



REPUBLIC OF SERBIA
Ministry of Environmental Protection
Environmental Protection Agency

REPUBLIC OF SERBIA
INFORMATIVE INVENTORY REPORT
TO LRTAP CONVENTION FOR 2021

Belgrade, 2021

TABLE OF CONTENT

EXECUTIVE SUMMARY	1
1. INTRODUCTION	1
1.1 NATIONAL INVENTORY BACKGROUND	2
1.2 INSTITUTIONAL ARRANGEMENTS	3
1.3 INVENTORY PREPARATION PROCESS	3
1.4 METHODS AND DATA SOURCES	4
1.5 KEY CATEGORIES	6
1.6 QA/QC AND VERIFICATION METHODS	8
1.7. GENERAL UNCERTAINTY EVALUATION	11
1.8 GENERAL ASSESSMENT OF COMPLETENESS	12
2. EXPLANATION OF KEY TRENDS	16
2.1. THE METHODOLOGY FOR KEY SOURCE ANALYSIS	16
2.2. KEY SOURCE ANALYSIS	16
2.3. RESULTS OF THE LEVEL AND TREND ASSESSMENT (APPROACH 1)	22
2.4. TREND IN TOTAL EMISSIONS	41
3. ENERGY (NFR 1)	106
-1 A Fuel Combustion Activities	107
-1.B Fugitive emissions	124
4.INDUSTRIAL PROCESSES AND PRODUCTS USE (NFR 2)	128
-2.A Mineral industry	129
-2.B Chemical industry	132
-2.C Metal industry	139
-2.D Other industry	143
5.AGRICULTURE (NFR 3)	152
-3.B Animal Husbandry and Manure Management	152
-3.D.a.1. Agricultural Soils	153
-3.D e. Cultivated crops	155
-3.F Field burning of agricultural wastes	156
6.WASTE (NFR 5)	157
-5.A Solid Waste Disposal on Land	157
-5.C.1. Cremation	157
-5.D.1. Domestic wastewater handling	158

-5.D.2. Industrial wastewater handling	158
-5.C Waste incineration	159
7. OTHER AND NATURAL EMISSIONS (NFR 11)	159
-11.A. Natural sources	159
-11.B Forest fires	159
8. RECALCULATION AND IMPROVEMENTS	166
9. PROJECTIONS	167
10. REPORTING OF GRIDDES EMISSIONS AND LPS	167
11. EMISSION TRENDS PER SECTOR	168

EXECUTIVE SUMMARY

Serbian Informative Inventory Report (IIR) and the complete set of NFR tables represent Serbian official submission under the United Nations Economic Commission 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 (NO_x), non-methane volatile organic compounds (NMVOC), Sulphur oxides (SO_x), ammonia (NH₃) and carbon monoxide (CO);

Particulate matter (PM): primary PM (fine particulate matter (PM_{2,5}) 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 2019. 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 2019 was compiled according to the recommendations for inventories as set out by the UNECE Executive Body and in the EMEP/EEA Emission Inventory Guidebook 2019.

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, 2018 and 2019 in Serbia are given in table 2.

Table 2. The total emissions time series by pollutants in 1990, 1995, 2000, 2005, 2010, 2018 and 2019 in Serbia

Pollutant	Unit	1990	1995	2000	2005	2010	2018	2019
NO _x	kt	185.43	154.92	148.36	169.13	151.24	130.90	128.82
NMVOC	kt	191.72	145.87	149.34	149.41	136.86	120.31	121.29
SO _x	kt	577.12	499.86	463.51	445.40	403.87	346.93	395.38
NH ₃	kt	128.53	117.95	108.72	110.63	94.92	81.75	76.07
PM _{2.5}	kt	60.37	42.13	44.22	48.35	50.23	44.87	45.59
PM ₁₀	kt	79.24	57.47	58.55	63.47	64.65	60.17	61.37
TSP	kt	164.25	108.05	91.96	124.06	111.96	107.62	81.70
BC	kt	32.74	39.33	24.12	46.32	41.98	34.60	33.01
CO	kt	587.92	441.79	451.96	510.09	442.78	327.63	329.93
Pb	t	372.31	285.60	196.81	234.89	105.83	52.67	47.37
Cd	t	4.91	3.61	2.64	3.29	3.09	3.64	3.77
Hg	t	2.92	2.34	2.23	2.41	2.30	2.02	1.84
As	t	7.77	6.10	5.59	5.55	5.08	5.58	5.59
Cr	t	11.71	6.97	7.34	10.18	10.50	13.50	13.11
Cu	t	15.65	10.09	8.87	12.47	13.84	17.87	17.84
Ni	t	16.94	10.02	8.80	22.98	21.44	25.43	22.38
Se	t	17.76	15.98	14.35	13.70	12.63	12.62	12.57
Zn	t	50.43	31.15	37.36	55.61	63.36	64.70	61.31
PCDD	g I-TEQ	595.50	722.33	441.77	860.17	766.36	633.65	602.38

benzo a pyren	t	82.39	98.54	61.54	116.76	103.82	85.10	80.83
benzo b fluoranthen	t	211.82	264.28	157.72	312.72	276.77	226.49	214.24
benzo k fluoranthen	t	98.38	123.39	73.19	145.94	129.12	105.66	99.90
Indeno 1,2,3 pyren	t	66.87	82.17	49.71	97.16	86.32	70.75	67.04
Total 1-4 PAH	t	465.25	568.65	343.67	675.95	599.37	492.63	466.61
HCB	kg	2.87	2.50	2.31	2.24	2.13	2.15	2.14
PCB	kg	844.22	837.02	816.17	774.37	805.48	718.21	723.14

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, NO_x, 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 — 2019. 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" (2019).

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 2019 is 1680 g/GJ.

Also new elementary lignite analysis was performed for the period 2015 – 2018 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,	Tier 2

Other metal production (Magnesium production)	
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 than 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 2019” (EEA 2019)”. It stipulates that a key category is one that is prioritised within the national inventory system because it 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 2019).

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 trees 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 2019).

The identification includes all NFR categories and all reported gases

SO₂, NO_x, NMVOC, NH₃, CO

PM: TSP, PM₁₀, PM_{2.5}

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 2019 to the UNECE/LRTAP. For all gases a level assessment for all years 1990 (base year) and 2019 (last year), as well as a trend assessment for 1990 to 2019 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 management - 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

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 manager 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	Nebojsa Redzic	December
Check availability of literature material	Andjelka Radosavljevic		Nebojsa Redzic	
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	Nebojsa Redzic	December
Cross-check descriptions of input data and the emission factors with information about categories	Andjelka Radosavljevic	December	Nebojsa Redzic	December
Check the correctness of interpretation and use of activity data and emission factors	Andjelka Radosavljevic	December	Nebojsa Redzic	December
Check that the parameters and units are	Andjelka	December	Nebojsa Redzic	December

Republic of Serbia Informative inventory report to LRTAP convention for 2021

accurately recorded	Radosavljevic			
Check that used appropriate conversion factors	Andjelka Radosavljevic	December	Nebojsa Redzic	December
Check whether the unit is properly marked in the worksheets	Andjelka Radosavljevic	December	Nebojsa Redzic	December
Check the consistency of data between the categories	Andjelka Radosavljevic	December	Nebojsa Redzic	December
Identified e.g. activity data common to several categories	Andjelka Radosavljevic	December	Nebojsa Redzic	December
Check the consistency of the activity data	Andjelka Radosavljevic	December	Nebojsa Redzic	December
Check the consistency of time series of input activity data for each category	Andjelka Radosavljevic	December	Nebojsa Redzic	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	Nebojsa Redzic	December
Check whether there is double counting, i.e. duplication of entries	Andjelka Radosavljevic	December	Nebojsa Redzic	December
Check out the use of units and all necessary conversions of the same	Andjelka Radosavljevic	December	Nebojsa Redzic	December
Used to check the consistency of data on activities for each pollutant within each category.	Andjelka Radosavljevic	December	Nebojsa Redzic	December
Check the correctness of the emissions calculation	Andjelka Radosavljevic	December	Nebojsa Redzic	December
Check the consistency of trends	Andjelka Radosavljevic	December	Nebojsa Redzic	December
PREPARING IIR (INFORMATIVE INVENTORY REPORT)				
Check the values in the text and excel tables	Andjelka Radosavljevic	10. February to 14th March	Nebojsa Redzic	the 14th March
Check out the Figures	Andjelka Radosavljevic	10. February to 14th March	Nebojsa Redzic	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 1990–2019.

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 2019. 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 2010-2018
1 A 1 a	All relevant	No available data for Light oil-gas oil from 1990-2004 and for 2011
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
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 2004-2018
1A2f	All relevant	No available data for Fine ceramic materials from 2016-2018
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 2011, 2012 and from 2014-2018
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
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
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 2013-2018
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 2014-2018
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
1A4aai	All relevant
1A4bii	All relevant
1A4ciii	All relevant
1A5a	All relevant
1A5b	All relevant
	NO _x , NMVOC,

2A1	SO _x , CO, HMs and POPs (except PCBs)
2A2	NO _x , SO _x , CO
2A3	NO _x , SO _x , 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
3F	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 2019, 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.

Republic of Serbia Informative inventory report to LRTAP convention for 2021

NFR Code	NFR Category	% 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					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											
3B1b	Manure management - Non-dairy cattle					11	17																																						28	27												
3B2	Manure management - Sheep						59																																							59	22											
3B3	Manure management - Swine					37	86				5																																			128	11											
3B4a	Manure management - Buffalo																																																									
3B4d	Manure management - Goats																																																									
3B4e	Manure management - Horses																																																									
3B4f	Manure management - Mules and asses																																																									
3B4gi	Manure mangement - Laying hens					7	46																																										53	23								
3B4gii	Manure mangement - Broilers						33																																										33	26								
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)																																																									
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																																																									

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 2019

Level Assessment							
NFR Category Code	NFR Category	Pollutant	Year (2019) Estim. [kt] Ex,t	Level Assessment Lx,t	Cumulative Total of Lx,t		
1A1a	Public electricity and heat production	NOx	69.3495	81.99%	81.99%		

Trend Assessment							
NFR Category Code	NFR Category	Pollutant	Base Year (1990) Estimate [kt] Ex,0	Latest Year (2019) 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	73.61	0.132	68.10%	68.1%
1A2f	Stationary combustion in manufacturing industries and construction: Non-metallic minerals	NOx	5.36	3.15	0.012	5.96%	74.1%
1A4bi	Residential: Stationary	NOx	5.96	4.25	0.009	4.68%	78.7%
1A2gvii	Mobile Combustion in manufacturing industries and construction: (please specify in the IIR)	NOx	3.85	3.40	0.007	3.79%	82.5%

Table 12. Key Categories for NMVOC emissions for the year 2019

Level Assessment						
NFR Category Code	NFR Category	Pollutant	Year (2019) Estimate [kt] Ex,t	Level Assessment Lx,t	Cumulative Total of Lx,t	
1B1a	Fugitive emission from solid fuels: Coal mining and handling	NMVOC	31.1024	29.27%	29.27%	
1A4bi	Residential: Stationary	NMVOC	26.1454	24.60%	53.9%	
2D3a	Domestic solvent use including fungicides	NMVOC	8.3120	7.82%	61.7%	
3B1a	Manure management - Dairy cattle	NMVOC	7.5799	7.13%	68.8%	
1B2av	Distribution of oil products	NMVOC	5.3564	5.04%	73.9%	

Republic of Serbia Informative inventory report to LRTAP convention for 2021

2D3h	Printing	NMVOG	4.5024	4.24%	78.1%
2H2	Food and beverages industry	NMVOG	4.4394	4.18%	82.3%

Trend Assessment							
NFR Category Code	NFR Category	Pollutant	Base Year (1990) Estimate [kt] Ex,0	Latest Year (2019) Estimate [kt] Ex,t	Trend Assessment Lx,t	% Contribution to the trend	Cumulative Total of Lx,t
1B1a	Fugitive emission from solid fuels: Coal mining and handling	NMVOC	35.02	31.82	0.061	34.46%	34.5%
1A4bi	Residential: Stationary	NMVOC	38.35	24.83	0.025	14.31%	48.8%
2D3a	Domestic solvent use including fungicides	NMVOC	9.39	8.43	0.016	9.15%	57.9%
2H2	Food and beverages industry	NMVOC	13.34	9.02	0.016	8.81%	66.7%
1B2av	Distribution of oil products	NMVOC	5.00	5.32	0.013	7.63%	74.4%
2D3h	Printing	NMVOC	5.09	4.56	0.009	4.96%	79.3%
1A2e	Stationary combustion in manufacturing industries and construction: Food processing, beverages and tobacco	NMVOC	0.66	0.92	0.005	2.97%	82.3%

Table 13. Key Categories for SO_x emissions for the year 2019

Level Assessment					
NFR Category Code	NFR Category	Pollutant	Year (2019) Estimate [kt] Ex,t	Level Assessment Lx,t	Cumulative Total of Lx,t
1A1a	Public electricity and heat production	SO _x	361.7756	96.11%	96.11%

Trend Assessment							
NFR Category Code	NFR Category	Pollutant	Base Year (1990) Estimate [kt] Ex,0	Latest Year (2019) Estimate [kt] Ex,t	Trend Assessment Lx,t	% Contribution to the trend	Cumulative Total of Lx,t
1A1a	Public electricity and heat production	SO _x	519.09	331.58	0.040	67.32%	67.3%
1A4bi	Residential: Stationary	SO _x	17.24	9.12	0.005	8.27%	75.6%
1A2e	Stationary combustion in manufacturing industries and construction: Food processing, beverages and tobacco	SO _x	3.91	0.68	0.004	6.38%	82.0%

Table 14. Key Categories for NH3 emissions for the year 2019

Level Assessment					
NFR Category Code	NFR Category	Pollutant	Year (2019) Estimate [kt] Ex,t	Level Assessment Lx,t	Cumulative Total of Lx,t
3B3	Manure management - Swine	NH3	24.4692	37.28%	37.28%
3B1a	Manure management - Dairy cattle	NH3	17.6640	26.91%	64.2%
3B1b	Manure management - Non-dairy cattle	NH3	7.1339	10.87%	75.1%
3B4gi	Manure management - Laying hens	NH3	4.8982	7.46%	82.5%

Trend Assessment							
NFR Category Code	NFR Category	Pollutant	Base Year (1990) Estimate [kt] Ex,0	Latest Year (2019) Estimate [kt] Ex,t	Trend Assessment Lx,t	% Contribution to the trend	Cumulative Total of Lx,t
3B1b	Manure management - Non-dairy cattle	NH3	11.49	7.07	0.009	16.76%	16.8%
3B4gii	Manure management - Broilers	NH3	1.56	1.46	0.009	15.78%	32.5%
3B4gi	Manure management - Laying hens	NH3	7.65	5.26	0.007	13.34%	45.9%
3B2	Manure management - Sheep	NH3	2.73	2.39	0.007	12.78%	58.7%
1A4bi	Residential: Stationary	NH3	3.43	2.36	0.006	11.19%	69.8%
5D1	Domestic wastewater handling	NH3	8.63	4.25	0.005	9.29%	79.1%
3B3	Manure management - Swine	NH3	46.12	25.97	0.004	6.48%	85.6%

Table 15. Key Categories for PM 2.5 emissions for the year 2019

Level Assessment					
NFR Category Code	NFR Category	Pollutant	Year (2019) Estimate [kt] Ex,t	Level Assessment Lx,t	Cumulative Total of Lx,t
1A4bi	Residential: Stationary	PM2.5	30.4941	86.60%	86.60%

Trend Assessment							
NFR Category Code	NFR Category	Pollutant	Base Year (1990) Estimate [kt] Ex,0	Latest Year (2019) Estimate [kt] Ex,t	Trend Assessment Lx,t	% Contribution to the trend	Cumulative Total of Lx,t
1A4bi	Residential: Stationary	PM2.5	43.60	28.72	0.044	50.74%	50.7%
1A1c	Manufacture of solid fuels and other energy industries	PM2.5	1.98	0.59	0.016	18.80%	69.5%
1A2e	Stationary combustion in manufacturing industries and construction: Food processing, beverages and tobacco	PM2.5	0.48	0.44	0.006	6.72%	76.3%
1A2gvii	Mobile Combustion in manufacturing industries and construction: (please specify in the IIR)	PM2.5	0.01	0.15	0.004	4.04%	80.3%

Table 16. Key Categories for PM10 emissions for the year 2019

Level Assessment							
NFR Category Code	NFR Category	Pollutant	Year (2019) Estimate [kt] Ex,t	Level Assessment Lx,t	Cumulative Total of Lx,t		
1A4bi	Residential: Stationary	PM10	31.2762	71.88%	71.88%		
1A1a	Public electricity and heat production	PM10	2.2281	5.12%	77.0%		
2D3b	Road paving with asphalt	PM10	1.9740	4.54%	81.5%		
Trend Assessment							
NFR Category Code	NFR Category	Pollutant	Base Year (1990) Estimate [kt] Ex,0	Latest Year (2019) Estimate [kt] Ex,t	Trend Assessment Lx,t	% Contribution to the trend	Cumulative Total of Lx,t
1A4bi	Residential: Stationary	PM10	44.69	29.45	0.065	48.22%	48.2%
2D3b	Road paving with asphalt	PM10	1.27	1.26	0.017	12.44%	60.7%
1A1c	Manufacture of solid fuels and other energy industries	PM10	2.84	0.85	0.016	11.66%	72.3%
1B1a	Fugitive emission from solid fuels: Coal mining and handling	PM10	1.84	1.67	0.007	5.52%	77.8%
1A2e	Stationary combustion in manufacturing industries and construction: Food processing, beverages and tobacco	PM10	0.52	0.45	0.005	3.43%	81.3%

Table 17. Key Categories for TSP emissions for the year 2019

Level Assessment					
NFR Category Code	NFR Category	Pollutant	Year (2019) Estimate [kt] Ex,t	Level Assessment Lx,t	Cumulative Total of Lx,t
1A4bi	Residential: Stationary	TSP	33.0859	53.17%	53.17%
2D3b	Road paving with asphalt	TSP	9.2118	14.80%	68.0%
1B1a	Fugitive emission from solid fuels: Coal mining and handling	TSP	3.4601	5.56%	73.5%
1A1a	Public electricity and heat production	TSP	3.2791	5.27%	78.8%
3B3	Manure management - Swine	TSP	2.9540	4.75%	83.6%

Trend Assessment							
NFR Category Code	NFR Category	Pollutant	Base Year (1990) Estimate [kt] Ex,0	Latest Year (2019) Estimate [kt] Ex,t	Trend Assessment Lx,t	% Contribution to the trend	Cumulative Total of Lx,t
1A4bi	Residential: Stationary	TSP	47.39	31.17	0.091	46.71%	46.7%
2D3b	Road paving with asphalt	TSP	5.92	5.86	0.044	22.26%	69.0%
1B1a	Fugitive emission from solid fuels: Coal mining and handling	TSP	3.90	3.54	0.012	6.23%	75.2%
1A1a	Public electricity and heat production	TSP	4.88	3.54	0.009	4.40%	79.6%
2A5a	Quarrying and mining of minerals other than coal	TSP	2.70	2.22	0.007	3.40%	83.0%

Table 18. Key Categories for BC emissions for the year 2019

Level Assessment							
NFR Category Code	NFR Category	Pollutant	Year (2019) Estimate [kt] Ex,t	Level Assessment Lx,t	Cumulative Total of Lx,t		
1A4bi	Residential: Stationary	BC	2.9233	87.17%	87.17%		
Trend Assessment							
NFR Category Code	NFR Category	Pollutant	Base Year (1990) Estimate [kt] Ex,0	Latest Year (2019) Estimate [kt] Ex,t	Trend Assessment Lx,t	% Contribution to the trend	Cumulative Total of Lx,t
1A4bi	Residential: Stationary	BC	4.09	2.73	0.058	42.13%	42.1%
1A2e	Stationary combustion in manufacturing industries and construction: Food processing, beverages and tobacco	BC	0.03	0.11	0.033	24.16%	66.3%
1A2gvii	Mobile Combustion in manufacturing industries and construction: (please specify in the IIR)	BC	0.00	0.09	0.029	21.01%	87.3%

Table 19. Key Categories for CO emissions for the year 2019

Level Assessment					
NFR Category Code	NFR Category	Pollutant	Year (2019) Estimate [kt] Ex,t	Level Assessment Lx,t	Cumulative Total of Lx,t
1A4bi	Residential: Stationary	CO	186.5619	80.56%	80.56%

Trend Assessment							
NFR Category Code	NFR Category	Pollutant	Base Year (1990) Estimate [kt] Ex,0	Latest Year (2019) Estimate [kt] Ex,t	Trend Assessment Lx,t	% Contribution to the trend	Cumulative Total of Lx,t
1A4bi	Residential: Stationary	CO	281.12	178.90	0.118	61.94%	61.9%
1A2a	Stationary combustion in manufacturing industries and construction: Iron and steel	CO	0.06	14.05	0.042	22.14%	84.1%

Table 20. Key Categories for Pb emissions for the year 2019

Level Assessment					
NFR Category Code	NFR Category	Pollutant	Year (2019) Estimate [t] Ex,t	Level Assessment Lx,t	Cumulative Total of Lx,t
2C1	Iron and steel production	Pb	7.7280	48.05%	48.05%
1A1a	Public electricity and heat production	Pb	4.0171	24.98%	73.0%
1A4bi	Residential: Stationary	Pb	2.1247	13.21%	86.2%

Trend Assessment							
NFR Category Code	NFR Category	Pollutant	Base Year (1990) Estimate [kt] Ex,0	Latest Year (2019) Estimate [kt] Ex,t	Trend Assessment Lx,t	% Contribution to the trend	Cumulative Total of Lx,t
2C1	Iron and steel production	Pb	4.19	37.25	0.020	49.43%	49.4%
1A1a	Public electricity and heat production	Pb	5.75	4.28	0.010	24.69%	74.1%
1A4bi	Residential: Stationary	Pb	3.73	2.15	0.005	12.86%	87.0%

Table 21. Key Categories for Cd emissions for the year 2019

Level Assessment					
NFR Category Code	NFR Category	Pollutant	Year (2019) Estimate [t] Ex,t	Level Assessment Lx,t	Cumulative Total of Lx,t
2C7a	Copper production	Cd	1.1831	49.65%	49.65%
1A4bi	Residential: Stationary	Cd	0.4873	20.45%	70.1%
1A1a	Public electricity and heat production	Cd	0.4846	20.34%	90.4%

Trend Assessment							
NFR Category Code	NFR Category	Pollutant	Base Year (1990) Estimate [kt] Ex,0	Latest Year (2019) Estimate [kt] Ex,t	Trend Assessment Lx,t	% Contribution to the trend	Cumulative Total of Lx,t
2C7a	Copper production	Cd	2.27	1.02	0.043	33.09%	33.1%
1A4bi	Residential: Stationary	Cd	0.66	0.45	0.023	17.66%	50.7%
2C1	Iron and steel production	Cd	0.07	0.25	0.022	17.06%	67.8%
1A1a	Public electricity and heat production	Cd	0.70	0.52	0.017	13.28%	81.1%

Table 22. Key Categories for Hg emissions for the year 2019

Level Assessment					
NFR Category Code	NFR Category	Pollutant	Year (2019) Estimate [t] Ex,t	Level Assessment Lx,t	Cumulative Total of Lx,t
1A1a	Public electricity and heat production	Hg	0.7781	68.17%	68.17%
1A1c	Manufacture of solid fuels and other energy industries	Hg	0.2074	18.17%	86.3%

Trend Assessment							
NFR Category Code	NFR Category	Pollutant	Base Year (1990) Estimate [kt] Ex,0	Latest Year (2019) Estimate [kt] Ex,t	Trend Assessment Lx,t	% Contribution to the trend	Cumulative Total of Lx,t
1A1a	Public electricity and heat production	Hg	1.11	0.83	0.116	51.82%	51.8%
1A1c	Manufacture of solid fuels and other energy industries	Hg	1.08	0.32	0.085	38.08%	89.9%

Table 23. Key Categories for As emissions for the year 2019

Level Assessment							
NFR Category Code	NFR Category	Pollutant	Year (2019) Estimate [t] Ex,t	Level Assessment Lx,t	Cumulative Total of Lx,t		
1A1a	Public electricity and heat production	As	3.8318	72.20%	72.20%		
2C1	Iron and steel production	As	0.7728	14.56%	86.8%		

Trend Assessment							
NFR Category Code	NFR Category	Pollutant	Base Year (1990) Estimate [kt] Ex,0	Latest Year (2018) 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	0.63	0.063	52.02%	52.0%
1A1c	Manufacture of solid fuels and other energy industries	As	0.40	0.12	0.026	21.58%	73.6%
2C7a	Copper production	As	1.06	0.48	0.024	19.36%	93.0%

Table 24 Key Categories for Cr emissions for the year 2019

Level Assessment						
NFR Category Code	NFR Category	Pollutant	Year (2019) Estimate [t] Ex,t	Level Assessment Lx,t	Cumulative Total of Lx,t	
2C1	Iron and steel production	Cr	4.4436	45.86%	45.86%	
1A1a	Public electricity and heat production	Cr	2.4360	25.14%	71.0%	
2C7a	Copper production	Cr	1.6399	16.93%	87.9%	

Trend Assessment							
NFR Category Code	NFR Category	Pollutant	Base Year (1990) Estimate [kt] Ex,0	Latest Year (2019) Estimate [kt] Ex,t	Trend Assessment Lx,t	% Contribution to the trend	Cumulative Total of Lx,t
2C1	Iron and steel production	Cr	2.41	6.42	0.210	55.95%	56.0%
2C7a	Copper production	Cr	3.17	1.42	0.086	23.00%	79.0%
1A1a	Public electricity and heat production	Cr	3.49	2.59	0.040	10.76%	89.7%

Table 25. Key Categories for Cu emissions for the year 2019

Level Assessment							
NFR Category Code	NFR Category	Pollutant	Year (2019) Estimate [t] Ex,t		Level Assessment Lx,t	Cumulative Total of Lx,t	
2C7a	Copper production	Cu	4.5938		81.59%	81.59%	

Trend Assessment							
NFR Category Code	NFR Category	Pollutant	Base Year (1990) Estimate [kt] Ex,0	Latest Year (2019) Estimate [kt] Ex,t	Trend Assessment Lx,t	% Contribution to the trend	Cumulative Total of Lx,t
2C7a	Copper production	Cu	8.61	3.90	0.095	75.46%	75.5%
1A4bi	Residential: Stationary	Cu	0.71	0.42	0.010	8.09%	83.5%

Table 26. Key Categories for Ni emissions for the year 2019

Level Assessment							
NFR Category Code	NFR Category	Pollutant	Year (2019) Estimate [t] Ex,t		Level Assessment Lx,t	Cumulative Total of Lx,t	
1A1a	Public electricity and heat production	Ni	3.5106		61.09%	61.09%	
2C7a	Copper production	Ni	1.4844		25.83%	86.9%	

Trend Assessment							
NFR Category Code	NFR Category	Pollutant	Base Year (1990) Estimate [kt] Ex,0	Latest Year (2019) Estimate [kt] Ex,t	Trend Assessment Lx,t	% Contribution to the trend	Cumulative Total of Lx,t
1A1a	Public electricity and heat production	Ni	6.49	3.95	0.077	54.69%	54.7%
2C7a	Copper production	Ni	2.87	1.29	0.030	21.33%	76.0%
1A3dii	National navigation (shipping)	Ni	1.28	0.22	0.014	10.20%	86.2%

Table 27. Key Categories for Se emissions for the year 2019

Level Assessment							
NFR Category Code	NFR Category	Pollutant	Year (2019) Estimate [t] Ex,t		Level Assessment Lx,t	Cumulative Total of Lx,t	
1A1a	Public electricity and heat production	Se	12.0082		99.06%	99.06%	

Trend Assessment							
NFR Category Code	NFR Category	Pollutant	Base Year (1990) Estimate [kt] Ex,0	Latest Year (2019) Estimate [kt] Ex,t	Trend Assessment Lx,t	% Contribution to the trend	Cumulative Total of Lx,t
1A1a	Public electricity and heat production	Se	17.13	12.76	0.017	75.03%	75.0%
1A1c	Manufacture of solid fuels and other energy industries	Se	0.10	0.03	0.003	12.56%	87.6%

Table 28. Key Categories for Zn emissions for the year 2019

Level Assessment					
NFR Category Code	NFR Category	Pollutant	Year (2019) Estimate [t] Ex,t	Level Assessment Lx,t	Cumulative Total of Lx,t
1A4bi	Residential: Stationary	Zn	20.6043	59.00%	59.00%
2C1	Iron and steel production	Zn	7.7280	22.13%	81.1%

Trend Assessment							
NFR Category Code	NFR Category	Pollutant	Base Year (1990) Estimate [kt] Ex,0	Latest Year (2018) Estimate [kt] Ex,t	Trend Assessment Lx,t	% Contribution to the trend	Cumulative Total of Lx,t
2C1	Iron and steel production	Zn	4.35	28.96	0.094	54.05%	54.0%
1A2e	Stationary combustion in manufacturing industries and construction: Food processing, beverages and tobacco	Zn	0.87	1.40	0.032	18.50%	72.5%
1A1c	Manufacture of solid fuels and other energy industries	Zn	1.66	0.50	0.017	9.71%	82.3%

Table 29. Key Categories for PCDD/PCDF emissions for the year 2019

Level Assessment						
NFR Category Code	NFR Category	Pollutant	Year (2019) Estimate [g I-TEQ] Ex,t		Level Assessment Lx,t	Cumulative Total of Lx,t
3F	Field burning of agricultural residues	PCDD/PCDF	546.6037		90.74%	90.74%

Trend Assessment							
NFR Category Code	NFR Category	Pollutant	Base Year (1990) Estimate [kt] Ex,0	Latest Year (2019) Estimate [kt] Ex,t	Trend Assessment Lx,t	% Contribution to the trend	Cumulative Total of Lx,t
1A4bi	Residential: Stationary	PCDD/PCDF	54.00	34.59	0.031	35.12%	35.1%
3F	Field burning of agricultural residues	PCDD/PCDF	526.14	612.38	0.024	27.43%	62.6%
2C1	Iron and steel production	PCDD/PCDF	0.73	7.35	0.017	19.76%	82.3%

Table 30. Key Categories for Benzo a pyren emissions for the year 2019

Level Assessment						
NFR Category Code	NFR Category	Pollutant	Year (2019) Estimate [t] Ex,t		Level Assessment Lx,t	Cumulative Total of Lx,t
3F	Field burning of agricultural residues	benzo a pyren	74.0101		91.56%	91.56%

Trend Assessment							
NFR Category Code	NFR Category	Pollutant	Base Year (1990) Estimate [kt] Ex,0	Latest Year (2019) Estimate [kt] Ex,t	Trend Assessment Lx,t	% Contribution to the trend	Cumulative Total of Lx,t
3F	Field burning of agricultural residues	benzo a pyren	71.24	82.92	43.940	85.71%	85.7%

Table 31. Key Categories for Benzo b flouranthen emissions for the year 2019

Level Assessment							
NFR Category Code	NFR Category	Pollutant	Year (2019) Estimate [t] Ex,t	Level Assessment Lx,t	Cumulative Total of Lx,t		
3F	Field burning of agricultural residues	benzo b flouranthen	206.7255	96.49%	96.49%		
Trend Assessment							
NFR Category Code	NFR Category	Pollutant	Base Year (1990) Estimate [kt] Ex,0	Latest Year (2019) Estimate [kt] Ex,t	Trend Assessment Lx,t	% Contribution to the trend	Cumulative Total of Lx,t
3F	Field burning of agricultural residues	benzo b flouranthen	198.99	231.60	0.026	49.74%	49.7%
1A4bi	Residential: Stationary	benzo b flouranthen	11.56	6.89	0.022	43.19%	92.9%

Table 32. Key Categories for Benzo k flouranthen emissions for the year 2019

Level Assessment							
NFR Category Code	NFR Category	Pollutant	Year (2019) Estimate [t] Ex,t	Level Assessment Lx,t	Cumulative Total of Lx,t		
3F	Field burning of agricultural residues	benzo k fluoranten	96.9675	97.06%	97.06%		
Trend Assessment							
NFR Category Code	NFR Category	Pollutant	Base Year (1990) Estimate [kt] Ex,0	Latest Year (2019) Estimate [kt] Ex,t	Trend Assessment Lx,t	% Contribution to the trend	Cumulative Total of Lx,t
3F	Field burning of agricultural residues	benzo k fluora nten	93.34	108.64	0.022	49.25%	49.2%
1A4bi	Residential: Stationary	benzo k fluora nten	4.47	2.66	0.019	42.07%	91.3%

Table 33. Key Categories for Indeno emissions for the year 2019

Level Assessment							
NFR Category Code	NFR Category	Pollutant	Year (2019) Estimate [t] Ex,t	Level Assessment Lx,t	Cumulative Total of Lx,t		
3F	Field burning of agricultural residues	Indeno 1,2,3 pyren	63.2967	94.41%	94.41%		
Trend Assessment							
NFR Category Code	NFR Category	Pollutant	Base Year (1990) Estimate [kt] Ex,0	Latest Year (2019) Estimate [kt] Ex,t	Trend Assessment Lx,t	% Contribution to the trend	Cumulative Total of Lx,t
3F	Field burning of agricultural residues	Indeno 1,2,3 pyren	60.93	70.91	0.033	49.53%	49.5%
1A4bi	Residential: Stationary	Indeno 1,2,3 pyren	5.52	3.44	0.030	44.26%	93.8%

Table 34. Key Categories for Total 1 – 4 PAH emissions for the year 2019

Level Assessment							
NFR Category Code	NFR Category	Pollutant	Year (2019) Estimate [t] Ex,t		Level Assessment Lx,t	Cumulative Total of Lx,t	
1A4bi	Residential: Stationary	Total 1-4 PAH	19.5986		96.53%	96.53%	
Trend Assessment							
NFR Category Code	NFR Category	Pollutant	Base Year (1990) Estimate [kt] Ex,0	Latest Year (2019) Estimate [kt] Ex,t	Trend Assessment Lx,t	% Contribution to the trend	Cumulative Total of Lx,t
3F	Field burning of agricultural residues	Total 1-4 PAH	424.49	494.07	0.033	49.62%	49.6%
1A4bi	Residential: Stationary	Total 1-4 PAH	31.73	19.26	0.026	39.71%	89.3%

Table 35. Key Categories for HCB emissions for the year 2019

Level Assessment							
NFR Category Code	NFR Category	Pollutant	Year (2019) Estimate [kg] Ex,t	Level Assessment Lx,t	Cumulative Total of Lx,t		
1A1a	Public electricity and heat production	HCB	1.7865	89.11%	89.11%		
Trend Assessment							
NFR Category Code	NFR Category	Pollutant	Base Year (1990) Estimate [kt] Ex,0	Latest Year (2019) Estimate [kt] Ex,t	Trend Assessment Lx,t	% Contribution to the trend	Cumulative Total of Lx,t
1A2e	Stationary combustion in manufacturing industries and construction: Food processing, beverages and tobacco	HCB	0.00	0.01	0.007	46.46%	46.5%
1A4bi	Residential: Stationary	HCB	0.26	0.17	0.003	21.21%	67.7%
1A2c	Stationary combustion in manufacturing industries and construction: Chemicals	HCB	0.00	0.00	0.002	14.93%	82.6%

Table 36. Key Categories for PCB emissions for the year 2019

Level Assessment							
NFR Category Code	NFR Category	Pollutant	Year (2019) Estimate [kg] Ex,t	Level Assessment Lx,t	Cumulative Total of Lx,t		
2C7a	Copper production	PCB	18.8414	73.40%	73.40%		
2C1	Iron and steel production	PCB	4.8300	18.82%	92.2%		
Trend Assessment							
NFR Category Code	NFR Category	Pollutant	Base Year (1990) Estimate [kt] Ex,0	Latest Year (2019) Estimate [kt] Ex,t	Trend Assessment Lx,t	% Contribution to the trend	Cumulative Total of Lx,t
2C7a	Copper production	PCB	0.00	5.44	0.022	74.59%	74.6%
2C1	Iron and steel production	PCB	8.40	7.24	0.005	18.11%	92.7%

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 (NO_x)

The amount of NO_x emissions in 2019 was 128,8247 kt which is around 1,61% less than in 2018 and compared to the base year of 1990 saw an decrease of 30.53%.

