalculations and other changes

No recalculations were performed.

Planned improvements

No planned improvements in the next period.

2.H.2 Food and drink

Methodology

The methodology used in this inventory for the emission calculation for food and drink production is in accordance with the EMEP/EEA Emission Inventory Guidebook 2023

Emission factors

Emission factors used in emission calculation for emissions from food and drink production is Tier 2 emission factors attained from EMEP/EEA Inventory Guidebook 2023.

Table 123. – Total amount of food and drink production in Serbia in the time period 1990-2023

2.H.2	Spirits	Beer	Wine	Animal feed	Margarine and solid cooking fats	Sugar	Meat, fish and poultry	Cakes, biscuits and breakfast cereals	Bread
	hl alcohol	hl alcohol	hl alcohol	Mg feed	Mg product	Mg sugar	Mg product	Mg product	Mg bread
1990	222185	5443580	988231	1541434	38968	619213	190944	48520	335022
1991	309778	5014543	1249532	1379919	40897	469520	170336	48500	282290
1992	362967	4295956	1169767	1202645	36501	314227	135883	45373	288909
1993	676649	2800718	836935	891811	32501	126646	81044	26028	350973
1994	139704	4677942	871245	775515	32222	209964	161289	31641	325631
1995	124750	5190133	676225	815291	36734	155750	100130	39305	331644
1996	56612	5608188	801073	691466	32499	382040	105529	38318	310188
1997	35294	5708069	931877	623470	32014	239527	95182	45098	270821
1998	38366	6174899	842158	665983	39237	212874	85690	53754	270140
1999	36607	6191445	602592	571766	39230	248442	87607	56415	290948
2000	229300	6171000	623900	492600	43700	115000	76500	86300	347500
2001	176100	5488000	558700	489300	41700	209000	67500	74100	303400
2002	171400	5462000	452200	564400	42400	282000	56200	82600	242700
2003	193600	5496000	631200	532000	41000	223000	59500	79900	222000
2004	203700	5328000	763900	493900	42300	340000	84400	102200	212200
2005	154400	5206000	363000	532300	42300	387000	96700	111900	200200
2006	179400	6451000	436900	620500	42600	430000	92400	119600	196100
2007	167100	6547000	482100	596600	43500	427000	102900	124700	190300
2008	167200	6470000	447100	821700	43500	445000	104700	129600	187900
2013	128300	5436000	368700	819100	40700	433000	91500	121900	173400
2010	112717	5289000	238200	837300	43600	469000	91000	122000	164800
2011	92275	5461617	226080	850245	41438	463103	195253	117465	145229
2012	76698	5794887	219592	958169	41880	402593	194077	129985	141532
2013	76646	5320652	230580	850054	37512	508452	178546	121299	136083
2014	58329	5229208	198215	892707	33750	545957	187909	102365	181363
2015	60662	5444191	241040	974038	32416	329440	211976	104751	204687
2016	65251	5412671	360250	1160846	32718	536121	225525	108499	210185
2017	74639	5433229	332828	1208126	27298	528417	103786	148679	171312
2018	72986	5650625	295200	1361650	27437	361746	103289	162510	167787
2019	72154	5734217	278216	1487115	25739	247194	119604	16345	342535
2020	68252	5354518	214041	1549208	18413	330046	115650	19407	161921
2021	74821	5534932	208709	1446931	25907	328879	116840	22245	165692
2022	81044	5659738	181620	1446394	23704	235300	111275	22547	169373
2023	71230	5825710	186145	1369675	23874	237722	123220	35694	197448

Activity data

The source for activity data for all subcategories in this category is SORS. There is a significant decrease in NMVOC IEF in period 1994-2001 and in 2015 compared to historic trend. From 1994 there is lower production for spirits, which is in line with NMVOC decrease. For the year 2015 there was smaller production of sugar in country.

Recalculations and other changes

No recalculations were performed.

Planned improvements

No planned improvements in the next period

2.I Wood processing

Methodology

The methodology used in this inventory for the emission calculation for wood processing is in accordance with the EMEP/EEA Emission Inventory Guidebook 2023

Emission factors

Emission factors used in emission calculation for emissions from wood processing is Tier 1 emission factors attained from EMEP/EEA Inventory Guidebook 2023.

2.I			
Wood processing (Mg wood product)			
1990	243788	2007	83984
1991	219309	2008	66332
1992	212364	2009	31060
1993	134171	2010	208814
1994	123509	2011	252256
1995	132074	2012	287682
1996	133407	2013	276564
1997	130007	2014	361879
1998	127720	2015	349501
1999	96265	2016	342788
2000	119295	2017	369853
2001	83383	2018	412884
2002	36425	2019	332296
2003	41083	2020	341892
2004	73285	2021	425043
2005	62941	2022	350754
2006	67766	2023	322474

Table 124. Total amount of wood production in Serbia in the time period 1990 – 2023

Activity data

The source for activity data for this category is SORS.

Recalculations and other changes

No recalculations were performed.

Planned improvements

No planned improvements in the next period.

2 J Production of POPs

Production of POPs does not occurred in Serbia.

2.K Consumption of POPs and heavy metal

Methodology

The methodology used in this inventory for the emission calculation for this category is in accordance with the EMEP/EEA Emission Inventory Guidebook 2023

2.K			
Consumption of POPs and heavy metals (g/capita)			
1990	7827000	2007	7381575
1991	7825000	2008	7350220
1992	7832000	2009	7320805
1993	7841000	2010	7291435
1994	7849000	2011	7258753
1995	7856000	2012	7199077
1996	7844000	2013	7164132
1997	7828000	2014	7131787
1998	7807000	2015	7095383
1999	7781000	2016	7058322
2000	7747000	2017	7020858

2001	7727000	2018	6982604
2002	7500030	2019	6926705
2003	7480590	2020	6871547
2004	7463155	2021	6797105
2005	7440765	2022	6641197
2006	7411565	2023	6605168

Table 125. Consumption of POPs and heavy metals in Serbia in the time period 1990 – 2023

Emission factors

Emissions were calculated on the base of methodology (Tier 1), which implies multiplication with appropriate default emission factors.

Activity data

The source for activity data for this category is SORS.

Recalculations and other changes

No recalculations were performed.

Planned improvements

No planned improvements in the next period.

5. AGRICULTURE (NFR 3)

This category comprises:

3.B.1.a Dairy cattle
3.B.1.b Cattle non-dairy
3.B.3 Sheep
3.B.4 Goats
3.B.6 Horses
3.B.8 Swine
3.B.9.a Laying hens
3.B.9.b Broilers
3.B.9.c Turkeys
3.B.9.d Other poultry
3.D.a.1 Synthetic N-fertilizers
3.F Field burning of agricultural residues

This chapter provides information on the estimated ammonia (NH_3) and nitric oxide (NO) emissions and emissions of particulate matter (PM_{10}, $PM_{2.5}$, TSP) of the sector Agriculture in Serbia.

This chapter describes emission calculation for the following source categories:

- 3 B Animal Husbandry and Manure Management
- 3 D Crop production and agricultural soils
- 3.F Field burning of agricultural residues

Category Other Agriculture - this inventory doesn't include this category, because in Serbia, according to the information and data from the Ministry of Agriculture and Environmental Protection and Serbian Chemical Agency, pesticides from the list from Table 3-1 (Tier 1 source for EFs category 4 . G Pesticides) were not used in observed period.

3.B Animal Husbandry and Manure Management

Methodology

The methodology used in this inventory is in accordance with the EMEP/EEA Emission Inventory Guidebook 2023 For the calculation of NH_3 and PM emissions from the NFR sector 3B Animal husbandry and manure management, Tier 1 methodology was used. The Excel calculation worksheet was used for all calculation in this category.

Emission factors

Emission factors used in emission calculation are default factors attained from EMEP/EEA Inventory Guidebook 2023. National emission factors have not been developed.

Emissions were calculated on the base of methodology (Tier 1), which implies multiplication with appropriate default emission factors.

Activity data

The main source for all activity is SORS.

Category Other poultry includes ducks and geese. Categories Buffalo and Mules/assess were not included in inventory, because they do not exist in Serbia.

Recalculations and other changes

No recalculations were performed.

Planned improvements

No planned improvements in the next period.

Table 126. Activity data for category 3.B Animal Husbandry and Manure Management in Serbia in the time period 1990 – 2023

3.B Animal Husbandry and Manure Management											
Year	Dairy cattle	Non - Dairy cattle	Fatting pigs	Sows	Laying hens	Broilers	Turkeys	Other poultry	Goats	Sheeps	Horses
	No	No	No	No	No	No	No	No	No	No	No
1990	794220	765780	4052541	1117459	15929247	9195405	246776	554865	170717	1949283	54000
1991	779592	702408	4151980	1135020	16331477	9796932	253008	568876	171281	1955719	53000
1992	714196	652804	3783797	936203	14515658	8219266	224877	505625	145915	1666085	48000
1993	727103	682897	3953767	997233	13524036	9570016	209515	471084	165000	1884000	41000
1994	653962	574038	3579334	908666	12980924	6321096	201101	452166	173000	1792000	42000
1995	721079	631921	4104634	1033366	15147247	6293326	234661	527625	228000	1852000	53000
1996	711614	621386	4495830	1084170	15521573	6127167	240461	540664	202000	1834000	53000
1997	707828	609672	4133162	1071638	15221500	6766027	235812	530212	184400	1757900	52200
1998	699137	580463	4092908	1000192	15381098	7007058	238284	535771	181400	1644800	50900
1999	710323	572077	4319821	1036479	15842880	4644164	245438	551856	193200	1598100	42800
2000	703268	542632	3921355	1033845	13865353	3644296	214802	482973	183300	1611100	36600
2001	677281	484519	3580074	920626	13128544	3483353	203388	457308	179500	1489400	29500
2002	647423	480577	3507123	942677	12797913	3615299	198266	445791	163900	1447600	29200
2003	636925	475075	3580638	949762	12030546	4626827	186377	419061	169200	1515500	24200
2004	638474	463326	3632646	816454	11080168	5821392	171654	385956	155300	1585600	26200
2005	620404	459596	3497237	803763	11318919	6694378	175353	394273	152000	1576000	25000

2006	607000	500000	3466000	786000	13728518	7221699	263992	504976	298563	1556000	20000
2007	584000	502000	3323000	734000	13523757	7048636	238342	475897	275037	1606000	18000
2008	542000	515000	3141000	695000	10112701	7229370	157388	482823	283984	1605000	17000
2009	501000	500000	3175000	714000	14439049	7493721	172523	372988	263286	1504000	14000
2010	482000	458000	3015000	697000	11614950	8241205	150243	372394	236935	1475000	14000
2011	477000	459000	2851000	657000	11641958	7828647	129162	330418	238751	1460000	12000
2012	455000	467000	2750000	598000	10518289	7092668	144318	381750	231837	1635218	11414
2013	429000	484000	2802000	550000	9229751	9903868	111310	443978	225073	1616219	15605
2014	437000	484000	2900000	540000	10650270	9879014	184562	384030	218603	1748110	15606
2015	430000	487000	2927000	531000	11537622	9379310	203605	326906	202828	1789144	15222
2016	426000	468000	2669000	519000	11163404	9419814	159308	374769	200150	1664895	15337
2017	429000	471000	2561000	527000	10964443	8617556	156815	236205	182558	1704192	16560
2018	423000	457000	2447000	518000	10807285	10538586	207400	339639	195932	1711677	14973
2019	422583	475595	2550000	446000	10204565	11160110	87813	275414	191280	1641827	13721
2020	417000	471000	2647000	516000	9845000	11023255	84000	237213	202325	1684613	13091
2021	407858	451656	2536000	488000	9842024	9909085	72180	154231	195037	1695408	12725
2022	374199	425645	2372000	452000	9407986	9975518	69381	123579	191703	1720826	12332
2023	335996	389412	1896000	325000	8770000	10687715	78365	287194	147077	1716809	14520

3.D.a.1. Agricultural Soils

Methodology

The methodology used in this inventory for the emission calculation for this category is in accordance with the EMEP/EEA Emission Inventory Guidebook 2023

Emission factors

Emissions were calculated on the base of methodology (Tier 1), which implies multiplication with appropriate default emission factors.

Activity data

The main source of activity data for this category is FAOSTAT and SORS.

Recalculations and other changes

No recalculations were performed.

Planned improvements

Serbia does not have information on the distribution of national fertilizer consumption in the relevant compounds in use. This is a part of the improvement plan.

3.D.a.1.			
Year	Fertilizers applied kg-1 fertilizer-N applied	Year	Fertilizers applied kg-1 fertilizer-N applied
1990	21781776	2007	289453652
1991	18496193	2008	257989388
1992	21942000	2013	332070220
1993	16572000	2010	191248900
1994	23250000	2011	220631640
1995	40740000	2012	327196080
1996	49205000	2013	293019650
1997	76922000	2014	198181460
1998	67299000	2015	208354610
1999	41201000	2016	265880720
2000	45101000	2017	244025123

2001	77133000	2018	151079842
2002	173193618	2019	147451663
2003	132456976	2020	213373773
2004	265249444	2021	101021198
2005	245487662	2022	151994841
2006	237073390	2023	134872183

Table 127. Activity data for category 3Da1 Agricultural Soils in Serbia in the time period 1990 – 2023

3.D.c. Farm-level agricultural operations including storage, handling and transport of agricultural products

Methodology

The methodology used in this inventory for the emission calculation for this category is in accordance with the EMEP/EEA Emission Inventory Guidebook 2023

3.D.c..			
Year	Area Ha	Year	Area Ha
1990	3619561	2007	3572865
1991	3618051	2008	3603637
1992	3616540	2013	3518046
1993	3615030	2010	3520871
1994	3613520	2011	3528258
1995	3612009	2012	3462215
1996	3610499	2013	3490632
1997	3608989	2014	3506830
1998	3607478	2015	3468519
1999	3605968	2016	3439887
2000	3604458	2017	3438130
2001	3604729	2018	3486908
2002	3605000	2019	3481567
2003	3605272	2020	3504290
2004	3605543	2021	3506075
2005	3607565	2022	3488752
2006	3537002	2023	3396315

Table 128. Activity data for category Farm-level agricultural operations including storage, handling and transport of agricultural products

Emission factors

Emissions were calculated on the base of methodology (Tier 1), which implies multiplication with appropriate default emission factors.

Activity data

The main source of activity data for this category is FAOSTAT and SORS.

Recalculations and other changes

No recalculations were performed.

Planned improvements

No planned improvements in the next period.

3.D e. Cultivated crops

Methodology

The methodology used in this inventory for the emission calculation for this category is in accordance with the EMEP/EEA Emission Inventory Guidebook 2023

3.D.e			
Year	Area Ha	Year	Area Ha
1990	3619561	2007	3572865
1991	3618051	2008	3603637
1992	3616540	2013	3518046
1993	3615030	2010	3520871
1994	3613520	2011	3528258
1995	3612009	2012	3462215
1996	3610499	2013	3490632
1997	3608989	2014	3506830
1998	3607478	2015	3468519
1999	3605968	2016	3439887

2000	3604458	2017	3438130
2001	3604729	2018	3486908
2002	3605000	2019	3481567
2003	3605272	2020	3504290
2004	3605543	2021	3506075
2005	3607565	2022	3488752
2006	3537002	2023	3396315

Table 129. Activity data for category 3.D e. Cultivated crops

in Serbia in the time period 1990 – 2023

Emission factors

Emissions were calculated on the base of methodology (Tier 1), which implies multiplication with appropriate default emission factors.

Activity data

The main source of activity data for this category is FAOSTAT and SORS.

Recalculations and other changes

No recalculations were performed.

Planned improvements

No planned improvements in the next period.

3.F Field burning of agricultural waste

Source category description

Field burning of agricultural residues is a minor source of several pollutants. The practice of burning crop residues is used as a quick and favourable method for clearing the land from crop residues that enables further and undisturbed land tillage. Field burning can also improve the fight against diseases and pests of certain crops. This activity is prohibited by the Serbian legislation (Fire protection Law, OG 111/2009, 20/5015, 87/2018, 87/2018 – article 50). Not all crop residues are burned after the harvest; agricultural land on which unburned residues remain is tillaged and thus the land is prepared for the next sowing.

This category does not include activities of burning crop residues after their use for another purpose, for example, straw used for protection of agricultural products during storage at the farms. This activities should be included in the sector NFR 5.C.2 Waste.

Methodology, emission factors and activity data

Tier 1 methodology is based on estimates for amounts of agricultural residues and the application of a default emission factors for each pollutant, and this level of calculation will be used for emission calculation in the Republic of Serbia.

Tier 1 methodology uses the general equation for calculation of emissions from field burning of agricultural residues:

Epollutant=ARresidue_burnt·EFpollutant

where:

Epollutant – emission (E) of pollutant (kg);

ARresidue_burnt – activity rate (AR), mass of residue burnt (kg dry matter);

EFpollutant – emission factor (EF) for pollutant (kg kg-1 dry matter).

This equation is applied at the national level, using annual national total amount of residue burned. Value of the activity rate (ARresidue_burnt) is the product of the land area on which the crops whose residues are burnt were grown (A), mass of the fuel available for combustion, in tonnes per hectare (Mb) and combustion factor (Cf). Default values are given in the 2006 IPPC Guidelines, Vol. 4, Chapter 2, Table 2.6.

Activity data should include estimates of land areas for each type, which are then used to estimate residues that are commonly burned, the fraction of residue burned and the dry matter content of residue. The mass of crop residue burned can be calculated from the following equation:

$ARresidue\_burnt = A \cdot Y \cdot s \cdot d \cdot pb \cdot Cf$

where:

A – area of land on which crops are grown whose residues are burned (ha);

Y – average crop yield (kg ha-1)

s – ratio between the mass of crop residues and the average crop yield

d – dry matter content of the yield;

pb – proportion of residues that are burned (not used elsewhere);

Cf – combustion factor (proportion of the fuel present at the time of the fire that is actually burned).

The most important data to collect for calculation of emissions are the actual amounts of crop produced (by type) with residues that are commonly burned. Considering that such data are missing, and in the absence of better data, the values given below are used.

Default values of the ratio of residue mass to crop yield (s) are given in Table . To ensure consistency with the IPCC Guidelines 2006 (Chapter 2.4), and with the assumption that the dry matter content in yield (d) is 0.85, for crops other than wheat, maize and rice, values for wheat should be used.

Data on the harvested area (Table) of the most important crops are obtained from the SORS for all years in data set. Value for the proportion of residues that are burned (pb) is calculated to be 0,1 (10%) for wheat and 0,19 (19%) for maize.

Data were calculated on the basis of the amount of wheat and maize produced in tonnes (source: SORS) and the reported quantities of wheat and maize residues burned in tonnes (source: FAOSTAT - unknown source of this data on their website). Since the data on FAOSTAT are available only for the period 2006-2023, the percentage of burned agricultural residues was calculated in accordance with their produced quantities. The average percentage from this period was applied to other years as well, based on which we calculated area of land on which the most important crops (wheat and maize) were burnt.

Table 130. Default values for estimating the amount of residues burned

	Y	s	d	pb	Cf
Wheat	3,6	1,3	0,85	0,1	0,9
Maize	11,8	1	0,85	0,19	0,8

Table 131. Data on the harvested area (ha) and the production (t) of wheat and maize

Harvested area (ha)	Wheat	Maize	Production (t)	Wheat	Maize
1990	775.000	1.275.000	**1990**	3.499.000	3.490.000
1991	823.000	1.254.000	**1991**	3.737.000	7.463.000
1992	574.000	1.412.000	**1992**	1.827.000	4.304.000
1993	788.000	1.289.000	**1993**	2.744.000	3.841.000
1994	806.000	1.281.000	**1994**	2.947.000	4.484.000
1995	768.000	1.271.000	**1995**	2.682.000	5.481.000
1996	511.000	1.334.000	**1996**	1.347.000	5.197.000
1997	713.000	1.270.000	**1997**	2.644.000	6.626.000
1998	707.000	1.255.000	**1998**	2.680.000	4.954.000
1999	616.816	1.263.020	**1999**	2.031.000	6.126.000
2000	651.197	1.202.944	**2000**	1.924.000	2.938.000
2001	691.377	1.216.607	**2001**	2.530.000	5.910.000
2002	693.823	1.196.353	**2002**	2.240.000	5.586.000
2003	611.633	1.199.871	**2003**	1.364.787	3.817.338
2004	636.289	1.199.921	**2004**	2.758.017	6.569.414
2005	563.269	1.220.174	**2005**	2.007.060	7.085.366
2006	539.813	1.169.976	**2006**	1.875.335	6.016.765
2007	559.257	1.201.832	**2007**	1.863.811	3.904.825
2008	487.399	1.273.908	**2008**	2.095.403	6.158.122
2009	567.654	1.208.640	**2009**	2.067.555	6.396.262
2010	484.242	1.229.573	**2010**	1.630.546	7.207.191
2011	493.006	1.258.437	**2011**	2.076.237	6.479.564
2012	603.275	976.021	**2012**	1.910.914	3.532.602
2013	631.640	980.333	**2013**	2.690.266	5.864.419
2014	604.748	1.057.876	**2014**	2.387.202	7.951.583
2015	589.922	1.010.227	**2015**	2.428.203	5.454.841
2016	595.118	1.010.097	**2016**	2.884.537	7.376.737
2017	556.115	1.002.319	**2017**	2.275.623	4.018.370
2018	643.083	901.753	**2018**	2.941.601	6.964.770
2019	577.499	962.083	**2019**	2.534.643	7.344.542
2020	581.128	996.527	**2020**	2.873.503	7.872.607
2021	598.735	1020.337	**2021**	3.442.308	6.027.131
2022	631086	952216	**2022**	3.109.827	4.283.293
2023	682246	922980	**2023**	3.4487.00	6.630.984

3. F			
Year	Field burning of agricultural residues (kg)	Year	Field burning of agricultural residues (kg)
1990	2221280	2007	2032490
1991	2206449	2008	2116648
1992	2358182	2013	2045876
1993	2247278	2010	2047926
1994	2241525	2011	2095069
1995	2212675	2012	1703987
1996	2216711	2013	1720716
1997	2191459	2014	1829307
1998	2166443	2015	1751356
1999	2146382	2016	1753018
2000	2067102	2017	1727196
2001	2102317	2018	1605013
2002	2072314	2019	1673509
2003	2048252	2020	1727321
2004	2057156	2021	1769924
2005	2061890	2022	1677652
2006	1976962	2023	1651396

Table 132. Activity data for category 3F Field burning of agricultural residues

Emission factors

Emissions were calculated on the base of methodology (Tier 1), which implies multiplication with appropriate default emission factors.

Activity data

The main source of activity data for this category is FAOSTAT and SORS.

Recalculations and other changes

According to Metodology EMEP/EEA 2023 emission factors have been changed for following pollutants: benzo(a) pyren, benzo(b) fluoranthen, benzo(k) fluoranthen and indeno (1,2,3) pyren.

Planned improvements

No planned improvements in the next period

6. WASTE (NFR 5)

Serbian report covered following source categories of the sector NFR 5 Waste:

5.A Solid waste disposal on land
5.D Waste water handling
5.C.1.b.v Cremation

5.A Solid Waste Disposal on Land

Methodology

The methodology for calculation emission of NMVOC for category Solid waste disposals on land was used it has been prepared for Ukraine on behalf of the Landfill Methane Outreach Program, U.S. Environmental Protection Agency, as part of the Methane to Markets program activities in Ukraine. The main purpose of the Ukraine LFG Model is to provide landfill owners and operators with a tool to use to evaluate the feasibility and potential benefits of collecting and using the generated LFG for energy recovery or other uses.