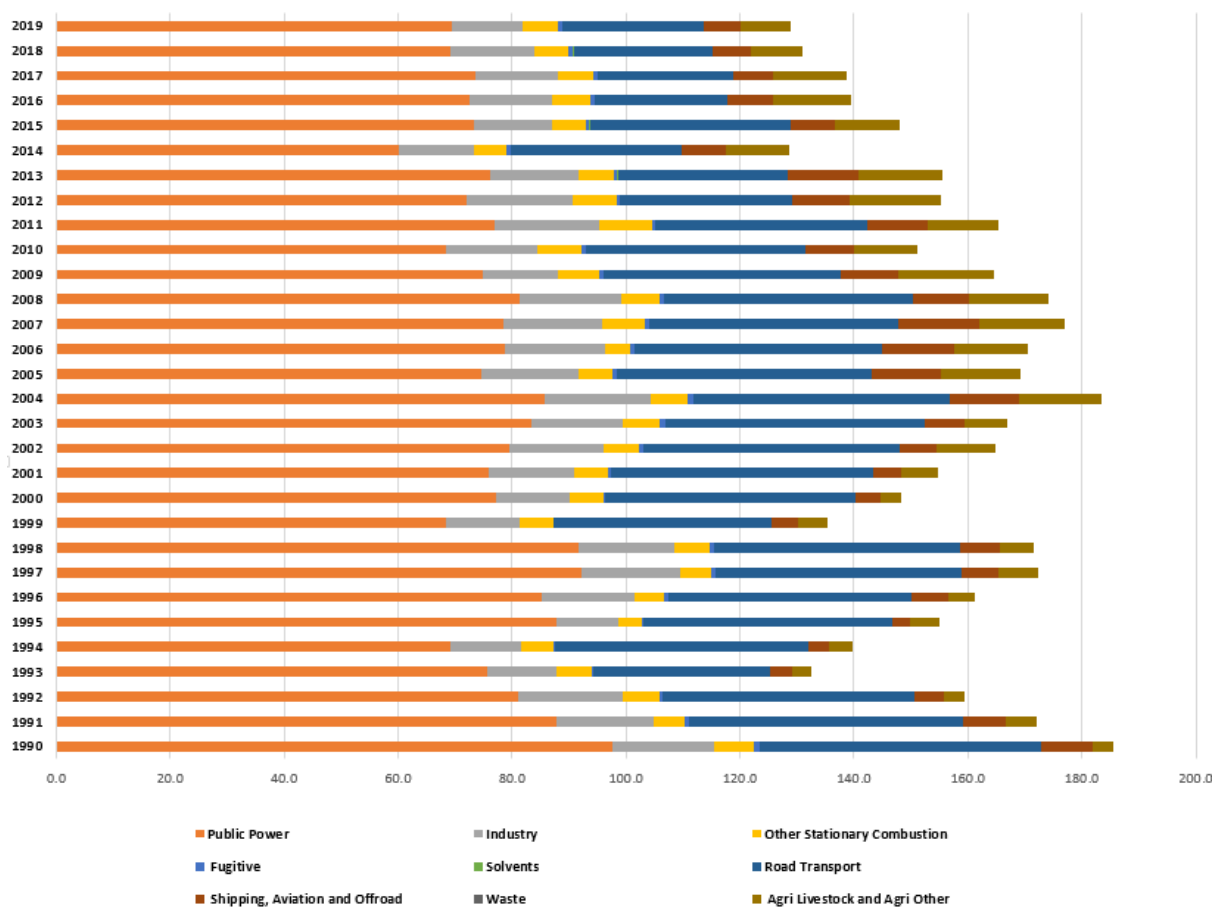


Figure 1. Distribution of NO_x between sectors for period 1990 - 2019

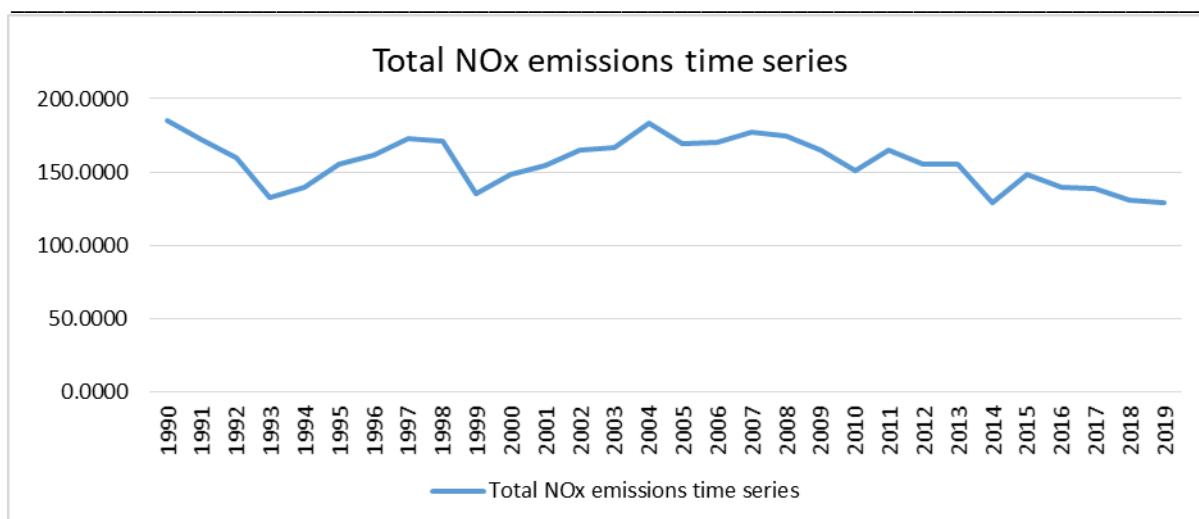


Figure 2. Total NOx emissions time series from 1990 to 2019.

Table 37. Total NOx emissions between sectors for years 1990 and 2019. Trends of dominant sources of NOx emissions compared to years 1990-2019 and 2018-2019. Share in National Total for years 1990 and 2019.

NFR Category	NOx Emission in [kt]		Trend		Share in National Total	
	1990	2019	1990 - 2019	2018 - 2019	1990	2019
A Public Power	97.6884	69.3641	-28.99%	0.41%	52.68%	53.84%
B Industry	17.8099	12.5354	-29.62%	-15.35%	9.60%	9.73%
C Other Stationary Combustion	6.8737	6.0882	-11.43%	1.15%	3.71%	4.73%
D Fugitive	1.1361	0.7539	-33.64%	-11.82%	0.61%	0.59%
E Solvents	0.0263	0.0722	174.47%	-5.41%	0.01%	0.06%
F Road Transport	49.3183	24.7899	-49.73%	2.12%	26.60%	19.24%
G Shipping + H Aviation + I Offroad	8.9636	6.4608	-27.92%	-4.13%	4.83%	5.02%
J Waste	0.0006	0.0028	381.31%	1.50%	0.00%	0.00%
K Agri Livestock + L Agri Other	3.6148	8.7574	142.26%	-3.15%	1.95%	6.80%
Total	185.4317	128.8247	-30.53%	-1.59%	100.00%	100.00%

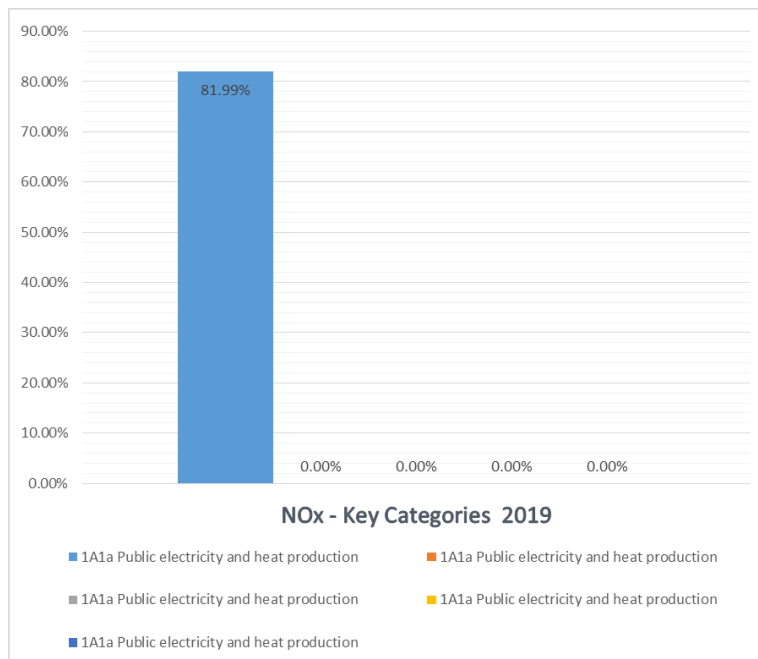


Figure 3. Key Categories assessments of NOx emissions for 2019

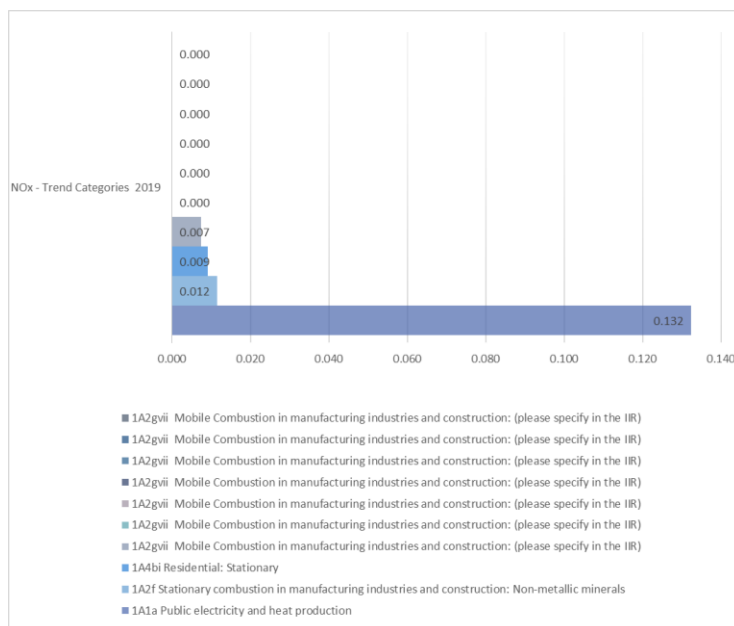


Figure 4. Trends assessments of NOx emissions for base year and 2019

2.4.2. Non-Methane Volatile Organic Compounds (NMVOC)

Anthropogenic NMVOC emissions in Serbia were 121,2948kt in 2019, which is 0.81 %% more than in 2018, compared to the base year of 1990 saw decrease of 36.7 %.

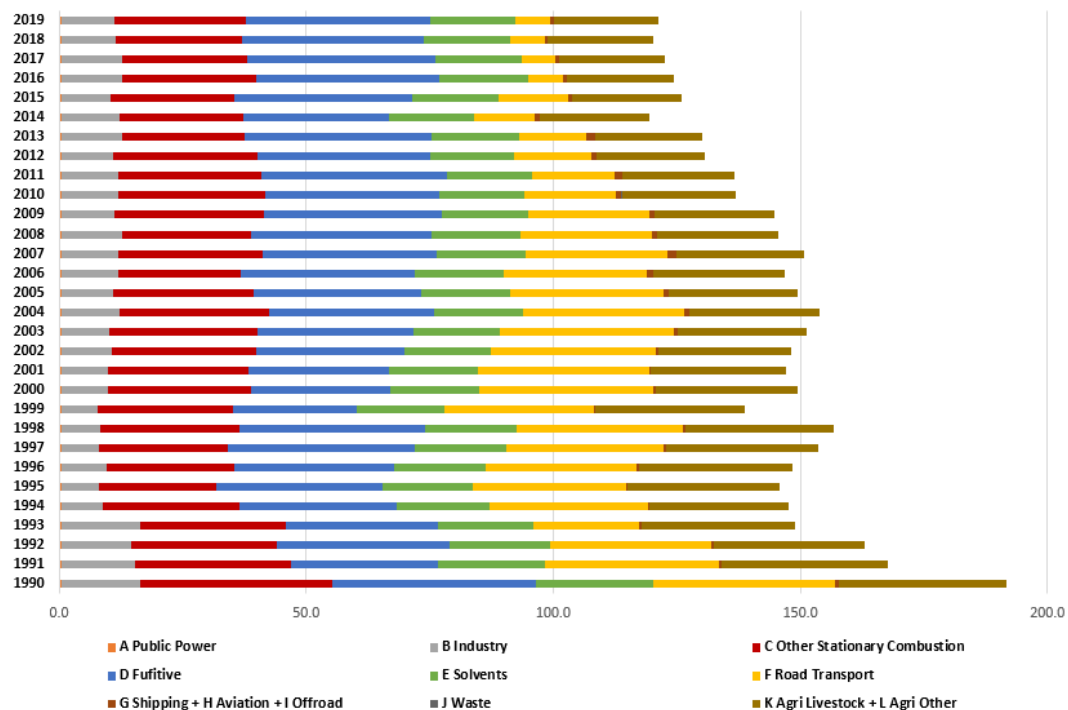


Figure 5. Distribution of NMVOC between sectors for period 1990 – 2018

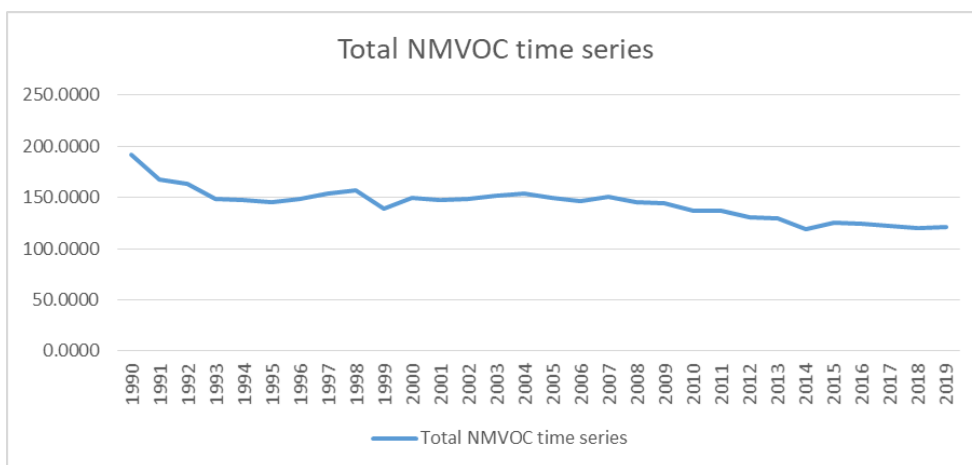


Figure 6.Total NMVOC emissions time series from 1990 to 2019.

Table 38. Total NMVOC emissions between sectors for years 1990 and 2019. Trends of dominant sources of NMVOC emissions compared to years 1990-2019 and 2018-2019. Share in National Total for years 1990 and 2019

NFR Category	NMVOC Emission in [kt]		Trend		Share in National Total	
	1990	2019	1990 - 2019	2018 - 2019	1990	2019
A Public Power	0.6139	0.4696	-23.51%	0.16%	0.32%	0.39%
B Industry	15.8514	10.7909	-31.92%	-0.76%	8.27%	8.90%
C Other Stationary Combustion	38.8170	26.5356	-31.64%	3.12%	20.25%	21.88%
D Fugitive	41.2610	37.3102	-9.58%	1.39%	21.52%	30.76%
E Solvents	23.6752	17.2385	-27.19%	-0.91%	12.35%	14.21%
F Road Transport	36.8884	7.0556	-80.87%	0.66%	19.24%	5.82%
G Shipping + H Aviation + I Offroad	0.6932	0.6225	-10.20%	-5.03%	0.36%	0.51%
J Waste	0.0001	0.0018	1182.11%	-24.97%	0.00%	0.00%
K Agri Livestock + L Agri Other	33.9229	21.2703	-37.30%	-0.47%	17.69%	17.54%
Total	191.7232	121.2948	-36.73%	0.82%	100.00%	100.00%

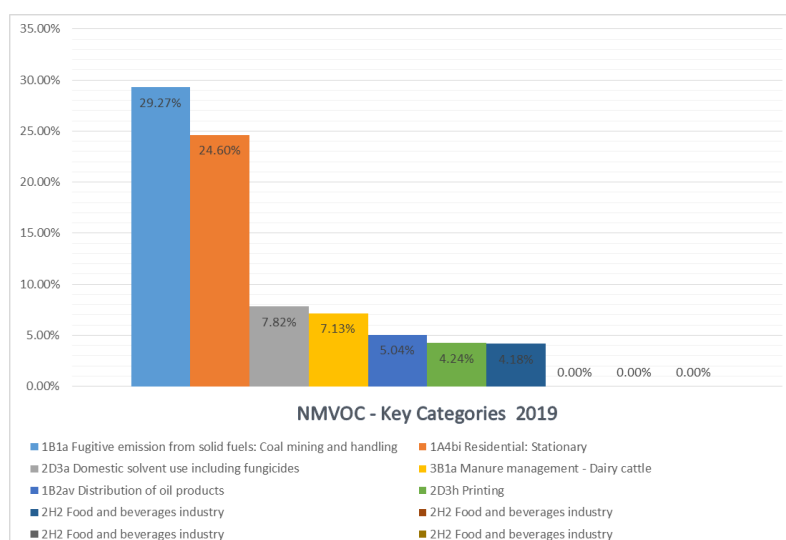


Figure 7. Key Categories assessments of NMVOC emissions for 2019

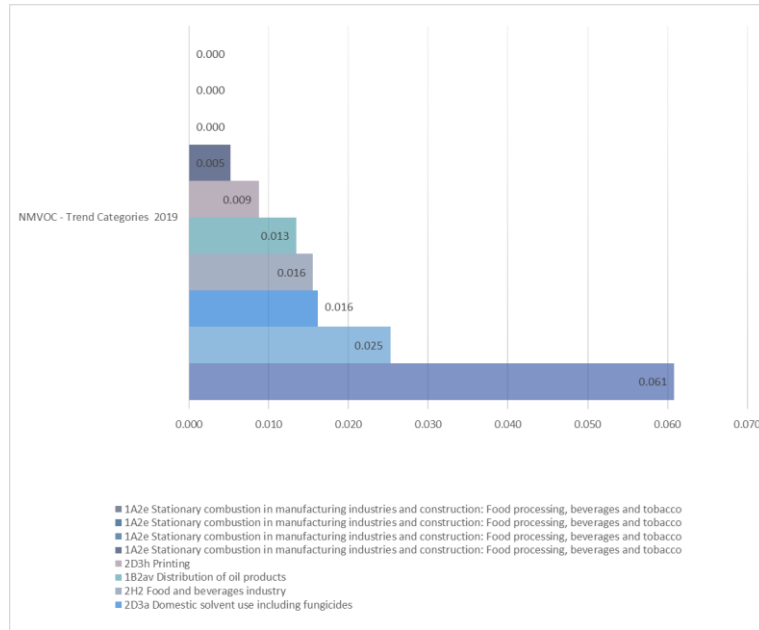


Figure 8. Trends assessments of NMVOC emissions for base year and 2019

2.4.3. Sulphur dioxide emission (SOX)

Total SOx emission in 2019 was 395,3803 kt which is 12.25 % more than in 2018. Compared to the base year of 1990, saw a decrease of 31.49 %

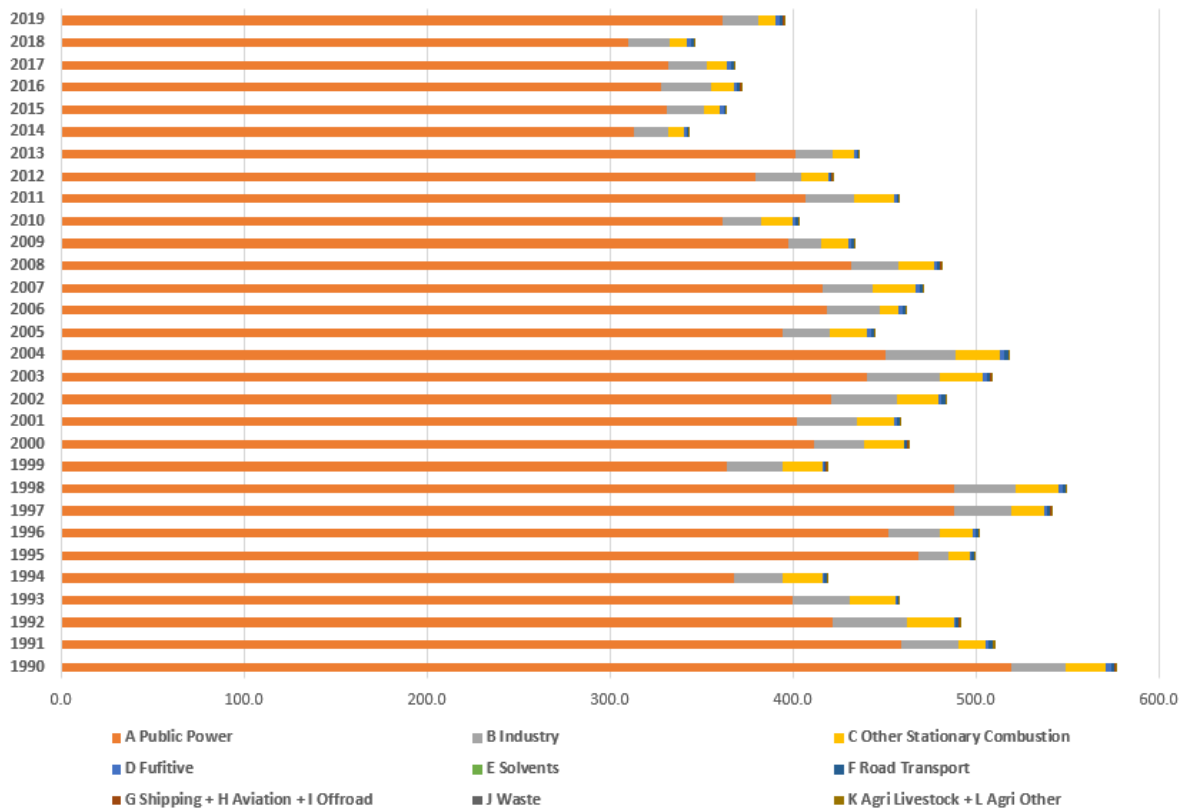


Figure 9. Distribution of SOx between sectors for period 1990 – 2018

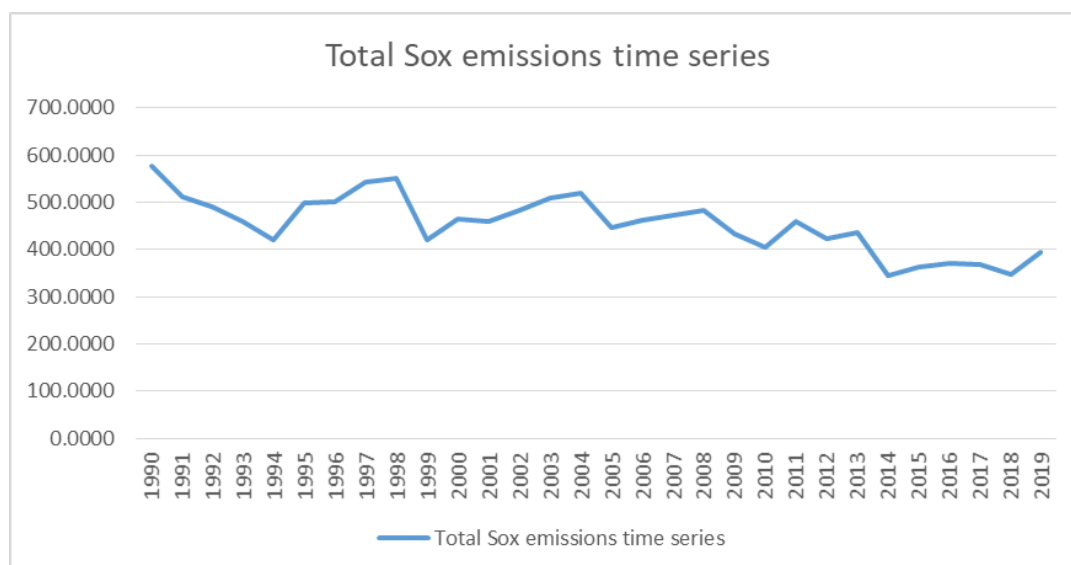


Figure 10. Total SOx emissions time series from 1990 to 2019.

Table 39. Total SOx emissions between sectors for years 1990 and 2019. Trends of dominant sources of SOx emissions compared to years 1990-2019 and 2018-2019. Share in National Total for years 1990 and 2019

NFR Category	SOx Emission in [kt]		Trend		Share in National Total	
	1990	2019	1990 - 2019	2018 - 2019	1990	2019
A Public Power	519.0920	361.7775	-30.31%	16.59%	89.95%	91.50%
B Industry	29.9822	19.2121	-35.92%	-14.10%	5.20%	4.86%
C Other Stationary Combustion	22.0086	9.8788	-55.11%	3.10%	3.81%	2.50%
D Fugitive	2.9316	1.9465	-33.60%	-11.80%	0.51%	0.49%
E Solvents	NA	NA	NA	NA	NA	NA
F Road Transport	1.7353	1.7975	3.59%	7.06%	0.30%	0.45%
G Shipping + H Aviation + I Offroad	0.8420	0.2208	-73.78%	1.81%	0.15%	0.06%
J Waste	0.0001	0.0004	381.31%	1.50%	0.00%	0.00%
K Agri Livestock + L Agri Other	0.5261	0.5466	3.89%	-5.68%	0.09%	0.14%
Total	577.1179	395.3803	-31.49%	13.97%	100.00%	100.00%

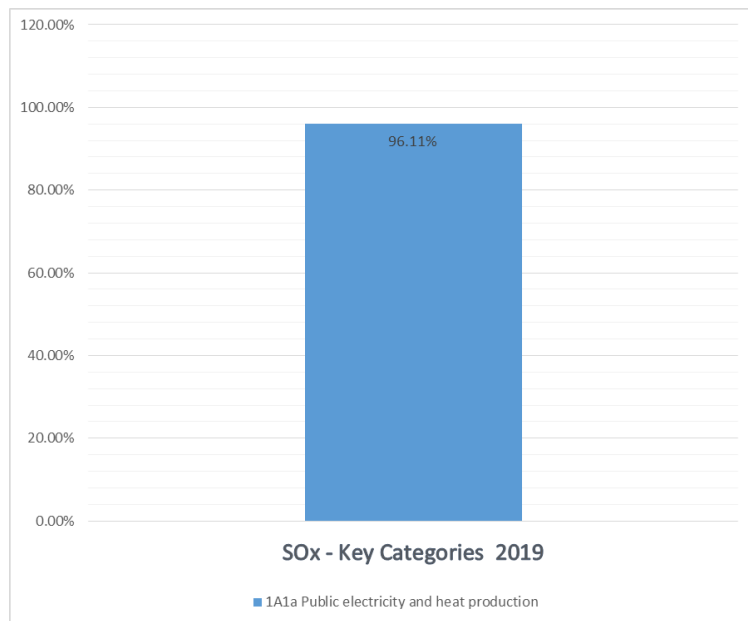


Figure 11. Key Categories assessments of SOx emissions for 2019.

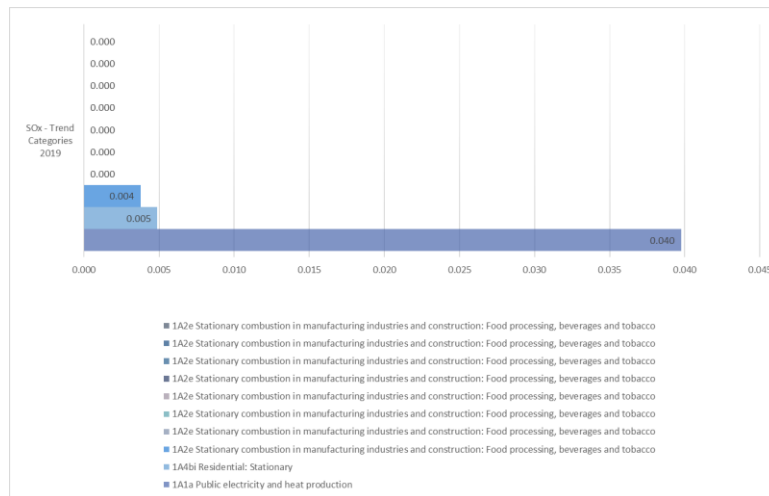


Figure 12. Trends assessments of SOx emissions for base year and 2019

2.4.4. Ammonia (NH₃)

NH₃ emissions in 2019. was 76,0733kt, which is 7.46 % decrease compared to 2018. Compared to the 1990 baseline emissions of NH₃ is 40.81 % lower.

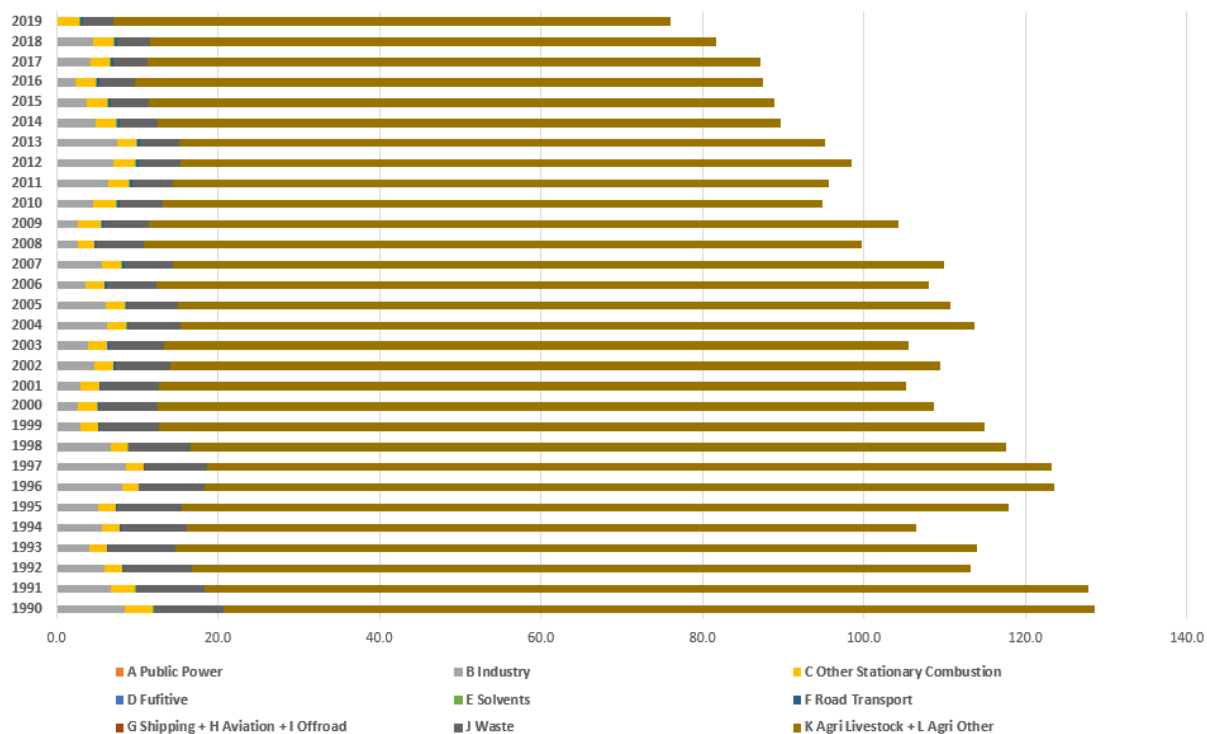


Figure 13. Distribution of NH₃ between sectors for period 1990 – 2019

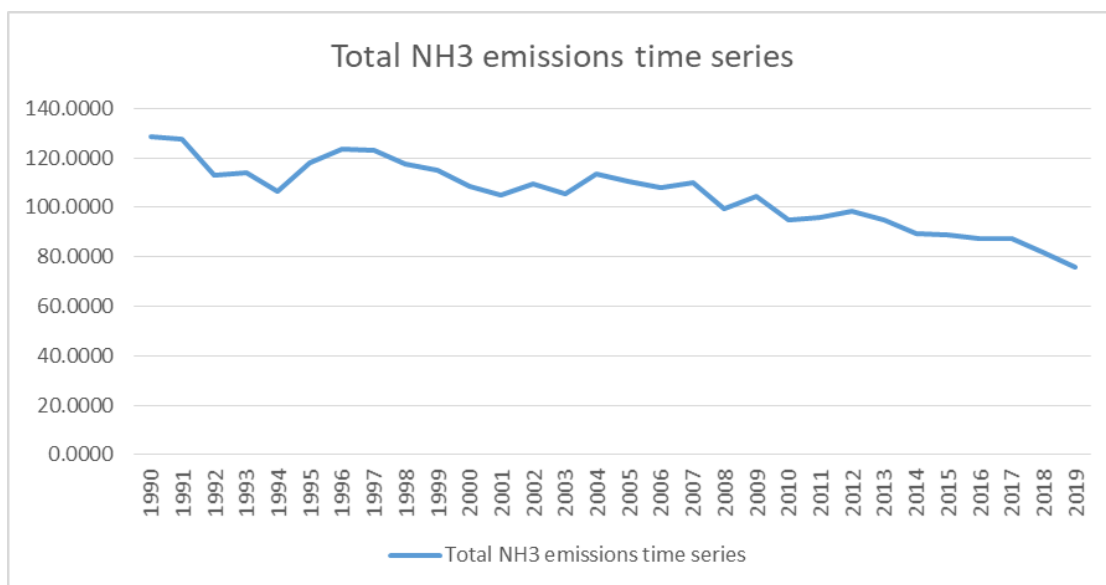


Figure 14. Total NH₃ emissions time series from 1990 to 2019.

Table 40. Total NH₃ emissions between sectors for years 1990 and 2019. Trends of dominant sources of NH₃ emissions compared to years 1990-2019 and 2018-2019. Share in National Total for years 1990 and 2019

NFR Category	NH ₃ Emission in [kt]		Trend		Share in National Total	
	1990	2019	1990 - 2019	2018 - 2019	1990	2019
A Public Power	NA	NA	NA	NA	NA	NA
B Industry	8.5014	0.2049	-97.59%	-95.51%	6.61%	0.27%
C Other Stationary Combustion	3.4316	2.5587	-25.44%	3.60%	2.67%	3.36%
D Fugitive	0.0130	0.0059	-54.48%	-12.93%	0.01%	0.01%
E Solvents	0.0631	0.1663	163.43%	-5.41%	0.05%	0.22%
F Road Transport	0.0268	0.2621	877.84%	-0.38%	0.02%	0.34%
G Shipping + H Aviation + I Offroad	0.0008	0.0012	45.90%	-1.51%	0.00%	0.00%
J Waste	8.6285	3.8568	-55.30%	-6.70%	6.71%	5.07%
K Agri Livestock + L Agri Other	107.8670	69.0174	-36.02%	-1.60%	83.92%	90.72%
Total	128.5323	76.0733	-40.81%	-6.94%	100.00%	100.00%

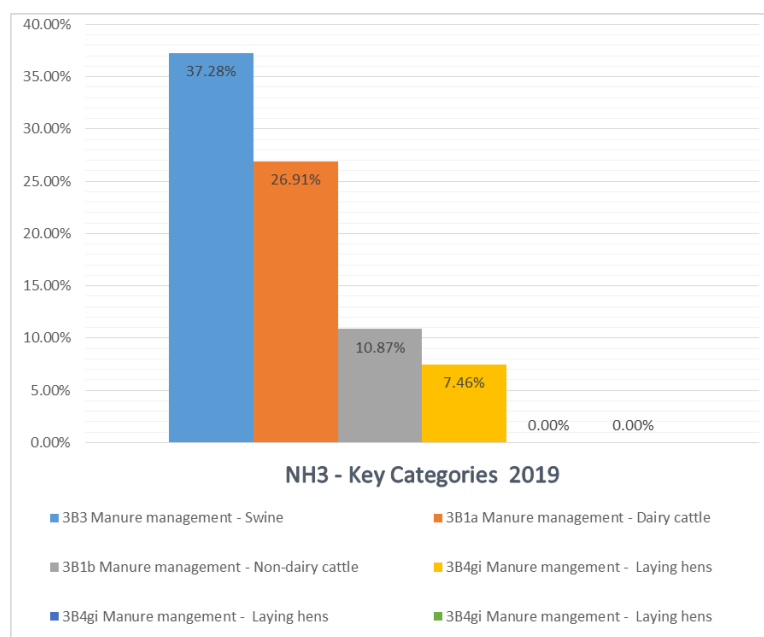


Figure 15. Key Categories assessments of NH₃ emissions for 2019

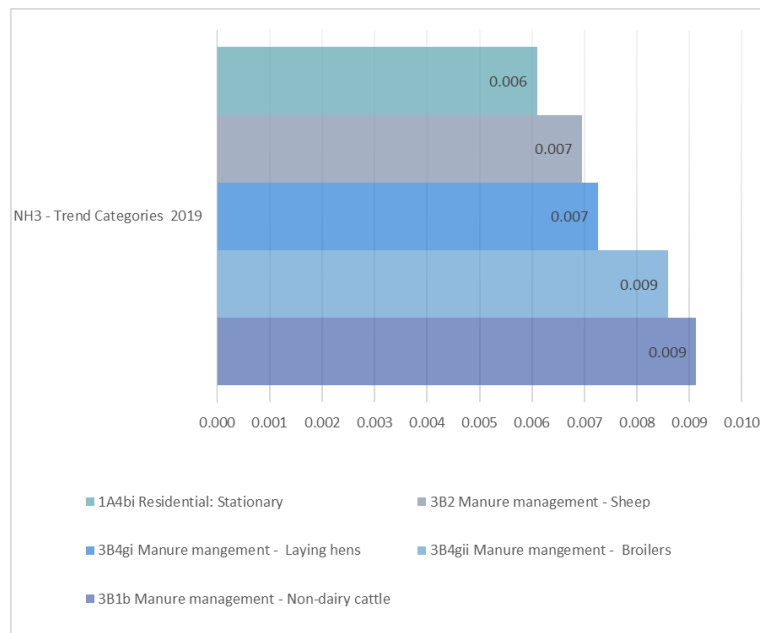


Figure 16. Trends assessments of NH3 emissions for base year and 2019

PARTICULATE MATTER

2.4.5. PM 2.5 Emission

PM 2.5 emissions in 2019. was 45.5938kt, which is 1,59 % increase compared to 2018. Compared to the 1990 baseline emissions of PM 2.5 is 24.47 % lower.

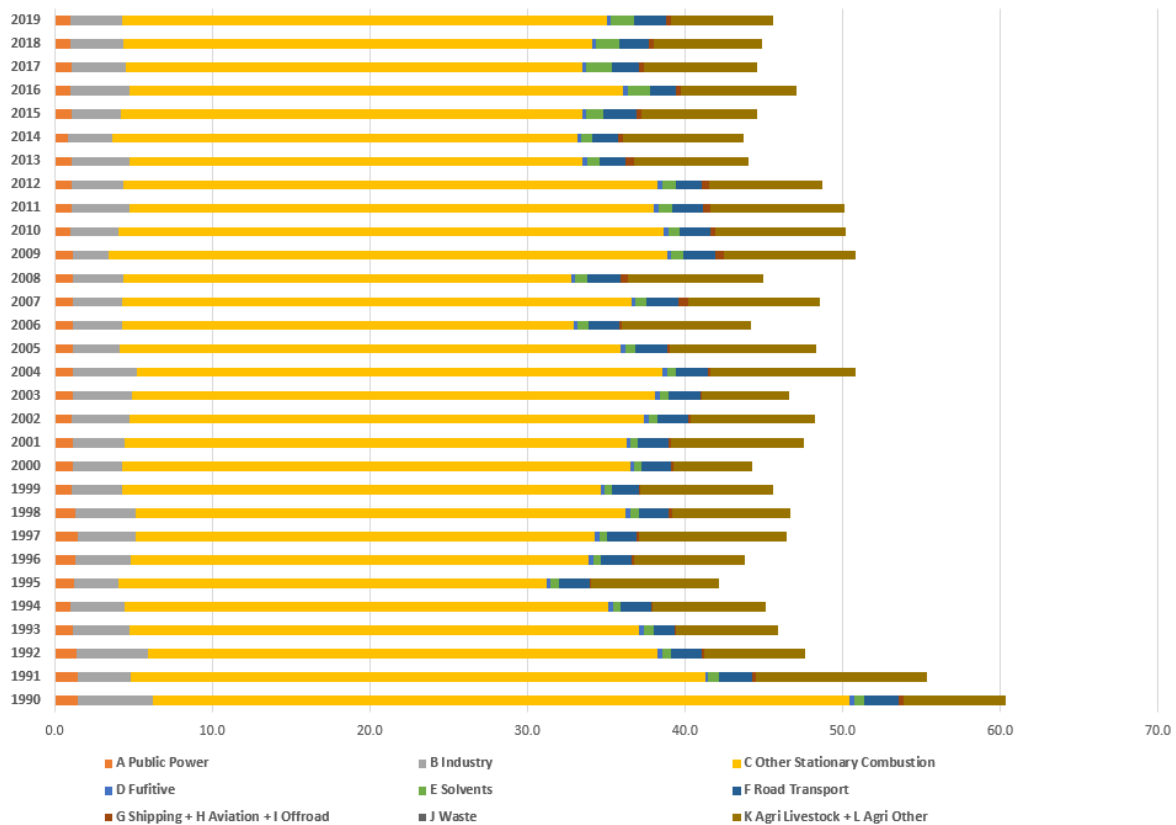


Figure 17. Distribution of PM2.5 between sectors for period 1990 – 2019

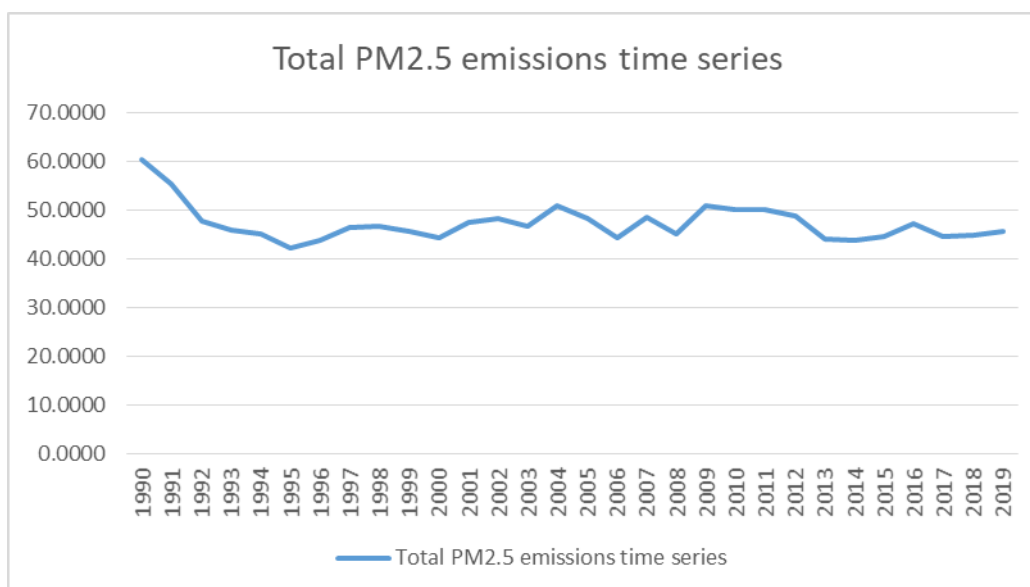


Figure 18.Total PM 2.5 emissions time series from 1990 to 2019.

Table 41. Total PM 2.5 emissions between sectors for years 1990 and 2019. Trends of dominant sources of PM 2.5 emissions compared to years 1990-2019 and 2018-2019. Share in National Total for years 1990 and 2019

NFR Category	PM2.5 Emission in [kt]		Trend		Share in National Total	
	1990	2019	1990 - 2019	2018 - 2019	1990	2019
A Public Power	1.4548	0.9770	-32.84%	-1.39%	2.41%	2.14%
B Industry	4.7792	3.3297	-30.33%	-0.44%	7.92%	7.30%
C Other Stationary Combustion	44.1754	30.7240	-30.45%	3.32%	73.18%	67.39%
D Fugitive	0.3678	0.2485	-32.43%	-0.98%	0.61%	0.55%
E Solvents	0.6197	1.4598	135.58%	-1.50%	1.03%	3.20%
F Road Transport	2.1499	2.0199	-6.05%	6.83%	3.56%	4.43%
G Shipping + H Aviation + I Offroad	0.2824	0.3424	21.23%	7.30%	0.47%	0.75%
J Waste	0.0000	0.0001	381.31%	1.50%	0.00%	0.00%
K Agri Livestock + L Agri Other	6.5362	6.4924	-0.67%	-5.24%	10.83%	14.24%
Total	60.3654	45.5938	-24.47%	1.62%	100.00%	100.00%

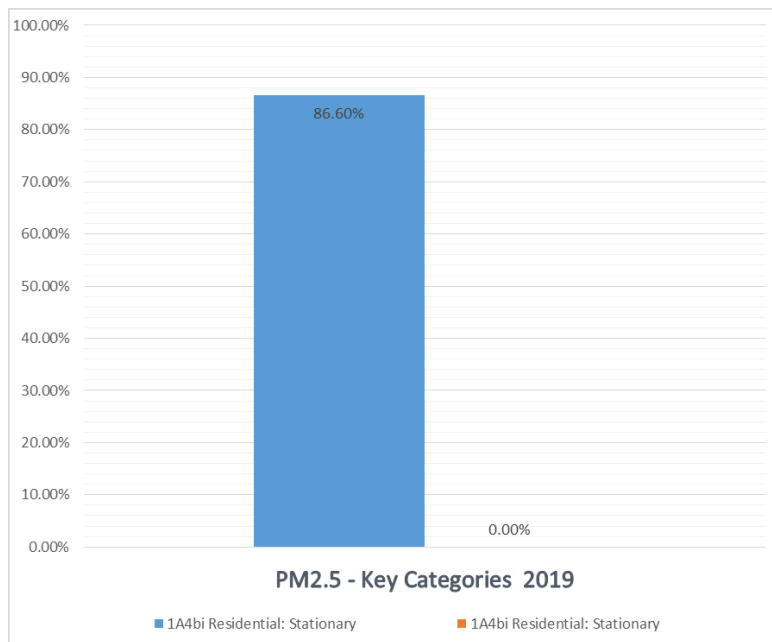


Figure 19. Key Categories assessments of PM 2.5 emissions for 2019.

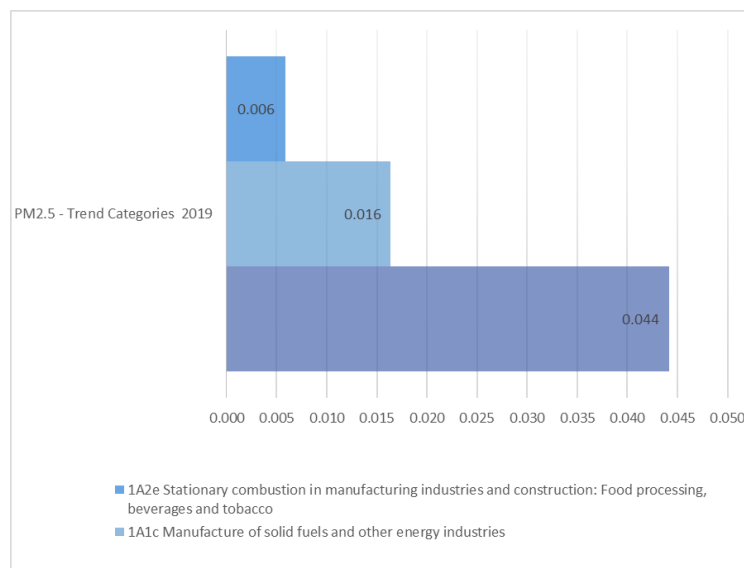


Figure 20. Trends assessments of PM 2.5 emissions for base year and 2019

2.4.6. PM₁₀ Emission

PM 10 emissions in 2019. was 61.3705 kt, which is 1.95 % increase compared to 2018. Compared to the 1990 baseline emissions of PM 10 is 22.55 % lower.

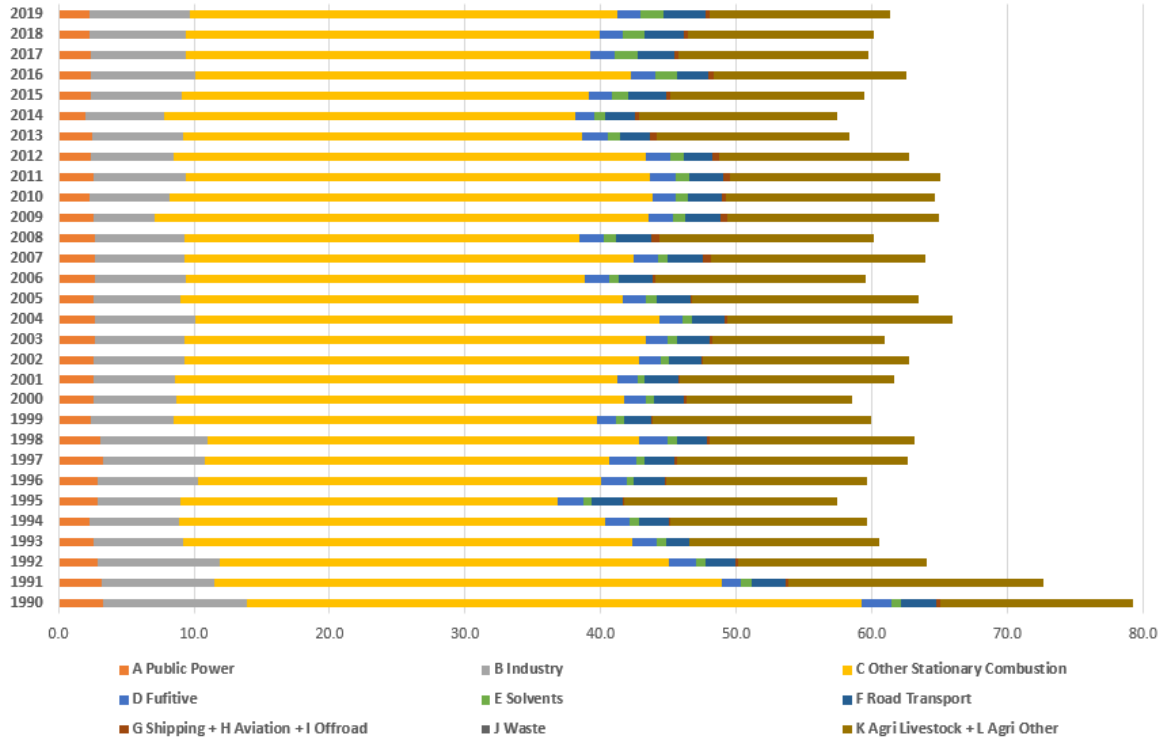


Figure 21. Distribution of PM10 between sectors for period 1990 – 2019.

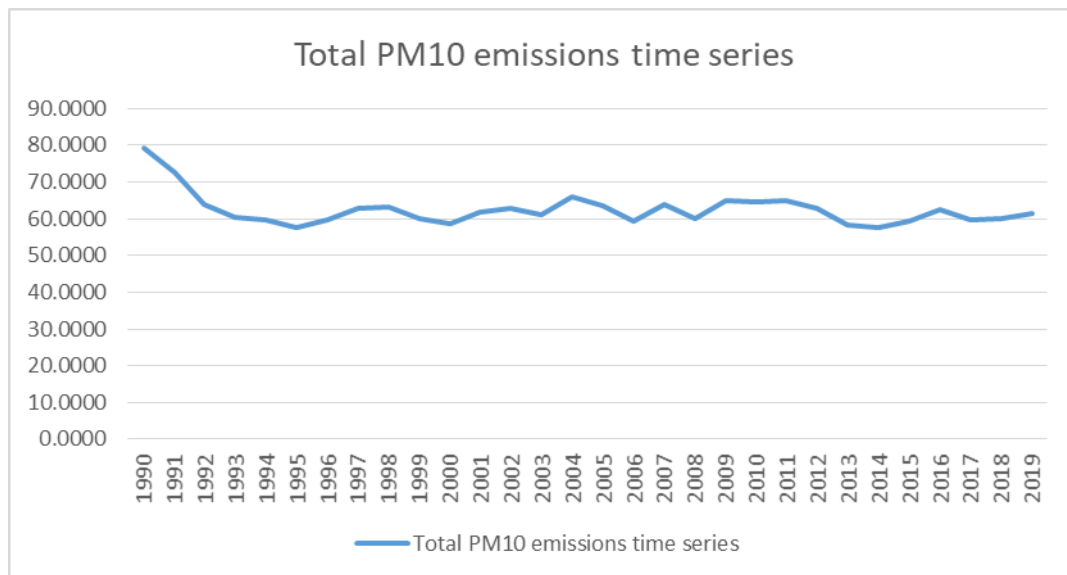


Figure 22. Total PM10 emissions time series from 1990 to 2019.

Table 42. Total PM10 emissions between sectors for years 1990 and 2019. Trends of dominant sources of PM10 emissions compared to years 1990-2019 and 2018-2019. Share in National Total for years 1990 and 2019

NFR Category	PM10 Emission in [kt]		Trend		Share in National Total	
	1990	2019	1990 - 2019	2018 - 2019	1990	2019
A Public Power	3.3141	2.2561	-31.92%	-0.52%	4.18%	3.68%
B Industry	10.6249	7.4252	-30.12%	4.57%	13.41%	12.10%
C Other Stationary Combustion	45.3133	31.5276	-30.42%	3.32%	57.18%	51.37%
D Fugitive	2.1932	1.7612	-19.70%	1.83%	2.77%	2.87%
E Solvents	0.7323	1.6486	125.11%	-0.15%	0.92%	2.69%
F Road Transport	2.5266	3.0947	22.49%	8.46%	3.19%	5.04%
G Shipping + H Aviation + I Offroad	0.3085	0.3468	12.41%	7.22%	0.39%	0.57%
J Waste	0.0000	0.0001	381.31%	1.50%	0.00%	0.00%
K Agri Livestock + L Agri Other	14.2295	13.3101	-6.46%	-3.07%	17.96%	21.69%
Total	79.2425	61.3705	-22.55%	1.99%	100.00%	100.00%

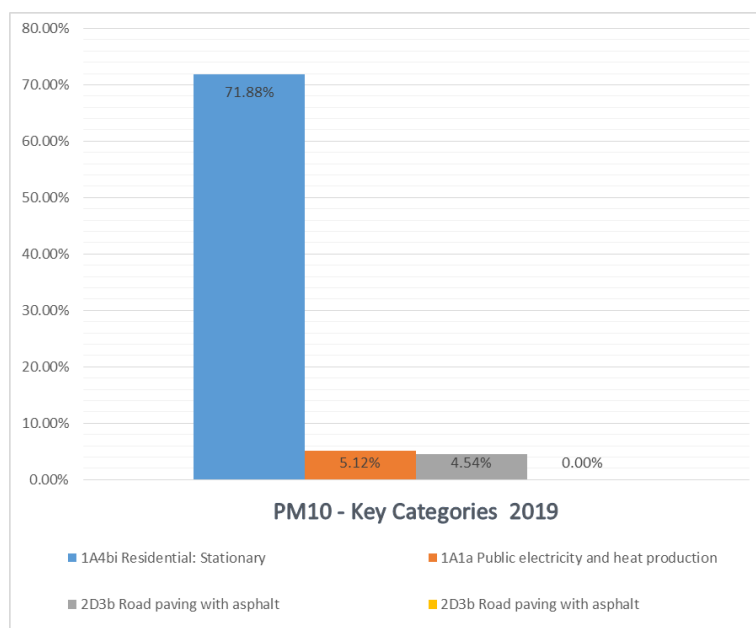


Figure 23. Key Categories assessments of PM10 emissions for 2019

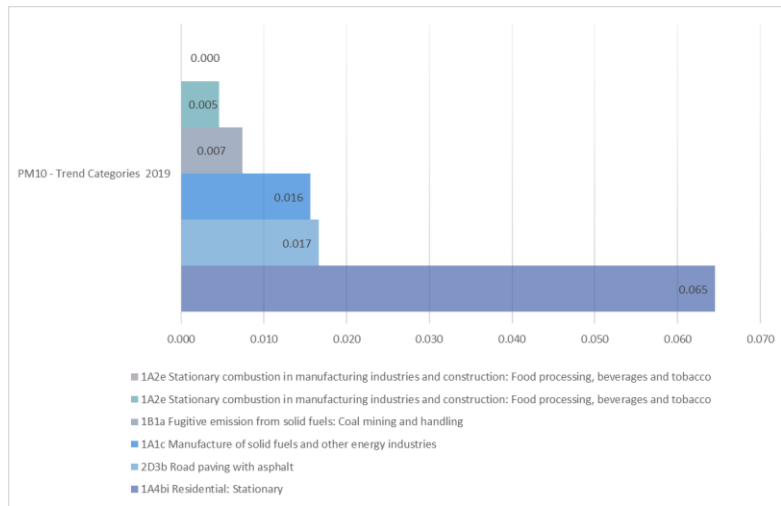


Figure 24. Trends assessments of PM10 emissions for base year and 2019

2.4.7. TSP Emission

TSP emissions in 2019. was 81.7036 kt, which is 31.71 % decrease compared to 2018. Compared to the 1990 baseline emissions of TSP is 50.26 % lower.

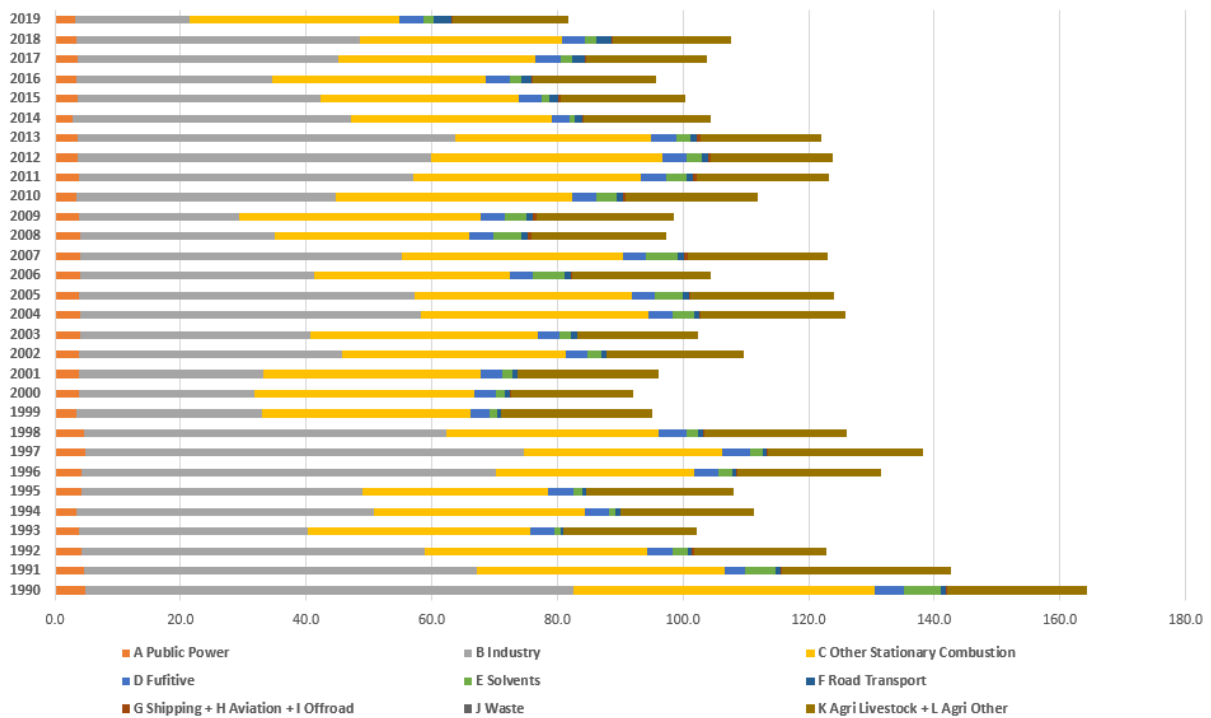


Figure 25. Distribution of TSP between sectors for period 1990 – 2019.

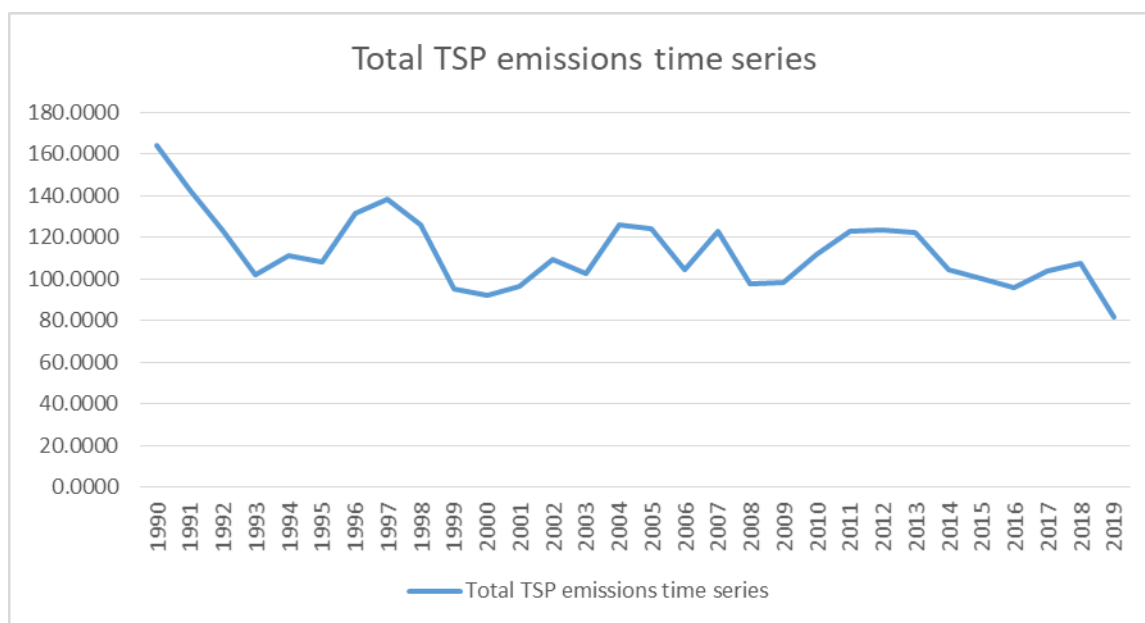


Figure 26. Total TSP emissions time series from 1990 to 2019.

Table 43. Total TSP emissions between sectors for years 1990 and 2019. Trends of dominant sources of TSP emissions compared to years 1990-2019 and 2018-2019. Share in National Total for years 1990 and 2019

NFR Category	TSP Emission in [kt]		Trend		Share in National Total	
	1990	2019	1990 - 2019	2018 - 2019	1990	2019
A Public Power	4.8780	3.3102	-32.14%	-0.44%	2.97%	4.05%
B Industry	77.5659	18.2022	-76.53%	-59.69%	47.22%	22.28%
C Other Stationary Combustion	48.0503	33.3485	-30.60%	3.31%	29.25%	40.82%
D Fugitive	4.7033	3.7415	-20.45%	1.77%	2.86%	4.58%
E Solvents	5.8847	1.7744	-69.85%	0.61%	3.58%	2.17%
F Road Transport	0.7354	2.6700	263.04%	14.25%	0.45%	3.27%
G Shipping + H Aviation + I Offroad	0.3078	0.3427	11.34%	7.29%	0.19%	0.42%
J Waste	0.0000	0.0001	381.31%	1.50%	0.00%	0.00%
K Agri Livestock + L Agri Other	22.1230	18.3139	-17.22%	-2.37%	13.47%	22.42%
Total	164.2486	81.7036	-50.26%	-24.08%	100.00%	100.00%

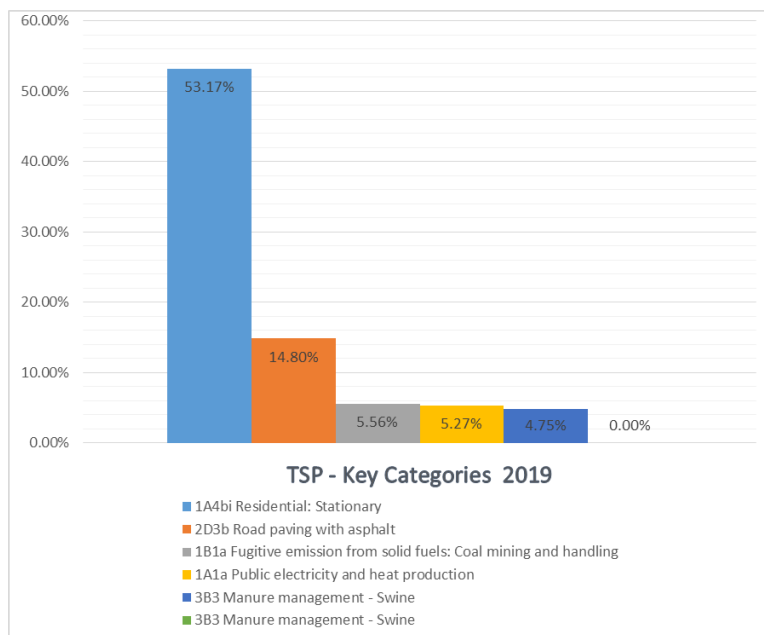


Figure 27. Key Categories assessments of TSP emissions for 2019

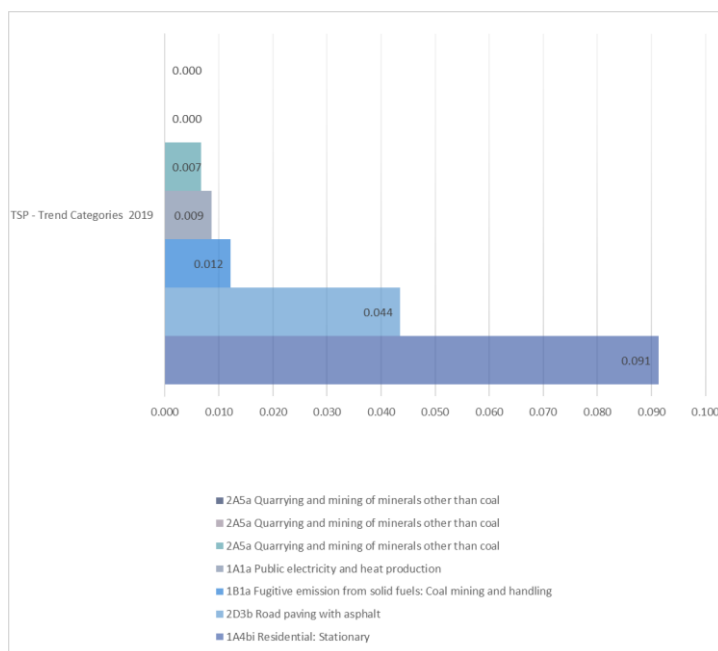


Figure 28. Trends assessments of TSP emissions for base year and 2019

2.4.8. Black Carbon (BC)

BC emissions in 2019. was 33.0095 kt, which is 4.82 % decrease compared to 2018. Compared to the 1990 baseline emissions of BC is 0.82 % higher.

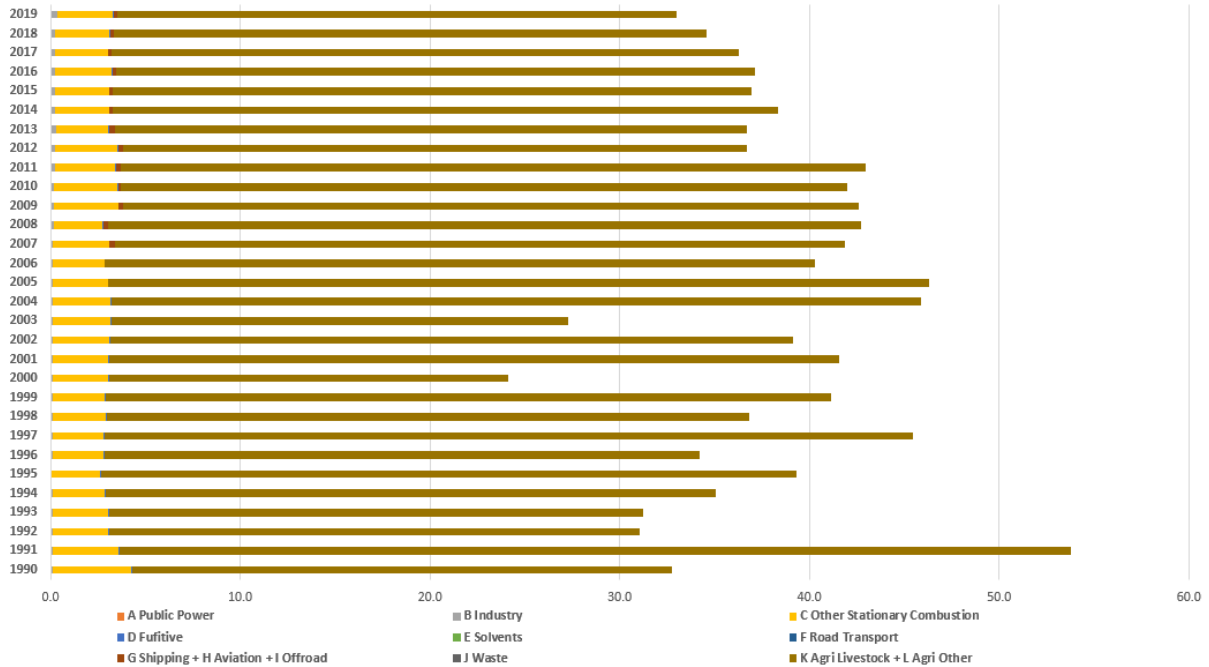


Figure 29. Distribution of BC between sectors for period 1990 – 2019.

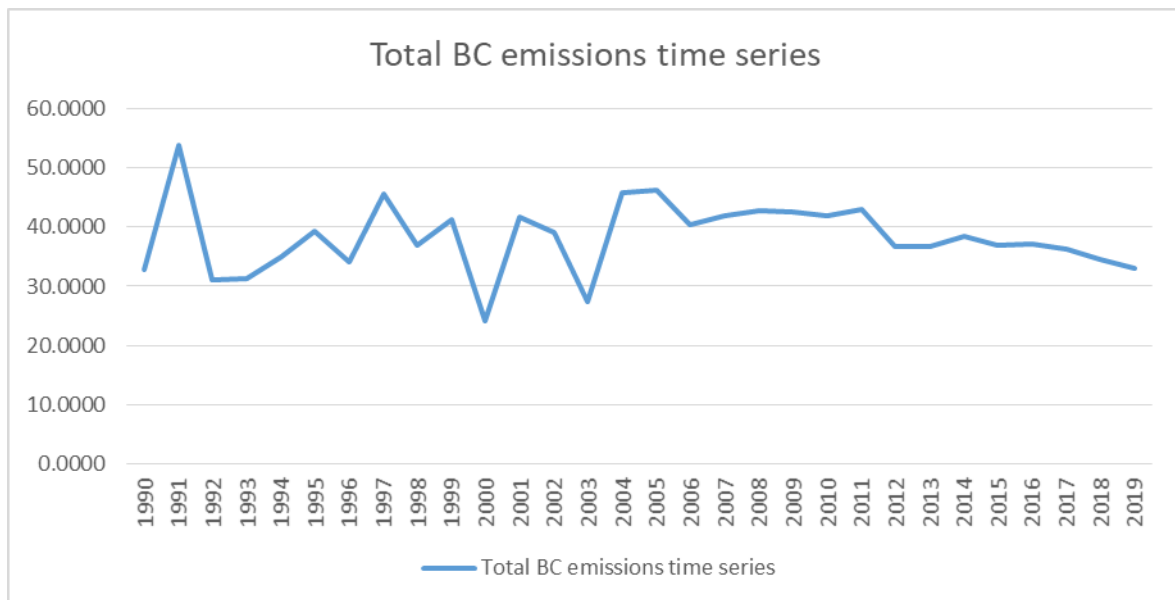


Figure 30. Total BC emissions time series from 1990 to 2019.