Emission factors

Emissions were calculated on the base of methodology (Tier 1), which implies multiplication with appropriate default emission factors. National emission factors have not been developed.

5.A Solid waste disposal on land (m3 landfill gas)			
1990	23041	2007	47590
1991	24680	2008	49003
1992	26258	2009	50392
1993	27784	2010	54662
1994	29263	2011	58948
1995	30715	2012	62489
1996	32142	2013	66179
1997	33540	2014	69609
1998	34918	2015	72756
1999	36269	2016	74468
2000	37607	2017	70974
2001	38984	2018	63641
2002	40436	2019	59059
2003	41889	2020	54171
2004	43330	2021	49957
2005	44758	2022	46789
2006	46178	2023	43885

Table 133. The amount of landfill gas calculated in Serbia for period 1990 – 2023.

Activity data

The number of data has been developed and incorporated into Ukrainian software for the calculation of emissions of landfill gas into the air. This calculations was performed around 10 years ago by Faculty of Technical Science and projections were done for the period 1980 - 2040. These results are used as activity data.

Recalculations and other changes

According to Metodology EMEP/EEA 2023 emission factors have been changed in subcategories Solid waste disposal on land - Mineral waste handling and storage and Solid waste disposal on land – Waste degradation for NMVOC.

Planned improvements

No planned improvements in the next period.

5.C.1. Cremation

Methodology

The methodology used in this inventory for the emission calculation for this category is in accordance with the EMEP/EEA Emission Inventory Guidebook 2023

Emission factors

National emission factors have not been developed.

5.C.1 bv Cremation (No of bodies)			
1990	717	2007	2608
1991	902	2008	2633
1992	859	2009	2747
1993	1153	2010	2900
1994	1019	2011	2784
1995	1112	2012	2818
1996	1101	2013	3063
1997	1196	2014	3044
1998	2215	2015	2687
1999	2350	2016	3090
2000	2363	2017	3357
2001	2177	2018	3400
2002	2315	2019	3451
2003	2514	2020	3930
2004	2355	2021	4369
2005	2333	2022	3561
2006	2467	2023	3388

Table 134. The number of cremated bodies in Serbia for period 1990 – 2023.

Recalculations and other changes

No recalculations were performed.

Planned improvements

No planned improvements in the next period.

Activity data

The main sources of activity data are data obtained from 2 existing crematorium in Belgrade and Novi Sad.

5.D.1. Domestic wastewater handling

Methodology

The methodology used in this inventory for the emission calculation for this category is in accordance with the EMEP/EEA Emission Inventory Guidebook 2023

Emission factors

Emission factors used in this category are emission factors attained from the EMEP/EEA Emission Inventory Guidebook 2023

National emission factors have not been developed.

Emissions were calculated on the base of methodology (Tier 2), which implies multiplication with appropriate default emission factors.

Activity data

Activity data is the percentage of the population not connected to the sewer network. The source for activity data for this category is SORS.

Recalculations and other changes

No recalculations were performed.

Planned improvements

No planned improvements in the next period.

5.D.2. Industrial wastewater handling

Methodology

The methodology used in this inventory for the emission calculation for this category is in accordance with the EMEP/EEA Emission Inventory Guidebook 2023

Emission factors

Emission factors used in this category are emission factors attained from the EMEP/EEA Emission Inventory Guidebook 2023

National emission factors have not been developed.

Emissions were calculated on the base of methodology (Tier 1), which implies multiplication with appropriate default emission factors.

Activity data

Activity data are treated waste waters (mill m3). The source for activity data for this category is SORS. Activity data from 1990-2003 are not available.

Recalculations and other changes

No recalculations were performed.

Planned improvements

No planned improvements in the next period.

5.C Waste incineration

Categories 5C 1 a Municipal waste incineration, 5 C 1 bi Industrial waste incineration and 5 C 1 biii Clinical waste incineration do not occurred in Serbia.

Open burning (Category 5.C.2) in Serbia is prohibited by law. Even if it happens in Serbia, we do not have official data about this practice. This will certainly be part of the improvement plan and if we have official data we will calculate the emissions according to the EMEP / EEA 2023 methodology.

7. OTHER AND NATURAL EMISSIONS (NFR 11)

11.B Forest fires

Methodology

The methodology used in this inventory for the emission calculation for this category is in accordance with the EMEP/EEA Emission Inventory Guidebook 2023

Emission factors

Emission factors used in this category are emission factors attained from EMEP/EEA Inventory Guidebook 2023. Emissions were calculated on the base of methodology (Tier 1), which implies multiplication with appropriate default emission factors.

National emission factors have not been developed.

Activity data

The source for activity data for this category is SORS.

11.B	ha	kg
1990	1514	69870000
1991	0	1083000
1992	0	6536000
1993	0	22309000
1994	0	6132000
1995	173	447000
1996	2707	2843000
1997	154	119000
1998	1403	2496000
1999	113	534000
2000	7944	5881000

2001	459	2979000
2002	969	12785000
2003	1402	37521000
2004	202	1502000
2005	52	528000
2006	494	1080000
2007	22161	5818000
2008	575	7149000
2009	1210	1932000
2010	503	57000
2011	2036	24570000
2012	7460	63118000
2013	561	7343000
2014	284	10256000
2015	827	5059000
2016	296	37114000
2017	1050	11415000
2018	303	707000
2019	1079	3397000
2020	3635	2158000
2021	834	10099000
2022	332	6267000
2023	192	680000

Table 135. The area and mass of timber burned in forest fires in Serbia for period 1990 – 2023.

Recalculations and other changes

No recalculations were performed.

Planned improvements

No planned improvements in the next period.

Serbian NFR tables for 2023

Table 136. NFR tables for 2023

Serbia: 28.02.2025.: 2023	NFR sectors to be reported			Main Pollutants (from 1990)				Particulate Matter (from 2000)				Other (from 1990)	Priority Heavy Metals (from 1990)			Additional Heavy Metals (from 1990, voluntary reporting)						POPs (1) (from 1990)								Activity Data (from 1990)						
				NOx (as NO2)	NMVOC	SOx (as SO2)	NH3	PM2.5	PM10	TSP	BC	CO	Pb	Cd	Hg	As	Cr	Cu	Ni	Se	Zn	PCDD/ PCDF (dioxins/ furans)	PAHs					HCB	PCBs	Liquid Fuels	Solid Fuels	Gaseous Fuels	Biomass	Other Fuels	*Other activity (specified)*	*Other Activity Units*
																							benzo(a) pyrene	benzo(b) fluoranthene	benzo(k) fluoranthene	Indeno (1,2,3-cd) pyrene	Total 1-4											
NFR Aggregation for Gridding and LPS (GNFR)	NFR Code	Longname	Notes	kt	kt	kt	kt	kt	kt	kt	kt	kt	t	t	t	t	t	t	t	t	t	g I-TEQ	t	t	t	t	t	kg	kg	TJ NCV	TJ NCV	TJ NCV	TJ NCV	TJ NCV		
A_PublicPower	1A1a	Public electricity and heat production		66.7075	0.4810	294.3851	NE	0.9877	2.2131	3.2336	0.0165	4.0151	3.8043	0.4603	0.7338	3.6227	2.3040	0.2933	3.8084	11.3131	2.7816	2.5519	0.0010	0.0094	0.0073	0.0006	0.0183	1.6846	0.0028	6096.2	251019.8	43280.7	560.0	NA	NA	*TJ NCV*
B_Industry	1A1b	Petroleum refining		0.3215	0.0010	0.0533	NE	0.0045	0.0045	0.0045	0.0008	0.0617	0.0082	0.0112	0.0019	0.0018	0.0341	0.0168	0.0376	0.0080	0.0868	NE	0.0000	0.0000	0.0000	0.0000	0.0000	NE	NA	NA	NA	3227.1	NA	NA	NA	*TJ NCV*
B_Industry	1A1c	Manufacture of solid fuels and other energy industries		0.1867	0.0071	0.8089	NA	0.4889	0.7022	0.7289	NE	0.0533	0.2489	0.0142	0.2667	0.0978	0.0507	0.2222	0.0462	0.0258	0.4089	0.2311	0.0026	0.0000	0.0000	0.0000	0.0026	NA	NA	NA	8889.0	NA	NA	NA	NA	*TJ NCV*
B_Industry	1A2a	Stationary combustion in manufacturing industries and construction: Iron and steel		0.7799	NE	0.6226	NA	NE	NE	NE	NE	22.1827	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NA	NA	NA	NA	NA	2551.3	*produced [kt]*
B_Industry	1A2b	Stationary combustion in manufacturing industries and construction: Non-ferrous metals		0.3801	NE	0.5647	NA	NE	NE	NE	NE	0.1050	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NA	NA	NA	NA	NA	NA	*produced [kt]*
B_Industry	1A2c	Stationary combustion in manufacturing industries and construction: Chemicals		1.2322	0.4861	2.4648	0.0006	0.3759	0.4015	0.4235	0.0469	2.9316	0.3724	0.0109	0.0236	0.0112	0.0472	0.0500	0.0359	0.0054	0.8048	0.5949	0.1285	0.1788	0.0675	0.0529	0.4276	0.0040	0.4564	878.4	2684.3	3711.0	468.2	NA	NA	*TJ NCV*
B_Industry	1A2d	Stationary combustion in manufacturing industries and construction: Pulp, Paper and Print		0.2713	0.1300	0.7545	0.0001	0.1034	0.1112	0.1176	0.0095	0.8642	0.1140	0.0026	0.0074	0.0035	0.0132	0.0151	0.0110	0.0016	0.2109	0.1782	0.0388	0.0511	0.0202	0.0158	0.1260	0.0009	0.1418	43.0	353.8	773.9	67.8	NA	NA	*TJ NCV*
B_Industry	1A2e	Stationary combustion in manufacturing industries and construction: Food processing, beverages and tobacco		1.2987	1.3281	0.3324	0.0047	0.6068	0.6209	0.6504	0.1697	2.6822	0.1412	0.0518	0.0065	0.0022	0.0945	0.0284	0.0113	0.0028	2.1089	0.4506	0.0534	0.0958	0.0278	0.0223	0.1993	0.0199	0.0440	1240.3	257.2	4004.4	3946.8	NA	NA	*TJ NCV*
B_Industry	1A2f	Stationary combustion in manufacturing industries and construction: Non-metallic minerals		3.8661	0.0448	1.1406	NE	NE	NE	NE	NE	4.5970	0.2437	0.0199	0.1219	0.0659	0.1020	0.1609	0.1219	0.0629	1.0545	0.0102	0.0002	0.0007	0.0002	0.0001	0.0012	0.0114	0.2562	NA	NA	NA	NA	NA	5666.8	*produced [kt]*
I_Offroad	1A2gvii	Mobile Combustion in manufacturing industries and construction: (please specify in the IIR)		5.1475	0.5771	0.0428	0.0012	0.2881	0.2881	0.2881	0.1772	3.2034	NE	0.0000	NA	NA	0.0000	0.0002	0.0000	0.0000	0.0001	NA	0.0000	0.0000	NA	NA	0.0000	NA	NA	NA	NA	NA	NA	NA	149.2	*produced [kt]*
B_Industry	1A2gviii	Stationary combustion in manufacturing industries and construction: Other (please specify in the IIR)		4.6673	0.0734	16.0288	NA	0.4129	0.5462	0.6920	0.0166	0.8454	0.2236	0.0332	0.0387	0.1848	0.1233	0.0991	1.7090	0.4641	0.9860	0.2141	0.0021	0.0005	0.0003	0.0002	0.0031	0.0747	0.0066	9881.4	4179.7	11065.1	1866.9	NA	NA	*TJ NCV*
H_Aviation	1A3ai(i)	International aviation LTO (civil)		0.7384	0.0445	0.0712	NE	0.0062	0.0062	NE	0.0000	1.0498	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NA	NA	NA	NA	NA	NA	NA	53083.4	*LTO*
H_Aviation	1A3aii(i)	Domestic aviation LTO (civil)		0.0013	0.0001	0.0001	NE	0.0000	0.0000	NE	0.0000	0.0019	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NA	NA	NA	NA	NA	NA	NA	158.5	*LTO*
F_RoadTransport	1A3bi	Road transport: Passenger cars		16.3309	6.3925	0.0001	0.2988	0.9464	1.3818	NA	NA	28.2637	2.8279	0.0123	NA	NA	1.0730	23.2910	0.1620	0.0171	7.2807	0.0000	0.0324	0.0366	0.0282	0.0315	0.1286	NA	NA	NA	NA	NA	NA	NA	NA	NA	*TJ NCV*
F_RoadTransport	1A3bii	Road transport: Light duty vehicles		4.2279	0.3820	0.0000	0.0165	0.2548	0.3514	NA	NA	1.7412	0.6439	0.0028	NA	NA	0.2441	5.3037	0.0366	0.0039	1.5657	0.0000	0.0069	0.0078	0.0061	0.0065	0.0273	NA	NA	NA	NA	NA	NA	NA	NA	NA	*TJ NCV*
F_RoadTransport	1A3biii	Road transport: Heavy duty vehicles and buses		14.7168	0.4789	0.0000	0.0393	0.5145	0.7500	NA	NA	4.2976	1.0736	0.0054	NA	NA	0.4074	8.7059	0.0635	0.0086	3.4484	0.0000	0.0046	0.0280	0.0313	0.0072	0.0710	NA	NA	NA	NA	NA	NA	NA	NA	NA	*TJ NCV*
F_RoadTransport	1A3biv	Road transport: Mopeds & motorcycles		0.0414	0.4390	0.0000	0.0006	0.0066	0.0086	NA	NA	1.2860	0.1746	0.0001	NA	NA	0.0048	0.1039	0.0008	0.0001	0.0335	0.0000	0.0001	0.0001	0.0001	0.0001	0.0005	NA	NA	NA	NA	NA	NA	NA	NA	NA	*TJ NCV*
F_RoadTransport	1A3bv	Road transport: Gasoline evaporation		NA	3.7692	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	*vehicle [1000]*
F_RoadTransport	1A3bvi	Road transport: Automobile tyre and brake wear		NA	NA	NA	NA	0.2292	0.5759	0.5876	0.0928	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	*10^6 km*
F_RoadTransport	1A3bvii	Road transport: Automobile road abrasion		NA	NA	NA	NA	0.1534	0.2840	0.5680	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	*10^6 km*
I_Offroad	1A3c	Railways		0.5240	0.0465	NE	0.0001	0.0137	0.0144	0.0152	0.0001	0.1070	NE	0.0001	NE	NE	0.0005	0.0170	0.0007	0.0001	0.0100	NE	0.0003	0.0005	NE	NE	0.0008	NA	NA	NA	NA	NA	NA	NA	10.0	*produced [kt]*
G_Shipping	1A3di(ii)	International inland waterways	1A3dii	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	*produced [kt]*
G_Shipping	1A3dii	National navigation (shipping)		1.5067	0.0513	0.3800	NE	0.1064	0.1178	0.1178	0.0001	0.1406	0.0034	0.0004	0.0004	0.0129	0.0137	0.0238	0.6080	0.0040	0.0228	0.0089	NE	NE	NE	NE	NE	0.0027	0.0108	NA	NA	NA	NA	NA	19.0	*produced [kt]*
I_Offroad	1A3ei	Pipeline transport		NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	*TJ NCV*
I_Offroad	1A3eii	Other (please specify in the IIR)	1A3	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	*TJ NCV*
C_OtherStationaryComb	1A4ai	Commercial/institutional: Stationary		1.9316	0.5161	2.6289	NA	0.3569	0.3894	0.4093	0.0429	3.0426	0.3871	0.0065	0.0289	0.0219	0.0400	0.0545	0.0381	0.0105	0.6597	0.5905	0.1299	0.1682	0.0677	0.0528	0.4185	0.0018	0.4852	2264.1	2853.9	10151.0	NA	NA	NA	*TJ NCV*
I_Offroad	1A4aii	Commercial/institutional: Mobile		IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	*produced [kt]*

Serbia: 28.02.2025.: 2023	NFR sectors to be reported			Main Pollutants (from 1990)				Particulate Matter (from 2000)				Other (from 1990)	Priority Heavy Metals (from 1990)			Additional Heavy Metals (from 1990, voluntary reporting)						POPs (1) (from 1990)								Activity Data (from 1990)						
				NOx (as NO2)	NMVOC	SOx (as SO2)	NH3	PM2.5	PM10	TSP	BC	CO	Pb	Cd	Hg	As	Cr	Cu	Ni	Se	Zn	PCDD/ PCDF (dioxins/ furans)	PAHs					HCB	PCBs	Liquid Fuels	Solid Fuels	Gaseous Fuels	Biomass	Other Fuels	*Other activity (specified)*	*Other Activity Units*
																						benzo(a) pyrene	benzo(b) fluoranthene	benzo(k) fluoranthene	Indeno (1,2,3-cd) pyrene	Total 1-4									
NFR Aggregation for Gridding and LPS (GNFR)	NFR Code	Longname	Notes	kt	kt	kt	kt	kt	kt	kt	kt	kt	t	t	t	t	t	t	t	t	t	g I-TEQ	t	t	t	t	t	kg	kg	TJ NCV	TJ NCV	TJ NCV	TJ NCV	TJ NCV		
C_OtherStationaryComb	1A4bi	Residential: Stationary		4.7377	40.5581	9.3517	0.4817	48.1112	49.3656	52.1417	4.6737	283.7300	2.8566	0.7925	0.0836	0.0356	1.4839	0.5721	0.2409	1.1750	32.7480	55.5480	9.4377	9.7932	3.7546	5.2999	28.2854	0.3052	1.6256	1460.4	9541.5	12578.1	59859.9	NA	NA	*TJ NCV*
I_Offroad	1A4bii	Residential: Household and gardening (mobile)	1A3	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	*produced [kt]*
C_OtherStationaryComb	1A4ci	Agriculture/Forestry/Fishing: Stationary		0.1126	0.0429	0.0202	0.0001	0.0160	0.0168	0.0173	0.0051	0.0828	0.0038	0.0010	0.0002	0.0002	0.0035	0.0010	0.0213	0.0001	0.0428	0.0096	0.0009	0.0014	0.0005	0.0004	0.0031	0.0004	0.0006	168.5	3.4	724.0	75.4	NA	NA	*TJ NCV*
I_Offroad	1A4cii	Agriculture/Forestry/Fishing: Off-road vehicles and other machinery		2.8079	0.2902	0.0229	0.0006	0.1446	0.1446	0.1446	0.0836	0.8794	NE	0.0000	NA	NA	0.0000	0.0001	0.0000	0.0000	0.0001	NA	0.0000	0.0000	NA	NA	0.0000	NA	NA	NA	NA	NA	NA	NA	78.3	*produced [kt]*
I_Offroad	1A4ciii	Agriculture/Forestry/Fishing: National fishing	1A3	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	*produced [kt]*
C_OtherStationaryComb	1A5a	Other stationary (including military)	1A4ai	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	*TJ NCV*
I_Offroad	1A5b	Other, Mobile (including military, land based and recreational boats)	1A3	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	*produced [kt]*
D_Fugitive	1B1a	Fugitive emission from solid fuels: Coal mining and handling		NA	25.5472	NA	NA	0.1597	1.3412	2.8421	NE	NA	NE	NE	NE	NE	NE	NE	NE	NE	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	31.9	*Coal produced [kt]*
D_Fugitive	1B1b	Fugitive emission from solid fuels: Solid fuel transformation		0.0004	0.0032	0.0003	0.0015	0.0254	0.0608	0.1445	0.0124	0.1916	0.1582	0.0029	0.0050	0.0054	0.0708	0.0200	0.0500	0.0067	0.0916	1.2493	0.0666	0.0833	0.0416	0.0292	0.2207	NE	NE	NA	NA	NA	NA	NA	0.4	*Coal used for transform.*
D_Fugitive	1B1c	Other fugitive emissions from solid fuels		NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	*Please specify*
D_Fugitive	1B2ai	Fugitive emissions oil: Exploration, production, transport		NA	1.4580	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.8	*Crude oil produced [kt]*
D_Fugitive	1B2aiv	Fugitive emissions oil: Refining / storage		0.1357	0.7753	0.9847	0.0043	0.0853	0.0194	0.0233	NE	0.1589	0.0116	0.0019	0.0023	0.0004	0.0004	0.0047	0.0205	0.0004	0.0039	0.0047	NE	NE	NE	NE	NE	NE	NE	NA	NA	NA	NA	NA	3.9	*Crude oil refined [kt]*
D_Fugitive	1B2av	Distribution of oil products		NA	14.6766	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	3.3	*Oil consume d [kt]*
D_Fugitive	1B2b	Fugitive emissions from natural gas (exploration, production, processing, transmission, storage, distribution and		NA	0.0353	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.4	*Gas throughpu t (km3)*
D_Fugitive	1B2c	Venting and flaring (oil, gas, combined oil and gas)		NA	NA	NA	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NE	NE	NE	NE	NE	NE	NA	NA	NA	NA	NA	NA	NA	NA	*Gas vented /flared*
D_Fugitive	1B2d	Other fugitive emissions from energy production	(a)	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NA	NA	NA	NA	NA	NA	*MWh electricity produced*
B_Industry	2A1	Cement production		IE	IE	IE	NA	0.3233	0.5820	0.6466	0.0097	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	NA	NA	NA	NA	NA	2487.0	*Clinker produced [kt]*
B_Industry	2A2	Lime production		IE	NE	IE	NA	0.1815	0.9076	2.3340	0.0008	IE	NE	NE	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	259.3	*Lime produced [kt]*
B_Industry	2A3	Glass production		IE	NE	IE	NE	0.0055	0.0062	0.0069	0.0000	IE	0.0390	0.0030	0.0001	0.0044	0.0053	0.0002	0.0112	0.0183	0.0085	NE	NE	NE	NE	NE	NE	NE	NE	NA	NA	NA	NA	NA	22.9	*Glass produced [kt]*
B_Industry	2A5a	Quarrying and mining of minerals other than coal		NA	NA	NA	NA	0.2602	2.6025	5.3090	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	52.0	*Material quarried [kt]*
B_Industry	2A5b	Construction and demolition		NA	NA	NA	NA	0.0231	0.2314	0.7804	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2.7	*floor space constructe*
B_Industry	2A5c	Storage, handling and transport of mineral products		NA	NA	NA	NA	0.0042	0.0419	0.0839	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	*Amount [Mt]*
B_Industry	2A6	Other mineral products (please specify in the IIR)		NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	*Please specify*
B_Industry	2B1	Ammonia production		NA	NE	NE	NA	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	*Ammonia produced [kt]*
B_Industry	2B2	Nitric acid production		NA	NA	NA	NA	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	*Nitric acid produced [kt]*
B_Industry	2B3	Adipic acid production		NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	*Adipic acid produced*
B_Industry	2B5	Carbide production		NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	*Carbide produced [kt]*
B_Industry	2B6	Titanium dioxide production		NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	*Titanium dioxide produced*
B_Industry	2B7	Soda ash production		NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	*Soda ash produced [kt]*
B_Industry	2B10a	Chemical industry: Other (please specify in the IIR)		NA	0.4621	NA	NA	0.0329	0.0439	0.1054	NA	NA	NE	NE	NA	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NA	NA	NA	NA	NA	368.1	*produced [kt]*
B_Industry	2B10b	Storage, handling and transport of chemical products (please specify in the IIR)		IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	*Please specify*
B_Industry	2C1	Iron and steel production		0.0145	0.1739	NA	NE	0.1706	0.2179	0.3629	0.0009	5.0890	16.0816	0.1321	0.1220	0.6091	3.9901	1.1579	3.5781	0.0349	10.7331	10.8733	NE	NE	NE	NE	2.9424	0.0458	6.3312	NA	NA	NA	NA	NA	4155.6	*Steel produced [kt]*