Table 44. Total BC emissions between sectors for years 1990 and 2019. Trends of dominant sources of BC emissions compared to years 1990-2019 and 2018-2019. Share in National Total for years 1990 and 2019

NFR Category	BC Emission in [kt]		Trend		Share in National Total	
	1990	2019	1990 - 2019	2018 - 2019	1990	2019
A Public Power	0.0248	0.0140	-43.27%	-6.04%	0.08%	0.04%
B Industry	0.1060	0.3158	197.91%	32.54%	0.32%	0.96%
C Other Stationary Combustion	4.1311	2.9629	-28.28%	3.30%	12.62%	8.98%
D Fugitive	0.0630	0.0199	-68.40%	-14.51%	0.19%	0.06%
E Solvents	0.0018	0.0049	174.47%	-5.41%	0.01%	0.01%
F Road Transport	0.0002	0.0006	273.20%	14.25%	0.00%	0.00%
G Shipping + H Aviation + I Offroad	0.0012	0.1748	13948.35%	9.76%	0.00%	0.53%
J Waste	NA	NA	NA	NA	NA	NA
K Agri Livestock + L Agri Other	28.4118	29.5166	3.89%	-5.68%	86.78%	89.42%
Total	32.7398	33.0095	0.82%	-4.60%	100.00%	100.00%

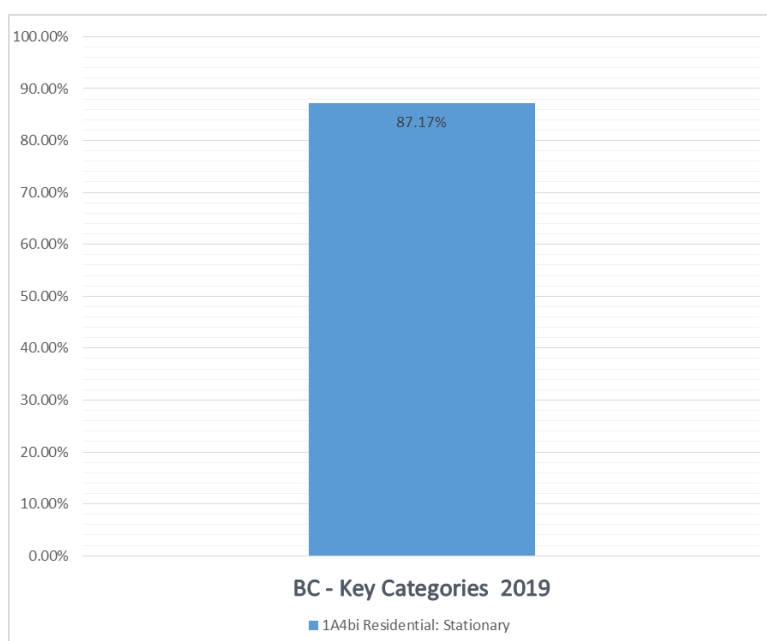


Figure 31. Key Categories assessments of BC emissions for 2019

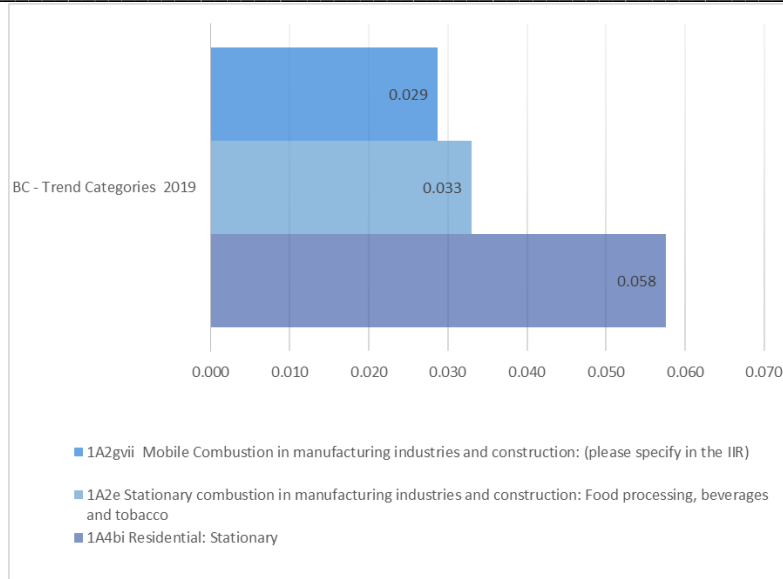


Figure 32. Trends assessments of BC emissions for base year and 2019

OTHER

2.4.9. Carbon Monoxide (CO)

Carbon monoxide (CO) emissions in 2019. was 329,9276 kt, which is 0.69 % increase compared to 2018. Compared to the 1990 baseline emissions of CO is 43.88 % lower.

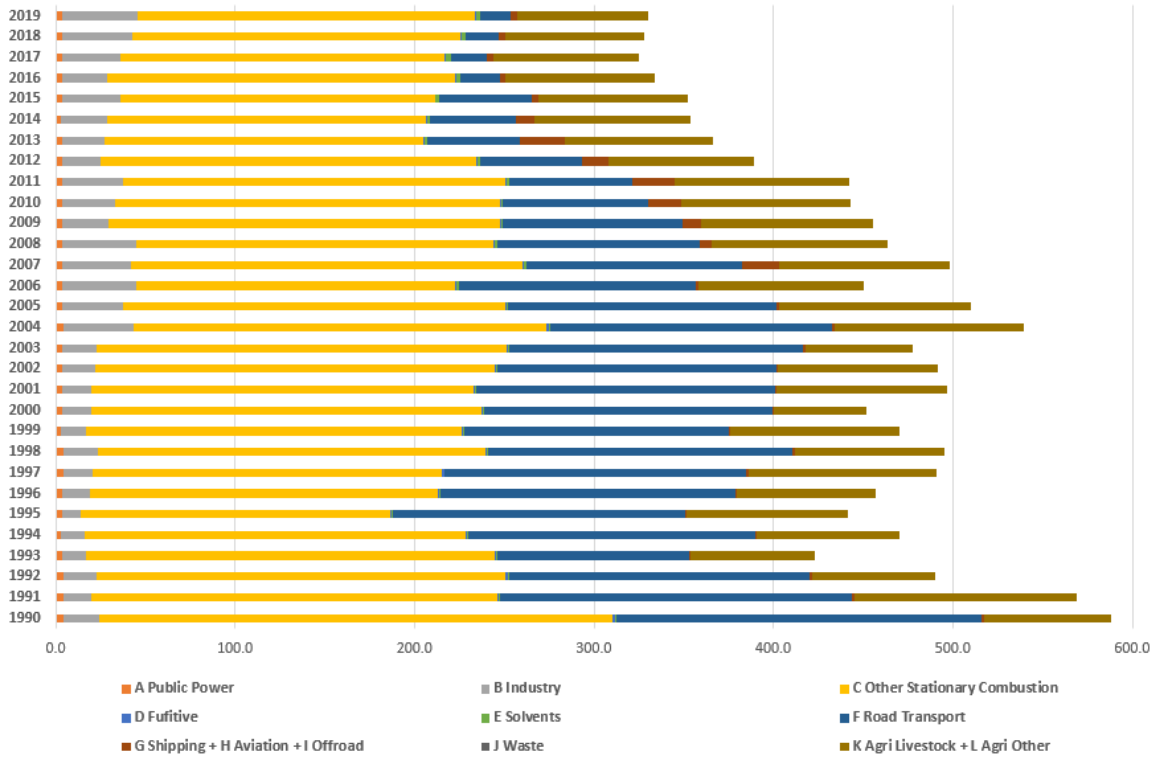


Figure 33. Distribution of CO between sectors for period 1990 – 2019

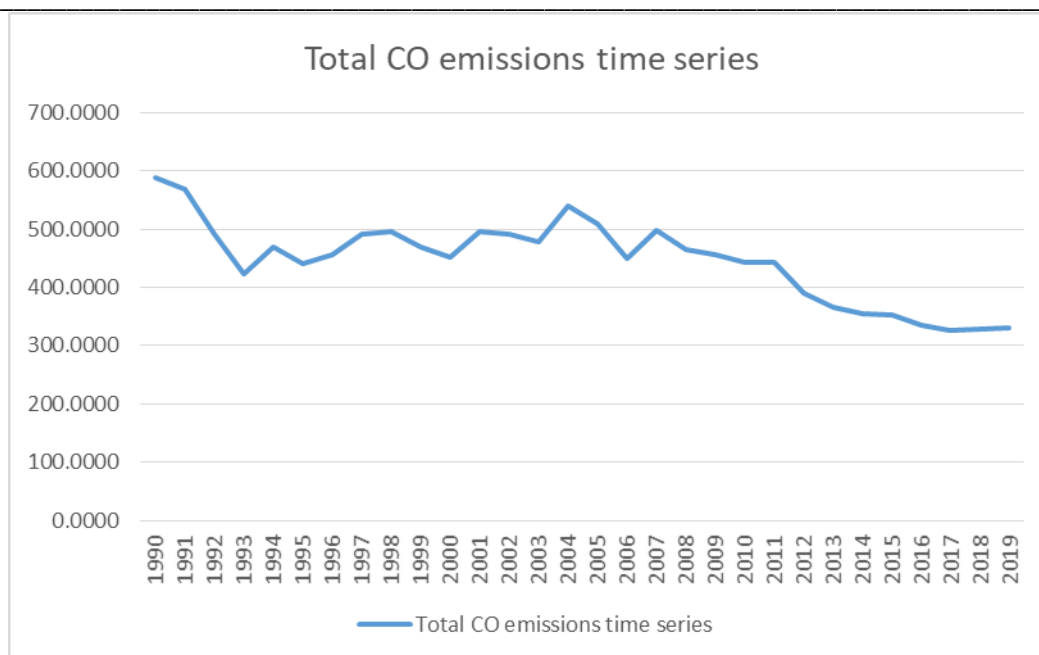


Figure 34. Total CO emissions time series from 1990 to 2019.

Table 45. Total CO emissions between sectors for years 1990 and 2019. Trends of dominant sources of CO emissions compared to years 1990-2019 and 2018-2019. Share in National Total for years 1990 and 2019

NFR Category	CO Emission in [kt]		Trend		Share in National Total	
	1990	2019	1990 - 2019	2018 - 2019	1990	2019
A Public Power	4.3209	3.6915	-14.57%	0.25%	0.73%	1.12%
B Industry	20.1935	41.8460	107.22%	7.04%	3.43%	12.68%
C Other Stationary Combustion	286.0574	188.3839	-34.14%	3.07%	48.66%	57.10%
D Fugitive	1.3950	0.5889	-57.78%	-13.23%	0.24%	0.18%
E Solvents	0.8047	2.2086	174.47%	-5.41%	0.14%	0.67%
F Road Transport	203.5089	16.7512	-91.77%	-8.96%	34.62%	5.08%
G Shipping + H Aviation + I Offroad	1.4480	3.5401	144.49%	4.94%	0.25%	1.07%
J Waste	0.0001	0.0005	381.31%	1.50%	0.00%	0.00%
K Agri Livestock + L Agri Other	70.1876	72.9169	3.89%	-5.68%	11.94%	22.10%
Total	587.9160	329.9276	-43.88%	0.70%	100.00%	100.00%

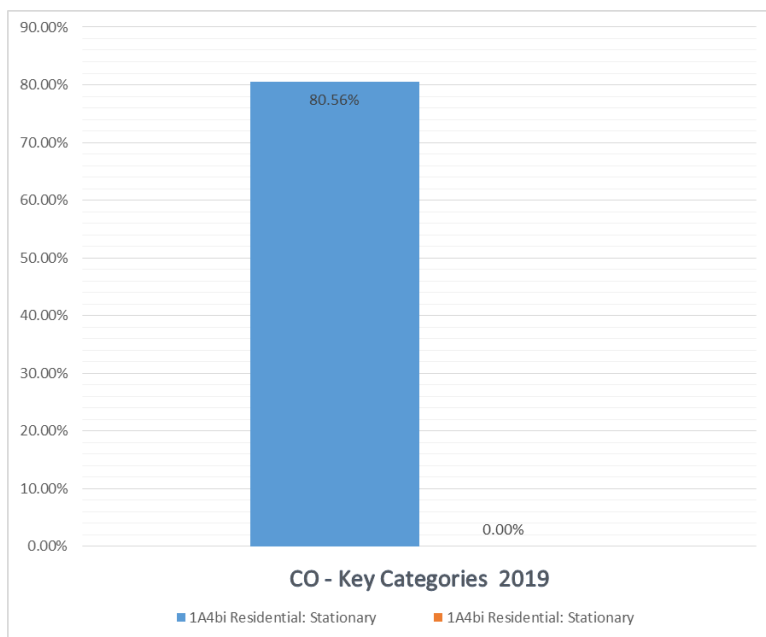


Figure 35. Key Categories assessments of CO emissions for 2019.

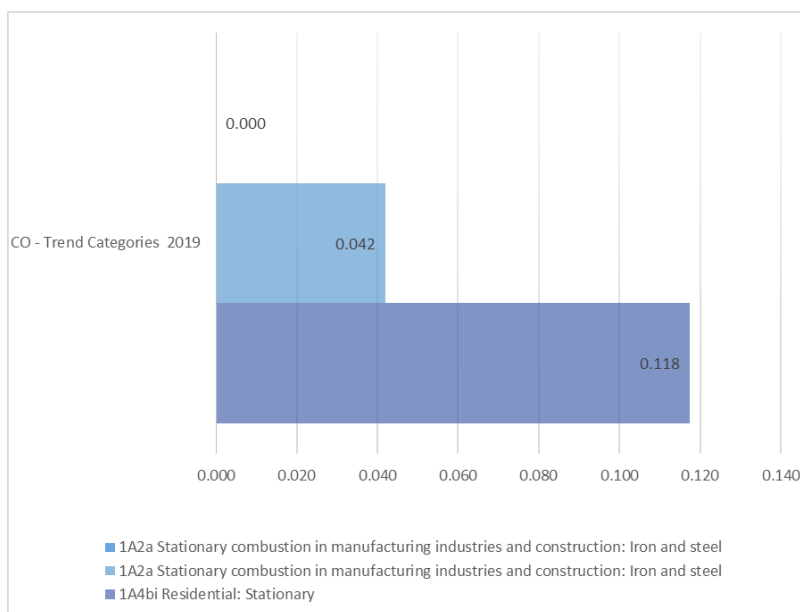


Figure 36. Trends assessments of CO emissions for base year and 2019

PRIORITY HEAVY METALS

2.4.10. Lead Emission (PB)

Lead (Pb) emissions in 2019. was 47,3669 kt, which is 11.20 % decrease compared to 2018. Compared to the 1990 baseline emissions of Pb is 87.28 % lower.

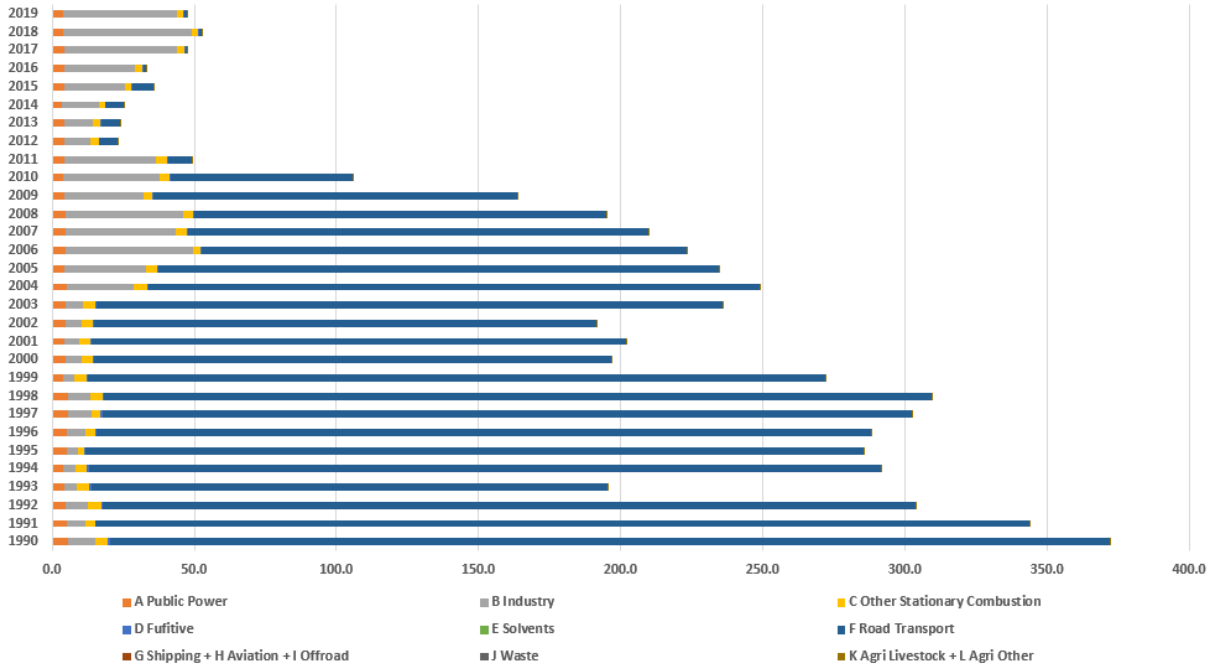


Figure 37. Distribution of Pb between sectors for period 1990 - 2019

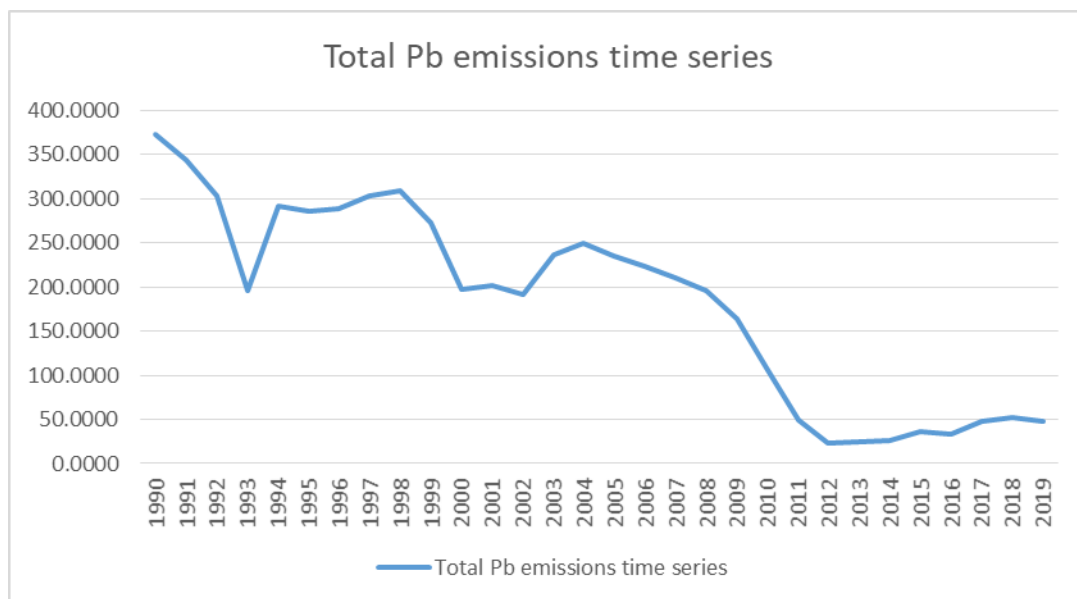


Figure 38. Total PB emissions time series from 1990 to 2019.

Table 46. Total Pb emissions between sectors for years 1990 and 2019. Trends of dominant sources of Pb emissions compared to years 1990-2019 and 2018-2019. Share in National Total for years 1990 and 2019

NFR Category	Pb Emission in [kt]		Trend		Share in National Total	
	1990	2019	1990 - 2019	2018 - 2019	1990	2019
A Public Power	5.7495	4.0209	-30.07%	0.46%	1.54%	8.49%
B Industry	9.3093	39.7595	327.09%	-11.93%	2.50%	83.94%
C Other Stationary Combustion	4.4439	2.3372	-47.41%	3.20%	1.19%	4.93%
D Fugitive	0.8251	0.2691	-67.38%	-14.35%	0.22%	0.57%
E Solvents	NA	NA	NA	NA	NA	NA
F Road Transport	351.8605	0.8587	-99.76%	4.99%	94.51%	1.81%
G Shipping + H Aviation + I Offroad	0.0072	0.0011	-85.00%	0.00%	0.00%	0.00%
J Waste	0.0000	0.0001	381.31%	1.50%	0.00%	0.00%
K Agri Livestock + L Agri Other	0.1158	0.1203	3.89%	-5.68%	0.03%	0.25%
Total	372.3114	47.3669	-87.28%	-10.07%	100.00%	100.00%

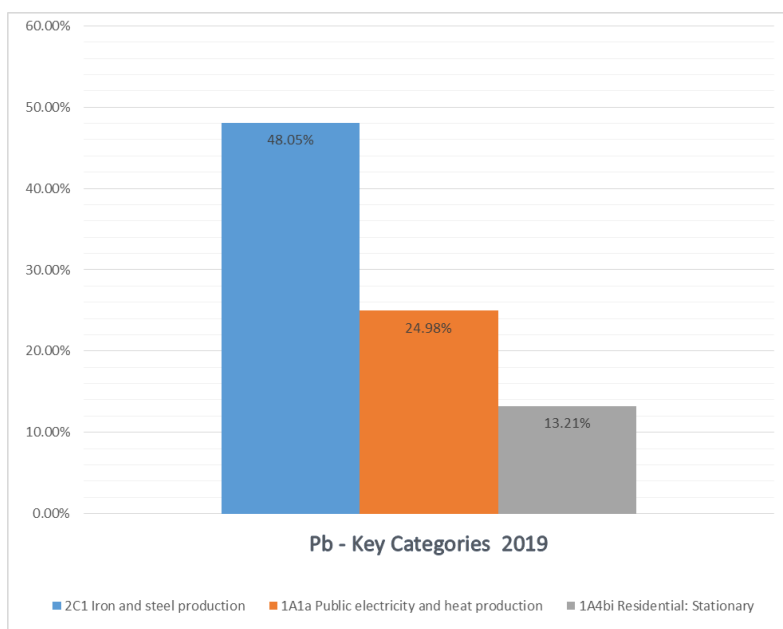


Figure 39. Key Categories assessments of Pb emissions for 2019.

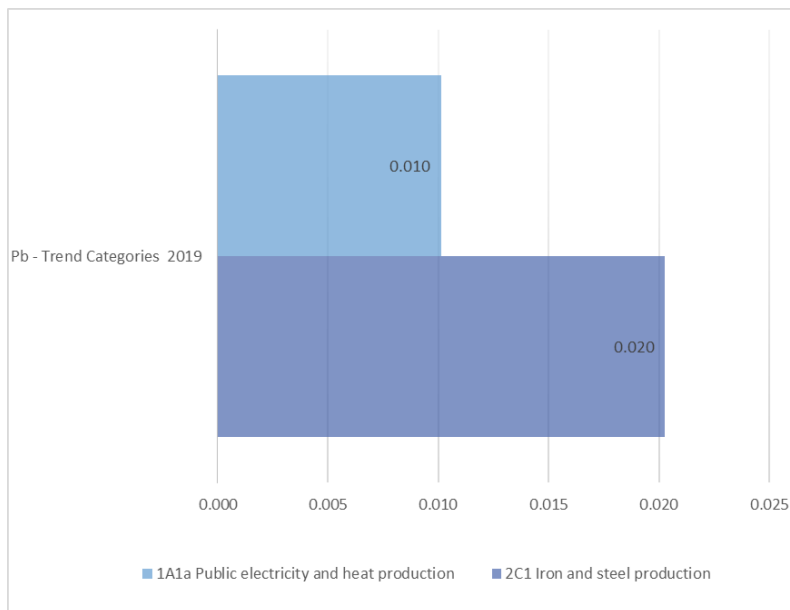


Figure 40. Trends assessments of Pb emissions for base year and 2019

2.4.11. Cadmium Emission (CD)

Cadmium (Cd) emissions in 2019. was 3,7667 t, which is 3.48 % increase compared to 2018. Compared to the 1990 baseline emissions of Cd is 23.35 % lower.

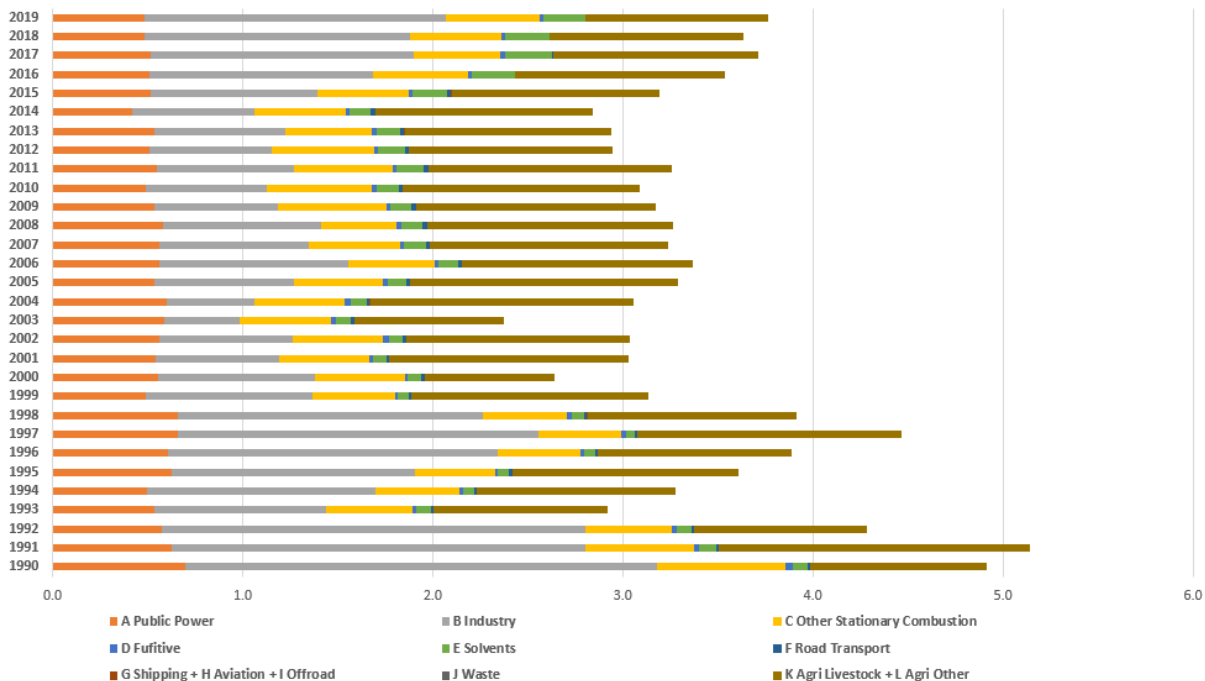


Figure 41. Distribution of Cd between sectors for period 1990 – 2019

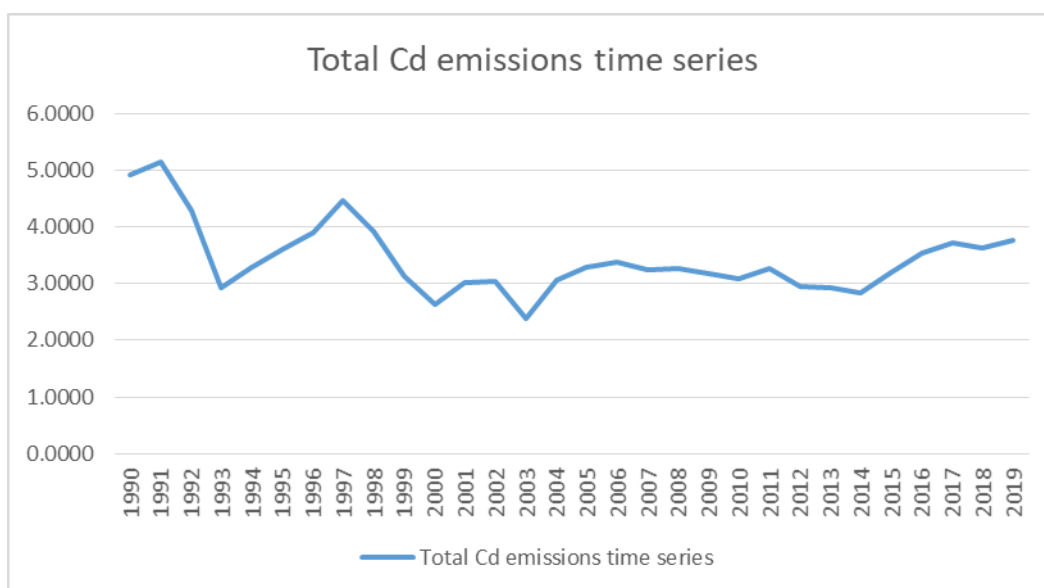


Figure 42. Total Cd emissions time series from 1990 to 2019.

Table 47. Total Cd emissions between sectors for years 1990 and 2019. Trends of dominant sources of Cd emissions compared to years 1990-2019 and 2018-2019. Share in National Total for years 1990 and 2019

NFR Category	Cd Emission in [kt]		Trend		Share in National Total	
	1990	2019	1990 - 2019	2018 - 2019	1990	2019
A Public Power	0.6972	0.4850	-30.44%	0.37%	14.19%	12.87%
B Industry	2.4832	1.5856	-36.15%	13.26%	50.53%	42.10%
C Other Stationary Combustion	0.6736	0.4926	-26.88%	3.55%	13.71%	13.08%
D Fugitive	0.0389	0.0207	-46.80%	-12.40%	0.79%	0.55%
E Solvents	0.0789	0.2165	174.32%	-5.41%	1.61%	5.75%
F Road Transport	0.0155	0.0041	-73.68%	5.08%	0.32%	0.11%
G Shipping + H Aviation + I Offroad	0.0011	0.0002	-78.05%	4.37%	0.02%	0.01%
J Waste	0.0000	0.0000	381.31%	1.50%	0.00%	0.00%
K Agri Livestock + L Agri Other	0.9260	0.9620	3.89%	-5.68%	18.84%	25.54%
Total	4.9144	3.7667	-23.35%	3.61%	100.00%	100.00%

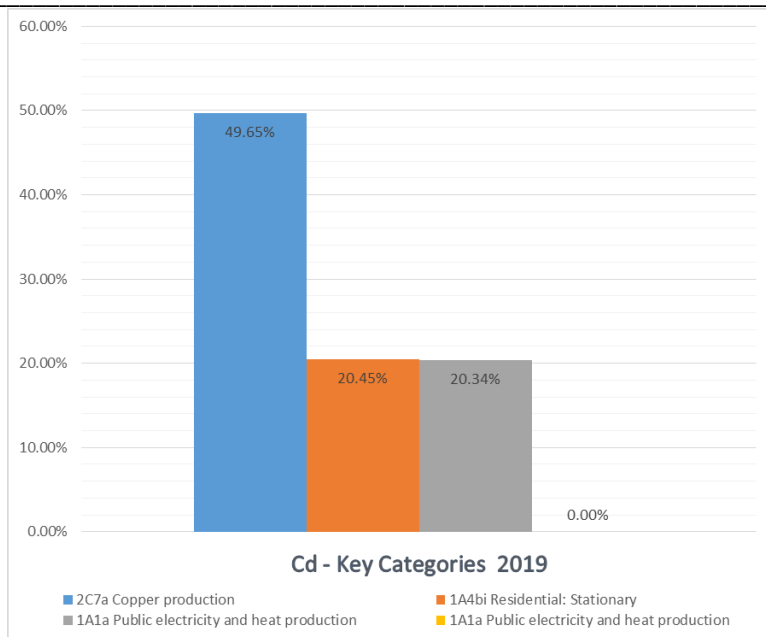


Figure 43. Key Categories assessments of Cd emissions for 2019.

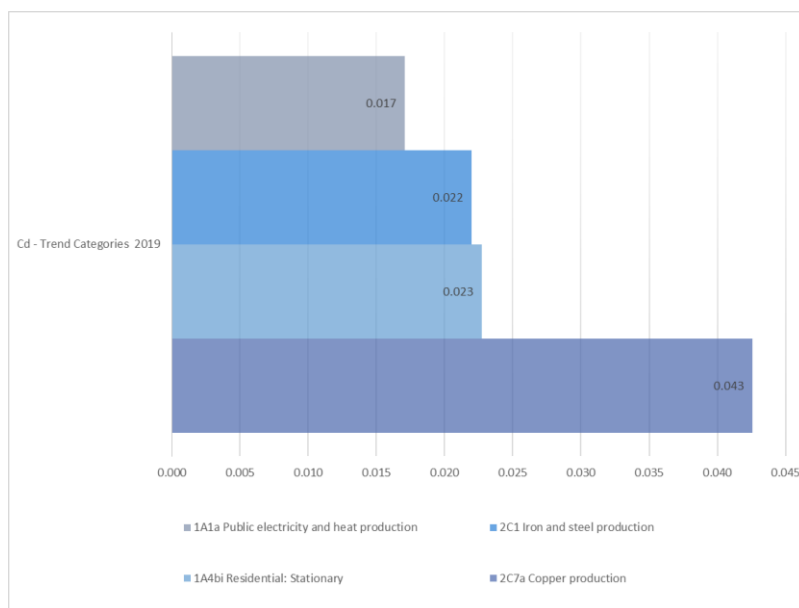


Figure 44. Trends assessments of Cd emissions for base year and 2019

2.4.12. Mercury Emission (HG)

Mercury (Hg) emissions in 2019. was 1,8376t, which is 9.66 % decrease compared to 2018. Compared to the 1990 baseline emissions of Cd is 36.97 % lower.

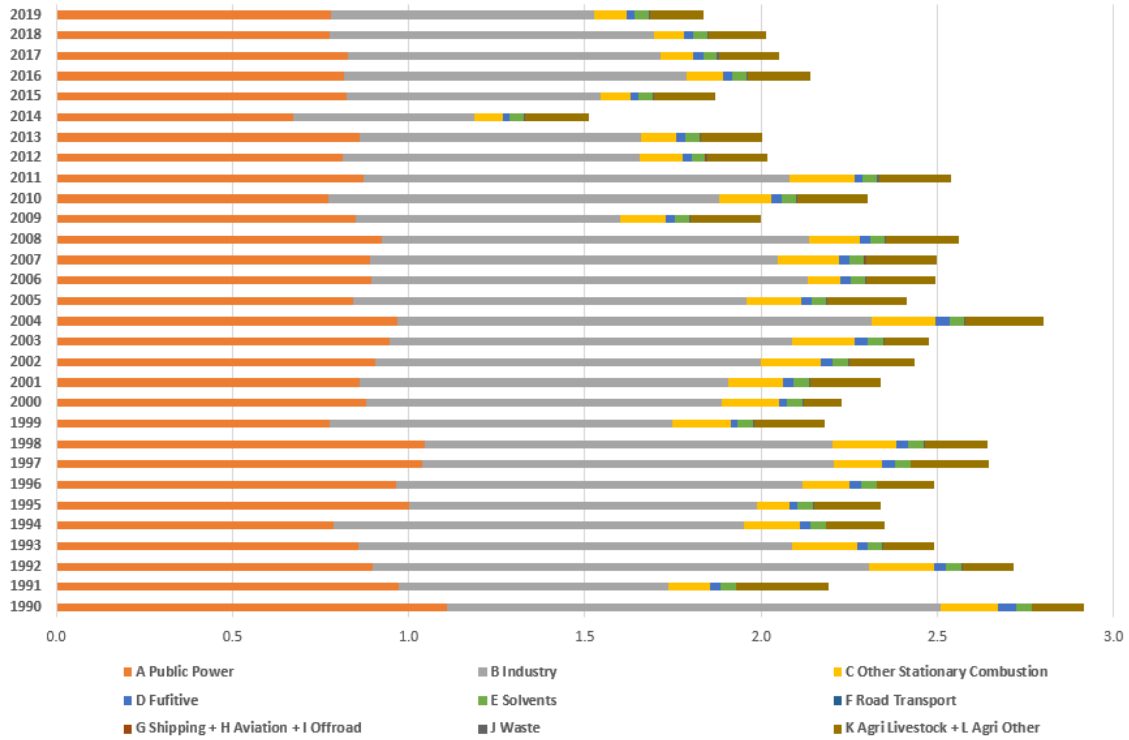


Figure 45. Distribution of Hg between sectors for period 1990 – 2019.

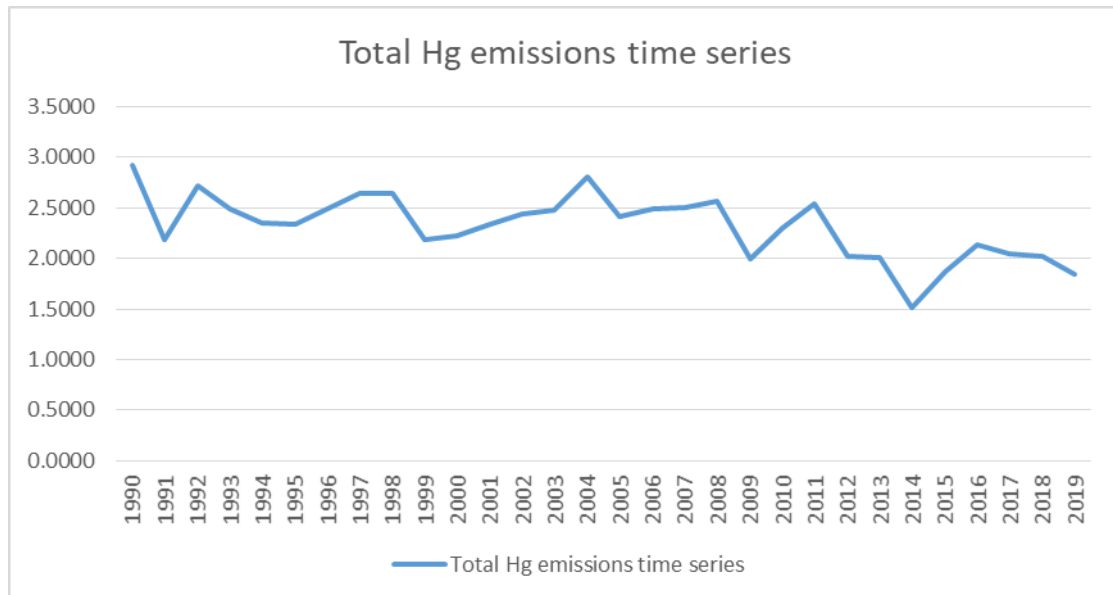


Figure 46. Total Hg emissions time series from 1990 to 2019.