Serbia: 28.02.2025.: 2023	NFR sectors to be reported			Main Pollutants (from 1990)				Particulate Matter (from 2000)				Other (from 1990)	Priority Heavy Metals (from 1990)			Additional Heavy Metals (from 1990, voluntary reporting)						POPs (1) (from 1990)								Activity Data (from 1990)						
				NOx (as NO2)	NMVOC	SOx (as SO2)	NH3	PM2.5	PM10	TSP	BC	CO	Pb	Cd	Hg	As	Cr	Cu	Ni	Se	Zn	PCDD/ PCDF (dioxins/ furans)	PAHs					HCB	PCBs	Liquid Fuels	Solid Fuels	Gaseous Fuels	Biomass	Other Fuels	Other activity (specified)	Other Activity Units
																							benzo(a) pyrene	benzo(b) fluoranthene	benzo(k) fluoranthene	Indeno (1,2,3-cd) pyrene	Total 1-4									
NFR Aggregation for Gridding and LPS (GNFR)	NFR Code	Longname	Notes	kt	kt	kt	kt	kt	kt	kt	kt	kt	t	t	t	t	t	t	t	t	t	g I-TEQ	t	t	t	t	t	kg	kg	TJ NCV	TJ NCV	TJ NCV	TJ NCV	TJ NCV		
B_Industry	2C2	Ferroalloys production		NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	Ferroalloys produced
B_Industry	2C3	Aluminium production		0.0000	NE	NA	NE	0.0075	0.0191	0.0273	0.0002	NA	NE	NE	NE	NE	NE	NE	NE	NE	NE	0.4773	NA	NA	NA	NA	NA	NE	NA	NA	NA	NA	NA	13.6	Aluminium produced
B_Industry	2C4	Magnesium production		NA	NE	NA	NA	NE	NE	NA	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NA	NA	NA	NA	NA	NA	Magnesium produced
B_Industry	2C5	Lead production		NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NA	NA	NA	NA	NA	NA	Lead produced [kt]
B_Industry	2C6	Zinc production		NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NA	NA	NA	NA	NA	NA	Zinc produced [kt]
B_Industry	2C7a	Copper production		NE	NE	0.5680	NE	0.0146	0.0191	0.0237	0.0000	NE	1.3657	0.8281	0.0016	0.4072	1.0873	3.5781	0.9867	NE	NE	1.1198	NE	NE	NE	NE	NE	NE	82.8286	NA	NA	NA	NA	NA	74.2	Copper produced [kt]
B_Industry	2C7b	Nickel production		NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	Nickel produced [kt]
B_Industry	2C7c	Other metal production (please specify in the IIR)		NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	Please specify
B_Industry	2C7d	Storage, handling and transport of metal products (please specify in the IIR)		NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	Amount [kt]
E_Solvents	2D3a	Domestic solvent use including fungicides		NA	7.9262	NA	NA	NE	NE	NE	NA	NA	NA	NA	0.0370	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	6605.2	Population size (1000
B_Solvents	2D3b	Road paving with asphalt		NE	0.0106	NE	NA	0.2641	1.9807	9.2432	0.0151	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NE	NE	NE	NE	NE	NE	NE	NE	NA	NA	NA	NA	NA	660.2	asphalt [kt]
B_Industry	2D3c	Asphalt roofing		NE	NA	NA	NA	NA	NA	NA	NA	NA	NE	NE	NE	NA	NA	NA	NA	NA	NA	NE	NE	NE	NE	NE	NE	NE	NE	NA	NA	NA	NA	NA	NA	metal produced [kt]
E_Industry	2D3d	Coating applications		NA	0.7676	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	3334.7	Paint applied [kt]
E_Solvents	2D3e	Degreasing		NA	0.0056	NA	NA	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	6605.2	Population size (1000
E_Solvents	2D3f	Dry cleaning		NA	0.0020	NA	NA	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	6605.2	Population size (1000
E_Solvents	2D3g	Chemical products		NE	0.3917	NE	NA	NE	NE	NA	NE	NE	NE	NA	NE	NA	NA	NE	NA	NA	NE	NE	NE	NE	NE	NE	NE	NE	NE	NA	NA	NA	NA	NA	NA	NA
E_Solvents	2D3h	Printing		NA	4.2934	NA	NA	NE	NA	NA	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	6605.2	Population size (1000
E_Solvents	2D3i	Other solvent use (please specify in the IIR)		0.0854	2.6091	NA	0.1970	1.6199	1.7890	1.9018	0.0058	2.6153	NA	0.2563	NA	NA	NA	0.2563	0.1282	NE	0.1282	0.0047	0.0053	0.0021	0.0021	0.0021	0.0117	NE	NE	NA	NA	NA	NA	NA	NA	NA
E_Solvents	2G	Other product use (please specify in the IIR)		NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	Please specify
B_Industry	2H1	Pulp and paper industry		0.5682	1.1363	1.1363	NE	0.3409	0.4545	0.5682	0.0089	3.1248	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NE	NE	NE	NE	NE	NE	NA	NA	NA	NA	NA	568.2	Pulp production [kt]
B_Industry	2H2	Food and beverages industry		NA	6.2341	NA	NA	NE	NA	NE	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	187.9	Bread, Wine, Beer
B_Industry	2H3	Other industrial processes (please specify in the IIR)		NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	Please specify
B_Industry	2I	Wood processing		NE	NE	NE	NE	NE	NE	0.3225	NE	NE	NA	NA	NA	NE	NA	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	322.5	wood product [kt]
B_Industry	2J	Production of POPs		NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	Please specify
B_Industry	2K	Consumption of POPs and heavy metals (e.g. electrical and scientific equipment)		NA	NA	NA	NA	NA	NA	NA	NA	NA	NE	NE	0.0661	NE	NE	NE	NE	NE	NE	NA	NA	NA	NA	NA	NA	NE	660.5168	NA	NA	NA	NA	NA	6605.2	Population size (1000
B_Industry	2L	Other production, consumption, storage, transportation or handling of bulk products (please specify in the IIR)		NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	Please specify
K_AgriLivestock	3B1a	Manure management - Dairy cattle		0.0034	6.0268	NA	14.0446	0.1378	0.2117	0.4637	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	336.0	Population size (1000
K_AgriLivestock	3B1b	Manure management - Non-dairy cattle		0.0012	3.4665	NA	5.8412	0.0701	0.1051	0.2298	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	389.4	Population size (1000

Serbia: 28.02.2025.: 2023	NFR sectors to be reported			Main Pollutants (from 1990)				Particulate Matter (from 2000)				Other (from 1990)	Priority Heavy Metals (from 1990)			Additional Heavy Metals (from 1990, voluntary reporting)						POPs (1) (from 1990)								Activity Data (from 1990)						
				NOx (as NO2)	NMVOC	SOx (as SO2)	NH3	PM2.5	PM10	TSP	BC	CO	Pb	Cd	Hg	As	Cr	Cu	Ni	Se	Zn	PCDD/ PCDF (dioxins/ furans)	PAHs					HCB	PCBs	Liquid Fuels	Solid Fuels	Gaseous Fuels	Biomass	Other Fuels	Other activity (specified)	Other Activity Units
																							benzo(a) pyrene	benzo(b) fluoranthene	benzo(k) fluoranthene	Indeno (1,2,3-cd) pyrene	Total 1-4											
NFR Aggregation for Gridding and LPS (GNFR)	NFR Code	Longname	Notes	kt	kt	kt	kt	kt	kt	kt	kt	kt	t	t	t	t	t	t	t	t	t	g I-TEQ	t	t	t	t	t	kg	kg	TJ NCV	TJ NCV	TJ NCV	TJ NCV	TJ NCV		
J_Waste	5A	Biological treatment of waste - Solid waste disposal on land		NA	0.0002	NA	NE	NA	NA	NA	NA	NE	NA	NA	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	89602.5	*Annual deposition of MSW at*
J_Waste	5B1	Biological treatment of waste - Composting		NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	*Organic waste [kt]*
J_Waste	5B2	Biological treatment of waste - Anaerobic digestion at biogas facilities		NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	*NH3-N per t N in feedstock*
J_Waste	5C1a	Municipal waste incineration	(c)	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	*MSW incinerated [kt]*
J_Waste	5C1bi	Industrial waste incineration	(c)	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	*Waste incinerated [kt]*
J_Waste	5C1bii	Hazardous waste incineration	(c)	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	*Waste incinerated [kt]*
J_Waste	5C1biii	Clinical waste incineration	(c)	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	*Waste incinerated [kt]*
J_Waste	5C1biv	Sewage sludge incineration	(c)	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	*[kt]*
J_Waste	5C1bv	Cremation	(c)	0.0028	0.0000	0.0004	NA	0.0001	0.0001	0.0001	NE	0.0005	0.0001	0.0000	0.0050	0.0000	0.0000	0.0000	0.0001	0.0001	0.0005	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0005	0.0014	NA	NA	NA	NA	NA	3388.0	*Incineration of corpses*
J_Waste	5C1bvi	Other waste incineration (please specify in the IIR)	(c)	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	*Please specify*
J_Waste	5C2	Open burning of waste		NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	*Waste incinerated [kt]*
J_Waste	5D1	Domestic wastewater handling		NA	NE	NA	4.0054	NE	NE	NE	NE	NA	NE	NE	NE	NE	NE	NE	NE	NE	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2503.4	*Population size (1000
J_Waste	5D2	Industrial wastewater handling		NA	0.0014	NA	NE	NE	NE	NE	NE	NA	NE	NE	NE	NE	NE	NE	NE	NE	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	91.0	*m3 waste water handled*
J_Waste	5D3	Other wastewater handling		NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	*m3 waste water handled*
J_Waste	5E	Other waste (please specify in IIR)	(d)	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	*fire (1000)*
M_Other	6A	Other (included in national total for entire territory) (please specify in IIR)		NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	*Please specify*
	NATIONAL TOTAL	**National total for the entire territory (based on fuel sold)**		**139.0691**	**140.1067**	**332.3640**	**58.7809**	**58.1804**	**75.3198**	**95.5130**	**5.4338**	**377.4544**	**30.7837**	**2.6509**	**1.5528**	**5.0871**	**11.1939**	**43.9763**	**11.7281**	**13.1635**	**65.2208**	**74.9430**	**9.9119**	**10.4592**	**4.0563**	**5.5221**	**32.8919**	**2.1520**	**752.7077**	**22032.3788**	**279782.3939**	**89515.2882**	**66844.9330**	**NA**	**370841.0652**	***NA***
	1A3bi(fu)	Road transport: Passenger cars (fuel used)	(b)	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	TJ NCV
	1A3bii(fu)	Road transport: Light duty vehicles (fuel used)	(b)	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	TJ NCV
	1A3biii(fu)	Road transport: Heavy duty vehicles and buses (fuel used)	(b)	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	TJ NCV
	1A3biv(fu)	Road transport: Mopeds & motorcycles (fuel used)	(b)	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	TJ NCV
	1A3bv(fu)	Road transport: Gasoline evaporation (fuel used)	(b)	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	TJ NCV
	1A3bvi(fu)	Road transport: Automobile tyre and brake wear (fuel used)	(b)	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	Mileage [10^6 km]
	1A3bvii(fu)	Road transport: Automobile road abrasion (fuel used)	(b)	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	Mileage [10^6 km]
	ADJUSTMENTS	Sum of approved adjustments (negative value) from Annex VII (CLRTAP)																																		
	COMPLIANCE TOTAL (CLRTAP)	National total for compliance calculations and checks (CLRTAP)	(c)	139.07	140.11	332.36	58.78	58.18	75.32	95.51	5.43	377.45	30.78	2.65	1.55	5.09	11.19	43.98	11.73	13.16	65.22	74.94	9.91	10.46	4.06	5.52	32.89	2.15	752.71							
	ADJUSTMENTS AND [illegible]	Sum of approved adjustments from Annex VII and other flexibilities (negative value)	(d)																																	
	COMPLIANCE TOTAL (NECD)	National total for compliance calculations and checks (NECD)	(e)	133.35	122.65	332.36	58.78	58.18	75.32	95.51	5.43	377.45	30.78	2.65	1.55	5.09	11.19	43.98	11.73	13.16	65.22	74.94	9.91	10.46	4.06	5.52	32.89	2.15	752.71							
MEMO ITEMS - NOT TO BE INCLUDED IN NATIONAL TOTALS																																				
O_AviCruise	1A3ai(ii)	International aviation cruise (civil)		NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	TJ NCV
O_AviCruise	1A3aii(ii)	Domestic aviation cruise (civil)		0.92	0.01	0.09	NE	0.02	0.02	NE	0.00	0.18	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NA	NA	0.00	0.00	0.00	0.00	0.00	0.00	LTO
P_IntShipping	1A3di(i)	International maritime navigation		NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	TJ NCV
z_Memo	1A5c	Multilateral operations		NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	TJ NCV
z_Memo	6B	Other not included in national total of the entire territory (please specify in the IIR)		NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	*Please specify*
N_Natural	11A	Volcanoes		NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	*Please specify*
N_Natural	11B	Forest fires		0.03	0.07	0.01	0.01	0.01	0.01	0.01	0.00	0.75	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NA	NA	0.00	0.00	0.00	0.00	0.00	0.00	*Area of forest*
N_Natural	11C	Other natural emissions (please specify in the IIR)		NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	*Please specify*

8. RECALCULATION AND IMPROVEMENTS

The main objective of recalculation is to improve the emissions inventory and the quality of reports.

The recalculations we have done in this Inventory:
1A1a From 2019 includes data used in calculations in category 1Bc Venting and Flaring
1A1a . In subcategory Brown coal activity data have been changed in 2015 because of changed data in Energy Balance.
1A1b Emission factors have been changed according to Metodology EMEP/EEA 2023 for following pollutants: NMVOC, SOx, Pb, Cd, Hg, As, Cr, Cu, Ni, Se and Zn.

1A1c Activity data of solid fuels in subcategory 1A1c show a sharp decrease of -60% between 2013-2014, between 2014-2016 activity data increased by +66% each year, from 2016-2017 show a decrease of -40%. During 2014, large floods hit the Republic of Serbia, especially in the areas where the mines are located. This is the cause of reduced activity due to coal mining for energy production, that directly influences emissions. Also, the use of steam locomotives in 2017 has been reduced. This is the cause of the reduction of emissions between 2016 and 2017.

1A2a For the years 2011-2017, CO-emissions from category 1.A.2.b show steep increases and decreases (2011-2012: -65%, 2013-2014: +51%, 2015-2016: -56%, 2016-2017:+101%). Reduced production due to the global crisis in steel production and the change in ownership structure influenced the significant reduction in emissions for the period 2011-2012. In this period, factory in Smederevo worked quietly with significantly reduced production. In the period from 2012 to 2016, we had the production of steel that was intended for domestic customers. During 2016, there was a change in the ownership structure, after which factory in Smederevo completely started operating since 2017.

1A2b An extrapolation of the data for secondary aluminum in 2021 , 2022 and 2023 was made because production exists, but the plants did not provide us with the data. Emission factors for SOx have been changed according to Metodology EMEP/EEA 2023 in following cubcategories: Primary Copper production, Secondary Copper production, Primary Lead production, Secondardy Lead production, Primary Zink production, Secondary Zink production.

1A2c In subcategory gaseous fuels activity data have been changed in 2022 because of changed data in Energy Balance. In subcategory gaseous fuels activity data have been changed in 2022 because of changed data in Energy Balance.
In subcategory Biomass activity data have been changed in 2021 and 2022 because of changed data in Energy Balance.
Emission factors have been changed according to Metodology EMEP/EEA 2023 for following subcategories and pollutants:
Combustion in industry using solid fuels – NH3
Combustion in industry using gaseous fuels – NH3, PCDD/PCDF, Benzo(a)pyren, Benzo(b)fluoranthen, Benzo(k)fluoranthen, Indeno 123 pyren, TOTAL 1-4 and HCB
Combustion in industry using liquid fuels – NH3
Combustion in industry using biomass – NH3

1A2d In subcategory gaseous fuels activity data have been changed in 2022 because of changed data in Energy Balance.
1A2d In subcategory Biomass activity data have been changed in 2021 and 2022 because of changed data in Energy Balance. In subcategory Biomass activity data have been changed in 2021 and 2022 because of changed data in Energy Balance.

Emission factors have been changed according to Metodology EMEP/EEA 2023 for following subcategories and pollutants:

Combustion in industry using solid fuels – NH3

Combustion in industry using gaseous fuels – NH3, PCDD/PCDF, Benzo(a)pyren, Benzo(b)fluoranthen, Benzo(k)fluoranthen, Indeno 123 pyren, TOTAL 1-4 and HCB

Combustion in industry using liquid fuels – NH3

Combustion in industry using biomass – NH3

1A2e In subcategory gaseous fuels activity data have been changed in 2022 because of changed data in Energy Balance. In subcategory Biomass activity data have been changed in 2021 and 2022 because of changed data in Energy Balance.
Emission factors have been changed according to Metodology EMEP/EEA 2023 for following subcategories and pollutants:

Combustion in industry using solid fuels – NH3

Combustion in industry using gaseous fuels – NH3, PCDD/PCDF, Benzo(a)pyren, Benzo(b)fluoranthen, Benzo(k)fluoranthen, Indeno 123 pyren, TOTAL 1-4 and HCB

Combustion in industry using liquid fuels – NH3

Combustion in industry using biomass – NH3

1A3b In sector Road transport recalculations were made for period 2016-2023. Previously, extrapolations were made for these years due to lack of activity data.

1A3bvii Emission factors have been changed according to Metodology EMEP/EEA 2023 for subcategories passenger cars and light duty trucks for pollutants: PM2.5, PM10 and TSP.

1A4ci According to Metodology EMEP/EEA 2023 in subcategory Gaseous fuels emission factor have been changed for following pollutants: NH3, Hg and PCCD/PCCF. In subcategory Liquid fuels EF have been changed for pollutants: Hg, NH3, PCCD/PCCF, NOx, SOx, CO, Pb,, cd, Hg, As, Cr, Cu, Ni, Se, Zn.

Also in subcategory Biomass EF for NH3 have been changed.

1B2ai According to Metodology EMEP/EEA 2023 in subcategory Fugitive emissions oil: Exploration, production, transport emission factor have been changed for NMVOC .

1B2aiv According to Metodology EMEP/EEA 2023 in subcategory Fugitive emissions oil: Refining / storage emission factor have been changed for following pollutants: NOx, SOx, NH3, PM2.5, PM10, TSP, BC, CO, Pb, Cd, Hg, As, Cr, Cu, Ni, Se, Zn, PCCD/PCCF, Benzo(a) pyren, benzo(b) fluoranthen, benzo(k) fluoranthen, Indeno (1,2,3) pyren, HCB, PCB

1B2av According to Metodology EMEP/EEA 2023 for subcategory Distribution of oil products emission factor have been changed for NMVOC.

1B2b According to Metodology EMEP/EEA 2023 emission factor have been changed for NMVOC in subcategory Fugitive emissions from natural gas (exploration, production, processing, transmission, storage, distribution and other).

1B2c From 2019, these data are included in category 1Aa Public electricity and heat production.

According to Metodology EMEP/EEA 2023 for category Flaring in oil and gas extraction emission factor have been changed for following pollutants: cd, Hg, As, Cr, Cu, Ni, Se and Zn.

2B1 In 2019, 2020, 2021, 2022 and 2023, there is no production of ammonia in Serbia

2B2 In 2019, the production of nitric acid was significantly reduced. In 2020, 2021, 2022 and 2023, there are no production of nitric acid in Serbia.

2B10a In 2020, 2021, 2022 and 2023, there are no production of Sulphuric acid in Serbia.

In 2019, 2020, 2021, 2022 and 2023 there is no production of ammonium nitrate and Urea in Serbia.

In subcategory Ethylene data for 2022 was entered, which was not in the previous submission.

In subcategory Polypropylene data from 2020 was entered, which was not in the previous submission.

2C3 From 2021 the extrapolation has been done due to lack of data.

According to Metedology EMEP/EEA 2023 emission factor for SOx have been changed.

2C5 According to Metedology EMEP/EEA 2023 in subcutegories Primary Lead production and Secondary Lead production emission factors for SOx have been changed.

2C6 According to Metedology EMEP/EEA 2023 in subcutegories Primary Zink production and Secondary Zink production emission factors for SOx have been changed

2C7a According to Metedology EMEP/EEA 2023 in subcutegories Primary Copper production and Secondary Copper production emission factors for SOx have been changed**.**

2D3b Recalculations have been made since 2017. Previously, only heated asphalt was used, but now cold asphalt has also been added.
2D3g In subcategory rubber recalculations were made for the year 2022, data on vulcanised rubber was added, which was not collected in the last submission.

2D3i In the subcategory Use of Shoes recalculations were made for the year 2022, data on footwear production was added, which was not collected in the last submission.

3F According to Metodology EMEP/EEA 2023 emission factors have been changed for following pollutants: benzo(a) pyren, benzo(b) fluoranthen, benzo(k) fluoranthen and indeno (1,2,3) pyren.

5A According to Metodology EMEP/EEA 2023 emission factors have been changed in subcategories Solid waste disposal on land - Mineral waste handling and storage and Solid waste disposal on land – Waste degradation for NMVOC.

9. PROJECTIONS

Parties shall report their latest available projections at least every four years, and provide any updated projections annually by 15-th of February for the years 2020, 2025 and 2030 etc.

The NEC Directive has been partially transposed into national legislation through the Law on Air Protection ("Official Gazette of the Republic of Serbia", No. 36/09 and 10/13), Regulation on emission limit values of pollutants in the air from stationary pollution sources, other than combustion plants ("Official Gazette of the Republic of Serbia", No. 111/15) and the Regulation on methodology for development of emission inventory and projections of air pollutants ("Official Gazette of RS", No. 03/2019).

For the calculation and evaluation of its emissions, both for the base year and the future emissions scenario, in order to fulfill its obligations under the NEC Directive, the Republic of Serbia will use the GAINS model. Emissions for 2005, as base, are calculated directly in the GAINS model, while the input data for the projections from the Energy and Agriculture sectors will be prepared in the PRIMES and CAPRI models, which are used in the framework of the Climate Change Strategy. This way of combining these models is in line with good EU practice.

10. REPORTING OF GRIDDED EMISSIONS AND LPS

In accordance with the CEIP reporting instructions, Serbia will provide data on LPS emissions and gridded data by May 1. 2025.