Table 48. Total Hg emissions between sectors for years 1990 and 2019. Trends of dominant sources of Hg emissions compared to years 1990-2019 and 2018-2019. Share in National Total for years 1990 and 2019.

NFR Category	Hg Emission in [kt]		Trend		Share in National Total	
	1990	2019	1990 - 2019	2018 - 2019	1990	2019
A Public Power	1.1077	0.7784	-29.73%	0.53%	38.00%	42.36%
B Industry	1.4013	0.7491	-46.54%	-18.62%	48.07%	40.77%
C Other Stationary Combustion	0.1639	0.0890	-45.72%	3.16%	5.62%	4.84%
D Fugitive	0.0494	0.0240	-51.41%	-12.70%	1.69%	1.31%
E Solvents	0.0438	0.0388	-11.50%	-0.80%	1.50%	2.11%
F Road Transport	NA	NA	NA	NA	NA	NA
G Shipping + H Aviation + I Offroad	0.0008	0.0001	-85.00%	0.00%	0.03%	0.01%
J Waste	0.0011	0.0051	381.31%	1.50%	0.04%	0.28%
K Agri Livestock + L Agri Other	0.1473	0.1530	3.89%	-5.68%	5.05%	8.33%
Total	2.9154	1.8376	-36.97%	-8.81%	100.00%	100.00%

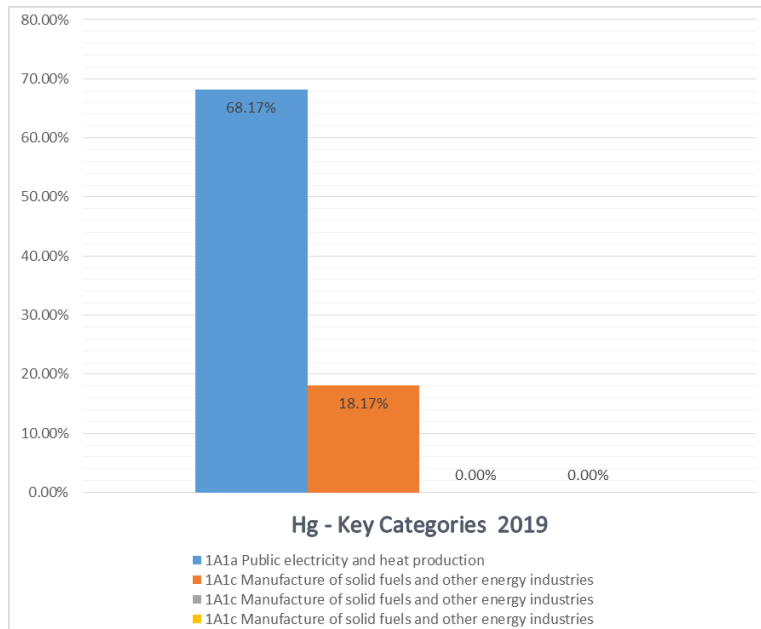


Figure 47. Key Categories assessments of Hg emissions for 2019.

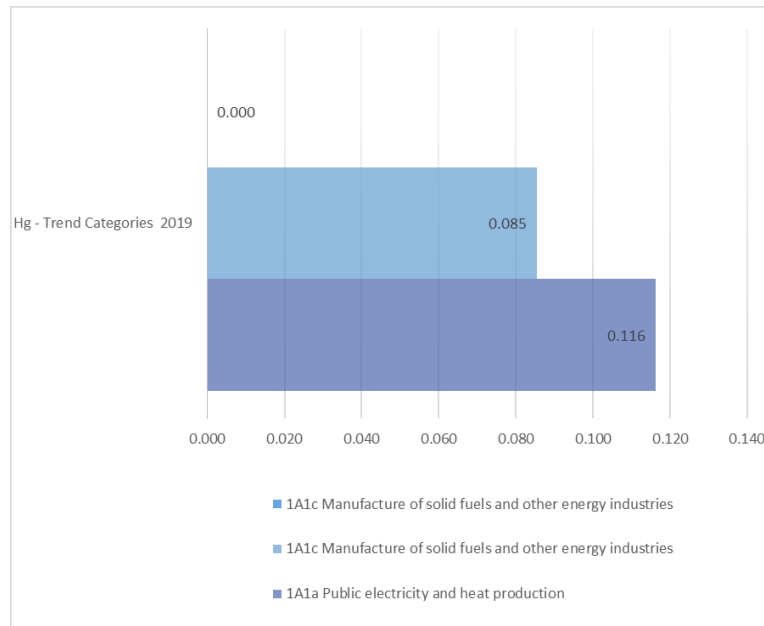


Figure 48. Trends assessments of Hg emissions for base year and 2019

Other Heavy Metals (As, Cr, Cu, Ni, Se AND Zn)

2.4.13. Arsenic emission (As)

Arsenic (As) emissions in 2019. was 5,5859 t, which is 0.18 % increase compared to 2018. Compared to the 1990 baseline emissions of As is 28.06 % lower.

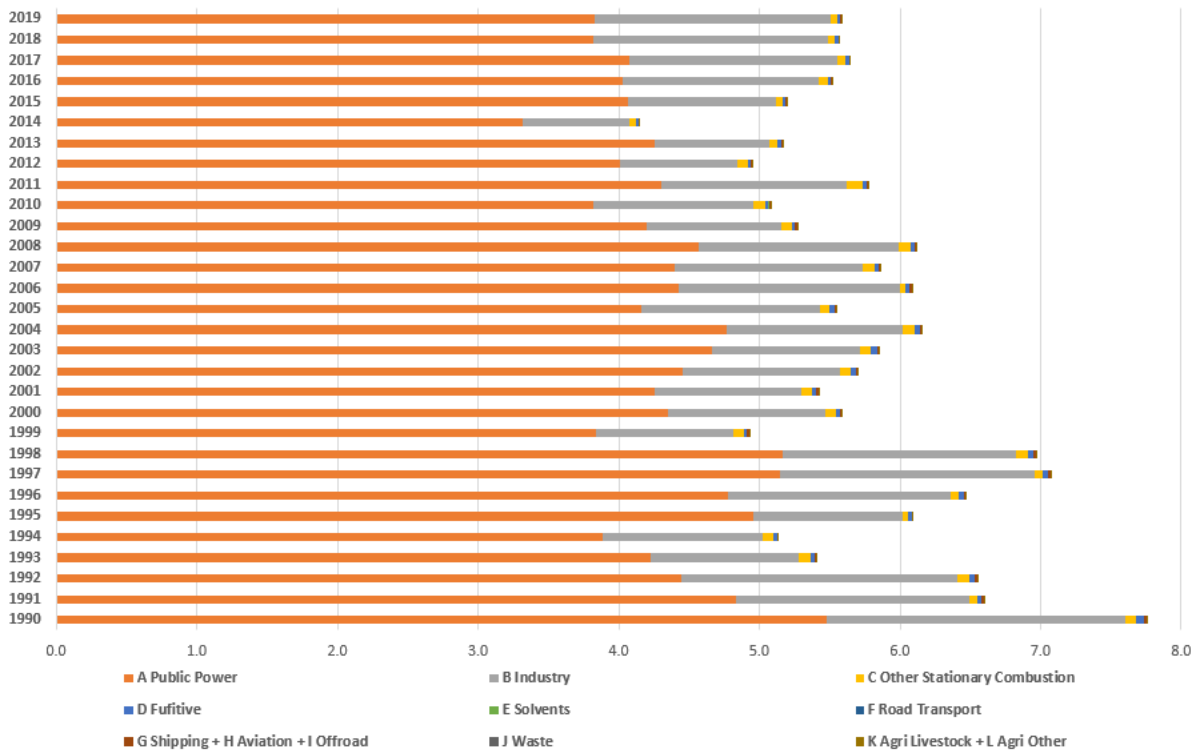


Figure 49. Distribution of As between sectors for period 1990 – 2019.

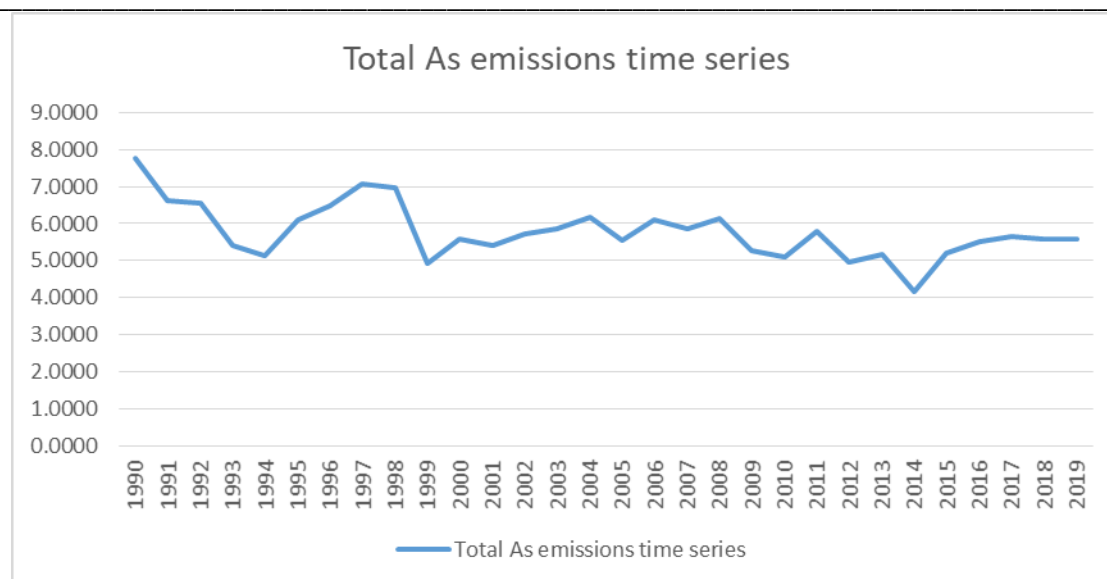


Figure 50. Total As emissions time series from 1990 to 2019.

Table 49. Total As emissions between sectors for years 1990 and 2019. Trends of dominant sources of As emissions compared to years 1990-2019 and 2018-2019. Share in National Total for years 1990 and 2019

NFR Category	As Emission in [kt]		Trend		Share in National Total	
	1990	2019	1990 - 2019	2018 - 2019	1990	2019
A Public Power	5.4803	3.8335	-30.05%	0.47%	70.58%	68.63%
B Industry	2.1222	1.6692	-21.35%	-0.24%	27.33%	29.88%
C Other Stationary Combustion	0.0769	0.0474	-38.33%	0.37%	0.99%	0.85%
D Fugitive	0.0515	0.0247	-52.11%	-12.75%	0.66%	0.44%
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	0.0041	-85.00%	0.00%	0.35%	0.07%
J Waste	0.0000	0.0000	381.31%	1.50%	0.00%	0.00%
K Agri Livestock + L Agri Other	0.0067	0.0070	3.89%	-5.68%	0.09%	0.13%
Total	7.7650	5.5859	-28.06%	0.18%	100.00%	100.00%

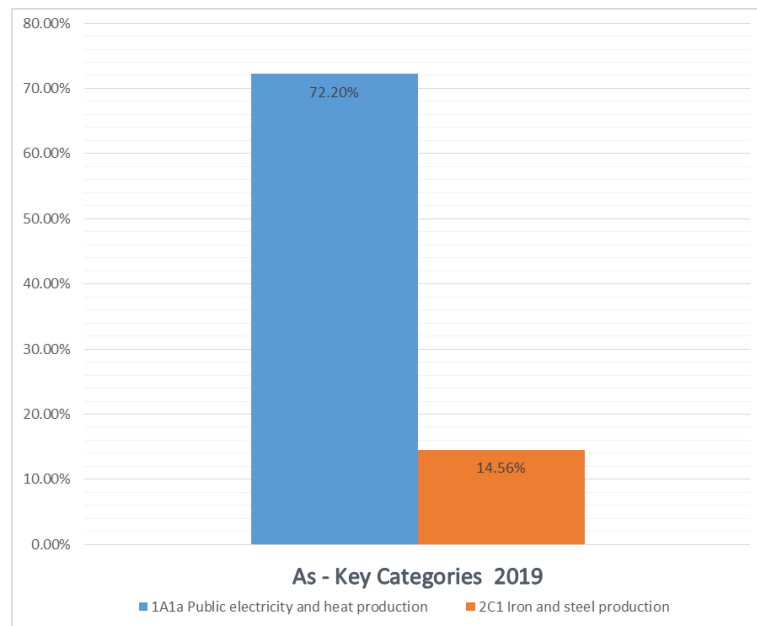


Figure 51. Key Categories assessments of As emissions for 2019

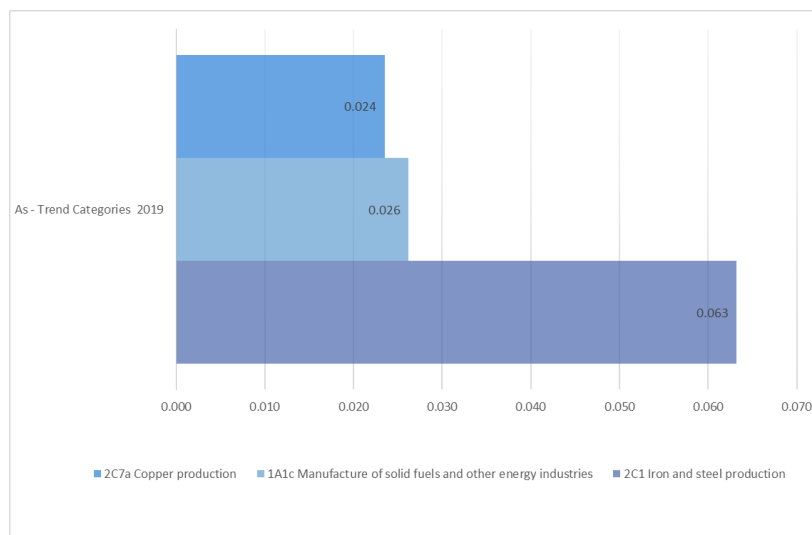


Figure 52. Trends assessments of As emissions for base year and 2019

2.4.14. Chromium emission (Cr)

Chromium (Cr) emissions in 2019. was 13,1143 t, which is 2.98 % decrease compared to 2018. Compared to the 1990 baseline emissions of Cr is 12.03 % lower.

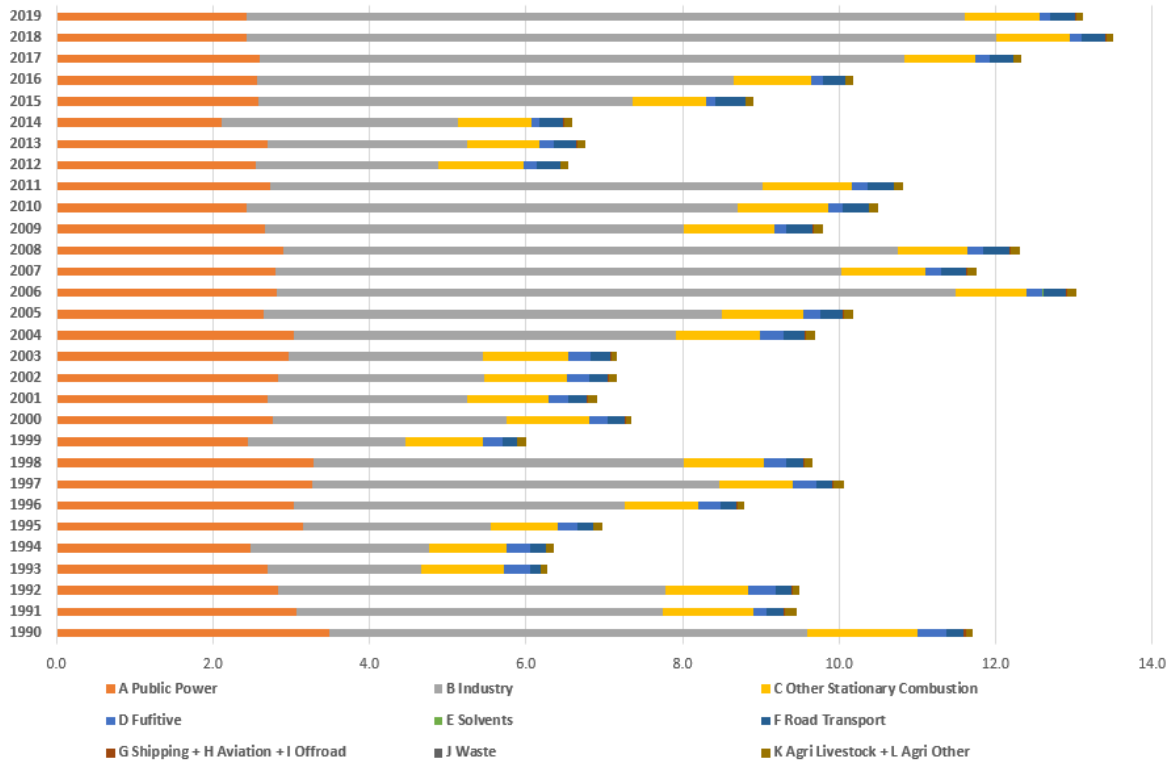


Figure 53. Distribution of Cr between sectors for period 1990 – 2019.

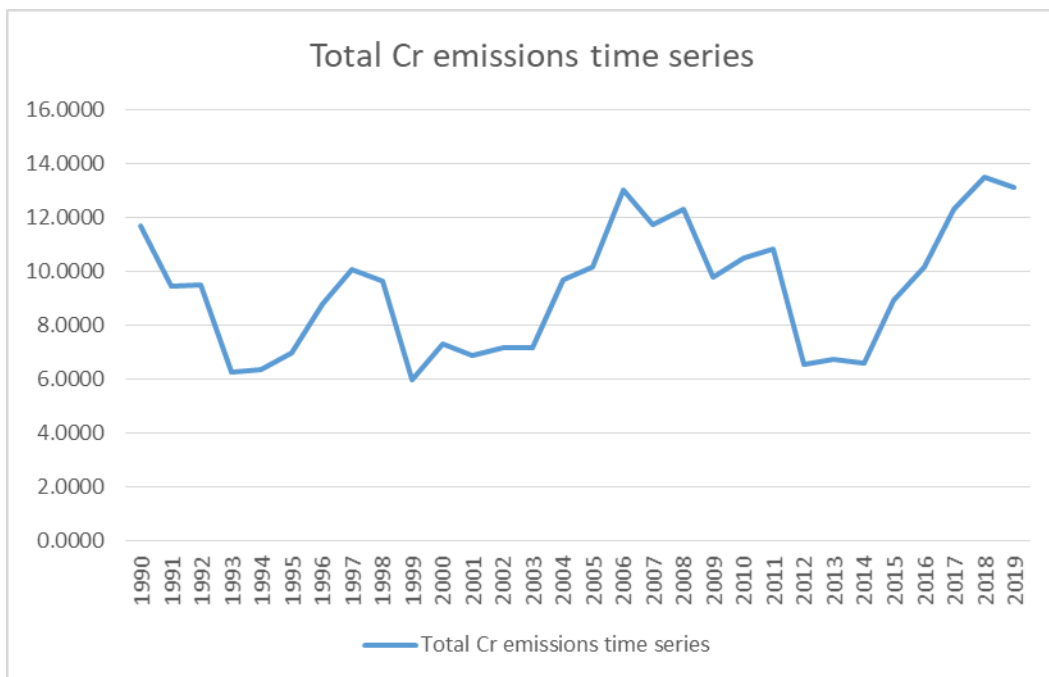


Figure 54. Total Cr emissions time series from 1990 to 2019.

Table 50. Total Cr emissions between sectors for years 1990 and 2019. Trends of dominant sources of Cr emissions compared to years 1990-2019 and 2018-2019. Share in National Total for years 1990 and 2019

NFR Category	Cr Emission in [kt]		Trend		Share in National Total	
	1990	2019	1990 - 2019	2018 - 2019	1990	2019
A Public Power	3.4859	2.4376	-30.07%	0.47%	29.78%	18.59%
B Industry	6.1020	9.1613	50.13%	-4.43%	52.13%	69.86%
C Other Stationary Combustion	1.4051	0.9616	-31.56%	3.54%	12.00%	7.33%
D Fugitive	0.3825	0.1292	-66.21%	-14.18%	3.27%	0.99%
E Solvents	0.0025	NA	NA	NA	0.02%	NA
F Road Transport	0.2136	0.3321	55.50%	5.04%	1.82%	2.53%
G Shipping + H Aviation + I Offroad	0.0303	0.0049	-83.74%	1.04%	0.26%	0.04%
J Waste	0.0000	0.0000	381.31%	1.50%	0.00%	0.00%
K Agri Livestock + L Agri Other	0.0842	0.0875	3.89%	-5.68%	0.72%	0.67%
Total	11.7062	13.1143	12.03%	-2.89%	100.00%	100.00%

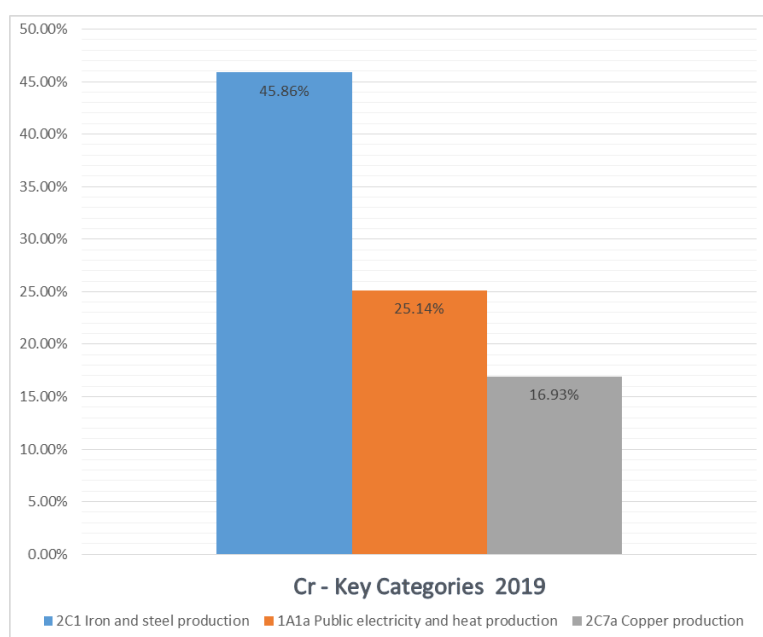


Figure 55. Key Categories assessments of Cr emissions for 2019.

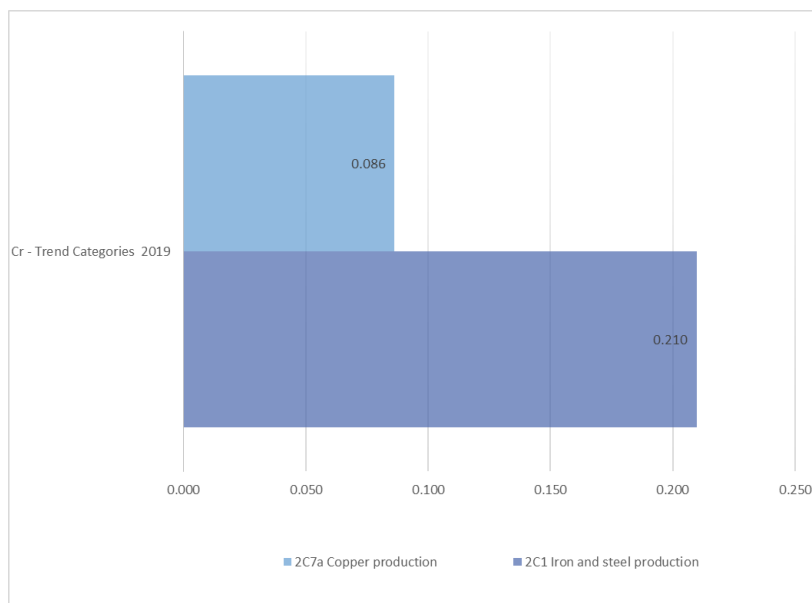


Figure 56. Trends assessments of Cr emissions for base year and 2019

2.4.15. Copper emission (Cu)

Copper (Cu) emissions in 2019. was 17,8397 t, which is 0.15 % decrease compared to 2018. Compared to the 1990 baseline emissions of Cu is 12.27 % higher.

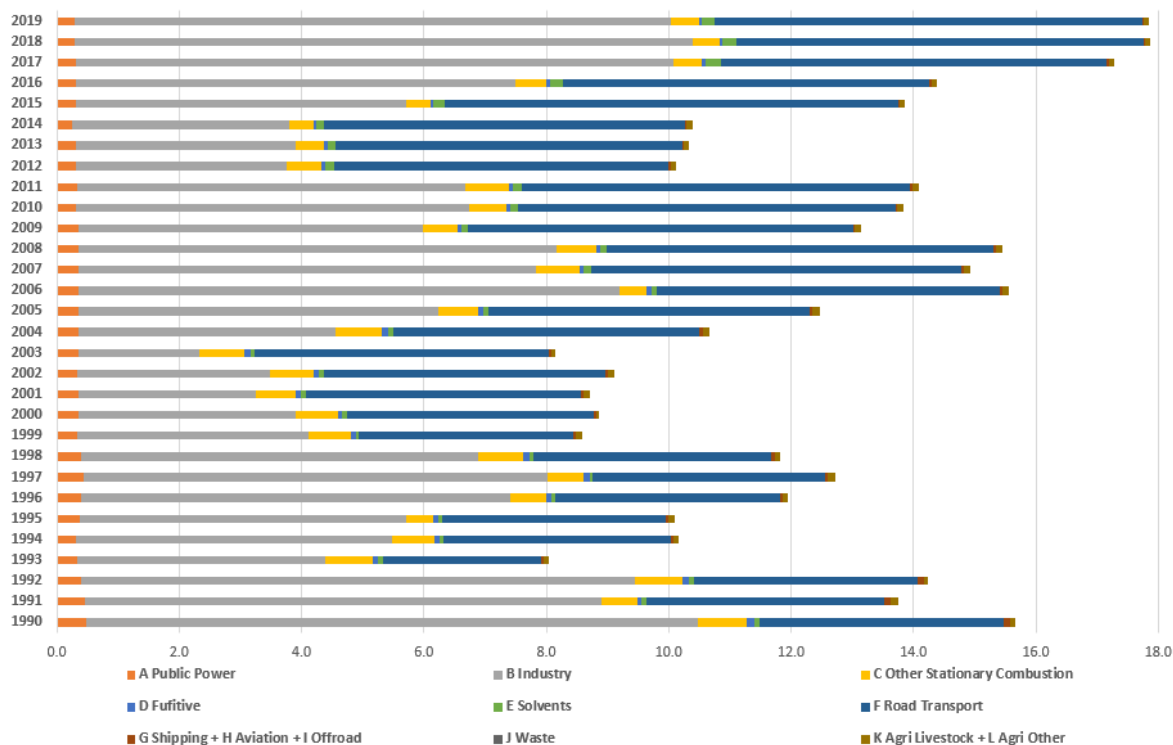


Figure 57. Distribution of Cu between sectors for period 1990 – 2019.

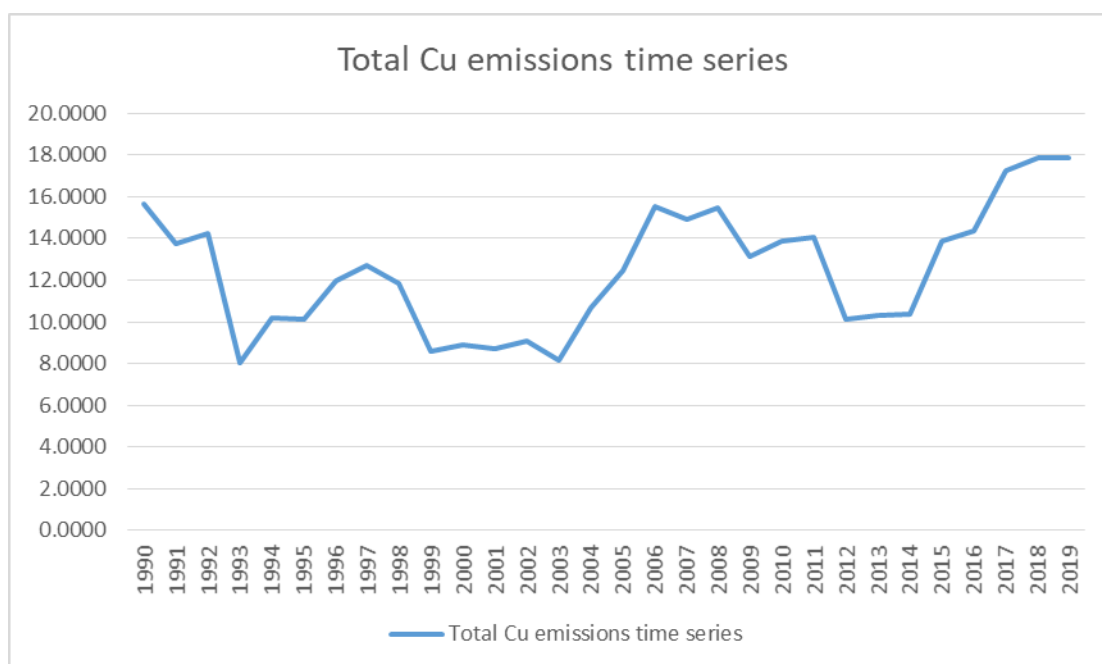


Figure 58. Total Cu emissions time series from 1990 to 2019.

Table 51. Total Cu emissions between sectors for years 1990 and 2019. Trends of dominant sources of Cu emissions compared to years 1990-2019 and 2018-2019. Share in National Total for years 1990 and 2019

NFR Category	Cu Emission in [kt]		Trend		Share in National Total	
	1990	2019	1990 - 2019	2018 - 2019	1990	2019
A Public Power	0.4700	0.2904	-38.22%	-1.06%	3.00%	1.63%
B Industry	10.0102	9.7515	-2.58%	-3.40%	63.96%	54.66%
C Other Stationary Combustion	0.8002	0.4469	-44.14%	2.90%	5.11%	2.51%
D Fugitive	0.1253	0.0480	-61.70%	-13.62%	0.80%	0.27%
E Solvents	0.0789	0.2165	174.47%	-5.41%	0.50%	1.21%
F Road Transport	3.9889	6.9786	74.95%	4.97%	25.49%	39.12%
G Shipping + H Aviation + I Offroad	0.1010	0.0281	-72.14%	6.50%	0.65%	0.16%
J Waste	0.0000	0.0000	381.31%	1.50%	0.00%	0.00%
K Agri Livestock + L Agri Other	0.0768	0.0798	3.89%	-5.68%	0.49%	0.45%
Total	15.6513	17.8397	13.98%	-0.15%	100.00%	100.00%

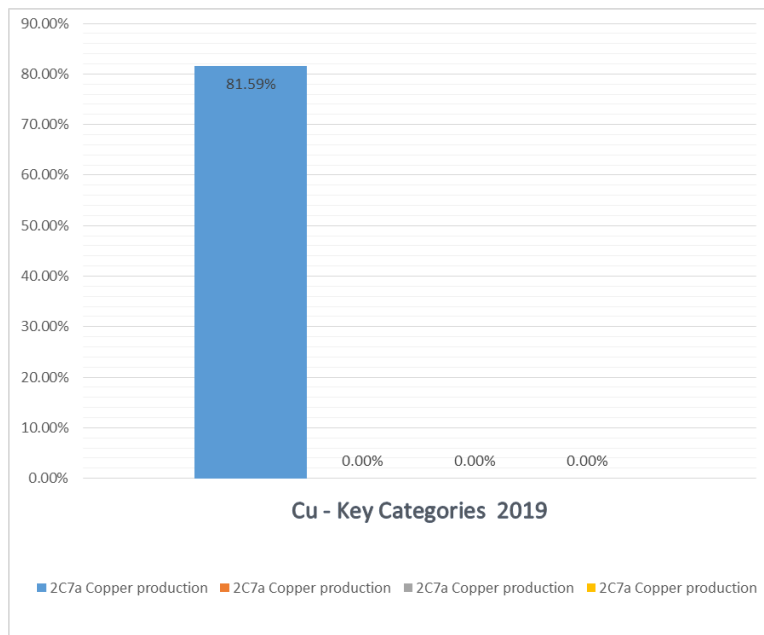


Figure 59. Key Categories assessments of Cu emissions for 2019

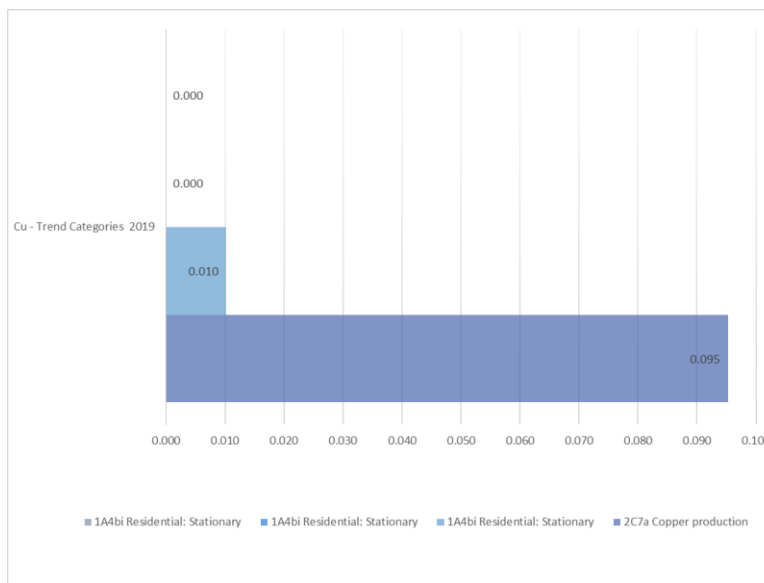


Figure 60. Trends assessments of Cu emissions for base year and 2019

2.4.16. Nickel emission (Ni)

Nickel (Ni) emissions in 2019. was 22,3829 t, which is 13.59 % decrease compared to 2018. Compared to the 1990 baseline emissions of Ni is 24.29 % higher.

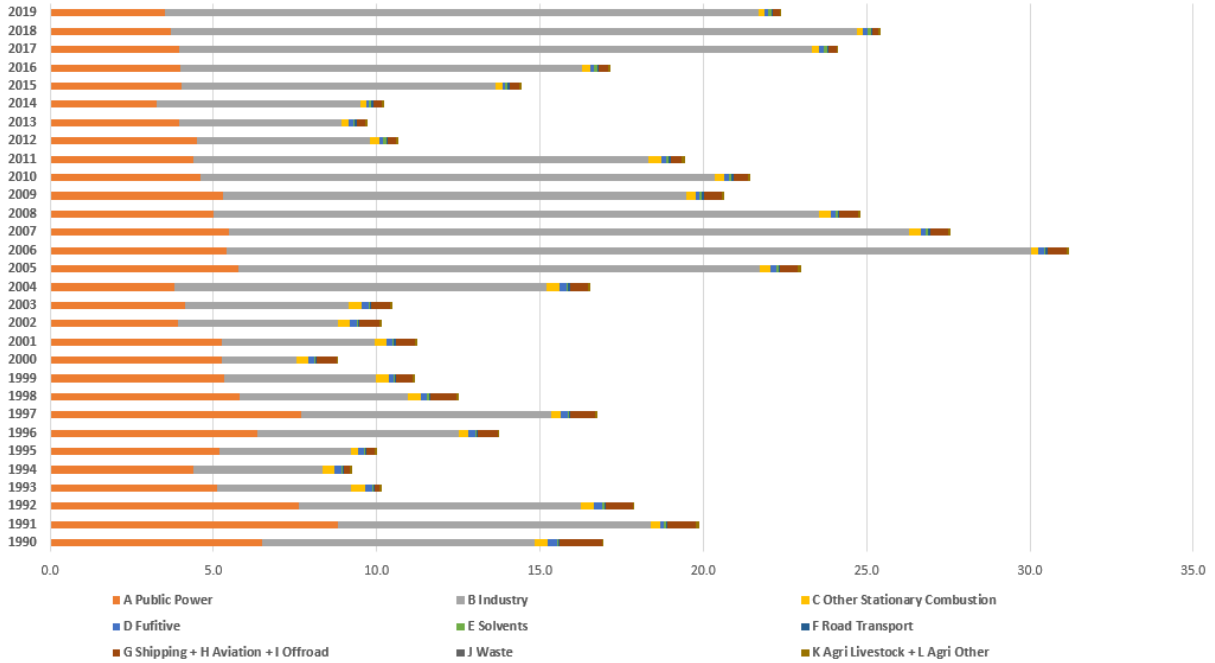


Figure 61. Distribution of Ni between sectors for period 1990 – 2019

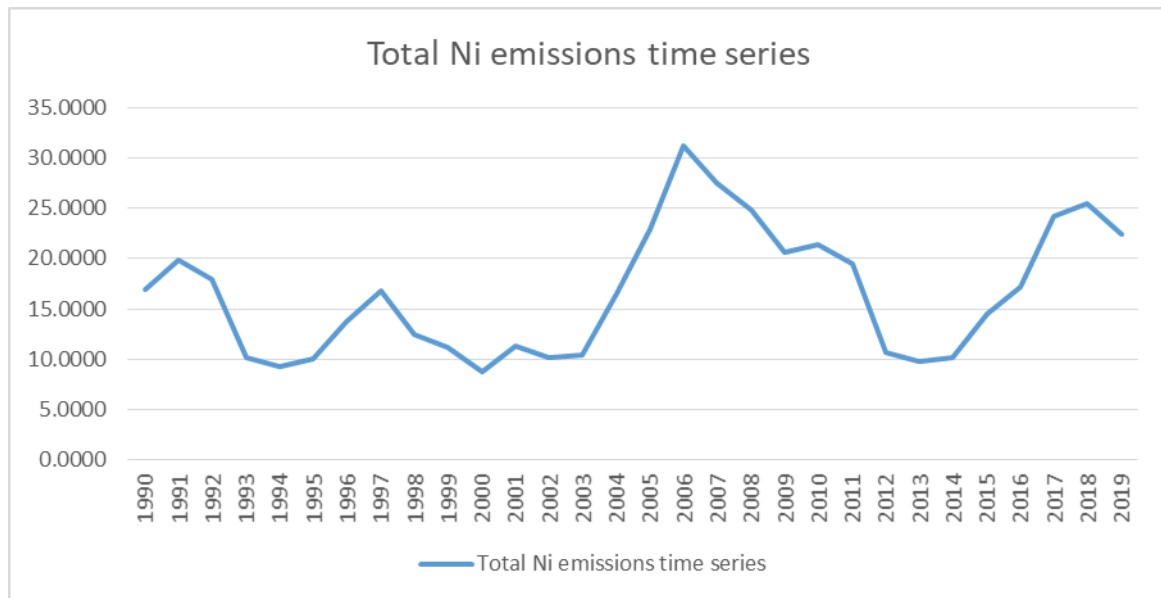


Figure 62.Total Ni emissions time series from 1990 to 2019.

Table 52. Total Ni emissions between sectors for years 1990 and 2019. Trends of dominant sources of Ni emissions compared to years 1990-2019 and 2018-2019. Share in National Total for years 1990 and 2019

NFR Category	Ni Emission in [kt]		Trend		Share in National Total	
	1990	2019	1990 - 2019	2018 - 2019	1990	2019
A Public Power	6.4871	3.5132	-45.84%	-5.05%		15.70%
B Industry	8.3378	18.1591	117.79%	-13.52%	49.21%	81.13%
C Other Stationary Combustion	0.4024	0.2055	-48.94%	3.11%	2.38%	0.92%
D Fugitive	0.2771	0.0959	-65.37%	-14.07%	1.64%	0.43%
E Solvents	0.0606	0.1082	78.63%	-5.41%	0.36%	0.48%
F Road Transport	0.0430	0.0512	19.14%	5.00%	0.25%	0.23%
G Shipping + H Aviation + I Offroad	1.2821	0.1928	-84.96%	0.04%	7.57%	0.86%
J Waste	0.0000	0.0001	381.31%	1.50%	0.00%	0.00%
K Agri Livestock + L Agri Other	0.0547	0.0568	3.89%	-5.68%	0.32%	0.25%
Total	16.9448	22.3829	32.09%	-11.97%	100.00%	100.00%

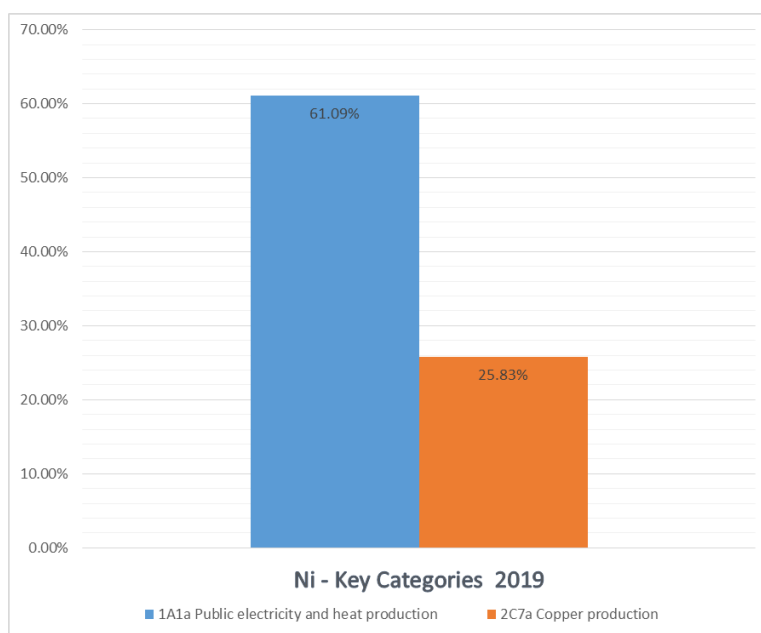


Figure 63. Key Categories assessments of Ni emissions for 2019

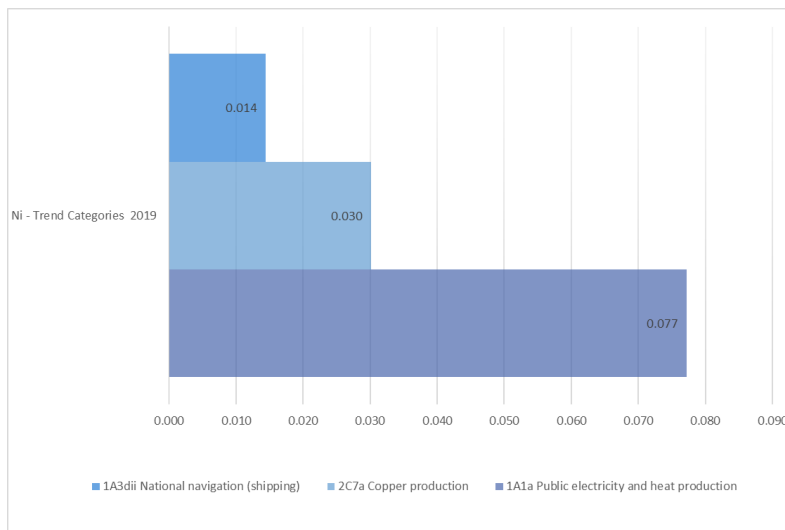


Figure 64. Trends assessments of Ni emissions for base year and 2019

2.4.17. Selenium emission (Se)

Selenium (Se) emissions in 2019. was 12,5739 t, which is 0.39 % decrease compared to 2018. Compared to the 1990 baseline emissions of Se is 41.23 % lower.

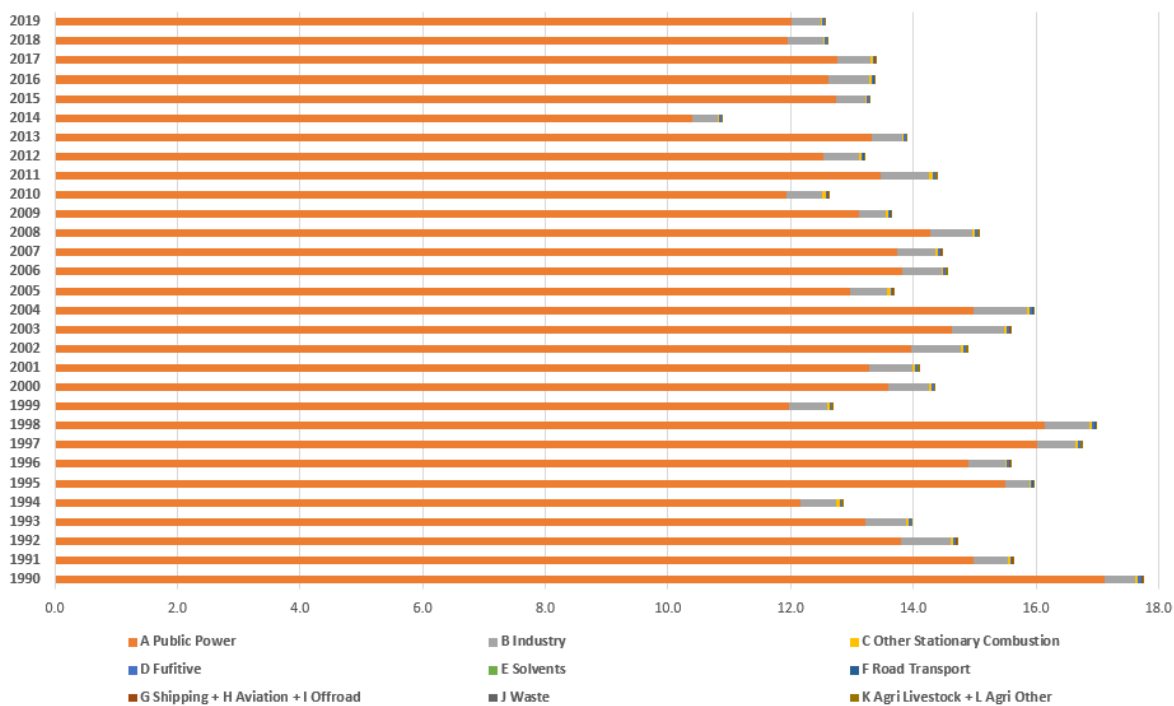


Figure 65. Distribution of Se between sectors for period 1990 – 2019.

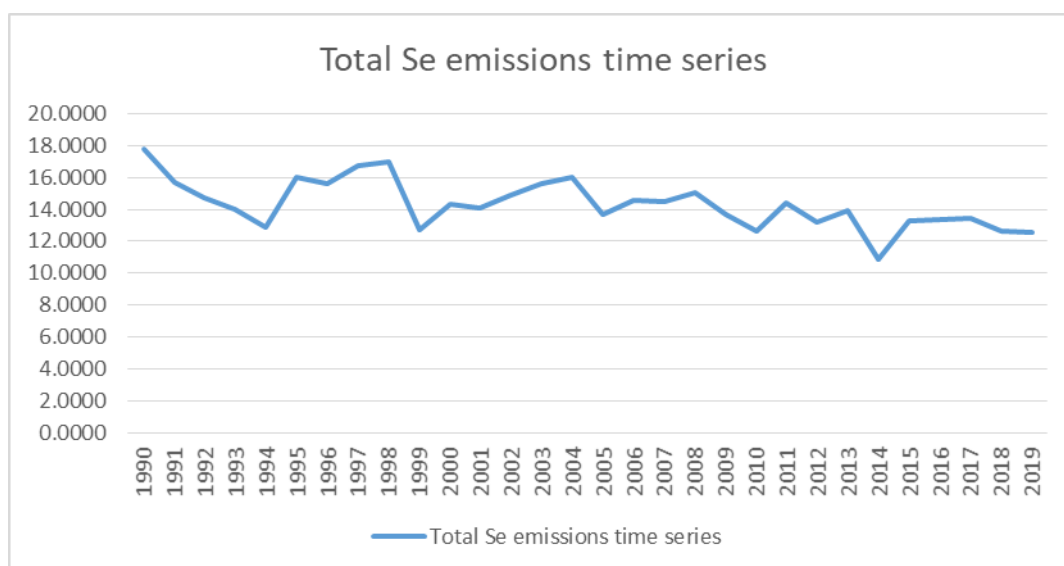


Figure 66.Total Se emissions time series from 1990 to 2019.

Table 53. Total Se emissions between sectors for years 1990 and 2019. Trends of dominant sources of Se emissions compared to years 1990-2019 and 2018-2019. Share in National Total for years 1990 and 2019

NFR Category	Se Emission in [kt]		Trend		Share in National Total	
	1990	2019	1990 - 2019	2018 - 2019	1990	2019
A Public Power	17.1257	12.0084	-29.88%	0.55%	96.44%	95.50%
B Industry	0.4881	0.4731	-3.08%	-18.91%	2.75%	3.76%
C Other Stationary Combustion	0.0526	0.0357	-32.15%	1.48%	0.30%	0.28%
D Fugitive	0.0578	0.0267	-53.89%	-12.89%	0.33%	0.21%
E Solvents	0.0002	NA	NA	NA	0.00%	NA
F Road Transport	0.0038	0.0067	76.99%	5.27%	0.02%	0.05%
G Shipping + H Aviation + I Offroad	0.0087	0.0014	-84.12%	0.74%	0.05%	0.01%
J Waste	0.0000	0.0001	381.31%	1.50%	0.00%	0.00%
K Agri Livestock + L Agri Other	0.0210	0.0219	3.89%	-5.68%	0.12%	0.17%
Total	17.7580	12.5739	-29.19%	-0.39%	100.00%	100.00%

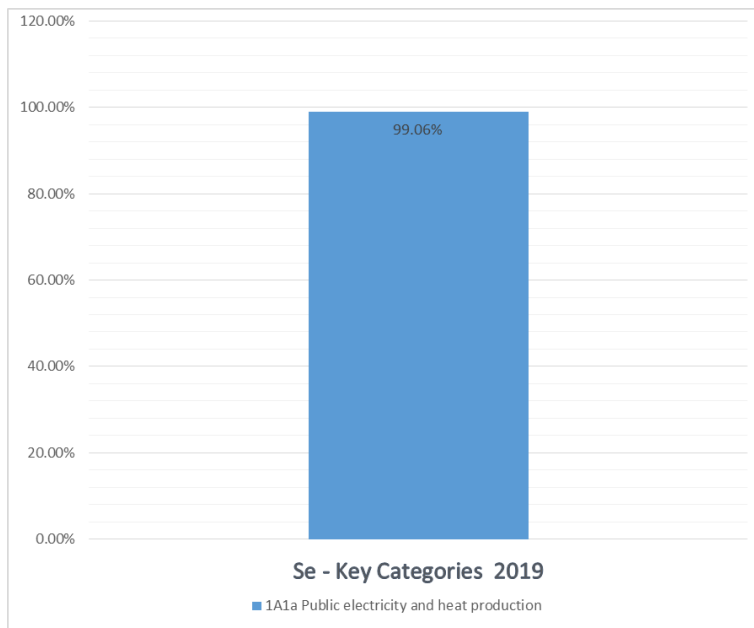


Figure 67. Key Categories assessments of Se emissions for 2019.

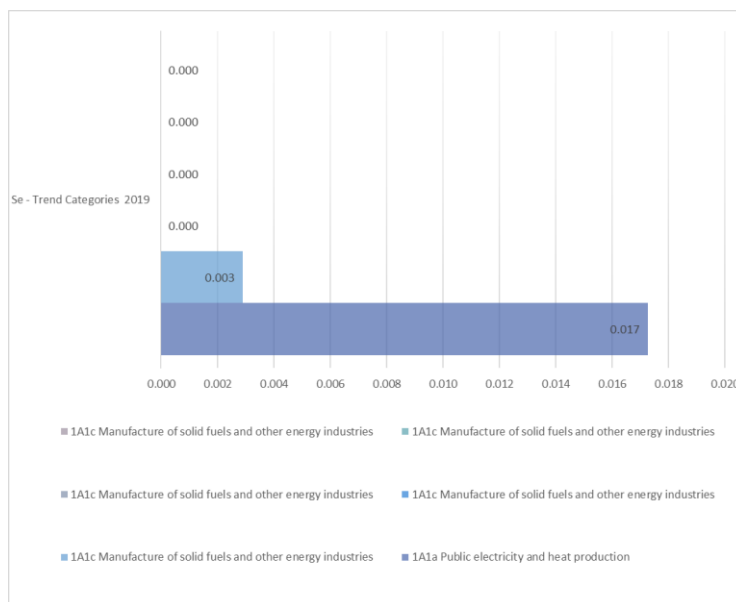


Figure 68. Trends assessments of Se emissions for base year and 2019

2.4.18. Zinc emission (Zn)

Zinc (Zn) emissions in 2019. was 61,3113t, which is 5.53 % decrease compared to 2018. Compared to the 1990 baseline emissions of Zn is 17.74 % higher.

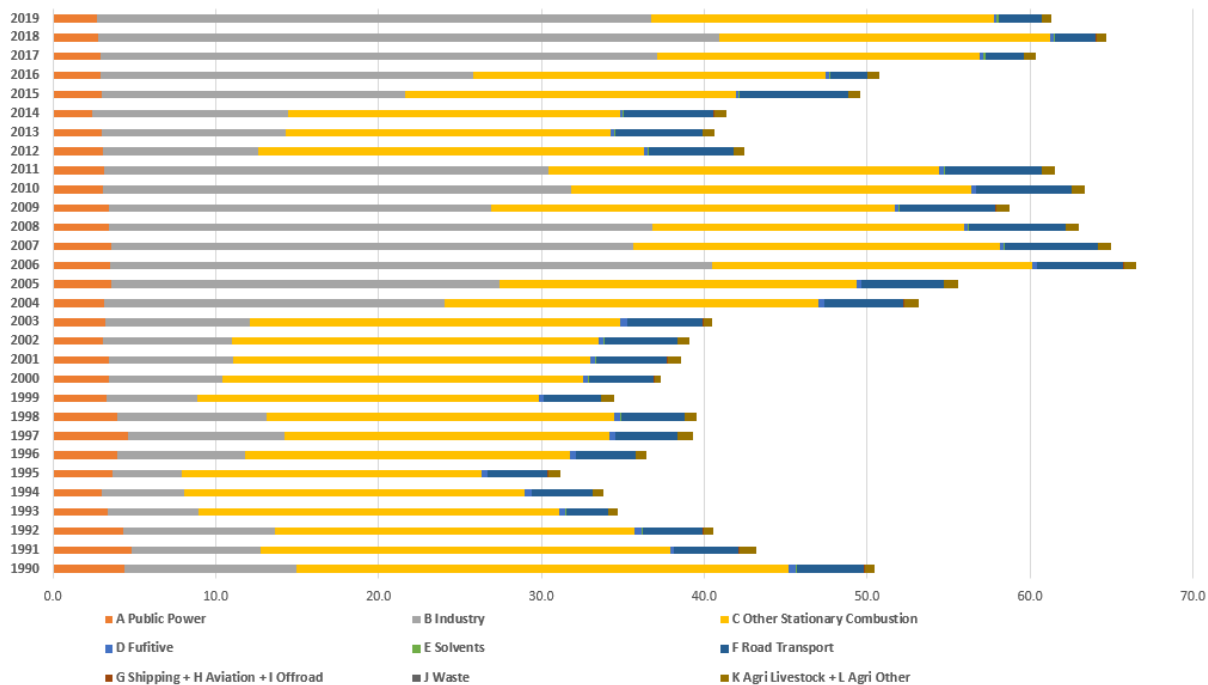


Figure 69. Distribution of Zn between sectors for period 1990 - 2019

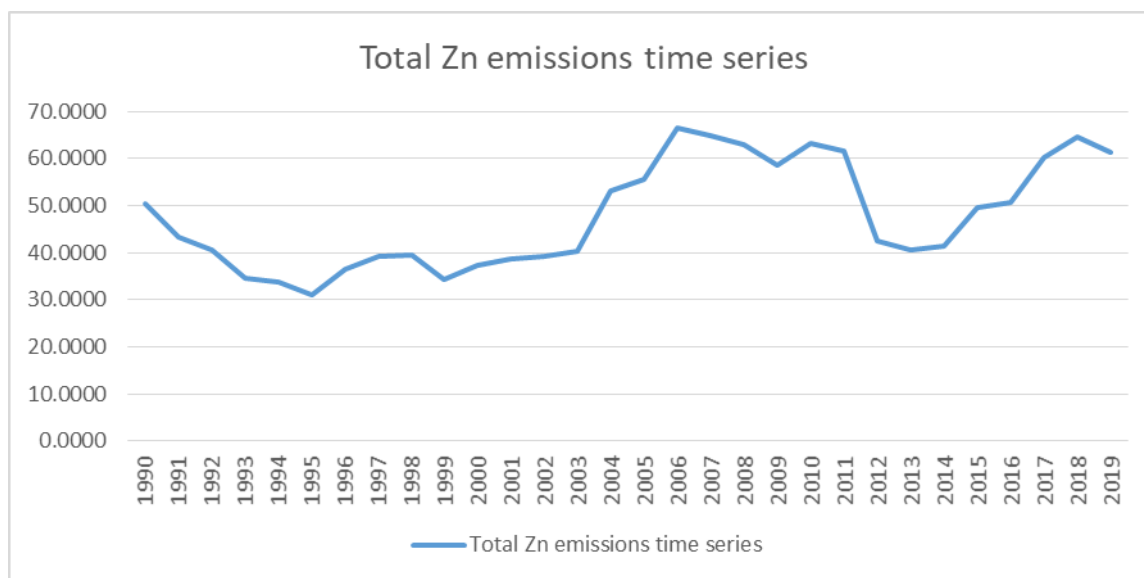


Figure 70.Total Zn emissions time series from 1990 to 2019.

Table 54. Total Zn emissions between sectors for years 1990 and 2019. Trends of dominant sources of Zn emissions compared to years 1990-2019 and 2018-2019. Share in National Total for years 1990 and 2019

NFR Category	Zn Emission in [kt]		Trend		Share in National Total	
	1990	2019	1990 - 2019	2018 - 2019	1990	2019
A Public Power	4.3718	2.6977	-38.29%	-2.21%	8.67%	4.40%
B Industry	10.5630	34.0372	222.23%	-10.74%	20.94%	55.52%
C Other Stationary Combustion	30.2015	21.0473	-30.31%	3.45%	59.88%	34.33%
D Fugitive	0.4879	0.1626	-66.68%	-14.25%	0.97%	0.27%
E Solvents	0.0394	0.1082	174.47%	-5.41%	0.08%	0.18%
F Road Transport	4.1025	2.6261	-35.99%	5.24%	8.13%	4.28%
G Shipping + H Aviation + I Offroad	0.0780	0.0193	-75.20%	5.52%	0.15%	0.03%
J Waste	0.0001	0.0006	381.31%	1.50%	0.00%	0.00%
K Agri Livestock + L Agri Other	0.5893	0.6122	3.89%	-5.68%	1.17%	1.00%
Total	50.4336	61.3113	21.57%	-5.24%	100.00%	100.00%

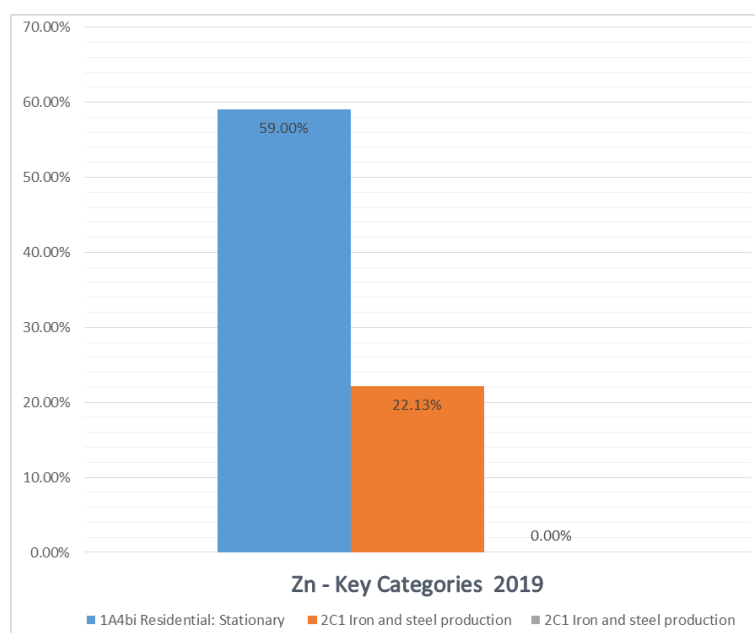


Figure 71. Key Categories assessments of Zn emissions for 2019

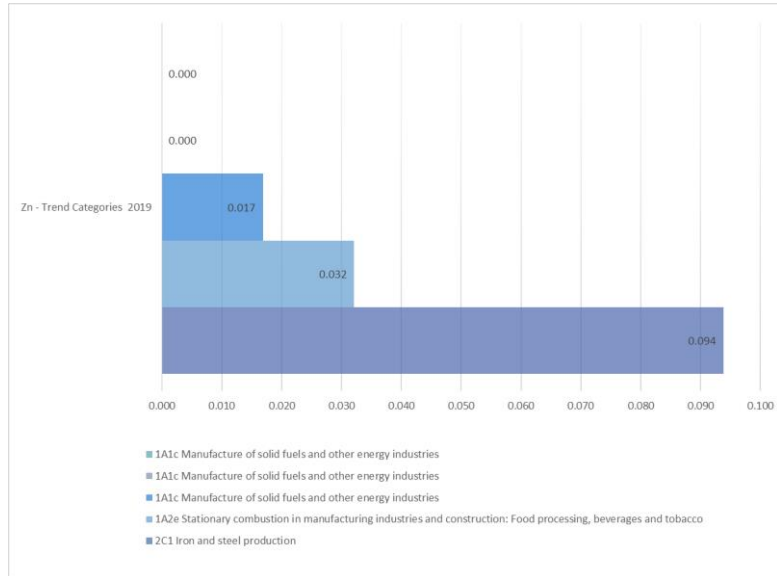


Figure 72. Trends assessments of Zn emissions for base year and 2019

PERSISTENT ORGANIC POLLUTANTS EMISSION (POP s)

2.4.19. DIOXINS AND FURANS EMISSION (PCDD/PCDF)

Dioxins and furans (PCDD/PCDF) emissions in 2019. was 602,3841g I-TEQ, which is 5.19 % decrease compared to 2018. Compared to the 1990 baseline emissions of PCDD/PCDF is 1.44 % higher.

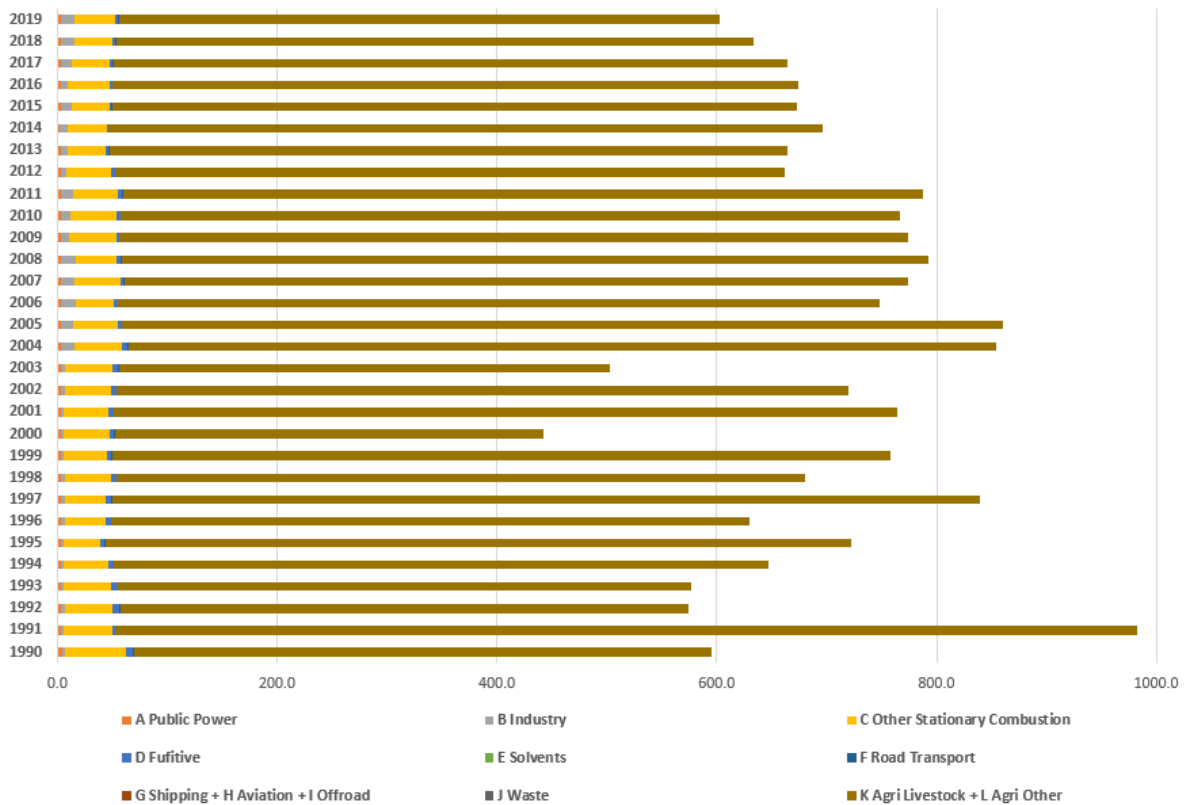


Figure 73. Distribution of PCDD/PCDF between sectors for period 1990 – 2019

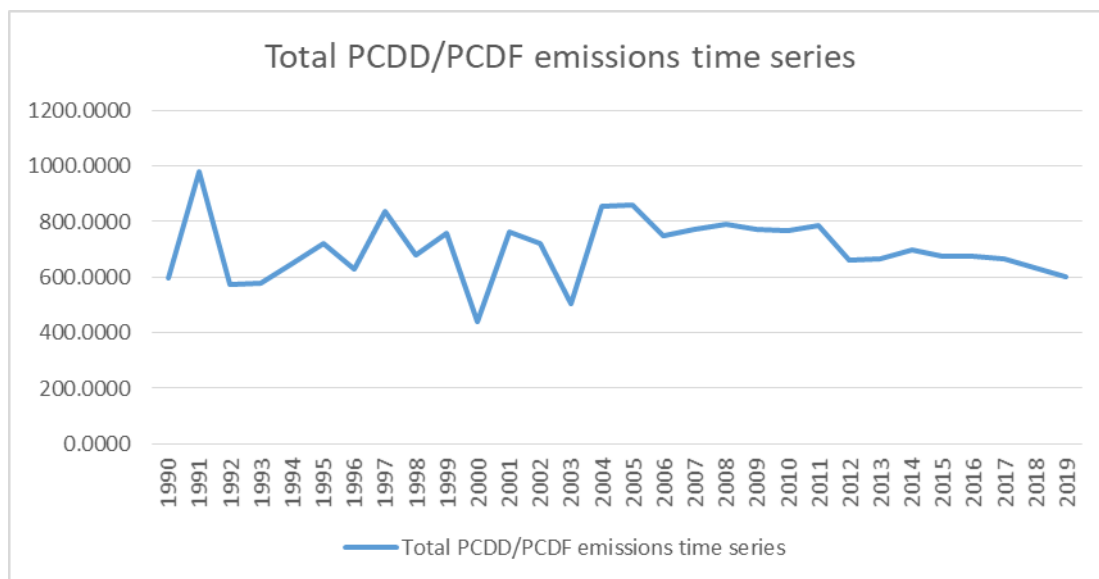


Figure 74. Total PCDD/PCDF emissions time series from 1990 to 2019.

Table 55. Total PCDD/PCDF emissions between sectors for years 1990 and 2019. Trends of dominant sources of PCDD emissions compared to years 1990-2019 and 2018-2019. Share in National Total for years 1990 and 2019

NFR Category	PCDD/PCDF Emission in [kt]		Trend		Share in National Total	
	1990	2019	1990 - 2019	2018 - 2019	1990	2019
A Public Power	3.8599	2.7012	-30.02%	0.44%	0.65%	0.45%
B Industry	3.5140	13.2202	276.22%	6.05%	0.59%	2.19%
C Other Stationary Combustion	55.0742	36.5476	-33.64%	3.16%	9.25%	6.07%
D Fugitive	6.3509	2.0162	-68.25%	-14.49%	1.07%	0.33%
E Solvents	0.0015	0.0040	174.47%	-5.41%	0.00%	0.00%
F Road Transport	0.5326	1.2882	141.87%	6.98%	0.09%	0.21%
G Shipping + H Aviation + I Offroad	0.0188	0.0028	-85.00%	0.00%	0.00%	0.00%
J Waste	0.0000	0.0001	381.31%	1.50%	0.00%	0.00%
K Agri Livestock + L Agri Other	526.1441	546.6037	3.89%	-5.68%	88.35%	90.74%
Total	595.4960	602.3841	1.16%	-4.93%	100.00%	100.00%

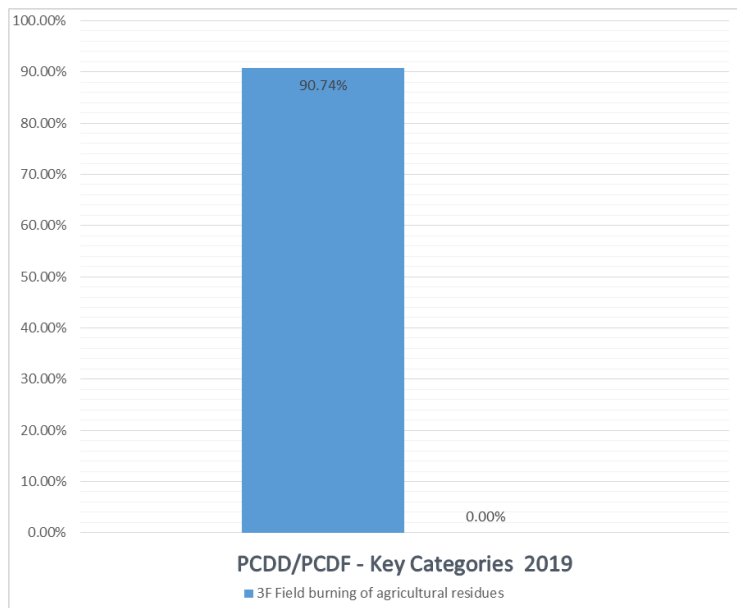


Figure 75. Key Categories assessments of PCDD/PCDF emissions for 2019.

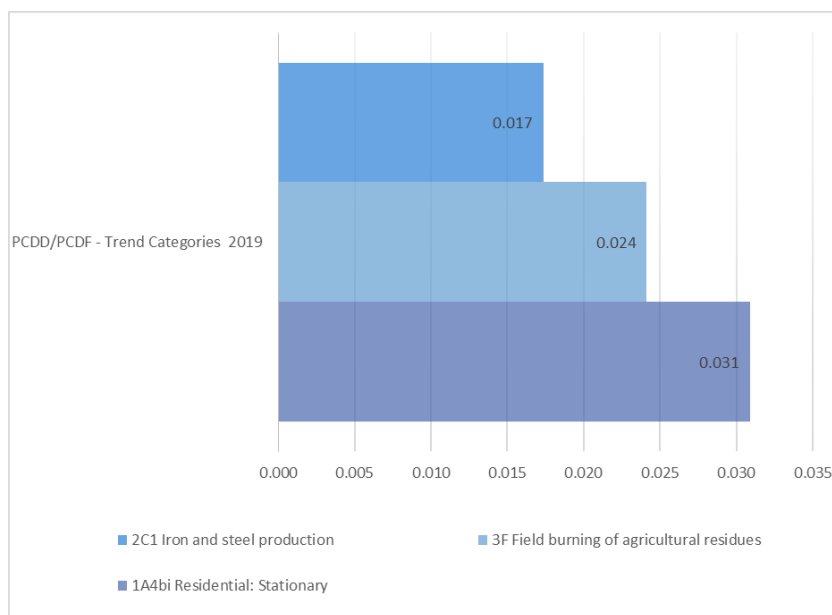


Figure 76. Trends assessments of PCDD/PCDF emissions for base year and 2019

POLYCYCLIC AROMATIC HYDROCARBON (PAH) EMISSION

2.4.20. PAHs – Benzo (a) pyrene

Benzo (a) pyrene emissions in 2019. was 80,8318 t, which is 5.28 % decrease compared to 2018. Compared to the 1990 baseline emissions of Benzo (a) pyrene is 1.93 % increase.