11. EMISSION TRENDS PER SECTOR

Table 137. Emission trends for NOx (kt) 1990-2023

NOx	A Public Power	B Industry	C Other Stationary Combustion	D Fugitive	E Solvents	F Road Transport	G Shipping + H Aviation + I Offroad	J Waste	K Agri Livestock + L Agri Other	Total
1990	97.6884	17.8099	5.4054	0.1673	0.0263	49.3183	8.9636	0.0006	1.1997	180.5794
1991	87.7269	17.1394	4.1800	0.1228	0.0294	48.0269	7.4387	0.0007	1.0845	165.7494
1992	81.1191	18.3124	5.5357	0.0845	0.0250	43.9833	5.3479	0.0007	1.1711	155.5798
1993	75.5511	12.1754	5.3969	0.0399	0.0266	31.0406	3.8019	0.0010	0.9939	129.0272
1994	69.2235	12.2891	4.8377	0.0480	0.0208	44.4823	3.6486	0.0008	1.1698	135.7207
1995	87.7568	10.8152	3.3220	0.0434	0.0202	43.5880	3.2040	0.0009	1.8768	150.6273
1996	85.1231	16.2460	4.4679	0.0844	0.0181	42.8326	6.2663	0.0009	2.2116	157.2510
1997	92.0873	17.3309	4.5297	0.1134	0.0153	43.1936	6.6135	0.0010	3.3351	167.2199
1998	91.6409	16.7744	5.4230	0.1076	0.0220	43.2303	6.8479	0.0018	2.9543	167.0022
1999	68.3998	12.8114	5.0132	0.0298	0.0192	38.2825	4.6618	0.0019	1.8452	131.0649
2000	77.2337	12.8163	5.0294	0.0368	0.0239	43.8025	4.4458	0.0019	1.9702	145.3606
2001	75.9003	14.9827	4.8876	0.0923	0.0226	45.8723	4.9645	0.0018	3.2416	149.9657
2002	79.5642	16.5228	5.1993	0.1172	0.0256	44.8116	6.6430	0.0019	7.0862	159.9719
2003	83.2911	16.2112	5.4034	0.1341	0.0259	45.4910	7.0213	0.0021	5.4832	163.0631
2004	85.6461	18.5756	5.5950	0.1398	0.0272	45.1423	11.9756	0.0019	10.8269	177.9305
2005	74.4850	16.9131	4.9521	0.1114	0.0312	44.8415	12.2386	0.0019	10.0592	163.6341
2006	78.6576	17.1978	3.5455	0.1121	0.0329	43.2882	12.6627	0.0020	9.7400	165.2389
2007	78.4898	16.9924	6.3456	0.1159	0.0383	43.7389	14.1800	0.0022	11.8288	171.7319
2008	81.3023	17.5745	5.9669	0.1131	0.0376	43.6962	9.8005	0.0022	10.5716	169.0649
2009	74.9015	12.8810	6.0006	0.1027	0.0369	41.5340	10.1799	0.0023	13.5397	159.1784
2010	68.4840	15.6429	6.4953	0.1018	0.0394	38.5274	8.6251	0.0024	7.9247	145.8431
2011	76.9945	17.8641	8.2272	0.0839	0.0492	37.3025	10.4301	0.0023	9.0869	160.0407
2012	72.0887	18.3172	6.3965	0.0761	0.0489	30.2346	10.0578	0.0023	13.3304	150.5525
2013	76.2285	15.2150	5.0828	0.0972	0.0429	29.9274	12.2439	0.0025	12.0389	150.8793
2014	60.0298	13.2621	4.6627	0.0922	0.0379	29.9071	7.7359	0.0025	8.2485	123.9788
2015	73.3085	13.4313	4.8644	0.1035	0.0601	35.2210	7.7451	0.0022	8.6422	143.3784
2016	72.6041	14.2934	5.5060	0.1096	0.0748	33.1778	7.9379	0.0025	10.9412	144.6474
2017	73.6140	14.2314	5.0936	0.1179	0.0827	32.5544	7.0424	0.0028	10.0449	142.7842
2018	69.0835	14.6218	4.9627	0.1256	0.0763	32.5568	6.7394	0.0028	6.3800	134.5489
2019	69.3641	12.3637	4.9942	0.1105	0.0722	32.2859	6.4608	0.0028	6.2469	131.9009
2020	73.0731	11.3314	6.3205	0.1168	0.0760	32.7000	7.4667	0.0032	8.8809	139.9687
2021	68.0851	11.5856	6.1814	0.1260	0.0795	34.1838	10.0260	0.0036	4.3555	134.6265
2022	67.7757	12.7301	6.6763	0.1449	0.0829	36.0402	10.9620	0.0029	6.3941	140.8092
2023	66.7075	13.5865	6.7819	0.1361	0.0854	35.3169	10.7259	0.0028	5.7261	139.0691

Table 138. Emission trends for NMVOC (kt) 1990-2023

NMVOC	A Public Power	B Industry	C Other Stationary Combustion	D Fugitive	E Solvents	F Road Transport	G Shipping + H Aviation + I Offroad	J Waste	K Agri Livestock + L Agri Other	Total
1990	0.6139	15.8514	38.8170	49.2118	23.6752	36.8884	0.6932	0.0001	33.3979	199.1489
1991	0.5908	14.8402	31.4097	37.2676	21.6440	35.1548	0.5962	0.0001	32.7904	174.2938
1992	0.5581	14.0056	29.5498	40.7849	20.2969	32.8379	0.3811	0.0001	29.9827	168.3972
1993	0.4858	15.8975	29.5074	34.6370	19.0689	21.5815	0.3656	0.0001	30.6545	152.1982
1994	0.4398	8.4027	27.7685	35.2204	18.6348	32.2094	0.3468	0.0001	27.5482	150.5708
1995	0.5486	7.4666	23.6473	37.3633	18.3034	30.8332	0.2748	0.0001	30.3124	148.7498
1996	0.5426	9.1545	25.8642	36.2258	18.4477	30.5721	0.5442	0.0001	30.3815	151.7328
1997	0.5930	7.5006	25.9498	43.9947	18.5237	31.8345	0.5584	0.0001	29.9604	158.9153
1998	0.5762	7.6487	28.1709	42.3496	18.6655	33.6301	0.5730	0.0002	29.4120	161.0262
1999	0.4346	7.3376	27.4843	27.7799	17.7608	30.1250	0.3977	0.0002	29.4873	140.8074
2000	0.4842	9.4066	28.8522	31.8867	17.9876	35.2062	0.3542	0.0002	28.3395	152.5173
2001	0.4861	9.4288	28.3480	33.2662	17.9436	34.6655	0.4082	0.0002	26.7266	151.2732
2002	0.5116	10.0607	29.3715	35.4622	17.6840	33.2589	0.5899	0.0002	26.0814	153.0202
2003	0.5356	9.7116	29.9570	37.3293	17.6247	35.1062	0.6360	0.0002	25.8440	156.7446
2004	0.5623	11.6038	30.1941	41.0049	17.9444	32.6389	1.1842	0.0039	25.5442	160.6807
2005	0.4790	10.4630	28.3350	41.3007	18.0872	30.9157	1.2138	0.0039	25.2179	156.0161
2006	0.4962	11.4742	24.6996	42.3791	18.0602	29.1014	1.2525	0.0040	25.8279	153.2950
2007	0.5009	11.5087	29.0417	42.6536	17.9319	28.5875	1.7750	0.0040	25.2011	157.2044
2008	0.5163	12.1670	26.0695	43.6785	18.0121	26.6757	0.9864	0.0035	23.8412	151.9503
2009	0.4781	10.6018	30.4579	42.4243	17.5407	24.4851	1.1101	0.0036	23.5814	150.6830
2010	0.4470	11.3852	29.7378	41.9669	17.2789	18.4762	1.1671	0.0034	22.3311	142.7936
2011	0.5000	11.3821	29.0542	43.3642	17.2025	16.8348	1.4982	0.0031	22.0086	141.8477
2012	0.4746	10.3208	29.2554	40.7822	17.0610	15.5231	1.2557	0.0028	21.2796	135.9553
2013	0.4998	12.2718	24.8050	45.1344	17.5922	13.6272	1.7206	0.0029	21.0643	136.7183
2014	0.4049	11.6876	25.2352	36.7617	17.3439	12.2495	0.9382	0.0023	21.5297	126.1531
2015	0.4894	9.9081	24.9206	43.7876	17.4816	14.0258	0.7690	0.0025	21.4699	132.8545
2016	0.4848	12.3508	27.1446	44.6164	18.1874	15.1992	0.7719	0.0026	20.9507	139.7085
2017	0.4947	12.3697	25.2554	46.1198	17.3903	14.9436	0.6922	0.0023	20.8048	138.0728
2018	0.4688	10.8986	25.7334	45.3911	17.3973	14.4158	0.6554	0.0016	20.7913	135.7534
2019	0.4696	10.8230	26.5360	45.3720	17.2385	13.0450	0.6225	0.0015	20.7245	134.8326
2020	0.4937	11.0150	39.5855	46.1154	16.7625	11.6081	0.7519	0.0014	20.6952	147.0288
2021	0.4862	11.1419	39.3256	44.6716	16.4525	12.4452	0.9358	0.0015	20.0821	145.5424
2021	0.4876	10.0225	39.0366	45.6678	16.0628	12.1915	1.0410	0.0015	19.0228	143.5343
2022	0.4810	10.0875	41.1172	42.4957	15.9956	11.4614	1.0097	0.0002	17.4572	140.1054
2023	0.6139	15.8514	38.8170	49.2118	23.6752	36.8884	0.6932	0.0001	33.3979	199.1489

Table 139 Emission trends for SOx (kt) 1990-2023

SOx	A Public Power	B Industry	C Other Stationary Combustion	D Fugitive	E Solvents	F Road Transport	G Shipping + H Aviation + I Offroad	J Waste	K Agri Livestock + L Agri Other	Total
1990	519.0912	31.7294	22.0086	1.2020	NA	1.7353	0.8420	0.0001	0.0011	576.6097
1991	458.9462	33.1187	14.9363	0.8860	NA	1.6474	0.5758	0.0001	0.0011	510.1117
1992	421.7483	42.9715	25.1438	0.6017	NA	1.5000	0.5356	0.0001	0.0012	492.5021
1993	400.1559	31.2826	25.3482	0.2785	NA	1.0082	0.1108	0.0001	0.0011	458.1855
1994	367.7897	27.4467	22.0683	0.3384	NA	1.4949	0.1294	0.0001	0.0011	419.2686
1995	468.2351	18.1048	11.3939	0.3065	NA	1.4733	0.1872	0.0001	0.0011	499.7021
1996	452.0939	30.0170	17.6437	0.6031	NA	1.4739	0.4063	0.0001	0.0011	502.2391
1997	487.9204	33.0271	17.7504	0.8135	NA	1.5303	0.4885	0.0001	0.0011	541.5313
1998	488.3071	34.5128	23.9329	0.7718	NA	1.5739	0.5293	0.0003	0.0011	549.6291
1999	363.6750	30.9307	22.1210	0.2085	NA	1.4149	0.3325	0.0003	0.0011	418.6840
2000	411.7380	28.1200	21.2169	0.2558	NA	1.5773	0.3993	0.0003	0.0010	463.3087
2001	402.3077	32.9886	20.1432	0.6569	NA	1.6976	0.4038	0.0002	0.0011	458.1991
2002	420.8562	36.6006	22.4217	0.8346	NA	1.6951	0.4100	0.0003	0.0010	482.8194
2003	440.6076	39.7003	23.7635	0.9584	NA	1.7268	0.3936	0.0003	0.0010	507.1515
2004	450.2554	38.9609	24.3208	0.9987	NA	1.7252	0.3848	0.0003	0.0010	516.6471
2005	394.2928	25.5005	20.2215	0.7936	NA	1.6981	0.3863	0.0003	0.0010	442.8941
2006	418.4628	27.1800	10.6464	0.7985	NA	1.6460	0.4106	0.0003	0.0010	459.1456
2007	416.3019	25.2729	23.5679	0.8278	NA	1.5893	0.4588	0.0003	0.0010	468.0199
2008	431.6622	24.5617	19.7347	0.8051	NA	1.5224	0.4581	0.0003	0.0011	478.7456
2009	397.1402	16.4688	14.9112	0.7339	NA	1.4309	0.4356	0.0003	0.0010	431.1220
2010	361.2124	20.1478	17.1555	0.7278	NA	1.0041	0.3664	0.0003	0.0010	400.6153
2011	406.5249	25.3834	22.1517	0.6006	NA	0.8379	0.3287	0.0003	0.0010	455.8285
2012	379.2099	24.3144	14.5478	0.5452	NA	0.6885	0.2603	0.0003	0.0009	419.5674
2013	401.3503	18.9653	11.8581	0.6989	NA	0.6946	0.2873	0.0003	0.0009	433.8557
2014	313.5295	18.1100	8.8063	0.6646	NA	0.7154	0.2544	0.0003	0.0009	342.0814
2015	330.8888	20.0247	8.9876	0.7465	NA	0.8660	0.2705	0.0003	0.0009	361.7852
2016	327.7090	27.4783	12.2845	0.7893	NA	0.0001	0.2703	0.0003	0.0009	368.5327
2017	331.5823	21.4780	10.8704	0.8478	NA	0.0001	0.2267	0.0004	0.0009	365.0065
2018	310.2995	22.2416	9.5869	0.9048	NA	0.0001	0.2169	0.0004	0.0008	343.2510
2019	311.6483	19.2576	9.8834	0.7978	NA	0.0001	0.2208	0.0004	0.0008	341.8093
2020	328.4858	17.3794	12.2189	0.8439	NA	0.0001	0.1812	0.0004	0.0009	359.1106
2021	301.1881	13.9713	7.2539	0.9110	NA	0.0001	0.5224	0.0005	0.0009	323.8482
2022	299.3648	14.0887	6.9539	1.0498	NA	0.0001	0.5049	0.0004	0.0008	321.9634
2023	294.3851	24.4748	12.0008	0.9850	NA	0.0001	0.5170	0.0004	0.0008	332.3640

Table 140. Emission trends for NH3 (kt) 1990-2023

NH3	A Public Power	B Industry	C Other Stationary Combustion	D Fugitive	E Solvents	F Road Transport	G Shipping + H Aviation + I Offroad	J Waste	K Agri Livestock + L Agri Other	Total
1990	NE	8.5014	0.3971	0.0130	0.0631	0.0268	0.0008	8.6285	105.3468	122.9776
1991	NE	6.7533	0.3428	0.0071	0.0693	0.0255	0.0008	8.5512	104.8775	120.6274
1992	NE	5.9298	0.2583	0.0102	0.0589	0.0437	0.0005	8.4586	93.9530	108.7131
1993	NE	4.0239	0.2583	0.0083	0.0621	0.0274	0.0005	8.3679	96.8091	109.5576
1994	NE	5.6449	0.2518	0.0080	0.0487	0.0451	0.0005	8.2383	87.5224	101.7596
1995	NE	5.2096	0.2495	0.0068	0.0473	0.0488	0.0004	8.1074	99.1187	112.7885
1996	NE	8.0858	0.2507	0.0087	0.0425	0.0605	0.0007	7.9570	102.5300	118.9358
1997	NE	8.6217	0.2508	0.0097	0.0361	0.0757	0.0007	7.8030	100.8155	117.6130
1998	NE	6.6626	0.2520	0.0093	0.0514	0.0977	0.0007	7.6321	97.9453	112.6512
1999	NE	2.9264	0.2516	0.0060	0.0448	0.1025	0.0005	7.4822	98.7546	109.5686
2000	NE	2.6857	0.2738	0.0063	0.0559	0.1382	0.0004	7.3008	94.3116	104.7727
2001	NE	2.9601	0.2735	0.0081	0.0531	0.1456	0.0005	7.1583	89.0449	99.6441
2002	NE	4.6772	0.2741	0.0092	0.0604	0.1778	0.0008	6.7440	92.2268	104.1703
2003	NE	3.9662	0.2745	0.0100	0.0610	0.2043	0.0009	6.6428	90.0789	101.2386
2004	NE	6.2987	0.2746	0.0104	0.0642	0.2335	0.0017	6.4601	94.4178	107.7609
2005	NE	6.1064	0.2735	0.0080	0.0734	0.2488	0.0017	6.2502	91.7459	104.7079
2006	NE	3.5122	0.2710	0.0077	0.0779	0.2675	0.0018	6.1427	92.3163	102.5972
2007	NE	5.6650	0.2729	0.0075	0.0904	0.2941	0.0027	6.0270	91.9987	104.3583
2008	NE	2.6890	0.2292	0.0076	0.0887	0.3012	0.0018	5.8150	85.3101	94.4425
2009	NE	2.5665	0.3361	0.0063	0.0866	0.3226	0.0019	5.4436	89.5114	98.2749
2010	NE	4.5151	0.3245	0.0070	0.0924	0.3772	0.0015	5.2732	78.3790	88.9699
2011	NE	6.2883	0.2961	0.0065	0.1144	0.3787	0.0020	5.0366	77.7394	89.8620
2012	NE	6.9541	0.3192	0.0059	0.1132	0.3426	0.0020	5.1275	80.1597	93.0243
2013	NE	7.4147	0.2710	0.0067	0.0995	0.3480	0.0025	4.8618	76.9892	89.9932
2014	NE	4.8332	0.2875	0.0047	0.0881	0.3549	0.0014	4.7013	73.9401	84.2112
2015	NE	3.6104	0.2858	0.0054	0.1392	0.4076	0.0014	4.6319	74.5846	83.6663
2016	NA	2.2566	0.2954	0.0063	0.1732	0.3546	0.0014	4.3705	74.7476	82.2056
2017	NA	4.0361	0.2721	0.0071	0.1908	0.3324	0.0013	4.2462	73.0318	82.1178
2018	NA	4.4358	0.2843	0.0068	0.1759	0.3462	0.0012	4.1337	67.3602	76.7441
2019	NA	0.0066	0.2945	0.0059	0.1663	0.3350	0.0012	3.8900	66.3977	71.0973
2020	NA	0.0063	0.4574	0.0062	0.1752	0.3289	0.0015	3.4743	71.1142	75.5640
2021	NA	0.0063	0.4803	0.0060	0.1832	0.3371	0.0018	3.5671	63.3799	67.9617
2022	NA	0.0054	0.4800	0.0058	0.1910	0.3517	0.0020	3.2515	62.3117	66.5991
2023	NA	0.0054	0.4818	0.0058	0.1970	0.3552	0.0019	4.0054	53.7284	58.7809

Table 141. Emission trends for PM2,5 (kt) 1990-2023

PM2.5	A Public Power	B Industry	C Other Stationary Combustion	D Fugitive	E Solvents	F Road Transport	G Shipping + H Aviation + I Offroad	J Waste	K Agri Livestock + L Agri Other	Total
1990	1.4388	4.7792	44.1754	0.4514	0.6197	2.1709	0.2824	0.0000	0.8658	54.7837
1991	1.4904	3.3027	36.4507	0.2815	0.6986	2.0862	0.2181	0.0000	0.8520	45.3802
1992	1.3336	4.5410	32.3086	0.3695	0.5946	1.9212	0.2043	0.0000	0.7947	42.0674
1993	1.1117	3.6610	32.2879	0.3205	0.6187	1.3916	0.0609	0.0000	0.8085	40.2610
1994	1.0011	3.4477	30.6412	0.3222	0.5306	1.9516	0.0620	0.0000	0.7453	38.7018
1995	1.2445	2.8223	27.1088	0.3157	0.5408	1.9321	0.0731	0.0000	0.8006	34.8379
1996	1.2963	3.5589	29.0322	0.3369	0.4768	1.9306	0.1461	0.0000	0.7980	37.5759
1997	1.4598	3.6756	29.0998	0.3799	0.4650	1.9225	0.1676	0.0000	0.7898	37.9600
1998	1.3257	3.8400	31.0241	0.3778	0.5694	1.9051	0.1779	0.0001	0.7785	39.9985
1999	1.0606	3.1782	30.4347	0.2474	0.4642	1.6758	0.1178	0.0001	0.7785	37.9573
2000	1.1458	3.1196	32.2330	0.2704	0.5020	1.8966	0.1309	0.0001	0.7560	40.0546
2001	1.1275	3.3171	31.8119	0.2992	0.4609	2.0178	0.1342	0.0001	0.7249	39.8935
2002	1.0672	3.6453	32.6714	0.3222	0.5635	1.9733	0.1418	0.0001	0.7092	41.0940
2003	1.1184	3.7974	33.1649	0.3468	0.5870	2.0109	0.1380	0.0001	0.7037	41.8672
2004	1.1142	4.0732	33.3649	0.3567	0.5895	2.0260	0.1523	0.0001	0.7010	42.3778
2005	1.1498	2.9578	31.8059	0.3187	0.6619	2.0416	0.1521	0.0001	0.6944	39.7823
2006	1.1676	3.0838	28.6660	0.3237	0.6593	2.0255	0.1592	0.0001	0.7064	36.7915
2007	1.1708	3.0716	32.3106	0.3220	0.7132	2.0790	0.5947	0.0001	0.6963	40.9583
2008	1.1685	3.1974	28.3924	0.3311	0.7479	2.1166	0.5271	0.0001	0.6710	37.1522
2009	1.1302	2.2766	35.4616	0.3063	0.7603	2.0755	0.5020	0.0001	0.6540	43.1666
2010	1.0148	3.0040	34.6148	0.3163	0.7461	1.9584	0.3704	0.0001	0.6291	42.6540
2011	1.0853	3.6571	33.2752	0.3246	0.8752	1.9803	0.4744	0.0001	0.6236	42.2958
2012	1.0385	3.2907	33.9190	0.2999	0.8820	1.6616	0.4775	0.0001	0.6090	42.1782
2013	1.0532	3.6981	28.7287	0.3246	0.7854	1.6748	0.5599	0.0001	0.6061	37.4309
2014	0.8411	2.8010	29.5159	0.2389	0.7265	1.6943	0.3371	0.0001	0.6178	36.7728
2015	1.0311	3.1784	29.2345	0.2910	1.0658	2.1781	0.3425	0.0001	0.6136	37.9351
2016	1.0210	3.7087	31.3305	0.3094	1.4439	1.9056	0.3373	0.0001	0.6022	40.6587
2017	1.0258	3.5143	28.9873	0.3293	1.5761	1.9244	0.3184	0.0001	0.5973	38.2731
2018	0.9660	3.4248	29.7375	0.3139	1.4821	1.9307	0.3191	0.0001	0.6015	38.7758
2019	0.9521	3.4324	30.7240	0.3041	1.4598	1.9049	0.3424	0.0001	0.5981	39.7178
2020	1.0002	3.2660	46.4834	0.3131	1.4777	1.9157	0.3823	0.0001	0.5963	55.4350
2021	0.9771	3.0226	46.8970	0.2948	1.4922	2.0225	0.5315	0.0002	0.5836	55.8215
2022	1.0099	2.9302	46.6694	0.2864	1.5696	2.1232	0.5698	0.0001	0.5625	55.7211
2023	0.9877	3.6210	48.4841	0.2704	1.6199	2.1048	0.5591	0.0001	0.5333	58.1804

Table 142. Emission trends for PM10 (kt) 1990-2023

PM10	A Public Power	B Industry	C Other Stationary Combustion	D Fugitive	E Solvents	F Road Transport	G Shipping + H Aviation + I Offroad	J Waste	K Agri Livestock + L Agri Other	Total
1990	3.2981	10.6249	45.3133	2.1701	0.7323	2.5770	0.3085	0.0000	8.2441	73.2684
1991	3.1808	8.3021	37.4093	1.4152	0.8274	2.4793	0.2371	0.0000	8.2646	62.1159
1992	2.8777	9.0364	33.1248	1.9246	0.7041	2.2902	0.2226	0.0000	7.9807	58.1613
1993	2.5417	6.6717	33.1066	1.7958	0.7284	1.6500	0.0651	0.0000	8.0182	54.5776
1994	2.3108	6.5733	31.4203	1.8227	0.6400	2.3257	0.0666	0.0000	7.7759	52.9353
1995	2.9051	6.0802	27.8044	1.8910	0.6597	2.3006	0.0790	0.0000	8.0432	49.7633
1996	2.9213	7.3443	29.7783	1.8049	0.5795	2.2996	0.1588	0.0000	8.1083	52.9950
1997	3.2276	7.5197	29.8464	2.0067	0.5826	2.3054	0.1825	0.0000	8.0393	53.7105
1998	3.0638	7.9405	31.8203	2.0354	0.6889	2.2988	0.1940	0.0001	8.0112	56.0529
1999	2.3720	6.1214	31.2166	1.4241	0.5526	2.0321	0.1283	0.0001	8.0234	51.8706
2000	2.6186	6.0446	33.0632	1.5774	0.5740	2.3050	0.1431	0.0001	7.8318	54.1578
2001	2.5681	5.9955	32.6344	1.5257	0.5220	2.4728	0.1465	0.0001	7.6841	53.5493
2002	2.5481	6.7168	33.5106	1.5650	0.6529	2.4383	0.1541	0.0001	7.6406	55.2266
2003	2.6689	6.5838	34.0140	1.6525	0.6865	2.4956	0.1497	0.0001	7.6294	55.8805
2004	2.6920	7.3669	34.2183	1.6933	0.6803	2.5311	0.1634	0.0001	7.5924	56.9378
2005	2.5731	6.4348	32.6293	1.6653	0.7590	2.5708	0.1632	0.0001	7.5905	54.3861
2006	2.6666	6.7350	29.4128	1.7301	0.7423	2.5900	0.1709	0.0001	7.6247	51.6725
2007	2.6640	6.5921	33.1553	1.7290	0.7822	2.6910	0.6057	0.0001	7.6179	55.8372
2008	2.7063	6.6019	29.1014	1.8009	0.8401	2.7549	0.5387	0.0001	7.4715	51.8158
2009	2.5591	4.5491	36.4182	1.7476	0.8639	2.7136	0.5129	0.0001	7.4614	56.8258
2010	2.3080	5.9011	35.5656	1.7582	0.8234	2.5939	0.3796	0.0001	7.3133	56.6431
2011	2.5274	6.8467	34.2046	1.9130	0.9439	2.6318	0.4817	0.0001	7.2716	56.8208
2012	2.3897	6.1228	34.8307	1.7788	0.9563	2.2305	0.4827	0.0001	7.0948	55.8862
2013	2.4718	6.6695	29.4946	1.8725	0.8564	2.2656	0.5653	0.0001	7.1419	51.3378
2014	1.9531	5.8344	30.2990	1.3519	0.8052	2.3112	0.3425	0.0001	7.2424	50.1398
2015	2.3938	6.6844	30.0175	1.7022	1.1481	2.9439	0.3486	0.0001	7.1961	52.4345
2016	2.3704	7.6477	32.1587	1.7593	1.6046	2.7286	0.3434	0.0001	7.0905	55.7033
2017	2.3895	7.5935	29.7432	1.8239	1.7436	2.7800	0.3233	0.0001	7.0206	53.4178
2018	2.2433	7.7159	30.5142	1.7121	1.6511	2.8349	0.3234	0.0001	7.1344	54.1294
2019	2.2312	8.2075	31.5276	1.7458	1.6486	2.8772	0.3468	0.0001	7.0884	55.6732
2020	2.3479	7.5500	47.7094	1.7825	1.6465	2.9268	0.3860	0.0001	7.1213	71.4705
2021	2.2249	7.5872	48.1459	1.6283	1.6423	3.1071	0.5450	0.0002	7.0496	71.9304
2022	2.2571	7.9515	47.9211	1.5372	1.7331	3.3329	0.5820	0.0001	6.9510	72.2660
2023	2.2131	9.4932	49.7718	1.4214	1.7890	3.3517	0.5712	0.0001	6.7082	75.3198

Table 143. Emission trends for TSP (kt) 1990-2023

TSP	A Public Power	B Industry	C Other Stationary Combustion	D Fugitive	E Solvents	F Road Transport	G Shipping + H Aviation + I Offroad	J Waste	K Agri Livestock + L Agri Other	Total
1990	4.8620	77.5659	48.0503	4.6561	5.8847	0.7886	0.3078	0.0000	16.0326	158.1481
1991	4.6667	62.4302	39.5970	3.0159	4.9405	0.7631	0.2375	0.0000	16.1929	131.8439
1992	4.2248	54.6888	35.2609	4.1449	2.4003	0.7173	0.2245	0.0000	15.0892	116.7508
1993	3.7459	36.5570	35.2397	3.8724	1.0167	0.5035	0.0658	0.0000	15.2235	96.2247
1994	3.4077	47.4316	33.4171	3.9225	1.0550	0.7263	0.0673	0.0000	14.3580	104.3855
1995	4.2872	44.7323	29.4619	4.0575	1.3095	0.7153	0.0780	0.0000	15.5648	100.2065
1996	4.3017	65.8529	31.6173	3.8753	2.1176	0.7161	0.1584	0.0000	16.0476	124.6869
1997	4.7469	69.7988	31.6924	4.3002	2.0814	0.7430	0.1819	0.0000	15.5964	129.1411
1998	4.5186	57.6741	33.8490	4.3600	1.9504	0.7629	0.1933	0.0001	15.5028	118.8112
1999	3.4911	29.4354	33.1892	3.0661	1.1025	0.6906	0.1286	0.0001	15.7606	86.8642
2000	3.8594	27.8106	35.1222	3.3908	1.4990	0.7905	0.1426	0.0001	14.8725	87.4877
2001	3.7839	29.3961	34.6518	3.2750	1.6012	0.8790	0.1457	0.0001	14.1996	87.9325
2002	3.7651	41.9063	35.6124	3.3580	2.2072	0.8980	0.1531	0.0001	14.0244	101.9246
2003	3.9435	36.6456	36.1640	3.5444	1.8626	0.9347	0.1485	0.0001	13.9833	97.2267
2004	3.9801	54.1553	36.3875	3.6316	3.5387	0.9727	0.1620	0.0001	13.8174	116.6453
2005	3.7876	53.3787	34.6454	3.5609	4.5311	1.0189	0.1616	0.0001	13.7237	114.8081
2006	3.9312	37.3188	31.1302	3.6955	4.9445	1.0860	0.1689	0.0001	14.1052	96.3805
2007	3.9256	51.2048	35.2158	3.6892	5.0358	1.1757	0.6036	0.0001	13.8957	114.7462
2008	3.9923	30.9296	30.9729	3.8441	4.4042	1.2257	0.5365	0.0001	13.0311	88.9366
2009	3.7694	25.4897	38.5201	3.7216	3.3898	1.2262	0.5108	0.0001	13.6686	90.2962
2010	3.3971	41.2609	37.6211	3.7521	3.2428	1.2226	0.3774	0.0001	12.9265	103.8005
2011	3.7253	53.2949	36.2324	4.0828	3.0538	1.2535	0.4793	0.0001	12.7084	114.8304
2012	3.5200	56.2769	36.8497	3.7959	2.4917	1.0916	0.4801	0.0001	12.2292	116.7351
2013	3.6418	60.0363	31.2063	3.9922	2.1906	1.1349	0.5627	0.0001	12.1499	114.9148
2014	2.8737	44.1517	32.0240	2.8718	0.8576	1.1845	0.3391	0.0001	12.5637	96.8663
2015	3.5230	38.6483	31.7175	3.6155	1.2030	1.4738	0.3452	0.0001	12.6587	93.1851
2016	3.4884	31.1104	34.0299	3.7427	1.7116	0.7978	0.3400	0.0001	12.2384	87.4593
2017	3.5178	44.1514	31.4851	3.8849	1.8552	0.8325	0.3200	0.0001	12.0332	98.0802
2018	3.3000	48.0427	32.2800	3.6409	1.7637	0.8829	0.3194	0.0001	12.0463	102.2760
2019	3.2853	21.8692	33.3485	3.7101	1.7744	0.9316	0.3427	0.0001	11.9830	77.2449
2020	3.4577	18.9781	50.4137	3.7876	1.7591	0.9547	0.3842	0.0002	12.0775	91.8127
2021	3.2640	19.8840	50.7926	3.4549	1.7423	1.0148	0.5422	0.0002	11.8566	92.5516
2022	3.2976	20.5286	50.5413	3.2513	1.8420	1.0975	0.5779	0.0001	11.5090	92.6454
2023	3.2336	22.4308	52.5684	3.0099	1.9018	1.1556	0.5657	0.0001	10.6470	95.5130

Table 144. Emission trends for BC (kt) 1990-2023

BC	A Public Power	B Industry	C Other Stationary Combustion	D Fugitive	E Solvents	F Road Transport	G Shipping + H Aviation + I Offroad	J Waste	K Agri Livestock + L Agri Other	Total
1990	0.0243	0.1060	4.1311	0.0630	0.0018	0.0002	0.0012	NA	0.0600	4.3876
1991	0.0344	0.0899	3.4629	0.0263	0.0020	0.0002	0.0011	NA	0.0596	3.6762
1992	0.0294	0.1082	2.9073	0.0615	0.0017	0.0002	0.0007	NA	0.0637	3.1726
1993	0.0189	0.0847	2.9060	0.0571	0.0018	0.0001	0.0006	NA	0.0607	3.1300
1994	0.0162	0.0764	2.7815	0.0526	0.0014	0.0002	0.0006	NA	0.0605	2.9894
1995	0.0189	0.0498	2.5554	0.0444	0.0014	0.0002	0.0005	NA	0.0597	2.7302
1996	0.0238	0.0792	2.6785	0.0489	0.0012	0.0002	0.0009	NA	0.0599	2.8925
1997	0.0293	0.0846	2.6828	0.0497	0.0010	0.0002	0.0010	NA	0.0592	2.9077
1998	0.0213	0.0927	2.8059	0.0483	0.0015	0.0002	0.0010	NA	0.0585	3.0295
1999	0.0202	0.0828	2.7682	0.0414	0.0013	0.0002	0.0007	NA	0.0580	2.9727
2000	0.0196	0.0749	2.9579	0.0420	0.0016	0.0002	0.0006	NA	0.0558	3.1526
2001	0.0196	0.0882	2.9310	0.0427	0.0015	0.0002	0.0007	NA	0.0568	3.1407
2002	0.0139	0.1004	2.9860	0.0451	0.0017	0.0002	0.0010	NA	0.0560	3.2043
2003	0.0146	0.1105	3.0176	0.0476	0.0017	0.0002	0.0011	NA	0.0553	3.2486
2004	0.0131	0.1149	3.0303	0.0488	0.0018	0.0002	0.0020	NA	0.0555	3.2667
2005	0.0219	0.0637	2.9306	0.0369	0.0021	0.0002	0.0020	NA	0.0557	3.1131
2006	0.0203	0.0712	2.7282	0.0347	0.0022	0.0002	0.0021	NA	0.0534	2.9123
2007	0.0207	0.0777	2.9636	0.0320	0.0026	0.0003	0.2830	NA	0.0549	3.4346
2008	0.0187	0.1366	2.5993	0.0337	0.0025	0.0003	0.2478	NA	0.0571	3.0962
2009	0.0205	0.1267	3.4094	0.0251	0.0025	0.0003	0.2330	NA	0.0552	3.8728
2010	0.0175	0.1871	3.3185	0.0314	0.0027	0.0003	0.1605	NA	0.0553	3.7733
2011	0.0163	0.2202	3.1692	0.0317	0.0033	0.0003	0.2347	NA	0.0566	3.7323
2012	0.0168	0.2391	3.2702	0.0290	0.0033	0.0003	0.2475	NA	0.0460	3.8522
2013	0.0148	0.2763	2.7622	0.0294	0.0029	0.0003	0.2937	NA	0.0465	3.4259
2014	0.0124	0.2130	2.8705	0.0151	0.0026	0.0003	0.1636	NA	0.0494	3.3269
2015	0.0154	0.2265	2.8481	0.0175	0.0041	0.0003	0.1636	NA	0.0473	3.3228
2016	0.0152	0.2126	3.0110	0.0230	0.0051	0.0637	0.1592	NA	0.0473	3.5371
2017	0.0150	0.2295	2.7800	0.0280	0.0056	0.0666	0.1554	NA	0.0466	3.3267
2018	0.0142	0.2430	2.8682	0.0233	0.0051	0.0707	0.1592	NA	0.0433	3.4270
2019	0.0133	0.3218	2.9629	0.0199	0.0049	0.0752	0.1748	NA	0.0452	3.6179
2020	0.0139	0.2960	4.5109	0.0205	0.0051	0.0766	0.2038	NA	0.0466	5.1734
2021	0.0157	0.2883	4.6178	0.0166	0.0054	0.0815	0.2375	NA	0.0478	5.3105
2022	0.0171	0.2691	4.6166	0.0102	0.0056	0.0880	0.2671	NA	0.0453	5.3190
2023	0.0165	0.2791	4.7217	0.0124	0.0058	0.0928	0.2610	NA	0.0446	5.4338

Table 145. Emission trends for CO (kt) 1990-2023

CO	A Public Power	B Industry	C Other Stationary Combustion	D Fugitive	E Solvents	F Road Transport	G Shipping + H Aviation + I Offroad	J Waste	K Agri Livestock + L Agri Other	Total
1990	4.3209	20.1935	286.0574	1.1634	0.8047	203.5089	1.4480	0.0001	0.1482	517.6450
1991	4.3545	15.2630	226.7071	0.5477	0.9001	195.8315	1.3058	0.0001	0.1472	445.0570
1992	4.2585	18.5072	227.8617	1.0440	0.7661	167.9281	0.8995	0.0001	0.1573	421.4224
1993	3.5094	13.5385	227.4613	0.9242	0.8153	106.8649	0.5125	0.0002	0.1499	353.7763
1994	3.1426	12.9732	212.0495	0.8640	0.6363	160.5050	0.4627	0.0001	0.1495	390.7830
1995	3.8551	9.7473	172.5320	0.7328	0.6181	162.9824	0.7046	0.0002	0.1476	351.3200
1996	3.8384	15.3379	193.8862	0.8492	0.5539	164.0968	0.9190	0.0002	0.1479	379.6293
1997	4.2027	16.5107	194.7019	0.8961	0.4687	167.9950	0.9730	0.0002	0.1462	385.8944
1998	4.0576	19.1782	216.0483	0.8682	0.6741	169.7497	0.9953	0.0003	0.1445	411.7162
1999	3.0441	13.8076	209.4368	0.6701	0.5865	147.6170	0.5855	0.0003	0.1432	375.8912
2000	3.3751	16.2750	217.6316	0.6869	0.7308	160.6049	0.6642	0.0003	0.1379	400.1067
2001	3.4870	16.5111	212.8232	0.7636	0.6909	166.6089	0.7636	0.0003	0.1402	401.7889
2002	3.7867	17.9901	222.5956	0.8291	0.7850	155.3222	0.9532	0.0003	0.1382	402.4004
2003	3.9635	19.0915	228.1931	0.8877	0.7921	163.6719	1.0222	0.0004	0.1366	417.7589
2004	4.2983	38.9636	230.4788	0.9117	0.8324	157.3312	1.4625	0.0003	0.1372	434.4160
2005	3.4218	34.4181	212.7193	0.6951	0.9546	149.3755	1.4901	0.0003	0.1375	403.2122
2006	3.4930	41.1634	177.9232	0.6628	1.0065	131.9934	1.5776	0.0003	0.1319	357.9522
2007	3.5770	37.9798	218.8975	0.6252	1.1739	120.0394	20.5042	0.0004	0.1356	402.9328
2008	3.7026	41.0048	199.4117	0.6482	1.1501	112.9900	6.8419	0.0004	0.1412	365.8909
2009	3.4152	25.9791	218.0010	0.5043	1.1286	100.4683	9.8482	0.0004	0.1365	359.4815
2010	3.2954	30.0712	213.9401	0.6013	1.2070	81.2390	17.7397	0.0004	0.1366	348.2306
2011	3.7077	33.5655	213.5362	0.5853	1.5057	68.4027	23.7624	0.0004	0.1397	345.2056
2012	3.5595	21.0384	209.8818	0.5336	1.4966	57.0285	14.6754	0.0004	0.1137	308.3279
2013	3.7751	23.3382	177.8330	0.5644	1.3131	51.9667	25.1698	0.0004	0.1148	284.0757
2014	3.1552	25.6822	177.7671	0.3400	1.1616	47.9613	10.9035	0.0004	0.1220	267.0933
2015	3.7654	32.2573	175.1656	0.3900	1.8391	51.6860	3.9872	0.0004	0.1168	269.2078
2016	3.7301	24.8206	194.3404	0.4806	2.2912	64.4984	3.2270	0.0004	0.1169	293.5057
2017	3.8416	32.1084	181.0397	0.5676	2.5330	57.0770	3.3442	0.0005	0.1152	280.6271
2018	3.6823	39.0731	182.7688	0.5044	2.3348	54.1756	3.3734	0.0005	0.1071	286.0199
2019	3.6915	41.8187	188.3873	0.4351	2.2086	46.9390	3.5401	0.0005	0.1116	287.1324
2020	3.8741	37.4807	277.8812	0.4509	2.3268	42.8519	3.4957	0.0006	0.1152	368.4772
2021	4.0240	39.8134	269.4566	0.4021	2.4327	43.1032	4.7029	0.0006	0.1181	364.0537
2022	4.0552	39.4349	266.5463	0.3270	2.5362	39.6114	5.2710	0.0005	0.1119	357.8943
2023	4.0151	42.5369	286.8554	0.3505	2.6153	35.5886	5.3820	0.0005	0.1101	377.4544

Table 146. Emission trends for Pb (kt) 1990-2023

Pb	A Public Power	B Industry	C Other Stationary Combustion	D Fugitive	E Solvents	F Road Transport	G Shipping + H Aviation + I Offroad	J Waste	K Agri Livestock + L Agri Other	Total
1990	5.7495	9.3093	4.4439	0.8152	NA	351.8605	0.0072	0.0000	0.0002	372.1859
1991	5.0774	6.6497	3.2538	0.3449	NA	328.6130	0.0049	0.0000	0.0002	343.9439
1992	4.6690	8.0520	4.4598	0.7895	NA	285.6732	0.0047	0.0000	0.0003	303.6485
1993	4.4378	4.1673	4.4910	0.7298	NA	181.6423	0.0009	0.0000	0.0002	195.4695
1994	4.0800	4.1131	3.9944	0.6728	NA	278.6388	0.0011	0.0000	0.0002	291.5004
1995	5.1957	3.6963	2.4362	0.5683	NA	273.5494	0.0014	0.0000	0.0002	285.4476
1996	5.0117	6.7893	3.3504	0.6284	NA	272.0703	0.0034	0.0000	0.0002	287.8539
1997	5.4057	8.2800	3.3655	0.6415	NA	284.6442	0.0041	0.0000	0.0002	302.3414
1998	5.4170	8.0955	4.2697	0.6236	NA	291.1375	0.0045	0.0001	0.0002	309.5481
1999	4.0306	3.9254	4.0052	0.5284	NA	259.4003	0.0029	0.0001	0.0002	271.8930
2000	4.5651	5.7565	3.9438	0.5365	NA	181.9144	0.0034	0.0001	0.0002	196.7200
2001	4.4603	5.2315	3.7880	0.5511	NA	188.0509	0.0034	0.0001	0.0002	202.0855
2002	4.6719	5.5302	4.1191	0.5836	NA	176.5603	0.0034	0.0001	0.0002	191.4688
2003	4.8913	5.8758	4.3143	0.6170	NA	219.9895	0.0032	0.0001	0.0002	235.6915
2004	4.9998	23.8479	4.3954	0.6319	NA	214.7996	0.0031	0.0001	0.0002	248.6779
2005	4.3695	28.7157	3.7998	0.4779	NA	197.3268	0.0031	0.0001	0.0002	234.6930
2006	4.6420	44.9433	2.3997	0.4506	NA	170.9155	0.0032	0.0001	0.0002	223.3547
2007	4.6179	38.7904	4.1690	0.4160	NA	161.5695	0.0031	0.0001	0.0002	209.5661
2008	4.7919	41.0675	3.5520	0.4377	NA	145.1722	0.0032	0.0001	0.0002	195.0249
2009	4.4094	27.6563	3.2284	0.3275	NA	127.9662	0.0031	0.0001	0.0002	163.5912
2010	4.0088	33.7568	3.5149	0.4083	NA	63.9534	0.0025	0.0001	0.0002	105.6451
2011	4.5139	31.9107	4.1353	0.4106	NA	8.0347	0.0020	0.0001	0.0002	49.0075
2012	4.2088	9.0150	3.0812	0.3746	NA	6.4875	0.0014	0.0001	0.0002	23.1688
2013	4.4590	9.9916	2.5443	0.3814	NA	6.4049	0.0014	0.0001	0.0002	23.7829
2014	3.4838	12.8690	2.1657	0.2001	NA	6.5447	0.0014	0.0001	0.0002	25.2650
2015	4.2671	21.5412	2.1814	0.2315	NA	7.6080	0.0016	0.0001	0.0002	35.8311
2016	4.2256	24.8517	2.6843	0.3012	NA	3.1080	0.0016	0.0001	0.0002	35.1726
2017	4.2758	39.7537	2.4085	0.3659	NA	3.2325	0.0013	0.0001	0.0002	50.0380
2018	4.0024	45.1342	2.2652	0.3068	NA	3.4112	0.0011	0.0001	0.0002	55.1211
2019	4.0209	39.7382	2.3376	0.2625	NA	3.6565	0.0011	0.0001	0.0002	50.0171
2020	4.2383	23.4579	3.2027	0.2700	NA	3.8375	0.0009	0.0001	0.0002	35.0077
2021	3.8864	24.4022	2.5545	0.2215	NA	4.1241	0.0038	0.0001	0.0002	35.1928
2022	3.8674	22.8189	2.5079	0.1426	NA	4.6217	0.0034	0.0001	0.0002	33.9621
2023	3.8043	18.8383	3.2475	0.1699	NA	4.7200	0.0034	0.0001	0.0002	30.7837