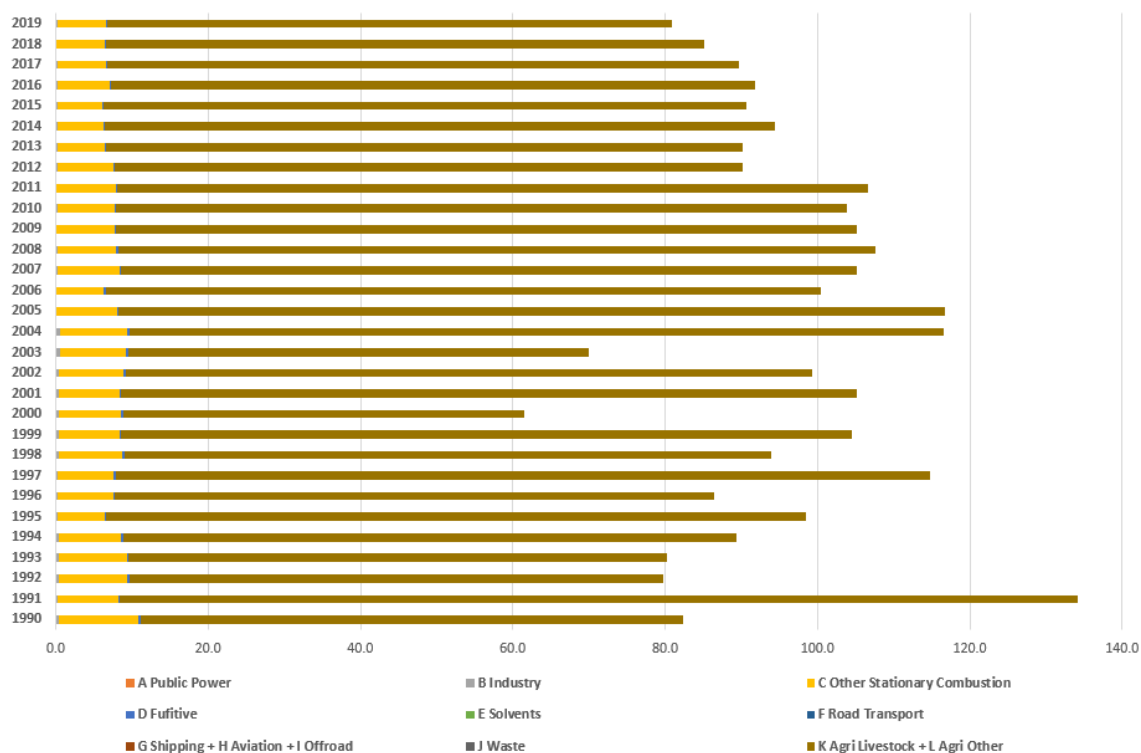


Figure 77. Distribution of Benzo (a) pyrene between sectors for period 1990 – 2019.

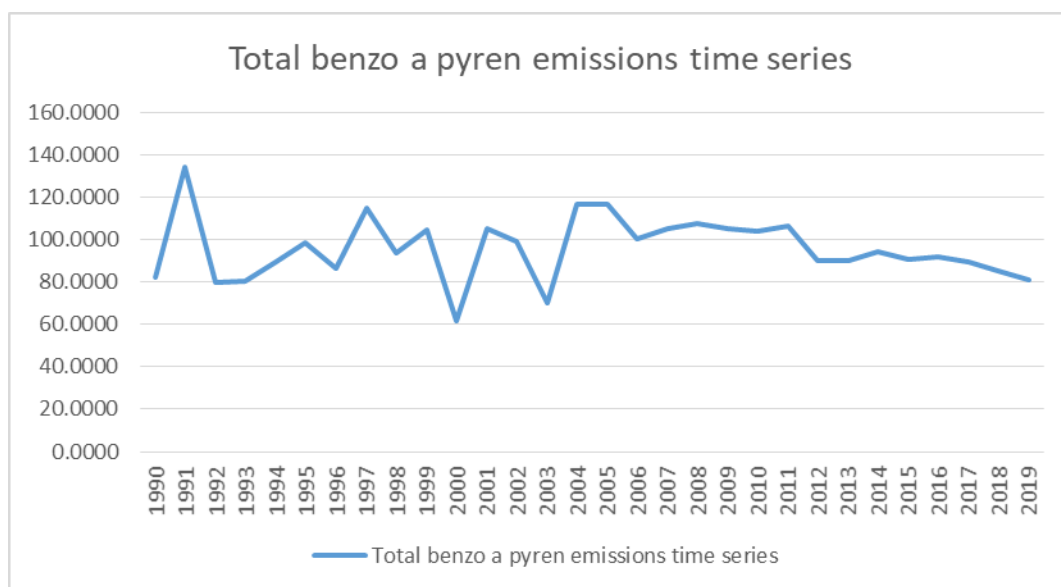


Figure 78. Total benzo a pyren emissions time series from 1990 to 2019.

Table 56. Total benzo (a) pyren emissions between sectors for years 1990 and 2019. Trends of dominant sources of benzo (a) pyren emissions compared to years 1990-2019 and 2018-2019. Share in National Total for years 1990 and 2019.

NFR Category	benzo a pyren Emission in [kt]		Trend		Share in National Total	
	1990	2019	1990 - 2019	2018 - 2019	1990	2019
A Public Power	0.0005	0.0006	12.14%	-4.74%	0.00%	0.00%
B Industry	0.3722	0.1751	-52.96%	14.12%	0.45%	0.22%
C Other Stationary Combustion	10.4307	6.5006	-37.68%	2.85%	12.66%	8.04%
D Fugitive	0.3373	0.1066	-68.40%	-14.51%	0.41%	0.13%
E Solvents	0.0016	0.0044	174.47%	-5.41%	0.00%	0.01%
F Road Transport	0.0092	0.0340	269.22%	8.28%	0.01%	0.04%
G Shipping + H Aviation + I Offroad	0.0009	0.0004	-59.53%	9.08%	0.00%	0.00%
J Waste	0.0000	0.0000	381.31%	1.50%	0.00%	0.00%
K Agri Livestock + L Agri Other	71.2399	74.0101	3.89%	-5.68%	86.46%	91.56%
Total	82.3923	80.8318	-1.89%	-5.01%	100.00%	100.00%

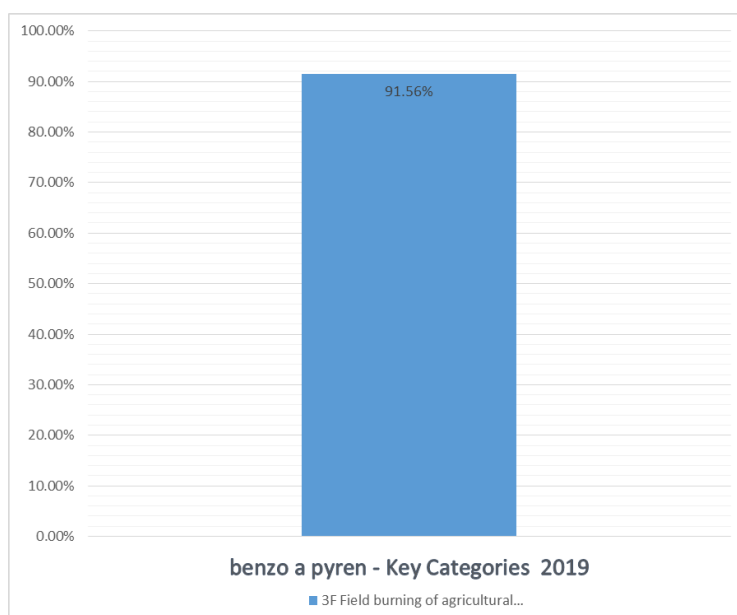


Figure 79. Key Categories assessments of benzo a pyren emissions for 2019.

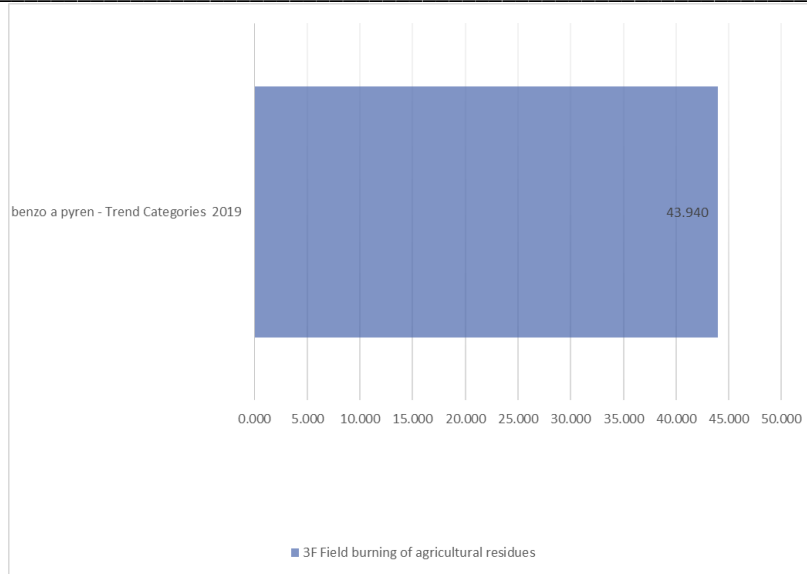


Figure 80. Trends assessments of Benzo a pyren emissions for base year and 2019

2.4.21. PAHs – Benzo (b) fluoranthene

Benzo (b) fluoranthene emissions in 2019. was 214,2432t, which is 5.72 % decrease compared to 2018. Compared to the 1990 baseline emissions of Benzo (b) fluoranthene is 1.13% higher.

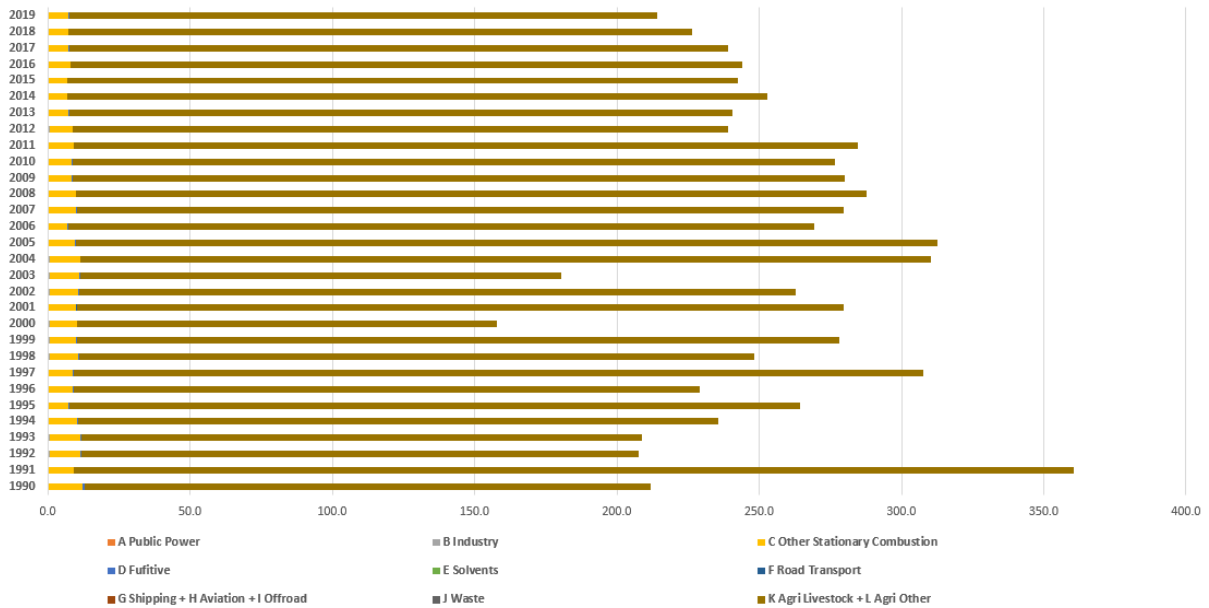


Figure 81. Distribution of benzo (b) fluoranthen between sectors for period 1990 – 2019.

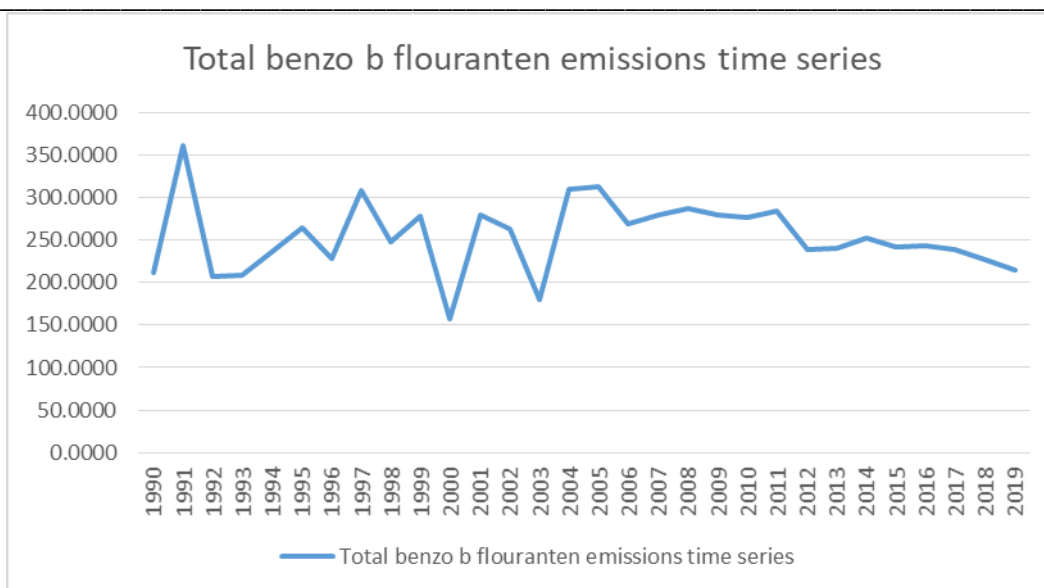


Figure 82. Total benzo b fluoranthen emissions time series from 1990 to 2019.

Table 57. Total benzo (b) fluoranthen emissions between sectors for years 1990 and 2019. Trends of dominant sources of benzo (b) fluoranthen emissions compared to years 1990-2019 and 2018-2019. Share in National Total for years 1990 and 2019

NFR Category	benzo b fluoranthen Emission in [kt]		Trend		Share in National Total	
	1990	2019	1990 - 2019	2018 - 2019	1990	2019
A Public Power	0.0142	0.0099	-30.20%	0.51%	0.01%	0.00%
B Industry	0.5057	0.2860	-43.44%	12.10%	0.24%	0.13%
C Other Stationary Combustion	11.8677	7.0337	-40.73%	2.60%	5.60%	3.28%
D Fugitive	0.4216	0.1332	-68.40%	-14.51%	0.20%	0.06%
E Solvents	0.0007	0.0018	174.47%	-5.41%	0.00%	0.00%
F Road Transport	0.0243	0.0525	115.49%	5.03%	0.01%	0.02%
G Shipping + H Aviation + I Offroad	0.0015	0.0006	-59.53%	9.08%	0.00%	0.00%
J Waste	0.0000	0.0000	381.31%	1.50%	0.00%	0.00%
K Agri Livestock + L Agri Other	198.9877	206.7255	3.89%	-5.68%	93.94%	96.49%
Total	211.8233	214.2432	1.14%	-5.41%	100.00%	100.00%

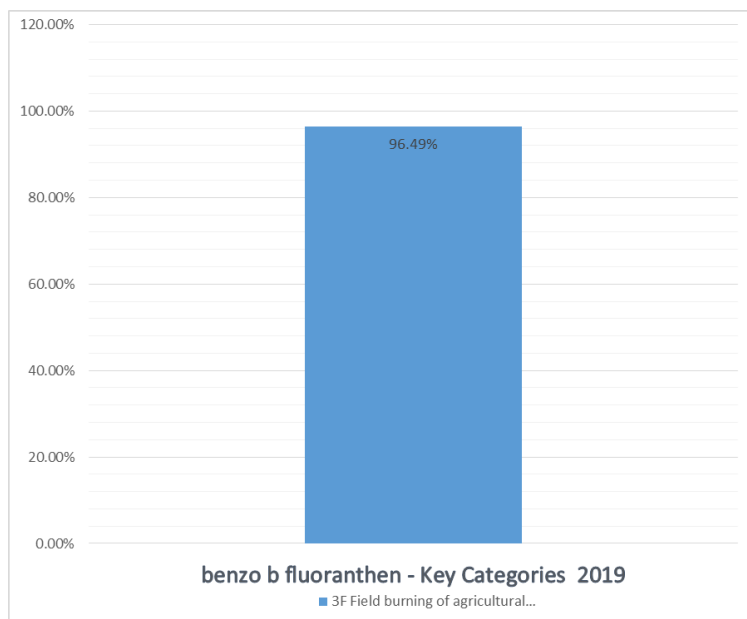


Figure 83. Key Categories assessments of benzo b fluoranthen emissions for 2019.

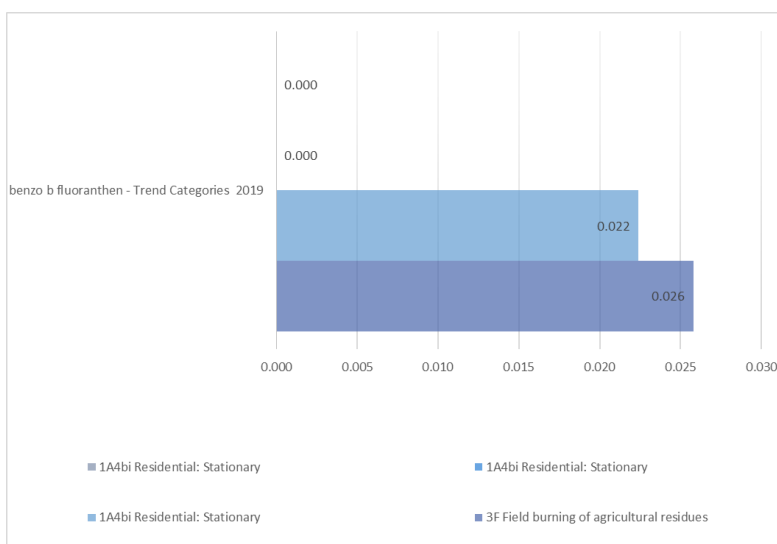


Figure 84. Trends assessments of benzo b fluoranthen emissions for base year and 2019

2.4.22. PAHs – Benzo (k) fluoranthene

Benzo (k) fluoranthene emissions in 2019. was 99,9006 t, which is 5.77 % decrease compared to 2018. Compared to the 1990 baseline emissions of Benzo (k) fluoranthene is 1.52 % higher.

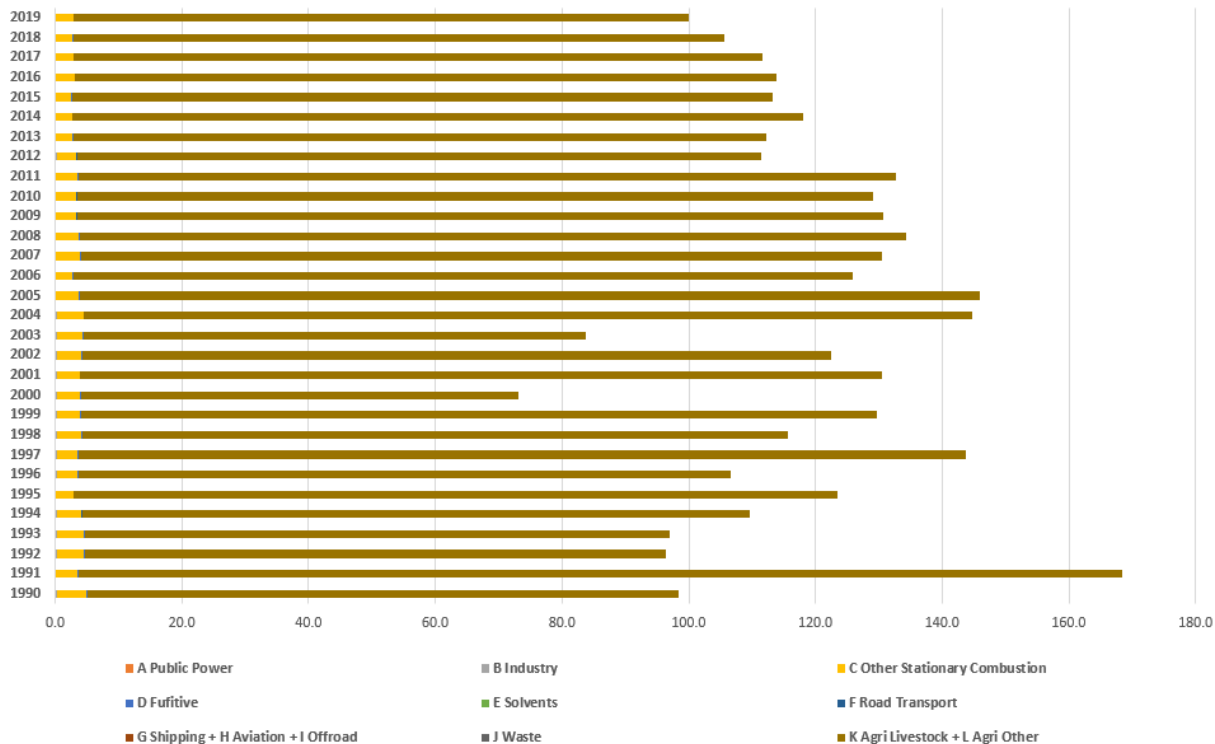


Figure 85. Distribution of benzo (k) fluoranthene between sectors for period 1990 – 2018.

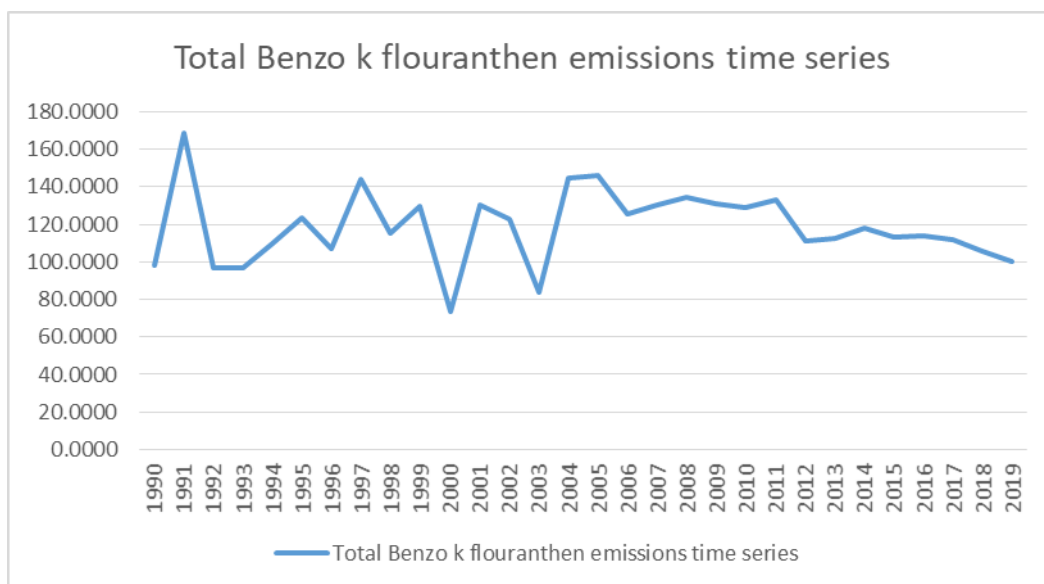


Figure 86. Total benzo k fluoranthene emissions time series from 1990 to 2019.

Table 58. Total benzo k fluoranthen emissions between sectors for years 1990 and 2019. Trends of dominant sources of benzo k fluoranthen x emissions compared to years 1990-2019 and 2018-2019. Share in National Total for years 1990 and 2019

NFR Category	benzo k fluoranten Emission in [kt]		Trend		Share in National Total	
	1990	2019	1990 - 2019	2018 - 2019	1990	2019
A Public Power	0.0112	0.0078	-30.23%	0.51%	0.01%	0.01%
B Industry	0.2022	0.0957	-52.70%	12.02%	0.21%	0.10%
C Other Stationary Combustion	4.5932	2.7086	-41.03%	2.58%	4.67%	2.71%
D Fugitive	0.2108	0.0666	-68.40%	-14.51%	0.21%	0.07%
E Solvents	0.0007	0.0018	174.47%	-5.41%	0.00%	0.00%
F Road Transport	0.0202	0.0527	160.51%	7.12%	0.02%	0.05%
G Shipping + H Aviation + I Offroad	NA	NA	NA	NA	NA	NA
J Waste	0.0000	0.0000	381.31%	1.50%	0.00%	0.00%
K Agri Livestock + L Agri Other	93.3380	96.9675	3.89%	-5.68%	94.88%	97.06%
Total	98.3763	99.9006	1.55%	-5.46%	100.00%	100.00%

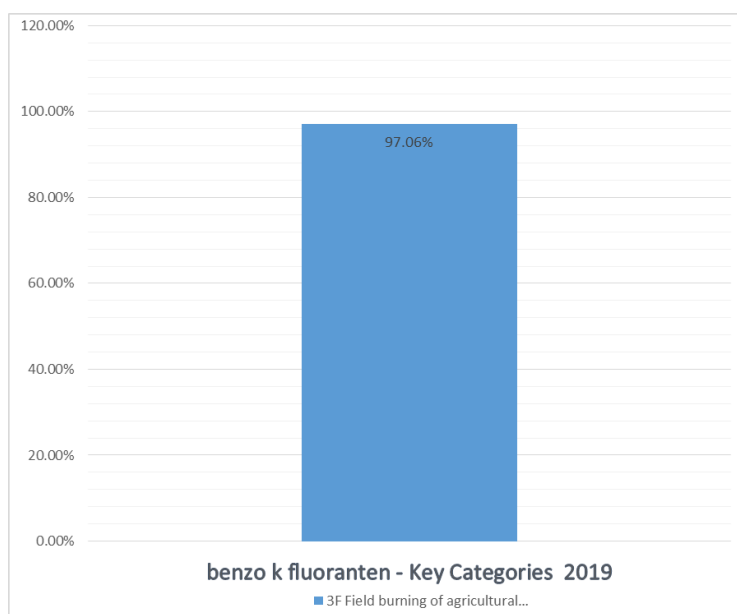


Figure 87. Key Categories assessments of benzo k fluoranthen emissions for 2019.

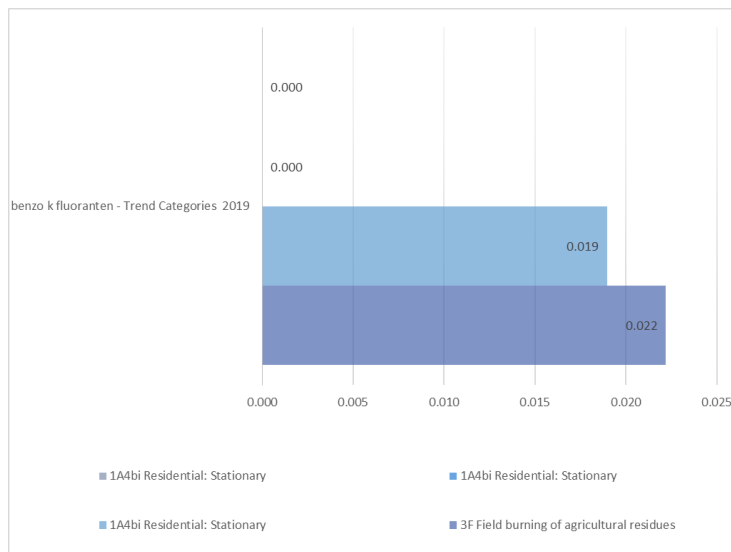


Figure 88. Trends assessments of benzo k fluoranthen emissions for base year and 2019

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

Indeno (1,2,3-cd) pyrene emissions in 2019. was 67,0414 t, which is 5.52 % decrease compared to 2018. Compared to the 1990 baseline emissions of Indeno (1,2,3-cd) pyrene is 0.26 % higher.

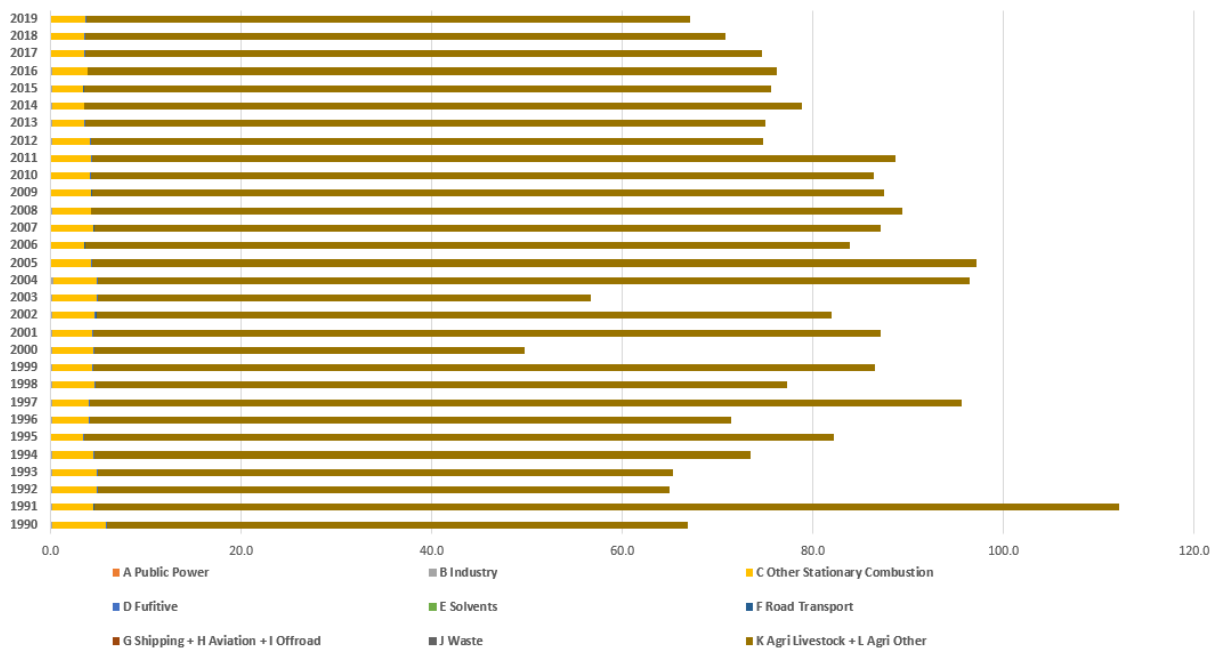


Figure 89. Distribution of Indeno (1,2,3-cd) pyrene between sectors for period 1990 – 2018.

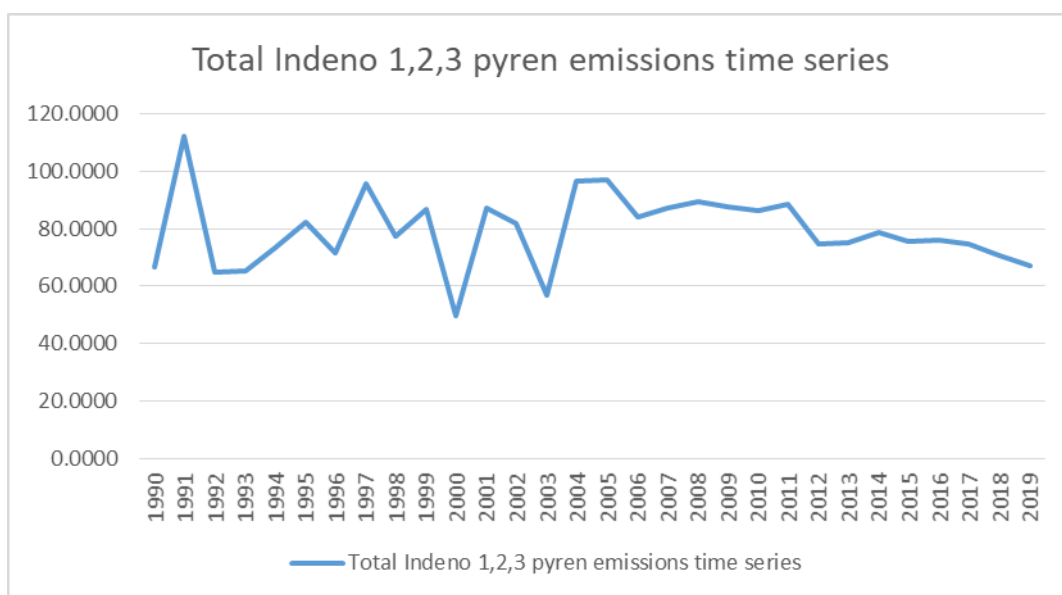


Figure 90. Total Indeno 1,2,3 pyren emissions time series from 1990 to 2019.

Table 59. Total Indeno 1,2,3 pyren emissions between sectors for years 1990 and 2019. Trends of dominant sources of Indeno 1,2,3 pyren emissions compared to years 1990-2019 and 2018-2019. Share in National Total for years 1990 and 2019

NFR Category	Indeno 1,2,3 pyren Emission in [kt]		Trend		Share in National Total	
	1990	2019	1990 - 2019	2018 - 2019	1990	2019
A Public Power	0.0009	0.0006	-30.35%	-0.44%	0.00%	0.00%
B Industry	0.1620	0.0774	-52.19%	11.12%	0.24%	0.12%
C Other Stationary Combustion	5.6140	3.5831	-36.18%	2.94%	8.40%	5.34%
D Fugitive	0.1476	0.0466	-68.40%	-14.51%	0.22%	0.07%
E Solvents	0.0007	0.0018	174.47%	-5.41%	0.00%	0.00%
F Road Transport	0.0152	0.0351	129.99%	7.38%	0.02%	0.05%
G Shipping + H Aviation + I Offroad	NA	NA	NA	NA	NA	NA
J Waste	0.0000	0.0000	381.31%	1.50%	0.00%	0.00%
K Agri Livestock + L Agri Other	60.9275	63.2967	3.89%	-5.68%	91.12%	94.41%
Total	66.8678	67.0414	0.26%	-5.24%	100.00%	100.00%

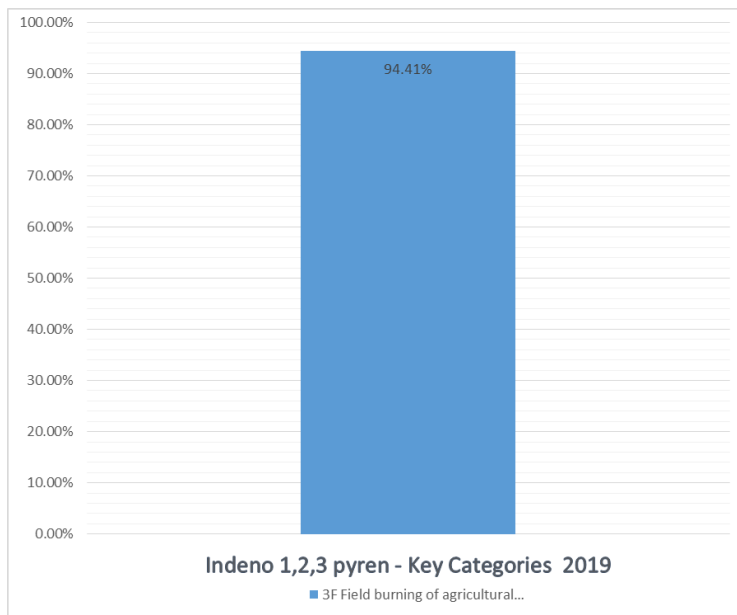


Figure 91. Key Categories assessments of Indeno 1,2,3 pyren emissions for 2019.