Table 147. Emission trends for Cd (kt) 1990-2023

Cd	A Public Power	B Industry	C Other Stationary Combustion	D Fugitive	E Solvents	F Road Transport	G Shipping + H Aviation + I Offroad	J Waste	K Agri Livestock + L Agri Other	Total
1990	0.6972	2.4832	0.6736	0.0171	0.0789	0.0155	0.0011	0.0000	0.0020	3.9686
1991	0.6236	2.1770	0.5769	0.0079	0.0882	0.0150	0.0009	0.0000	0.0019	3.4916
1992	0.5721	2.2338	0.4531	0.0156	0.0751	0.0139	0.0009	0.0000	0.0021	3.3666
1993	0.5383	0.9016	0.4536	0.0139	0.0799	0.0096	0.0003	0.0000	0.0020	1.9992
1994	0.4942	1.2047	0.4384	0.0130	0.0624	0.0140	0.0003	0.0000	0.0020	2.2289
1995	0.6282	1.2779	0.4194	0.0110	0.0606	0.0138	0.0003	0.0000	0.0019	2.4133
1996	0.6094	1.7351	0.4307	0.0126	0.0543	0.0138	0.0006	0.0000	0.0020	2.8584
1997	0.6595	1.8978	0.4309	0.0132	0.0459	0.0141	0.0006	0.0000	0.0019	3.0640
1998	0.6560	1.6065	0.4420	0.0128	0.0661	0.0146	0.0007	0.0000	0.0019	2.8006
1999	0.4908	0.8733	0.4388	0.0101	0.0575	0.0130	0.0005	0.0000	0.0019	1.8858
2000	0.5538	0.8275	0.4735	0.0103	0.0716	0.0149	0.0005	0.0000	0.0018	1.9539
2001	0.5414	0.6568	0.4716	0.0113	0.0677	0.0163	0.0005	0.0000	0.0019	1.7675
2002	0.5630	0.7070	0.4756	0.0122	0.0769	0.0165	0.0005	0.0000	0.0018	1.8535
2003	0.5895	0.3999	0.4779	0.0130	0.0776	0.0172	0.0005	0.0000	0.0018	1.5775
2004	0.6015	0.4642	0.4789	0.0134	0.0816	0.0178	0.0005	0.0000	0.0018	1.6597
2005	0.5322	0.7401	0.4718	0.0102	0.0936	0.0185	0.0005	0.0000	0.0018	1.8686
2006	0.5639	0.9918	0.4539	0.0097	0.0987	0.0195	0.0005	0.0000	0.0017	2.1397
2007	0.5612	0.7897	0.4752	0.0091	0.1151	0.0210	0.0005	0.0000	0.0018	1.9735
2008	0.5808	0.8333	0.3990	0.0095	0.1127	0.0218	0.0005	0.0000	0.0019	1.9594
2009	0.5368	0.6521	0.5691	0.0073	0.1106	0.0217	0.0004	0.0000	0.0018	1.9000
2010	0.4865	0.6422	0.5550	0.0088	0.1183	0.0215	0.0004	0.0000	0.0018	1.8346
2011	0.5456	0.7235	0.5194	0.0086	0.1476	0.0217	0.0003	0.0000	0.0018	1.9685
2012	0.5097	0.6407	0.5424	0.0079	0.1467	0.0190	0.0002	0.0000	0.0015	1.8680
2013	0.5378	0.6862	0.4586	0.0082	0.1287	0.0194	0.0002	0.0000	0.0015	1.8407
2014	0.4206	0.6439	0.4814	0.0048	0.1138	0.0202	0.0003	0.0000	0.0016	1.6867
2015	0.5155	0.8823	0.4791	0.0056	0.1802	0.0244	0.0003	0.0000	0.0015	2.0888
2016	0.5103	1.1805	0.4985	0.0069	0.2245	0.0131	0.0003	0.0000	0.0015	2.4357
2017	0.5162	1.3852	0.4577	0.0082	0.2482	0.0136	0.0002	0.0000	0.0015	2.6310
2018	0.4832	1.4031	0.4757	0.0072	0.2288	0.0144	0.0002	0.0000	0.0014	2.6141
2019	0.4850	1.5883	0.4926	0.0062	0.2165	0.0156	0.0002	0.0000	0.0015	2.8059
2020	0.5111	1.2377	0.7602	0.0065	0.2280	0.0163	0.0002	0.0000	0.0015	2.7616
2021	0.4702	1.0392	0.7907	0.0057	0.2384	0.0176	0.0005	0.0000	0.0016	2.5640
2022	0.4681	0.5775	0.7910	0.0045	0.2486	0.0199	0.0005	0.0000	0.0015	2.1115
2023	0.4603	1.1070	0.8000	0.0049	0.2563	0.0205	0.0005	0.0000	0.0015	2.6509

Table 148. Emission trends for Hg (kt) 1990-2023

Hg	A Public Power	B Industry	C Other Stationary Combustion	D Fugitive	E Solvents	F Road Transport	G Shipping + H Aviation + I Offroad	J Waste	K Agri Livestock + L Agri Other	Total
1990	1.1066	1.4013	0.1639	0.0281	0.0438	NA	0.0008	0.0011	0.0003	2.7460
1991	0.9712	0.7640	0.1187	0.0127	0.0438	NA	0.0005	0.0013	0.0003	1.9126
1992	0.8945	1.4084	0.1783	0.0261	0.0439	NA	0.0005	0.0013	0.0003	2.5534
1993	0.8543	1.2326	0.1802	0.0236	0.0439	NA	0.0001	0.0017	0.0003	2.3367
1994	0.7859	1.1637	0.1579	0.0219	0.0440	NA	0.0001	0.0015	0.0003	2.1753
1995	1.0015	0.9868	0.0861	0.0186	0.0440	NA	0.0002	0.0017	0.0003	2.1391
1996	0.9633	1.1513	0.1300	0.0210	0.0439	NA	0.0004	0.0016	0.0003	2.3119
1997	1.0373	1.1672	0.1305	0.0219	0.0438	NA	0.0005	0.0018	0.0003	2.4032
1998	1.0434	1.1593	0.1733	0.0212	0.0437	NA	0.0005	0.0033	0.0003	2.4451
1999	0.7741	0.9736	0.1607	0.0171	0.0436	NA	0.0003	0.0035	0.0003	1.9732
2000	0.8784	1.0109	0.1557	0.0174	0.0434	NA	0.0004	0.0035	0.0003	2.1099
2001	0.8582	1.0490	0.1491	0.0187	0.0433	NA	0.0004	0.0032	0.0003	2.1222
2002	0.9026	1.0976	0.1634	0.0201	0.0420	NA	0.0004	0.0034	0.0003	2.2298
2003	0.9449	1.1429	0.1720	0.0214	0.0419	NA	0.0004	0.0037	0.0003	2.3276
2004	0.9671	1.3454	0.1759	0.0219	0.0418	NA	0.0003	0.0035	0.0003	2.5562
2005	0.8396	1.1152	0.1500	0.0167	0.0417	NA	0.0003	0.0035	0.0003	2.1672
2006	0.8936	1.2356	0.0848	0.0158	0.0415	NA	0.0004	0.0037	0.0003	2.2756
2007	0.8888	1.1516	0.1710	0.0148	0.0413	NA	0.0003	0.0039	0.0003	2.2721
2008	0.9238	1.2098	0.1377	0.0154	0.0412	NA	0.0004	0.0039	0.0003	2.3324
2009	0.8489	0.7453	0.1258	0.0118	0.0410	NA	0.0003	0.0041	0.0003	1.7775
2010	0.7718	1.1036	0.1449	0.0143	0.0408	NA	0.0003	0.0043	0.0003	2.0803
2011	0.8707	1.2034	0.1799	0.0142	0.0406	NA	0.0002	0.0041	0.0003	2.3135
2012	0.8111	0.8387	0.1197	0.0129	0.0403	NA	0.0002	0.0042	0.0002	1.8273
2013	0.8609	0.7928	0.0972	0.0134	0.0401	NA	0.0002	0.0046	0.0002	1.8094
2014	0.6724	0.5108	0.0768	0.0076	0.0399	NA	0.0002	0.0045	0.0003	1.3125
2015	0.8235	0.7185	0.0800	0.0088	0.0397	NA	0.0002	0.0040	0.0002	1.6750
2016	0.8154	0.9697	0.1012	0.0111	0.0395	NA	0.0002	0.0046	0.0002	1.9420
2017	0.8254	0.8846	0.0887	0.0132	0.0393	NA	0.0001	0.0050	0.0002	1.8567
2018	0.7726	0.9195	0.0812	0.0115	0.0391	NA	0.0001	0.0051	0.0002	1.8293
2019	0.7768	0.7481	0.0837	0.0099	0.0388	NA	0.0001	0.0051	0.0002	1.6627
2020	0.8188	0.6220	0.1096	0.0102	0.0385	NA	0.0001	0.0059	0.0002	1.6053
2021	0.7501	0.5390	0.0813	0.0088	0.0381	NA	0.0004	0.0065	0.0002	1.4243
2022	0.7457	0.4530	0.0811	0.0066	0.0372	NA	0.0004	0.0053	0.0002	1.3294
2023	0.7338	0.6564	0.1127	0.0073	0.0370	NA	0.0004	0.0050	0.0002	1.5528

Table 149.Emission trends for As (kt) 1990-2023

As	A Public Power	B Industry	C Other Stationary Combustion	D Fugitive	E Solvents	F Road Transport	G Shipping + H Aviation + I Offroad	J Waste	K Agri Livestock + L Agri Other	Total
1990	5.4803	2.1222	0.0769	0.0279	0.0002	NA	0.0272	0.0000	0.0000	7.7347
1991	4.8360	1.6582	0.0552	0.0118	0.0002	NA	0.0184	0.0000	0.0000	6.5797
1992	4.4485	1.9601	0.0855	0.0270	0.0001	NA	0.0177	0.0000	0.0000	6.5388
1993	4.2300	1.0505	0.0865	0.0250	0.0000	NA	0.0034	0.0000	0.0000	5.3954
1994	3.8891	1.1298	0.0755	0.0230	0.0000	NA	0.0041	0.0000	0.0000	5.1215
1995	4.9529	1.0649	0.0397	0.0194	0.0000	NA	0.0054	0.0000	0.0000	6.0824
1996	4.7757	1.5829	0.0616	0.0215	0.0001	NA	0.0129	0.0000	0.0000	6.4547
1997	5.1500	1.8035	0.0618	0.0219	0.0001	NA	0.0156	0.0000	0.0000	7.0530
1998	5.1633	1.6647	0.0832	0.0213	0.0000	NA	0.0170	0.0000	0.0000	6.9496
1999	3.8403	0.9741	0.0769	0.0181	0.0000	NA	0.0109	0.0000	0.0000	4.9203
2000	4.3506	1.1209	0.0742	0.0184	0.0000	NA	0.0129	0.0000	0.0000	5.5770
2001	4.2512	1.0505	0.0709	0.0188	0.0000	NA	0.0129	0.0000	0.0000	5.4044
2002	4.4557	1.1131	0.0780	0.0200	0.0001	NA	0.0129	0.0000	0.0000	5.6798
2003	4.6650	1.0468	0.0823	0.0211	0.0000	NA	0.0122	0.0000	0.0000	5.8275
2004	4.7698	1.2452	0.0841	0.0216	0.0001	NA	0.0116	0.0000	0.0000	6.1325
2005	4.1630	1.2557	0.0714	0.0163	0.0002	NA	0.0116	0.0000	0.0000	5.5182
2006	4.4226	1.5559	0.0389	0.0154	0.0002	NA	0.0122	0.0000	0.0000	6.0452
2007	4.3996	1.3087	0.0819	0.0142	0.0002	NA	0.0116	0.0000	0.0000	5.8163
2008	4.5659	1.4102	0.0807	0.0150	0.0001	NA	0.0122	0.0000	0.0000	6.0842
2009	4.1984	0.9374	0.0700	0.0112	0.0001	NA	0.0116	0.0000	0.0000	5.2287
2010	3.8199	1.1157	0.0815	0.0140	0.0001	NA	0.0095	0.0000	0.0000	5.0408
2011	4.3029	1.3010	0.1122	0.0140	0.0001	NA	0.0075	0.0000	0.0000	5.7378
2012	4.0120	0.8134	0.0725	0.0128	0.0001	NA	0.0052	0.0000	0.0000	4.9160
2013	4.2509	0.8031	0.0545	0.0130	0.0001	NA	0.0054	0.0000	0.0000	5.1272
2014	3.3211	0.7476	0.0454	0.0068	NA	NA	0.0054	0.0000	0.0000	4.1264
2015	4.0672	1.0408	0.0477	0.0079	NA	NA	0.0061	0.0000	0.0000	5.1698
2016	4.0280	1.3865	0.0581	0.0103	NA	NA	0.0061	0.0000	0.0000	5.4890
2017	4.0763	1.4717	0.0507	0.0125	NA	NA	0.0048	0.0000	0.0000	5.6161
2018	3.8154	1.6645	0.0462	0.0105	NA	NA	0.0041	0.0000	0.0000	5.5408
2019	3.8335	1.6596	0.0464	0.0090	NA	NA	0.0041	0.0000	0.0000	5.5526
2020	4.0408	1.3487	0.0567	0.0092	NA	NA	0.0034	0.0001	0.0000	5.4588
2021	3.7037	1.2964	0.0417	0.0076	NA	NA	0.0143	0.0001	0.0000	5.0637
2022	3.6828	1.0593	0.0476	0.0049	NA	NA	0.0129	0.0000	0.0000	4.8076
2023	3.6227	1.3879	0.0578	0.0058	NA	NA	0.0129	0.0000	0.0000	5.0871

Table 150. Emission trends for Cr (kt) 1990-2023

Cr	A Public Power	B Industry	C Other Stationary Combustion	D Fugitive	E Solvents	F Road Transport	G Shipping + H Aviation + I Offroad	J Waste	K Agri Livestock + L Agri Other	Total
1990	3.4859	6.1020	1.4051	0.3588	0.0025	0.2136	0.0303	0.0000	0.0002	11.5985
1991	3.0756	4.6645	1.1663	0.1499	0.0020	0.2080	0.0214	0.0000	0.0002	9.2879
1992	2.8286	4.9557	1.0493	0.3503	0.0008	0.1956	0.0207	0.0000	0.0002	9.4011
1993	2.6904	1.9742	1.0527	0.3251	0.0001	0.1384	0.0045	0.0000	0.0002	6.1855
1994	2.4736	2.2858	0.9928	0.2993	0.0002	0.1989	0.0050	0.0000	0.0002	6.2559
1995	3.1505	2.3963	0.8505	0.2527	0.0003	0.1958	0.0065	0.0000	0.0002	6.8529
1996	3.0378	4.2269	0.9350	0.2782	0.0007	0.1956	0.0146	0.0000	0.0002	8.6890
1997	3.2759	5.1974	0.9362	0.2830	0.0007	0.2018	0.0174	0.0000	0.0002	9.9126
1998	3.2843	4.7361	1.0195	0.2752	0.0006	0.2065	0.0188	0.0000	0.0002	9.5413
1999	2.4429	2.0155	0.9953	0.2354	0.0002	0.1860	0.0122	0.0000	0.0002	5.8876
2000	2.7675	2.9907	1.0469	0.2388	0.0004	0.2137	0.0142	0.0000	0.0002	7.2725
2001	2.7039	2.5568	1.0332	0.2434	0.0005	0.2385	0.0143	0.0000	0.0002	6.7907
2002	2.8335	2.6450	1.0627	0.2570	0.0007	0.2435	0.0143	0.0000	0.0002	7.0570
2003	2.9666	2.5029	1.0802	0.2714	0.0006	0.2537	0.0136	0.0000	0.0002	7.0891
2004	3.0327	4.8916	1.0875	0.2778	0.0014	0.2643	0.0129	0.0000	0.0002	9.5685
2005	2.6480	5.8618	1.0345	0.2099	0.0019	0.2772	0.0129	0.0000	0.0002	10.0463
2006	2.8133	8.6668	0.9051	0.1977	0.0021	0.2951	0.0136	0.0000	0.0002	12.8938
2007	2.7986	7.2315	1.0735	0.1821	0.0021	0.3192	0.0129	0.0000	0.0002	11.6199
2008	2.9044	7.8410	0.8939	0.1919	0.0018	0.3330	0.0135	0.0000	0.0002	12.1797
2009	2.6710	5.3427	1.1569	0.1429	0.0012	0.3315	0.0127	0.0000	0.0002	9.6592
2010	2.4296	6.2736	1.1548	0.1791	0.0012	0.3232	0.0106	0.0000	0.0002	10.3723
2011	2.7366	6.2895	1.1442	0.1808	0.0010	0.3331	0.0084	0.0000	0.0002	10.6938
2012	2.5514	2.3159	1.1016	0.1649	0.0007	0.2869	0.0059	0.0000	0.0001	6.4276
2013	2.7035	2.5360	0.9287	0.1672	0.0006	0.2975	0.0062	0.0000	0.0001	6.6399
2014	2.1119	3.0242	0.9336	0.0863	NA	0.3107	0.0062	0.0000	0.0001	6.4731
2015	2.5866	4.7863	0.9320	0.0999	NA	0.3891	0.0070	0.0000	0.0001	8.8010
2016	2.5616	6.0933	0.9988	0.1309	NA	1.1376	0.0070	0.0000	0.0001	10.9293
2017	2.5922	8.2430	0.9110	0.1596	NA	1.1828	0.0055	0.0000	0.0001	13.0943
2018	2.4262	9.5911	0.9294	0.1328	NA	1.2489	0.0049	0.0000	0.0001	14.3335
2019	2.4376	9.1595	0.9622	0.1136	NA	1.3443	0.0049	0.0000	0.0001	14.0223
2020	2.5695	6.2830	1.4583	0.1167	NA	1.4028	0.0041	0.0001	0.0001	11.8345
2021	2.3548	6.3987	1.4625	0.0947	NA	1.5075	0.0157	0.0001	0.0001	11.8340
2022	2.3422	5.7322	1.4598	0.0587	NA	1.6973	0.0142	0.0000	0.0001	11.3046
2023	2.3040	5.5477	1.5274	0.0712	NA	1.7293	0.0142	0.0000	0.0001	11.1939

Table 151. Emission trends for Cu (kt) 1990-2023

Cu	A Public Power	B Industry	C Other Stationary Combustion	D Fugitive	E Solvents	F Road Transport	G Shipping + H Aviation + I Offroad	J Waste	K Agri Livestock + L Agri Other	Total
1990	0.4700	10.0102	0.8002	0.1069	0.0789	3.9889	0.1010	0.0000	0.0002	15.5562
1991	0.4537	8.4441	0.5909	0.0464	0.0882	3.8875	0.1001	0.0000	0.0002	13.6111
1992	0.4022	9.0494	0.7705	0.1017	0.0751	3.6606	0.0988	0.0000	0.0002	14.1584
1993	0.3401	4.0431	0.7738	0.0931	0.0799	2.5836	0.0352	0.0000	0.0002	7.9490
1994	0.3070	5.1687	0.6939	0.0861	0.0624	3.7176	0.0313	0.0000	0.0002	10.0672
1995	0.3828	5.3264	0.4491	0.0728	0.0606	3.6627	0.0355	0.0000	0.0002	9.9901
1996	0.3954	7.0151	0.5900	0.0813	0.0543	3.6642	0.0544	0.0000	0.0002	11.8548
1997	0.4433	7.5740	0.5929	0.0837	0.0459	3.7938	0.0577	0.0000	0.0002	12.5914
1998	0.4068	6.4820	0.7327	0.0813	0.0661	3.8877	0.0585	0.0000	0.0002	11.7152
1999	0.3230	3.7960	0.6914	0.0674	0.0575	3.5097	0.0421	0.0000	0.0002	8.4873
2000	0.3549	3.5501	0.6873	0.0686	0.0716	4.0301	0.0425	0.0000	0.0002	8.8052
2001	0.3480	2.9075	0.6616	0.0717	0.0677	4.5049	0.0442	0.0000	0.0002	8.6057
2002	0.3330	3.1493	0.7156	0.0764	0.0769	4.6059	0.0459	0.0000	0.0002	9.0032
2003	0.3480	1.9764	0.7472	0.0810	0.0776	4.7986	0.0446	0.0000	0.0001	8.0737
2004	0.3483	4.2162	0.7602	0.0830	0.0816	5.0043	0.0451	0.0000	0.0002	10.5388
2005	0.3569	5.8753	0.6629	0.0629	0.0935	5.2497	0.0434	0.0000	0.0002	12.3448
2006	0.3635	8.8319	0.4441	0.0595	0.0986	5.5987	0.0446	0.0000	0.0001	15.4410
2007	0.3635	7.4642	0.7177	0.0552	0.1150	6.0521	0.0421	0.0000	0.0001	14.8101
2008	0.3636	7.8085	0.6379	0.0579	0.1127	6.3187	0.0415	0.0000	0.0002	15.3410
2009	0.3516	5.6264	0.5830	0.0437	0.1106	6.2822	0.0386	0.0000	0.0001	13.0364
2010	0.3095	6.4283	0.6164	0.0539	0.1183	6.1680	0.0365	0.0000	0.0001	13.7310
2011	0.3324	6.3456	0.7078	0.0538	0.1476	6.3462	0.0311	0.0000	0.0002	13.9647
2012	0.3172	3.4478	0.5627	0.0491	0.1467	5.4703	0.0243	0.0000	0.0001	10.0182
2013	0.3218	3.5863	0.4668	0.0504	0.1287	5.6600	0.0252	0.0000	0.0001	10.2395
2014	0.2557	3.5370	0.4147	0.0274	0.1138	5.9076	0.0255	0.0000	0.0001	10.2820
2015	0.3141	5.3914	0.4136	0.0317	0.1802	7.4060	0.0285	0.0000	0.0001	13.7656
2016	0.3107	7.1931	0.4986	0.0406	0.2245	24.6634	0.0285	0.0000	0.0001	32.9595
2017	0.3125	9.7688	0.4543	0.0490	0.2482	25.6369	0.0260	0.0000	0.0001	36.4959
2018	0.2935	10.0974	0.4344	0.0417	0.2288	27.0687	0.0264	0.0000	0.0001	38.1910
2019	0.2904	9.7537	0.4470	0.0357	0.2165	29.1121	0.0281	0.0000	0.0001	39.8836
2020	0.3053	6.4298	0.6186	0.0368	0.2280	30.3696	0.0235	0.0000	0.0001	38.0119
2021	0.2942	5.7796	0.5190	0.0309	0.2384	32.6262	0.0470	0.0001	0.0001	39.5355
2022	0.2996	3.6360	0.5118	0.0214	0.2486	36.7290	0.0428	0.0000	0.0001	41.4893
2023	0.2933	5.3288	0.6276	0.0246	0.2563	37.4044	0.0411	0.0000	0.0001	43.9763

Table 152. Emission trends for Ni (kt) 1990-2023

Ni	A Public Power	B Industry	C Other Stationary Combustion	D Fugitive	E Solvents	F Road Transport	G Shipping + H Aviation + I Offroad	J Waste	K Agri Livestock + L Agri Other	Total
1990	6.4871	8.3378	0.4024	0.2780	0.0606	0.0430	1.2821	0.0000	0.0001	16.8912
1991	8.8085	9.5824	0.2904	0.1241	0.0609	0.0416	0.8667	0.0000	0.0001	19.7747
1992	7.5965	8.6450	0.4150	0.2596	0.0443	0.0389	0.8347	0.0000	0.0001	17.8342
1993	5.0979	4.1114	0.4180	0.2352	0.0408	0.0272	0.1612	0.0000	0.0001	10.0919
1994	4.4027	3.9280	0.3700	0.2182	0.0326	0.0394	0.1930	0.0000	0.0001	9.1841
1995	5.1948	4.0195	0.2182	0.1847	0.0327	0.0388	0.2571	0.0000	0.0001	9.9459
1996	6.3260	6.1749	0.3072	0.2088	0.0333	0.0388	0.6093	0.0000	0.0001	13.6984
1997	7.6697	7.6651	0.3087	0.2165	0.0289	0.0402	0.7372	0.0000	0.0001	16.6664
1998	5.8017	5.1415	0.3968	0.2101	0.0380	0.0411	0.8011	0.0000	0.0001	12.4304
1999	5.3387	4.6509	0.3710	0.1704	0.0308	0.0370	0.5129	0.0000	0.0001	11.1119
2000	5.2711	2.2621	0.3633	0.1738	0.0395	0.0424	0.6088	0.0000	0.0001	8.7610
2001	5.2537	4.7123	0.3481	0.1853	0.0382	0.0471	0.6088	0.0000	0.0001	11.1936
2002	3.9286	4.8939	0.3804	0.1986	0.0447	0.0480	0.6089	0.0000	0.0001	10.1032
2003	4.1310	5.0219	0.3994	0.2112	0.0434	0.0501	0.5769	0.0000	0.0001	10.4342
2004	3.8079	11.3980	0.4073	0.2166	0.0524	0.0520	0.5450	0.0000	0.0001	16.4795
2005	5.7592	15.9670	0.3492	0.1645	0.0622	0.0544	0.5449	0.0000	0.0001	22.9016
2006	5.3905	24.6549	0.2128	0.1559	0.0666	0.0576	0.5769	0.0000	0.0001	31.1154
2007	5.4656	20.8073	0.4308	0.1455	0.0751	0.0620	0.5449	0.0000	0.0001	27.5313
2008	5.0188	18.5358	0.3512	0.1520	0.0710	0.0646	0.5768	0.0000	0.0001	24.7702
2009	5.2995	14.1837	0.3461	0.1159	0.0655	0.0644	0.5447	0.0000	0.0001	20.6200
2010	4.5955	15.7333	0.3404	0.1414	0.0690	0.0629	0.4488	0.0001	0.0001	21.3915
2011	4.3929	13.9317	0.4382	0.1399	0.0824	0.0643	0.3527	0.0000	0.0001	19.4024
2012	4.4760	5.3175	0.3268	0.1276	0.0795	0.0558	0.2438	0.0000	0.0001	10.6273
2013	3.9527	4.9505	0.2925	0.1324	0.0697	0.0576	0.2566	0.0001	0.0001	9.7122
2014	3.2494	6.2581	0.2069	0.0746	0.0569	0.0600	0.2566	0.0001	0.0001	10.1626
2015	4.0226	9.6268	0.2085	0.0859	0.0901	0.0745	0.2887	0.0000	0.0001	14.3972
2016	3.9856	12.3118	0.2628	0.1086	0.1123	0.1720	0.2887	0.0001	0.0001	17.2420
2017	3.9527	19.3838	0.2295	0.1301	0.1241	0.1787	0.2247	0.0001	0.0001	24.2237
2018	3.7001	21.0027	0.2092	0.1124	0.1144	0.1888	0.1928	0.0001	0.0001	25.5205
2019	3.5132	18.1630	0.2137	0.0966	0.1082	0.2037	0.1928	0.0001	0.0001	22.4914
2020	3.6701	9.0627	0.2935	0.0997	0.1140	0.2126	0.1607	0.0001	0.0001	13.6135
2021	3.8919	9.2289	0.2303	0.0856	0.1192	0.2286	0.6729	0.0001	0.0001	14.4575
2022	3.9704	8.9309	0.2289	0.0630	0.1243	0.2573	0.6088	0.0001	0.0001	14.1838
2023	3.8084	6.5489	0.3003	0.0705	0.1282	0.2629	0.6087	0.0001	0.0001	11.7281

Table 153. Emission trends for Se (kt) 1990-2023

Se	A Public Power	B Industry	C Other Stationary Combustion	D Fugitive	E Solvents	F Road Transport	G Shipping + H Aviation + I Offroad	J Waste	K Agri Livestock + L Agri Other	Total
1990	17.1257	0.4881	2.2604	0.0342	0.0002	0.0038	0.0087	0.0000	0.0000	19.9212
1991	14.9785	0.5553	1.4054	0.0144	0.0002	0.0037	0.0061	0.0000	0.0000	16.9636
1992	13.7962	0.8073	2.5103	0.0332	0.0001	0.0034	0.0059	0.0000	0.0000	17.1563
1993	13.2109	0.6676	2.4940	0.0307	0.0000	0.0024	0.0012	0.0000	0.0000	16.4069
1994	12.1586	0.5902	2.1929	0.0283	0.0000	0.0035	0.0014	0.0000	0.0000	14.9750
1995	15.5028	0.3838	1.2535	0.0239	0.0000	0.0035	0.0018	0.0000	0.0000	17.1694
1996	14.8931	0.5982	1.7425	0.0264	0.0001	0.0034	0.0042	0.0000	0.0000	17.2679
1997	16.0250	0.6108	1.7645	0.0269	0.0001	0.0036	0.0050	0.0000	0.0000	18.4359
1998	16.1453	0.7275	2.2592	0.0262	0.0000	0.0037	0.0054	0.0000	0.0000	19.1674
1999	11.9660	0.6197	2.1052	0.0222	0.0000	0.0034	0.0035	0.0000	0.0000	14.7202
2000	13.5891	0.6685	2.0387	0.0226	0.0000	0.0039	0.0041	0.0000	0.0000	16.3271
2001	13.2725	0.7212	1.9175	0.0231	0.0000	0.0043	0.0041	0.0000	0.0000	15.9428
2002	13.9745	0.7999	2.1609	0.0245	0.0001	0.0043	0.0041	0.0000	0.0000	16.9684
2003	14.6299	0.8474	2.2989	0.0259	0.0000	0.0045	0.0039	0.0000	0.0000	17.8107
2004	14.9736	0.8785	2.3533	0.0265	0.0001	0.0047	0.0037	0.0000	0.0000	18.2405
2005	12.9727	0.5791	1.9109	0.0200	0.0002	0.0049	0.0037	0.0000	0.0000	15.4916
2006	13.8129	0.5803	1.0967	0.0189	0.0002	0.0052	0.0039	0.0000	0.0000	15.5182
2007	13.7356	0.5530	2.0214	0.0174	0.0002	0.0057	0.0037	0.0001	0.0000	16.3371
2008	14.2816	0.6317	2.2233	0.0183	0.0001	0.0060	0.0039	0.0001	0.0000	17.1651
2009	13.1037	0.3810	1.2195	0.0137	0.0001	0.0059	0.0037	0.0001	0.0000	14.7277
2010	11.9274	0.5273	1.2034	0.0171	0.0001	0.0058	0.0031	0.0001	0.0000	13.6842
2011	13.4674	0.7375	1.5054	0.0172	0.0001	0.0059	0.0024	0.0001	0.0000	15.7361
2012	12.5407	0.5144	1.2425	0.0157	0.0001	0.0052	0.0017	0.0001	0.0000	14.3203
2013	13.3178	0.4375	1.0576	0.0160	0.0001	0.0055	0.0018	0.0001	0.0000	14.8362
2014	10.3948	0.3958	0.8799	0.0084	NA	0.0056	0.0018	0.0001	0.0000	11.6863
2015	12.7300	0.4534	0.8139	0.0097	NA	0.0060	0.0020	0.0001	0.0000	14.0151
2016	12.6070	0.6461	1.1883	0.0126	NA	0.0187	0.0020	0.0001	0.0000	14.4748
2017	12.7614	0.5096	1.1750	0.0153	NA	0.0194	0.0016	0.0001	0.0000	14.4824
2018	11.9425	0.5592	1.0694	0.0128	NA	0.0205	0.0014	0.0001	0.0000	13.6058
2019	12.0084	0.4497	1.0789	0.0110	NA	0.0226	0.0014	0.0001	0.0000	13.5721
2020	12.6596	0.4713	1.2880	0.0113	NA	0.0236	0.0012	0.0001	0.0000	14.4550
2021	11.5733	0.3911	0.7806	0.0092	NA	0.0255	0.0045	0.0001	0.0000	12.7844
2022	11.4972	0.3858	0.6997	0.0059	NA	0.0286	0.0041	0.0001	0.0000	12.6215
2023	11.3131	0.6238	1.1856	0.0071	NA	0.0297	0.0041	0.0001	0.0000	13.1635

Table 154. Emission trends for Zn (kt) 1990-2023

Zn	A Public Power	B Industry	C Other Stationary Combustion	D Fugitive	E Solvents	F Road Transport	G Shipping + H Aviation + I Offroad	J Waste	K Agri Livestock + L Agri Other	Total
1990	4.3718	10.5630	30.2015	0.4685	0.0394	4.1025	0.0780	0.0001	0.0012	49.8261
1991	4.8558	7.8688	25.1628	0.1971	0.0441	3.9488	0.0714	0.0001	0.0012	42.1501
1992	4.2850	9.3376	22.0607	0.4553	0.0375	3.6769	0.0702	0.0001	0.0013	39.9248
1993	3.3561	5.5975	22.1036	0.4217	0.0400	2.5594	0.0230	0.0002	0.0013	34.1027
1994	2.9895	5.0472	20.9591	0.3885	0.0312	3.7202	0.0212	0.0002	0.0013	33.1583
1995	3.6679	4.2420	18.4316	0.3281	0.0303	3.6648	0.0246	0.0002	0.0012	30.3908
1996	3.9822	7.8312	19.9008	0.3621	0.0271	3.6585	0.0408	0.0002	0.0012	35.8041
1997	4.5811	9.6499	19.9282	0.3691	0.0230	3.7711	0.0446	0.0002	0.0012	38.3682
1998	3.9543	9.1448	21.3837	0.3588	0.0330	3.8649	0.0460	0.0004	0.0012	38.7872
1999	3.2874	5.5645	20.9558	0.3053	0.0287	3.4778	0.0322	0.0004	0.0012	33.6533
2000	3.4704	6.9160	22.1705	0.3099	0.0358	3.9742	0.0338	0.0004	0.0012	36.9121
2001	3.4241	7.6151	21.9117	0.3172	0.0339	4.3803	0.0348	0.0003	0.0012	37.7185
2002	3.0545	7.9354	22.4585	0.3355	0.0385	4.4518	0.0358	0.0004	0.0012	38.3114
2003	3.2020	8.8463	22.7795	0.3544	0.0388	4.6383	0.0346	0.0004	0.0011	39.8955
2004	3.1345	20.8978	22.9122	0.3630	0.0408	4.8067	0.0344	0.0004	0.0012	52.1909
2005	3.5675	23.7972	21.9279	0.2744	0.0468	5.0128	0.0334	0.0004	0.0012	54.6615
2006	3.5396	36.9095	19.6376	0.2586	0.0493	5.2856	0.0346	0.0004	0.0011	65.7162
2007	3.5575	32.0711	22.4623	0.2384	0.0575	5.7044	0.0326	0.0004	0.0011	64.1254
2008	3.4699	33.3170	19.1069	0.2511	0.0564	5.9136	0.0328	0.0004	0.0012	62.1493
2009	3.4317	23.4127	24.8271	0.1875	0.0553	5.9085	0.0306	0.0004	0.0011	57.8550
2010	3.0425	28.7314	24.5848	0.2343	0.0591	5.8349	0.0279	0.0005	0.0011	62.5165
2011	3.1611	27.2432	23.9936	0.2360	0.0738	5.9300	0.0234	0.0004	0.0012	60.6628
2012	3.0740	9.4905	23.7091	0.2153	0.0733	5.1856	0.0178	0.0005	0.0010	41.7670
2013	3.0035	11.2352	19.9750	0.2188	0.0643	5.3502	0.0186	0.0005	0.0010	39.8671
2014	2.4087	12.0031	20.4026	0.1139	0.0569	5.5561	0.0187	0.0005	0.0010	40.5616
2015	2.9622	18.6223	20.3146	0.1319	0.0901	6.6660	0.0209	0.0004	0.0010	48.8094
2016	2.9339	22.8459	21.6487	0.1721	0.1123	8.1325	0.0209	0.0005	0.0010	55.8678
2017	2.9393	34.1004	19.8482	0.2094	0.1241	8.3201	0.0185	0.0005	0.0010	65.5616
2018	2.7586	38.1014	20.3449	0.1750	0.1144	8.7381	0.0183	0.0005	0.0009	70.2521
2019	2.6977	33.9974	21.0462	0.1497	0.1082	9.5363	0.0193	0.0006	0.0009	67.5562
2020	2.8313	20.7467	31.9487	0.1539	0.1140	9.9373	0.0162	0.0006	0.0010	65.7496
2021	2.8003	21.2623	32.2991	0.1256	0.1192	10.6840	0.0374	0.0007	0.0010	67.3297
2022	2.8594	20.5149	32.2564	0.0795	0.1243	11.9349	0.0340	0.0006	0.0009	67.8049
2023	2.7816	16.4023	33.4505	0.0955	0.1282	12.3283	0.0330	0.0005	0.0009	65.2208

Table 155. Emission trends for PCDD/PCDF (kt) 1990-2023

PCDD/PCDF	A Public Power	B Industry	C Other Stationary Combustion	D Fugitive	E Solvents	F Road Transport	G Shipping + H Aviation + I Offroad	J Waste	K Agri Livestock + L Agri Other	Total
1990	3.8493	3.5140	55.0742	6.3297	0.0015	0.5326	0.0188	0.0000	1.1106	70.4307
1991	3.3769	2.4071	44.0430	2.6442	0.0016	0.4975	0.0127	0.0000	1.1032	54.0864
1992	3.1028	4.0497	43.1696	6.1798	0.0014	0.4631	0.0122	0.0000	1.1791	58.1577
1993	2.9538	3.0453	43.1262	5.7373	0.0015	0.3160	0.0024	0.0000	1.1236	56.3061
1994	2.7162	2.7003	40.3269	5.2816	0.0012	0.4652	0.0028	0.0000	1.1208	52.6149
1995	3.4599	1.7831	33.2833	4.4594	0.0011	0.4595	0.0038	0.0000	1.1063	44.5565
1996	3.3345	3.0215	37.1050	4.9078	0.0010	0.4662	0.0089	0.0000	1.1084	49.9534
1997	3.5949	3.3357	37.2410	4.9928	0.0009	0.4908	0.0108	0.0000	1.0957	50.7626
1998	3.6064	3.6290	41.0703	4.8546	0.0012	0.5109	0.0118	0.0001	1.0832	54.7674
1999	2.6812	2.6224	39.8984	4.1530	0.0011	0.4679	0.0075	0.0001	1.0732	50.9048
2000	3.0416	2.9979	41.5948	4.2132	0.0013	0.5360	0.0089	0.0001	1.0336	53.4273
2001	2.9710	2.9403	40.7509	4.2931	0.0013	0.5970	0.0089	0.0001	1.0512	52.6136
2002	3.1151	3.2672	42.4713	4.5339	0.0014	0.6045	0.0089	0.0001	1.0362	55.0387
2003	3.2607	3.6943	43.4579	4.7865	0.0014	0.6301	0.0085	0.0001	1.0241	56.8637
2004	3.3344	11.6395	43.8557	4.9007	0.0015	0.6625	0.0080	0.0001	1.0286	65.4309
2005	2.9107	11.0262	40.7360	3.7027	0.0017	0.6886	0.0080	0.0001	1.0309	60.1050
2006	3.0913	13.5562	34.5172	3.4868	0.0018	0.7279	0.0085	0.0001	0.9885	56.3782
2007	3.0753	12.1961	41.8094	3.2109	0.0021	0.7948	0.0080	0.0001	1.0162	62.1130
2008	3.1916	13.2164	37.6566	3.3848	0.0021	0.8348	0.0085	0.0001	1.0583	59.3531
2009	2.9358	7.7651	42.4441	2.5205	0.0020	0.8396	0.0080	0.0001	1.0229	57.5381
2010	2.6706	9.3194	41.6897	3.1594	0.0022	0.8436	0.0066	0.0001	1.0240	58.7155
2011	3.0089	11.0427	41.3361	3.1888	0.0027	0.8573	0.0052	0.0001	1.0475	60.4893
2012	2.8045	5.5607	40.7522	2.9096	0.0027	0.7744	0.0036	0.0001	0.8520	53.6597
2013	2.9758	6.3833	34.5122	2.9493	0.0024	0.8103	0.0038	0.0001	0.8604	48.4975
2014	2.3262	7.5449	34.6528	1.5211	0.0021	0.8406	0.0038	0.0001	0.9147	47.8062
2015	2.8483	10.0724	34.2034	1.7615	0.0033	1.0167	0.0042	0.0001	0.8757	50.7857
2016	2.8208	6.6224	37.6641	2.3077	0.0042	0.0000	0.0042	0.0001	0.8765	50.3000
2017	2.8540	9.5784	34.9869	2.8139	0.0046	0.0000	0.0033	0.0001	0.8636	51.1048
2018	2.6729	12.4593	35.4291	2.3418	0.0042	0.0000	0.0028	0.0001	0.8025	53.7129
2019	2.6846	13.2121	36.5479	2.0021	0.0040	0.0000	0.0028	0.0001	0.8368	55.2903
2020	2.8295	11.5674	54.2605	2.0569	0.0042	0.0000	0.0024	0.0001	0.8637	71.5846
2021	2.5985	13.0357	53.0298	1.6683	0.0044	0.0000	0.0099	0.0001	0.8850	71.2317
2022	2.5939	12.0696	52.5248	1.0327	0.0046	0.0000	0.0089	0.0001	0.8388	69.0736
2023	2.5519	14.1496	56.1481	1.2540	0.0047	0.0000	0.0089	0.0001	0.8257	74.9430

Table 156. Emission trends for benzo a pyren (kt) 1990-2023

benzo a pyren	A Public Power	B Industry	C Other Stationary Combustion	D Fugitive	E Solvents	F Road Transport	G Shipping + H Aviation + I Offroad	J Waste	K Agri Livestock + L Agri Other	Total
1990	0.0005	0.3588	10.4307	0.3373	0.0016	0.0092	0.0009	0.0000	0.0009	11.1399
1991	0.0004	0.2212	7.9795	0.1408	0.0018	0.0084	0.0012	0.0000	0.0009	8.3542
1992	0.0004	0.4283	8.8833	0.3294	0.0015	0.0077	0.0012	0.0000	0.0009	9.6528
1993	0.0004	0.4247	8.8677	0.3059	0.0016	0.0052	0.0005	0.0000	0.0009	9.6069
1994	0.0004	0.3683	8.1563	0.2816	0.0013	0.0078	0.0004	0.0000	0.0009	8.8170
1995	0.0005	0.1828	6.1835	0.2378	0.0012	0.0077	0.0005	0.0000	0.0009	6.6149
1996	0.0004	0.2976	7.2431	0.2616	0.0011	0.0079	0.0005	0.0000	0.0009	7.8132
1997	0.0005	0.3004	7.2826	0.2661	0.0009	0.0083	0.0005	0.0000	0.0009	7.8602
1998	0.0005	0.4105	8.3480	0.2587	0.0036	0.0086	0.0005	0.0000	0.0009	9.0313
1999	0.0004	0.3773	8.0218	0.2214	0.0024	0.0079	0.0004	0.0000	0.0008	8.6325
2000	0.0004	0.3654	8.2103	0.2246	0.0026	0.0092	0.0003	0.0000	0.0008	8.8137
2001	0.0004	0.3618	7.9701	0.2288	0.0023	0.0107	0.0004	0.0000	0.0008	8.5753
2002	0.0004	0.4270	8.4581	0.2416	0.0021	0.0109	0.0004	0.0000	0.0008	9.1414
2003	0.0004	0.4966	8.7372	0.2550	0.0022	0.0117	0.0004	0.0000	0.0008	9.5043
2004	0.0005	0.5059	8.8484	0.2611	0.0027	0.0125	0.0004	0.0000	0.0008	9.6324
2005	0.0004	0.1096	7.9635	0.1973	0.0025	0.0132	0.0004	0.0000	0.0008	8.2878
2006	0.0004	0.1100	6.2319	0.1858	0.0025	0.0147	0.0004	0.0000	0.0008	6.5464
2007	0.0004	0.1850	8.2417	0.1710	0.0027	0.0166	0.0004	0.0000	0.0008	8.6186
2008	0.0004	0.2325	7.7297	0.1803	0.0030	0.0177	0.0003	0.0000	0.0008	8.1648
2009	0.0005	0.1393	7.5785	0.1342	0.0025	0.0183	0.0003	0.0000	0.0008	7.8744
2010	0.0005	0.1928	7.4829	0.1683	0.0029	0.0175	0.0003	0.0000	0.0008	7.8660
2011	0.0005	0.1548	7.7346	0.1699	0.0037	0.0189	0.0003	0.0000	0.0008	8.0835
2012	0.0005	0.3004	7.3258	0.1550	0.0035	0.0178	0.0003	0.0000	0.0007	7.8039
2013	0.0006	0.2741	6.2041	0.1571	0.0033	0.0196	0.0003	0.0000	0.0007	6.6598
2014	0.0005	0.2395	6.0395	0.0810	0.0031	0.0212	0.0003	0.0000	0.0007	6.3857
2015	0.0006	0.2542	5.9200	0.0938	0.0043	0.0264	0.0003	0.0000	0.0007	6.3002
2016	0.0006	0.2760	6.7895	0.1229	0.0046	0.0256	0.0003	0.0000	0.0007	7.2202
2017	0.0006	0.2108	6.3564	0.1499	0.0051	0.0277	0.0003	0.0000	0.0007	6.7515
2018	0.0006	0.1459	6.3203	0.1247	0.0047	0.0294	0.0003	0.0000	0.0006	6.6264
2019	0.0006	0.1691	6.5006	0.1066	0.0044	0.0335	0.0004	0.0000	0.0007	6.8158
2020	0.0006	0.2000	9.3711	0.1095	0.0047	0.0352	0.0003	0.0000	0.0007	9.7220
2021	0.0007	0.0980	8.7038	0.0887	0.0049	0.0376	0.0004	0.0000	0.0007	8.9348
2022	0.0010	0.0962	8.5543	0.0548	0.0051	0.0420	0.0003	0.0000	0.0007	8.7544
2023	0.0010	0.2256	9.5685	0.0666	0.0053	0.0440	0.0003	0.0000	0.0006	9.9119

Table 157. Emission trends for benzo b fluoranthen (kt) 1990-2023

benzo b fluoranthen	A Public Power	B Industry	C Other Stationary Combustion	D Fugitive	E Solvents	F Road Transport	G Shipping + H Aviation + I Offroad	J Waste	K Agri Livestock + L Agri Other	Total
1990	0.0142	0.4517	11.8677	0.4216	0.0007	0.0243	0.0015	0.0000	0.0024	12.7841
1991	0.0124	0.2833	8.7637	0.1760	0.0007	0.0235	0.0020	0.0000	0.0024	9.2640
1992	0.0114	0.5440	10.7285	0.4118	0.0006	0.0220	0.0020	0.0000	0.0026	11.7229
1993	0.0109	0.5382	10.7037	0.3824	0.0007	0.0156	0.0009	0.0000	0.0025	11.6548
1994	0.0100	0.4662	9.7353	0.3520	0.0005	0.0224	0.0007	0.0000	0.0025	10.5896
1995	0.0128	0.2277	6.9309	0.2972	0.0005	0.0219	0.0008	0.0000	0.0024	7.4943
1996	0.0123	0.3756	8.4326	0.3270	0.0005	0.0217	0.0009	0.0000	0.0024	9.1730
1997	0.0132	0.3791	8.4897	0.3326	0.0004	0.0225	0.0009	0.0000	0.0024	9.2408
1998	0.0133	0.5220	10.0005	0.3234	0.0017	0.0227	0.0008	0.0000	0.0024	10.8868
1999	0.0099	0.4804	9.5372	0.2768	0.0011	0.0204	0.0007	0.0000	0.0024	10.3288
2000	0.0112	0.4650	9.6355	0.2808	0.0012	0.0233	0.0006	0.0000	0.0023	10.4198
2001	0.0110	0.4602	9.2919	0.2860	0.0010	0.0262	0.0006	0.0000	0.0023	10.0793
2002	0.0115	0.5442	9.9889	0.3020	0.0009	0.0265	0.0007	0.0000	0.0023	10.8770
2003	0.0121	0.6337	10.3871	0.3188	0.0009	0.0274	0.0007	0.0000	0.0022	11.3829
2004	0.0124	0.6455	10.5456	0.3264	0.0012	0.0285	0.0007	0.0000	0.0023	11.5626
2005	0.0107	0.1348	9.2817	0.2466	0.0011	0.0299	0.0007	0.0000	0.0023	9.7077
2006	0.0114	0.1357	6.8255	0.2322	0.0011	0.0318	0.0007	0.0000	0.0022	7.2406
2007	0.0113	0.2333	9.6748	0.2138	0.0012	0.0346	0.0006	0.0000	0.0022	10.1718
2008	0.0118	0.3616	9.3203	0.2254	0.0013	0.0363	0.0006	0.0000	0.0023	9.9596
2009	0.0108	0.2295	8.2282	0.1678	0.0011	0.0364	0.0005	0.0000	0.0022	8.6765
2010	0.0098	0.3212	8.1643	0.2104	0.0012	0.0334	0.0006	0.0000	0.0022	8.7432
2011	0.0111	0.2832	8.7353	0.2124	0.0015	0.0356	0.0005	0.0000	0.0023	9.2820
2012	0.0104	0.5131	8.0040	0.1938	0.0015	0.0307	0.0004	0.0000	0.0019	8.7558
2013	0.0110	0.4022	6.7775	0.1964	0.0014	0.0329	0.0004	0.0000	0.0019	7.4237
2014	0.0086	0.3674	6.4208	0.1012	0.0013	0.0351	0.0005	0.0000	0.0020	6.9369
2015	0.0105	0.3831	6.2559	0.1172	0.0018	0.0446	0.0005	0.0000	0.0019	6.8156
2016	0.0104	0.3984	7.4320	0.1536	0.0019	0.0418	0.0005	0.0000	0.0019	8.0405
2017	0.0105	0.3058	7.0021	0.1873	0.0021	0.0444	0.0005	0.0000	0.0019	7.5547
2018	0.0099	0.2247	6.8555	0.1558	0.0019	0.0466	0.0006	0.0000	0.0018	7.2968
2019	0.0099	0.2621	7.0337	0.1332	0.0018	0.0526	0.0006	0.0000	0.0018	7.4957
2020	0.0105	0.2909	9.8764	0.1369	0.0019	0.0566	0.0005	0.0000	0.0019	10.3756
2021	0.0096	0.1622	8.7385	0.1109	0.0020	0.0616	0.0006	0.0000	0.0019	9.0874
2022	0.0095	0.1650	8.5229	0.0685	0.0021	0.0726	0.0006	0.0000	0.0018	8.8430
2023	0.0094	0.3269	9.9628	0.0833	0.0021	0.0725	0.0005	0.0000	0.0018	10.4592

Table 158. Emission trends for benzo k fluoranthen (kt) 1990-2023

benzo k fluoranten	A Public Power	B Industry	C Other Stationary Combustion	D Fugitive	E Solvents	F Road Transport	G Shipping + H Aviation + I Offroad	J Waste	K Agri Livestock + L Agri Other	Total
1990	0.0112	0.1818	4.5932	0.2108	0.0007	0.0202	NA	0.0000	0.0010	5.0189
1991	0.0098	0.1135	3.3814	0.0880	0.0007	0.0197	NA	0.0000	0.0010	3.6141
1992	0.0090	0.2185	4.1753	0.2059	0.0006	0.0187	NA	0.0000	0.0011	4.6291
1993	0.0086	0.2167	4.1658	0.1912	0.0007	0.0138	NA	0.0000	0.0011	4.5978
1994	0.0079	0.1877	3.7850	0.1760	0.0005	0.0192	NA	0.0000	0.0010	4.1773
1995	0.0100	0.0917	2.6782	0.1486	0.0005	0.0188	NA	0.0000	0.0010	2.9488
1996	0.0097	0.1512	3.2712	0.1635	0.0005	0.0187	NA	0.0000	0.0010	3.6157
1997	0.0104	0.1526	3.2937	0.1663	0.0004	0.0190	NA	0.0000	0.0010	3.6434
1998	0.0105	0.2102	3.8902	0.1617	0.0017	0.0191	NA	0.0000	0.0010	4.2943
1999	0.0078	0.1934	3.7073	0.1384	0.0011	0.0171	NA	0.0000	0.0010	4.0661
2000	0.0088	0.1872	3.7409	0.1404	0.0012	0.0199	NA	0.0000	0.0010	4.0994
2001	0.0086	0.1853	3.6055	0.1430	0.0010	0.0226	NA	0.0000	0.0010	3.9671
2002	0.0090	0.2191	3.8803	0.1510	0.0009	0.0230	NA	0.0000	0.0010	4.2844
2003	0.0095	0.2552	4.0374	0.1594	0.0009	0.0239	NA	0.0000	0.0010	4.4872
2004	0.0097	0.2599	4.0999	0.1632	0.0012	0.0249	NA	0.0000	0.0010	4.5598
2005	0.0084	0.0543	3.6015	0.1233	0.0011	0.0264	NA	0.0000	0.0010	3.8161
2006	0.0090	0.0547	2.6321	0.1161	0.0011	0.0285	NA	0.0000	0.0009	2.8424
2007	0.0089	0.0939	3.7582	0.1069	0.0012	0.0310	NA	0.0000	0.0010	4.0010
2008	0.0092	0.1220	3.6249	0.1127	0.0013	0.0327	NA	0.0000	0.0010	3.9039
2009	0.0085	0.0736	3.1725	0.0839	0.0011	0.0330	NA	0.0000	0.0010	3.3735
2010	0.0077	0.1014	3.1512	0.1052	0.0012	0.0306	NA	0.0000	0.0010	3.3983
2011	0.0087	0.0803	3.3838	0.1062	0.0015	0.0328	NA	0.0000	0.0010	3.6144
2012	0.0081	0.1603	3.0875	0.0969	0.0015	0.0278	NA	0.0000	0.0008	3.3829
2013	0.0086	0.1401	2.6139	0.0982	0.0014	0.0297	NA	0.0000	0.0008	2.8928
2014	0.0067	0.1251	2.4687	0.0506	0.0013	0.0317	NA	0.0000	0.0009	2.6850
2015	0.0082	0.1319	2.4045	0.0586	0.0018	0.0405	NA	0.0000	0.0008	2.6464
2016	0.0082	0.1417	2.8663	0.0768	0.0019	0.0377	NA	0.0000	0.0008	3.1333
2017	0.0083	0.1071	2.7012	0.0937	0.0021	0.0398	NA	0.0000	0.0008	2.9530
2018	0.0077	0.0739	2.6405	0.0779	0.0019	0.0416	NA	0.0000	0.0008	2.8442
2019	0.0078	0.0866	2.7086	0.0666	0.0018	0.0470	NA	0.0000	0.0008	2.9192
2020	0.0082	0.1022	3.7937	0.0684	0.0019	0.0510	NA	0.0000	0.0008	4.0263
2021	0.0075	0.0497	3.3396	0.0555	0.0020	0.0557	NA	0.0000	0.0008	3.5109
2022	0.0075	0.0496	3.2548	0.0343	0.0021	0.0667	NA	0.0000	0.0008	3.4158
2023	0.0073	0.1161	3.8227	0.0416	0.0021	0.0656	NA	0.0000	0.0008	4.0563

Table 159. Emission trends for Indeno 1,2,3 pyren (kt) 1990-2023

Indeno 1,2,3 pyren	A Public Power	B Industry	C Other Stationary Combustion	D Fugitive	E Solvents	F Road Transport	G Shipping + H Aviation + I Offroad	J Waste	K Agri Livestock + L Agri Other	Total
1990	0.0009	0.1419	5.6140	0.1476	0.0007	0.0152	NA	0.0000	0.0007	5.9210
1991	0.0009	0.0886	4.3582	0.0616	0.0007	0.0141	NA	0.0000	0.0007	4.5249
1992	0.0008	0.1704	4.6400	0.1441	0.0006	0.0129	NA	0.0000	0.0008	4.9696
1993	0.0007	0.1690	4.6313	0.1338	0.0007	0.0087	NA	0.0000	0.0008	4.9450
1994	0.0006	0.1464	4.2854	0.1232	0.0005	0.0128	NA	0.0000	0.0008	4.5697
1995	0.0008	0.0715	3.3553	0.1040	0.0005	0.0127	NA	0.0000	0.0007	3.5455
1996	0.0008	0.1179	3.8525	0.1145	0.0005	0.0128	NA	0.0000	0.0007	4.0997
1997	0.0009	0.1191	3.8716	0.1164	0.0004	0.0134	NA	0.0000	0.0007	4.1225
1998	0.0008	0.1639	4.3721	0.1132	0.0017	0.0138	NA	0.0000	0.0007	4.6662
1999	0.0006	0.1508	4.2185	0.0969	0.0011	0.0126	NA	0.0000	0.0007	4.4813
2000	0.0007	0.1459	4.3470	0.0983	0.0012	0.0141	NA	0.0000	0.0007	4.6078
2001	0.0007	0.1445	4.2327	0.1001	0.0010	0.0159	NA	0.0000	0.0007	4.4956
2002	0.0007	0.1708	4.4644	0.1057	0.0009	0.0159	NA	0.0000	0.0007	4.7592
2003	0.0007	0.1990	4.5967	0.1116	0.0009	0.0164	NA	0.0000	0.0007	4.9261
2004	0.0007	0.2027	4.6494	0.1142	0.0012	0.0172	NA	0.0000	0.0007	4.9862
2005	0.0007	0.0424	4.2291	0.0863	0.0011	0.0177	NA	0.0000	0.0007	4.3780
2006	0.0007	0.0427	3.4129	0.0813	0.0011	0.0190	NA	0.0000	0.0007	3.5583
2007	0.0007	0.0733	4.3559	0.0748	0.0012	0.0206	NA	0.0000	0.0007	4.5272
2008	0.0007	0.0960	4.0541	0.0789	0.0013	0.0214	NA	0.0000	0.0007	4.2532
2009	0.0007	0.0582	4.1514	0.0587	0.0011	0.0217	NA	0.0000	0.0007	4.2924
2010	0.0006	0.0802	4.0784	0.0736	0.0012	0.0197	NA	0.0000	0.0007	4.2545
2011	0.0007	0.0639	4.1415	0.0743	0.0015	0.0207	NA	0.0000	0.0007	4.3034
2012	0.0007	0.1269	4.0060	0.0678	0.0015	0.0191	NA	0.0000	0.0006	4.2225
2013	0.0007	0.1104	3.3954	0.0687	0.0014	0.0206	NA	0.0000	0.0006	3.5978
2014	0.0005	0.0986	3.3501	0.0354	0.0013	0.0220	NA	0.0000	0.0006	3.5086
2015	0.0007	0.1039	3.2884	0.0410	0.0018	0.0273	NA	0.0000	0.0006	3.4637
2016	0.0007	0.1113	3.7169	0.0538	0.0019	0.0264	NA	0.0000	0.0006	3.9115
2017	0.0007	0.0844	3.4759	0.0656	0.0021	0.0285	NA	0.0000	0.0006	3.6577
2018	0.0006	0.0584	3.4809	0.0545	0.0019	0.0303	NA	0.0000	0.0005	3.6272
2019	0.0006	0.0685	3.5831	0.0466	0.0018	0.0340	NA	0.0000	0.0006	3.7353
2020	0.0007	0.0805	5.2199	0.0479	0.0019	0.0359	NA	0.0000	0.0006	5.3874
2021	0.0006	0.0396	4.9448	0.0388	0.0020	0.0386	NA	0.0000	0.0006	5.0651
2022	0.0006	0.0395	4.8722	0.0240	0.0021	0.0436	NA	0.0000	0.0006	4.9825
2023	0.0006	0.0913	5.3530	0.0292	0.0021	0.0453	NA	0.0000	0.0006	5.5221

Table 160. Emission trends for Total 1-4 PAH (kt) 1990-2023

Total 1-4 PAH	A Public Power	B Industry	C Other Stationary Combustion	D Fugitive	E Solvents	F Road Transport	G Shipping + H Aviation + I Offroad	J Waste	K Agri Livestock + L Agri Other	Total
1990	0.0268	6.9271	32.5056	1.1172	0.0036	0.0690	0.0024	0.0000	0.0051	40.6568
1991	0.0235	3.8778	24.4827	0.4664	0.0040	0.0658	0.0031	0.0000	0.0051	28.9285
1992	0.0216	2.6454	28.4271	1.0913	0.0034	0.0614	0.0031	0.0000	0.0054	32.2587
1993	0.0206	1.5055	28.3684	1.0134	0.0036	0.0434	0.0014	0.0000	0.0052	30.9613
1994	0.0189	1.2249	25.9620	0.9328	0.0028	0.0623	0.0011	0.0000	0.0051	28.2099
1995	0.0241	0.8456	19.1479	0.7876	0.0028	0.0612	0.0012	0.0000	0.0051	20.8753
1996	0.0232	2.3617	22.7994	0.8666	0.0025	0.0612	0.0014	0.0000	0.0051	26.1211
1997	0.0250	3.2289	22.9376	0.8814	0.0021	0.0633	0.0014	0.0000	0.0050	27.1447
1998	0.0251	3.4414	26.6107	0.8570	0.0087	0.0643	0.0013	0.0000	0.0050	31.0134
1999	0.0186	1.5517	25.4848	0.7335	0.0058	0.0581	0.0010	0.0000	0.0049	27.8585
2000	0.0211	2.6654	25.9337	0.7441	0.0061	0.0666	0.0009	0.0000	0.0047	29.4427
2001	0.0207	2.2978	25.1002	0.7579	0.0054	0.0755	0.0010	0.0000	0.0048	28.2632
2002	0.0217	2.5796	26.7918	0.8003	0.0049	0.0764	0.0010	0.0000	0.0048	30.2805
2003	0.0227	3.1791	27.7584	0.8448	0.0050	0.0795	0.0010	0.0000	0.0047	31.8952
2004	0.0232	4.4166	28.1433	0.8650	0.0064	0.0832	0.0011	0.0000	0.0047	33.5435
2005	0.0202	3.7034	25.0758	0.6535	0.0058	0.0873	0.0010	0.0000	0.0047	29.5519
2006	0.0215	5.0113	19.1024	0.6153	0.0057	0.0940	0.0010	0.0000	0.0045	24.8559
2007	0.0214	4.6556	26.0306	0.5666	0.0062	0.1027	0.0010	0.0000	0.0047	31.3888
2008	0.0222	5.1499	24.7290	0.5973	0.0070	0.1081	0.0009	0.0000	0.0049	30.6193
2009	0.0205	3.2389	23.1306	0.4447	0.0057	0.1093	0.0008	0.0000	0.0047	26.9553
2010	0.0187	4.0280	22.8767	0.5576	0.0066	0.1012	0.0009	0.0000	0.0047	27.5943
2011	0.0210	4.0320	23.9953	0.5629	0.0083	0.1080	0.0008	0.0000	0.0048	28.7330
2012	0.0196	2.0708	22.4233	0.5136	0.0078	0.0954	0.0007	0.0000	0.0039	25.1350
2013	0.0209	2.0602	18.9909	0.5205	0.0076	0.1028	0.0007	0.0000	0.0039	21.7075
2014	0.0164	2.5127	18.2792	0.2682	0.0070	0.1099	0.0007	0.0000	0.0042	21.1984
2015	0.0200	3.5732	17.8689	0.3106	0.0096	0.1388	0.0008	0.0000	0.0040	21.9260
2016	0.0198	4.2968	20.8046	0.4070	0.0102	0.1315	0.0008	0.0000	0.0040	25.6748
2017	0.0201	4.3094	19.5357	0.4964	0.0113	0.1405	0.0008	0.0000	0.0040	24.5182
2018	0.0188	5.1283	19.2972	0.4130	0.0104	0.1478	0.0009	0.0000	0.0037	25.0201
2019	0.0189	5.1716	19.8261	0.3530	0.0099	0.1671	0.0010	0.0000	0.0038	25.5513
2020	0.0199	3.7589	28.2612	0.3627	0.0104	0.1787	0.0008	0.0000	0.0040	32.5966
2021	0.0184	3.6780	25.7268	0.2940	0.0109	0.1935	0.0010	0.0000	0.0041	29.9267
2022	0.0186	3.5032	25.2042	0.1816	0.0113	0.2249	0.0009	0.0000	0.0038	29.1485
2023	0.0183	3.7022	28.7070	0.2207	0.0117	0.2274	0.0008	0.0000	0.0038	32.8919

Table 161. Emission trends for HCB (kt) 1990-2023

HCB	A Public Power	B Industry	C Other Stationary Combustion	D Fugitive	E Solvents	F Road Transport	G Shipping + H Aviation + I Offroad	J Waste	K Agri Livestock + L Agri Other	Total
1990	2.5606	0.0431	0.2595	NA	NA	NA	0.0056	0.0001	NA	2.8689
1991	2.2258	0.0529	0.2221	NA	NA	NA	0.0038	0.0001	NA	2.5047
1992	2.0485	0.0986	0.1747	NA	NA	NA	0.0036	0.0001	NA	2.3255
1993	1.9642	0.0761	0.1748	NA	NA	NA	0.0007	0.0002	NA	2.2160
1994	1.8081	0.0672	0.1690	NA	NA	NA	0.0008	0.0002	NA	2.0453
1995	2.3059	0.0354	0.1616	NA	NA	NA	0.0011	0.0002	NA	2.5042
1996	2.2136	0.0661	0.1659	NA	NA	NA	0.0027	0.0002	NA	2.4485
1997	2.3808	0.0687	0.1660	NA	NA	NA	0.0032	0.0002	NA	2.6189
1998	2.4010	0.0921	0.1703	NA	NA	NA	0.0035	0.0003	NA	2.6672
1999	1.7783	0.0822	0.1690	NA	NA	NA	0.0022	0.0004	NA	2.0320
2000	2.0224	0.0993	0.1824	NA	NA	NA	0.0027	0.0004	NA	2.3071
2001	1.9748	0.0978	0.1816	NA	NA	NA	0.0027	0.0003	NA	2.2572
2002	2.0811	0.1087	0.1832	NA	NA	NA	0.0027	0.0003	NA	2.3760
2003	2.1782	0.1140	0.1841	NA	NA	NA	0.0025	0.0004	NA	2.4792
2004	2.2302	0.1602	0.1845	NA	NA	NA	0.0024	0.0004	NA	2.5776
2005	1.9306	0.1168	0.1817	NA	NA	NA	0.0024	0.0003	NA	2.2318
2006	2.0551	0.1415	0.1748	NA	NA	NA	0.0025	0.0004	NA	2.3742
2007	2.0434	0.1282	0.1828	NA	NA	NA	0.0024	0.0004	NA	2.3572
2008	2.1247	0.1612	0.1531	NA	NA	NA	0.0025	0.0004	NA	2.4419
2009	1.9484	0.0975	0.2182	NA	NA	NA	0.0024	0.0004	NA	2.2669
2010	1.7735	0.1319	0.2125	NA	NA	NA	0.0020	0.0004	NA	2.1202
2011	2.0036	0.1823	0.1979	NA	NA	NA	0.0015	0.0004	NA	2.3858
2012	1.8652	0.0956	0.2076	NA	NA	NA	0.0011	0.0004	NA	2.1700
2013	1.9822	0.1074	0.1759	NA	NA	NA	0.0011	0.0005	NA	2.2670
2014	1.5471	0.1029	0.1846	NA	NA	NA	0.0011	0.0005	NA	1.8362
2015	1.8944	0.1279	0.1836	NA	NA	NA	0.0013	0.0004	NA	2.2076
2016	1.8762	0.1442	0.1912	NA	NA	NA	0.0013	0.0005	NA	2.2133
2017	1.8992	0.1601	0.1757	NA	NA	NA	0.0010	0.0005	NA	2.2365
2018	1.7775	0.1875	0.1826	NA	NA	NA	0.0008	0.0005	NA	2.1489
2019	1.7874	0.1587	0.1891	NA	NA	NA	0.0008	0.0005	NA	2.1366
2020	1.8843	0.1373	0.2921	NA	NA	NA	0.0007	0.0006	NA	2.3150
2021	1.7224	0.1329	0.3038	NA	NA	NA	0.0029	0.0007	NA	2.1627
2022	1.7120	0.1246	0.3035	NA	NA	NA	0.0027	0.0005	NA	2.1433
2023	1.6846	0.1568	0.3074	NA	NA	NA	0.0027	0.0005	NA	2.1520

Table 162. Emission trends for PCB (kt) 1990-2023

PCB	A Public Power	B Industry	C Other Stationary Combustion	D Fugitive	E Solvents	F Road Transport	G Shipping + H Aviation + I Offroad	J Waste	K Agri Livestock + L Agri Other	Total
1990	0.0013	840.1327	4.0584	NA	NA	NA	0.0228	0.0003	NA	844.2155
1991	0.0011	924.5225	2.7357	NA	NA	NA	0.0154	0.0004	NA	927.2750
1992	0.0010	975.1400	4.6852	NA	NA	NA	0.0148	0.0004	NA	979.8414
1993	0.0010	808.6036	4.7241	NA	NA	NA	0.0029	0.0005	NA	813.3320
1994	0.0009	822.2481	4.1060	NA	NA	NA	0.0034	0.0004	NA	826.3589
1995	0.0011	834.9253	2.0897	NA	NA	NA	0.0046	0.0005	NA	837.0211
1996	0.0011	908.5007	3.2700	NA	NA	NA	0.0108	0.0005	NA	911.7830
1997	0.0012	916.8829	3.2901	NA	NA	NA	0.0131	0.0005	NA	920.1878
1998	0.0012	880.5958	4.4579	NA	NA	NA	0.0143	0.0009	NA	885.0701
1999	0.0009	799.6606	4.1158	NA	NA	NA	0.0091	0.0010	NA	803.7874
2000	0.0010	812.2219	3.9394	NA	NA	NA	0.0108	0.0010	NA	816.1741
2001	0.0010	811.6457	3.7366	NA	NA	NA	0.0108	0.0009	NA	815.3949
2002	0.0010	782.6407	4.1670	NA	NA	NA	0.0108	0.0009	NA	786.8204
2003	0.0011	779.5463	4.4204	NA	NA	NA	0.0103	0.0010	NA	783.9791
2004	0.0011	771.1329	4.5255	NA	NA	NA	0.0097	0.0010	NA	775.6702
2005	0.0010	770.6087	3.7513	NA	NA	NA	0.0097	0.0010	NA	774.3717
2006	0.0010	776.9118	1.9428	NA	NA	NA	0.0103	0.0010	NA	778.8669
2007	0.0010	777.0091	4.2240	NA	NA	NA	0.0097	0.0011	NA	781.2450
2008	0.0011	785.4169	3.6307	NA	NA	NA	0.0103	0.0011	NA	789.0601
2009	0.0012	778.7877	2.7091	NA	NA	NA	0.0097	0.0011	NA	781.5088
2010	0.0012	802.3432	3.1225	NA	NA	NA	0.0080	0.0012	NA	805.4761
2011	0.0013	811.1470	4.0334	NA	NA	NA	0.0063	0.0011	NA	815.1891
2012	0.0012	780.0282	2.5891	NA	NA	NA	0.0043	0.0012	NA	782.6240
2013	0.0015	751.7683	2.1095	NA	NA	NA	0.0046	0.0013	NA	753.8851
2014	0.0013	724.2448	1.5506	NA	NA	NA	0.0046	0.0012	NA	725.8026
2015	0.0016	723.6246	1.5747	NA	NA	NA	0.0051	0.0011	NA	725.2072
2016	0.0016	721.4462	2.1916	NA	NA	NA	0.0051	0.0013	NA	723.6458
2017	0.0016	715.5980	1.9426	NA	NA	NA	0.0040	0.0014	NA	717.5475
2018	0.0016	716.4998	1.7037	NA	NA	NA	0.0034	0.0014	NA	718.2099
2019	0.0015	721.3687	1.7532	NA	NA	NA	0.0034	0.0014	NA	723.1283
2020	0.0016	731.2262	2.1648	NA	NA	NA	0.0029	0.0016	NA	733.3971
2021	0.0020	762.6870	1.2176	NA	NA	NA	0.0120	0.0018	NA	763.9203
2022	0.0028	699.6986	1.1511	NA	NA	NA	0.0108	0.0015	NA	700.8648
2023	0.0028	750.5813	2.1114	NA	NA	NA	0.0108	0.0014	NA	752.7077