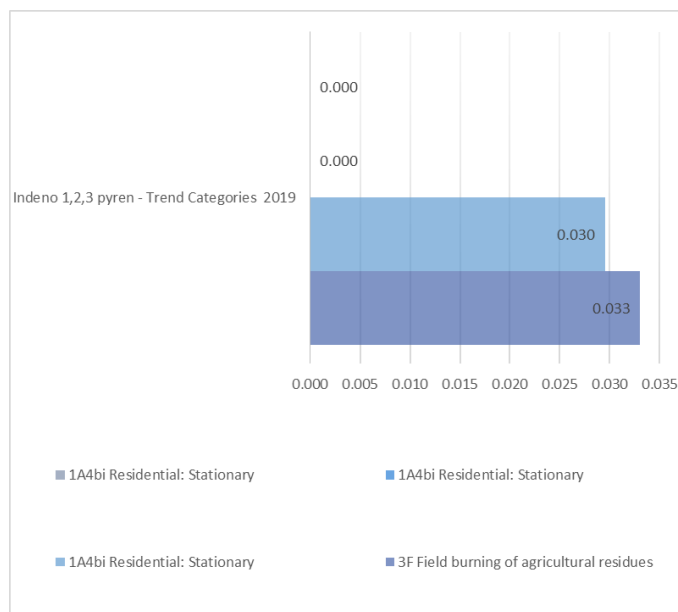


Figure 92. Trends assessments of Indeno 1,2,3 pyren emissions for base year and 2019

2.4.24. PAHs - Total 1-4 PAHs

Total 1-4 PAHs emissions in 2019. was 466,6063 t, which is 5.58 % decrease compared to 2018. Compared to the 1990 baseline emissions of Total 1-4 PAHs is 0.29 % higher.

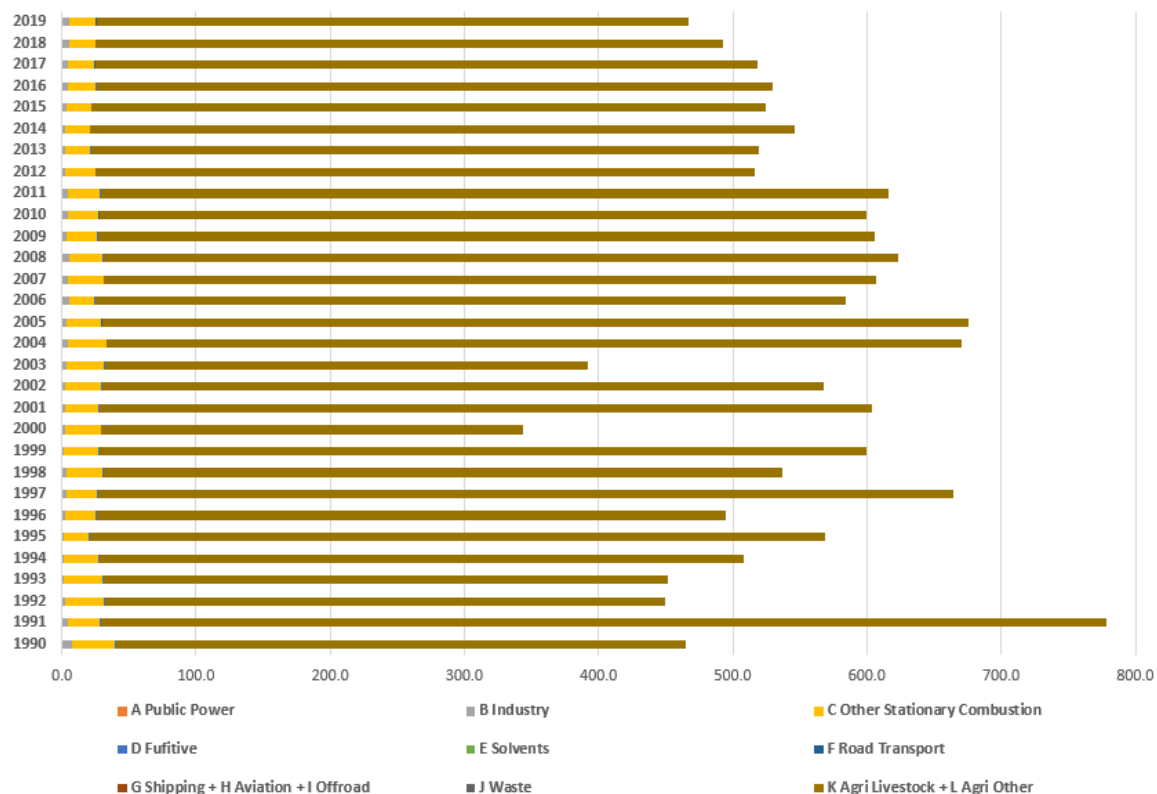


Figure 93. Distribution of Total 1-4 PAH between sectors for period 1990 – 2018.

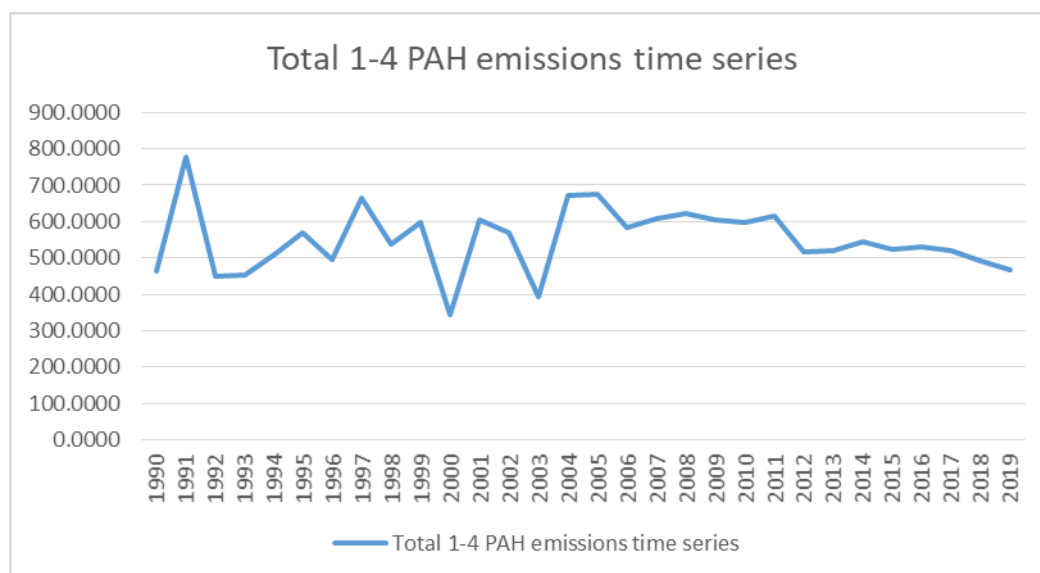


Figure 94. Total 1-4 PAH emissions time series from 1990 to 2019.

Table 60. Total 1-4 PAH emissions between sectors for years 1990 and 2019. Trends of dominant sources of Total 1-4 PAH emissions compared to years 1990-2019 and 2018-2019. Share in National Total for years 1990 and 2019

NFR Category	Total 1-4 PAH Emission in [kt]		Trend		Share in National Total	
	1990	2019	1990 - 2019	2018 - 2019	1990	2019
A Public Power	0.0268	0.0189	-29.42%	0.32%	0.01%	0.00%
B Industry	7.0350	5.2195	-25.81%	0.58%	1.51%	1.12%
C Other Stationary Combustion	32.5056	19.8261	-39.01%	2.74%	6.99%	4.25%
D Fugitive	1.1172	0.3530	-68.40%	-14.51%	0.24%	0.08%
E Solvents	0.0036	0.0099	174.47%	-5.41%	0.00%	0.00%
F Road Transport	0.0690	0.1781	158.14%	8.16%	0.01%	0.04%
G Shipping + H Aviation + I Offroad	0.0024	0.0010	-59.53%	9.08%	0.00%	0.00%
J Waste	0.0000	0.0000	381.31%	1.50%	0.00%	0.00%
K Agri Livestock + L Agri Other	424.4931	440.9999	3.89%	-5.68%	91.24%	94.51%
Total	465.2527	466.6063	0.29%	-5.28%	100.00%	100.00%

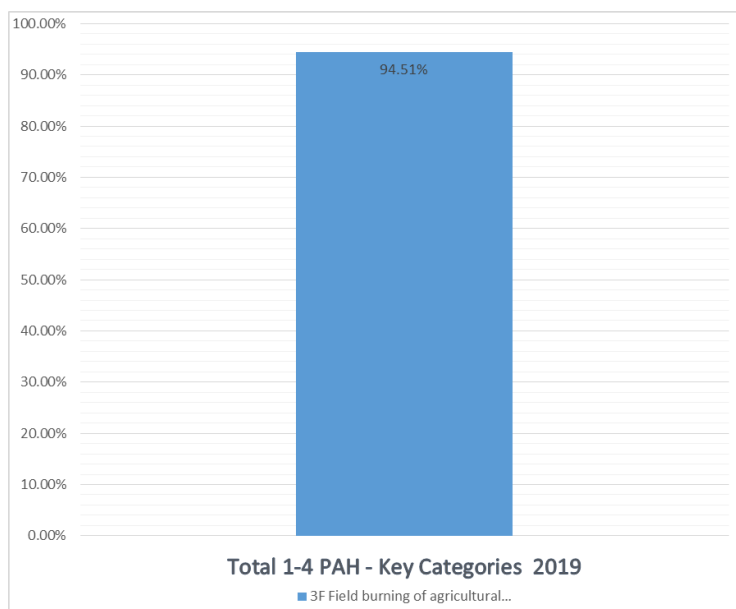


Figure 95. Key Categories assessments of Total 1-4 PAH emissions for 2019.

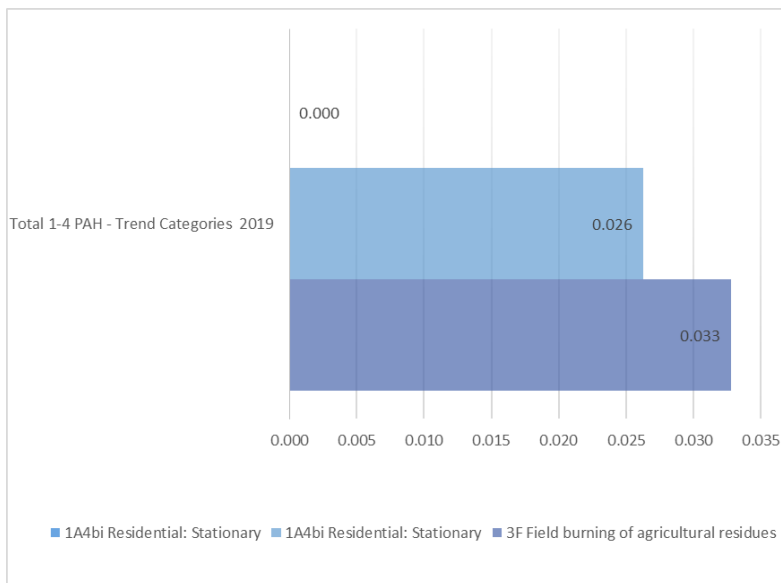


Figure 96. Trends assessments of Total 1-4 PAH emissions for base year and 2019

2.4.25. Emissions HCBs

HCBs emissions in 2019. was 2,1405 kg, which is 0.59 % decrease compared to 2018. Compared to the 1990 baseline emissions of HCBs is 34.03 % decrease.

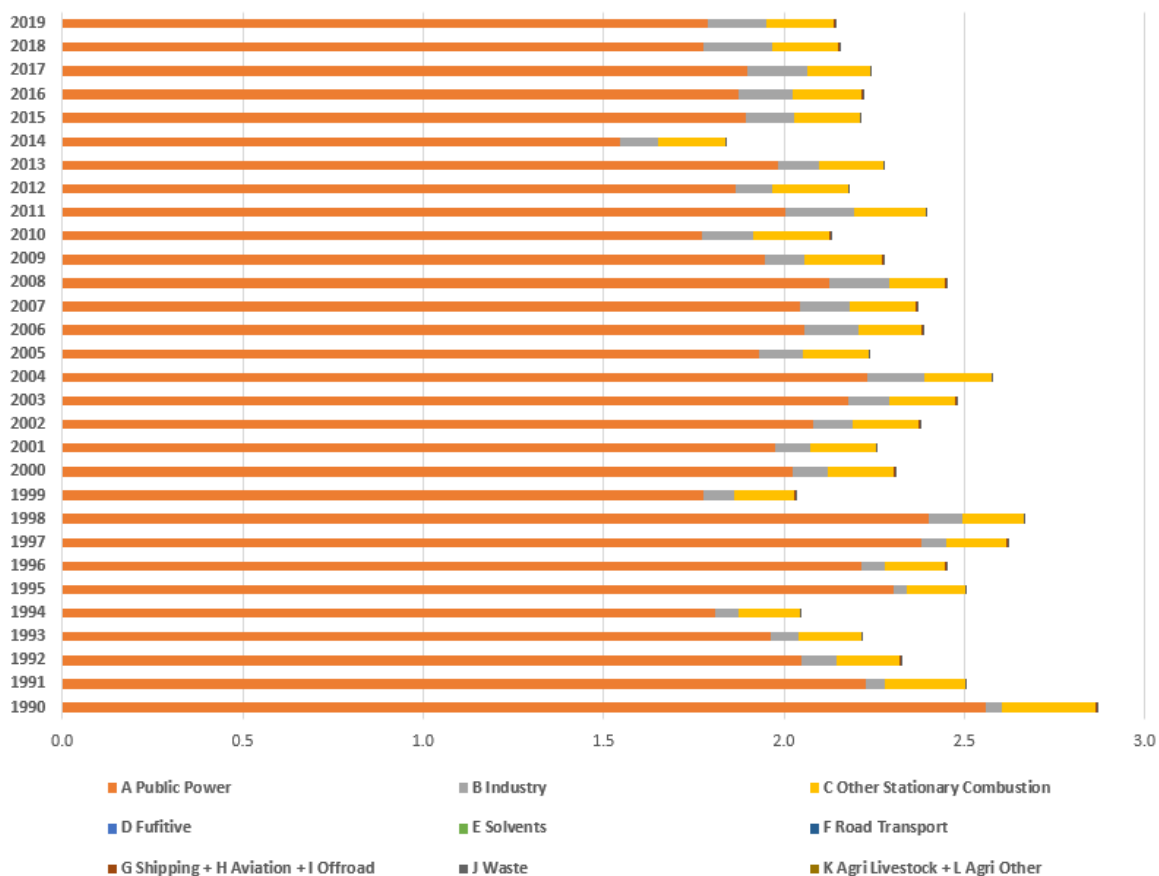


Figure 97. Distribution of HCB between sectors for period 1990 – 2019.

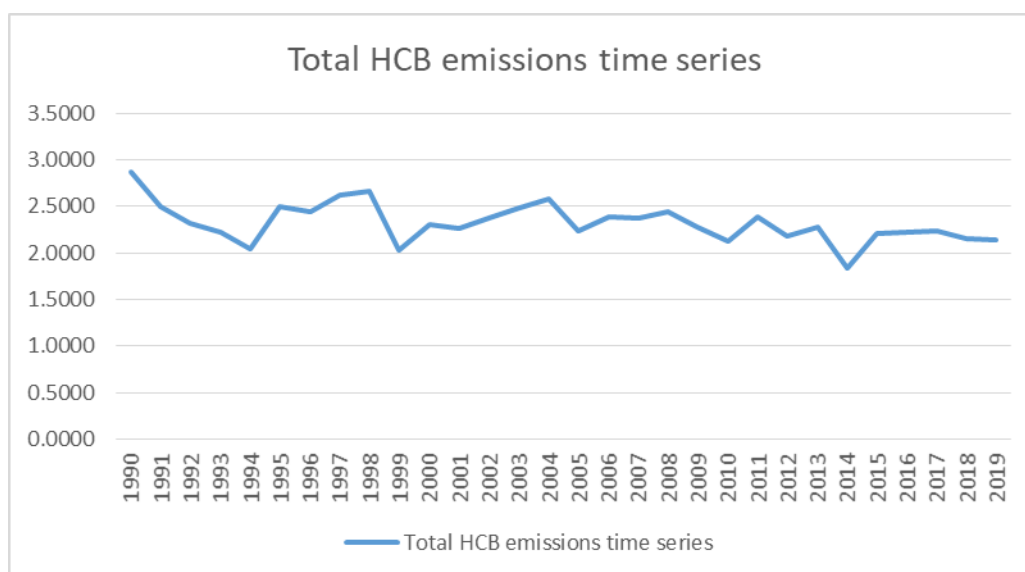


Figure 98.Total HCB emissions time series from 1990 to 2019.

Table 61. Total HCB emissions between sectors for years 1990 and 2019. Trends of dominant sources of HCB emissions compared to years 1990-2019 and 2018-2019. Share in National Total for years 1990 and 2019

NFR Category	HCB Emission in [kt]		Trend		Share in National Total	
	1990	2019	1990 - 2019	2018 - 2019	1990	2019
A Public Power	2.5606	1.7874	-30.20%	0.56%	89.25%	83.50%
B Industry	0.0431	0.1626	277.44%	-15.13%	1.50%	7.60%
C Other Stationary Combustion	0.2595	0.1891	-27.11%	3.58%	9.05%	8.84%
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	0.0008	-85.00%	0.00%	0.20%	0.04%
J Waste	0.0001	0.0005	381.31%	1.50%	0.00%	0.02%
K Agri Livestock + L Agri Other	NA	NA	NA	NA	NA	NA
Total	2.8689	2.1405	-25.39%	-0.58%	100.00%	100.00%

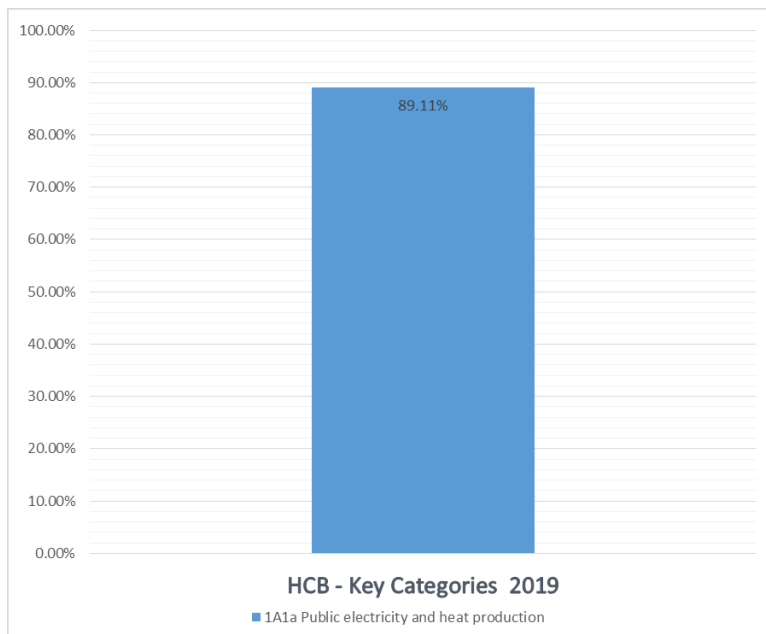


Figure 99. Key Categories assessments of HCB emissions for 2019.

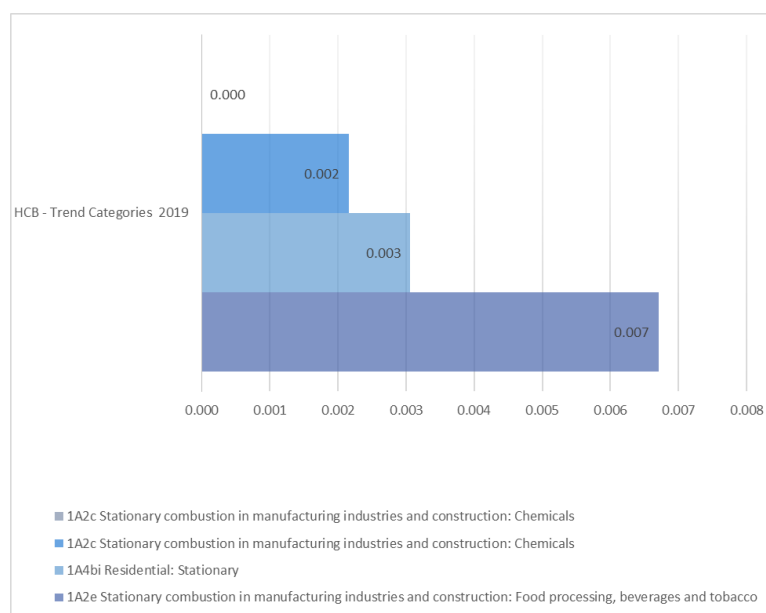


Figure 100. Trends assessments of HCB emissions for base year and 2019

2.4.26. Emissions PCBs

PCBs emissions in 2019. was 723,1358 kg, which is 0,68 % increase compared to 2018. Compared to the 1990 baseline emissions of PCBs is 16.74 % lower.

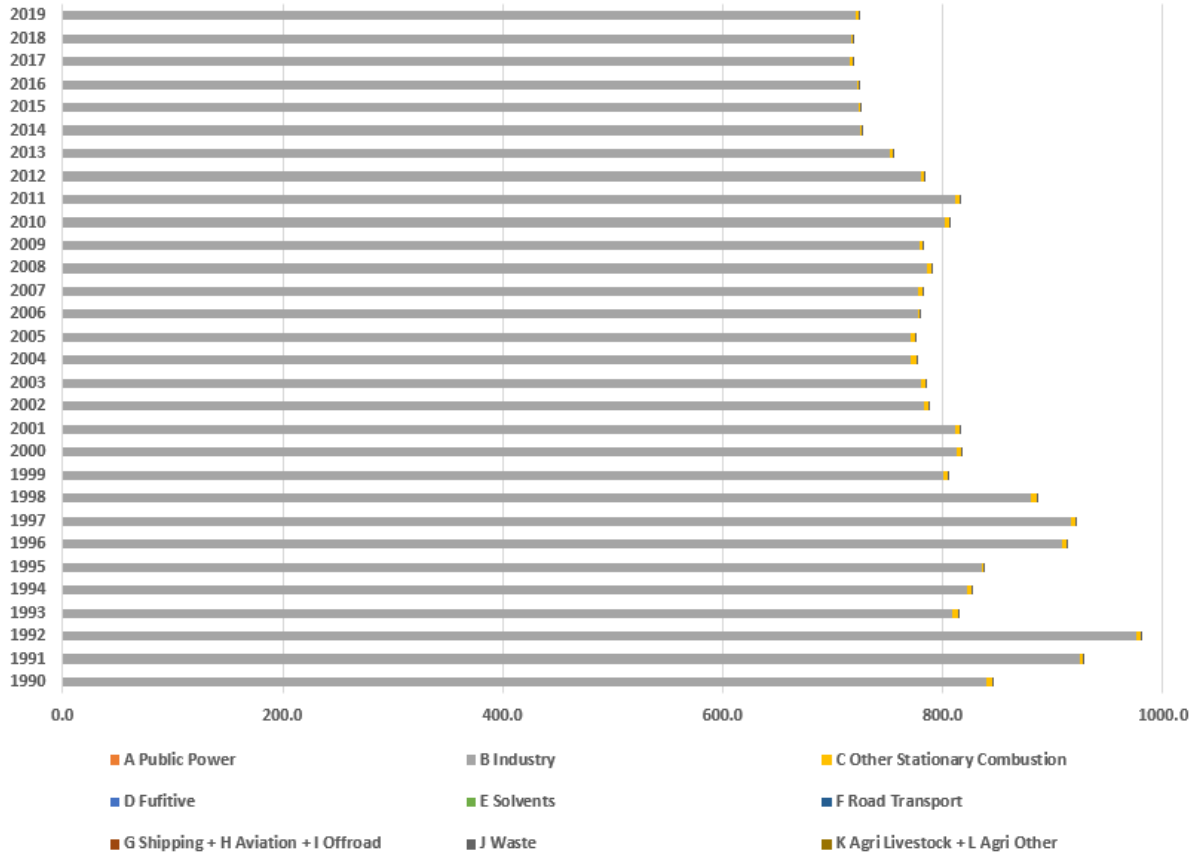


Figure 101. Distribution of PCB between sectors for period 1990 – 2019.

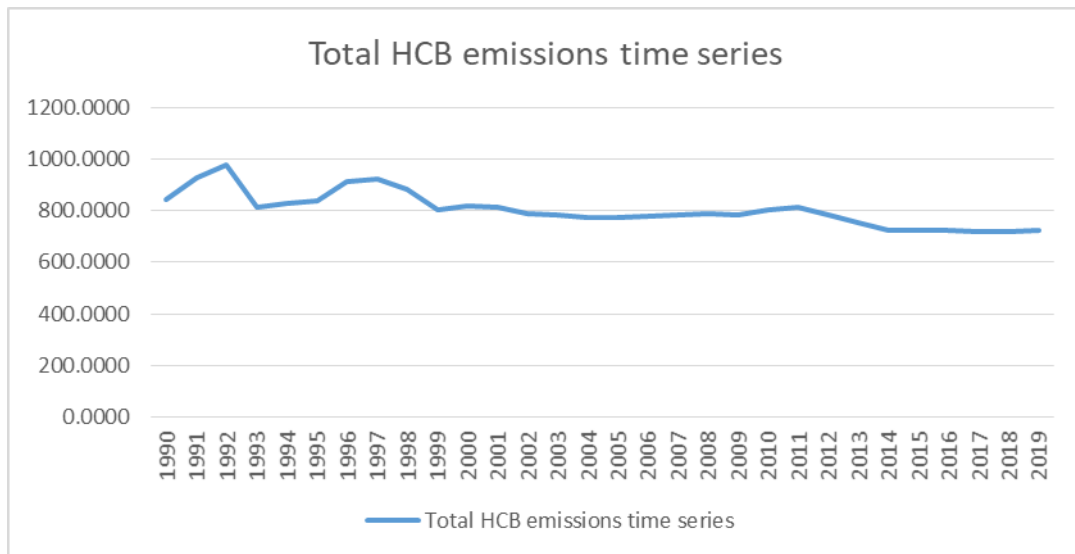


Figure 102.Total PCB emissions time series from 1990 to 2019.

Table 62. Total PCB emissions between sectors for years 1990 and 2019. Trends of dominant sources of PCB emissions compared to years 1990-2019 and 2018-2019. Share in National Total for years 1990 and 2019

NFR Category	PCB Emission in [kt]		Trend		Share in National Total	
	1990	2019	1990 - 2019	2018 - 2019	1990	2019
A Public Power	0.0013	0.0015	19.91%	-5.61%	0.00%	0.00%
B Industry	840.1327	721.3762	-14.14%	0.68%	99.52%	99.76%
C Other Stationary Combustion	4.0584	1.7532	-56.80%	2.91%	0.48%	0.24%
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	0.0034	-85.00%	0.00%	0.00%	0.00%
J Waste	0.0003	0.0014	381.31%	1.50%	0.00%	0.00%
K Agri Livestock + L Agri Other	NA	NA	NA	NA	NA	NA
Total	844.2155	723.1358	-14.34%	0.69%	100.00%	100.00%

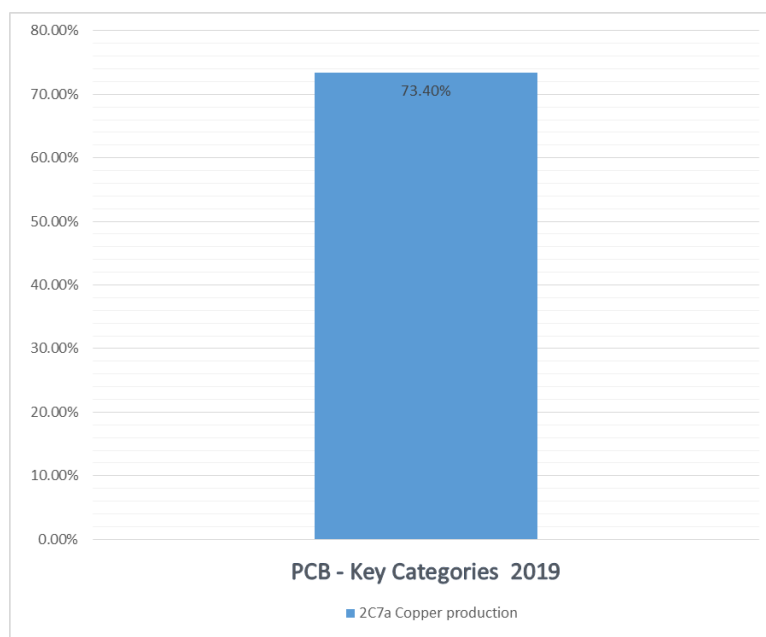


Figure 103. Key Categories assessments of PCB emissions for 2019.

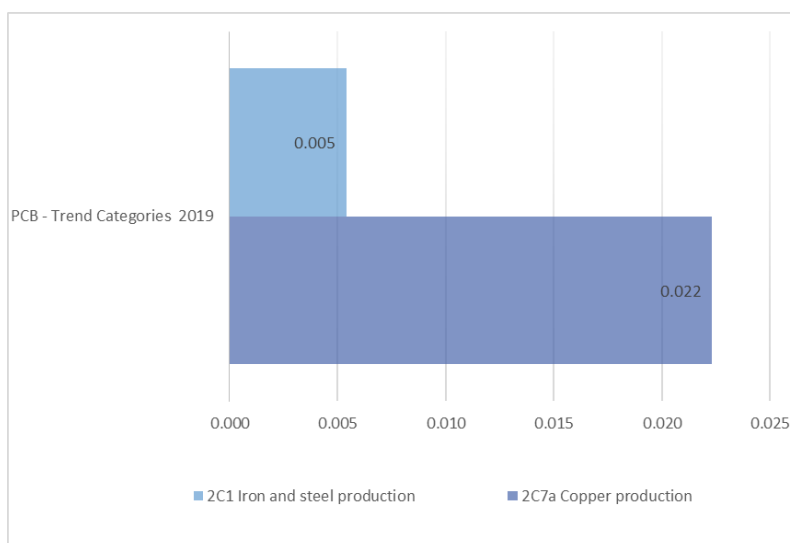


Figure 104. Trends assessments of PCB emissions for base year and 2019

SECTORAL METODOLOGIES

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

The first one were 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.

The second project were is related to the harmonization of reporting between CLRTAP and UNFCCC. This particularly related to the use of the same activity data in the reports for both conventions.

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	Combustion
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	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.3.a.ii.(i)	Civil aviation (domestic, LTO)
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 tyre and brake wear
1.A.3.b.vii	Road surface wear
1.A.3.c	Railways
1 A 3 d ii	National navigation (Shipping)
1 A 4 a i	Commercial / institutional: Stationary
1 A 4 b i	Residential: Stationary plants
1 A 4 c i	1 A 4 c i Agriculture/Forestry/Fishing: Stationary
1.B	Fugitive emissions from fuels
1.B.1.a	Fugitive emissions from solid fuels: Coal mining and handling
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 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 2019.

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 2019 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 SO_x 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 2019 is 1680 g/GJ.

Also new elementary lignite analysis was performed for the period 2015 – 2019 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

Recalculations and other changes

For subcategories Heavy Fuel Oil and Light oil-gas Oil, we changed the whole period because we used to use only 1A1aiii Heat plants, now we have entered quantities from 1A1a electricity and Heat.

For subcategory Gaseous fuels we changed the whole period because we used gross value value before, now we have entered net value value.

From 2019, this category 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 we have changed the emission factor for SOx for 2015, 2016, 2017, 2018 and 2019.

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 four years for SOx.

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 2019.

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.

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

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

No recalculations were performed.

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 2019.

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 – 2019. (Table 9.2.)

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

Year	GJ	Year	GJ
1990	36000424	2005	21057174
1991	15028640	2006	19827558
1992	35163602	2007	18256382
1993	32653136	2008	19246906
1994	30057280	2009	9518455
1995	25377908	2010	19512496
1996	27922530	2011	23119740
1997	28400714	2012	17774367
1998	27615126	2013	16508402
1999	23635952	2014	6552194
2000	23977512	2015	10848032
2001	24421540	2016	18052608
2002	25787780	2017	10808676
2003	27222332	2018	10715939
2004	27871296	2019	6912210

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.

No recalculations were performed.

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 2019.

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

Year	Sinter (t)	Pellet (t)
1990	0	0
1991	0	0
1992	0	0
1993	0	0
1994	0	0
1995	0	0
1996	0	0
1997	0	0
1998	0	0
1999	0	0
2000	0	0
2001	0	0
2002	0	0
2003	0	0
2004	941349	641095
2005	1094502	889273
2006	1341834	1542287
2007	1137976	1338261
2008	1215427	1393685
2009	690020	973477
2010	773848	1208049
2011	967194	1058133
2012	336994	207266
2013	413968	235919
2014	624035	327470
2015	884550	623097
2016	384081	802219
2017	773232	1431960
2018	1113352	1552507
2019	1203368	1265650

Emission factors

Emission factors used in emission calculation for this category are Tier 2 emission factors attained from EMEP/EEA Inventory Guidebook 2019.

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 for the period 2003 - 2010. The activity da

ta for the period 1990 - 2003 and for 2011, 2012 were added in time series for whole period.

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 2019.

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

Emission factors

Emission factors used in emission calculation for this category are Tier 2 emission factors attained from EMEP/EEA Inventory Guidebook 2019.

National emission factors have not been developed.

Activity data

Activity data are given in chapter Industry.

Recalculations and other changes

No recalculations were performed.

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 2019.

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 – 2019.

Recalculations and other changes

We changed the data for Combustion in industry using gaseous fuels from 2018. and Combustion in industry using liquid fuels from 2016. because the data in the Energy Balance changed.

Planned improvements

No planned 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 2019.

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 -2019 were obtained from Statistical Office of Serbia, which is now responsible for development of National energy balances.

Recalculations and other changes

We changed the data for Combustion in industry using gaseous fuels from 2018 and Combustion in industry using liquid fuels from 2017. because the data in the Energy Balance changed.

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 2019.

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.

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 – 2019. Data from 2015 were obtained from Statistical Office of Serbia, which is now responsible for development of National energy balances.

Recalculations and other changes

We changed the data for Combustion in industry using gaseous fuels from 2018 and Combustion in industry using liquid fuels from 2017. because the data in the Energy Balance changed.

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 2019.

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 (gypsum) 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 68. Activity data for category 1.A.2.f

Year	Plaster (gypsum) 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

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 2019.

Emission factors

Emission factors used in emission calculation for this category are Tier 2 emission factors attained from EMEP/EEA Inventory Guidebook 2019. 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 – 2018.

Recalculations and other changes

We have changed quantities because they have changed in the Energy Balance for Gaseous fuels since 2016.

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 2019.

Emission factors

Emission factors used in emission calculation for this category are Tier 2 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 National Energy balance for period 1990 – 2019.

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 and "Konstantin Veliki" in Nis.

For calculation of emissions of pollutants from category 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

Table 69. 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 2019.

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

Activity data are taken from airport "Nikola Tesla" in Belgrade and airport "Konstantin Veliki" in Nis.

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.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	2005	37614
1991	-4962	2006	42360
1992	67808	2007	43448
1993	-41	2008	44454
1994	4375	2009	40664
1995	22527	2010	44160
1996	54941	2011	46105
1997	56819	2012	46551
1998	52222	2013	47822
1999	18569	2014	59237
2000	47764	2015	59559
2001	40918	2016	60077
2002	28872	2017	57510
2003	32484	2018	70296
2004	36416	2019	72484

Table 70. 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 2019.

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

Activity data are taken from airport "Nikola Tesla" in Belgrade and airport "Konstantin Veliki" in Nis. 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 5.2.2e was used for air emission calculation from sub-sectors 1 A 3 b (i-v) Road transport. The COPERT calculates emission factors according to driving conditions data (the average speed per vehicle type and per road).

Emission factors

In a case of road transport, COPERT program contains all necessary emission factors, the method-

logy and calculation algorithm to estimate total road-transport emissions on a national, regional or urban level at a year to day-long time resolution.

The software calculates emission factors based on driving conditions (the average speed of vehicles by type of vehicle and type of road), changing characteristics of fuels and climatologically conditions (temperature and pressure).

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

Due to missing activity data, it was made extrapolation for year 2019.

Recalculations and other changes

No recalculations were performed.

Planned improvements

There is no planned improvement.

1 A 3 b v Road transport: Gasoline evaporation

Methodology

The methodology used in this inventory for the emission calculation for this category is in accordance with the EMEP/EEA Emission Inventory Guidebook 2019.

Emission factors

Emission factors used in emission calculation for this category are Tier 1 emission factors attained from EMEP/EEA Inventory Guidebook 2016.

National emission factors have not been developed.

Activity data

Due to missing activity data, it was made extrapolation for year 2019.

Recalculations and other changes

No recalculations were performed.

Planned improvements

No planned improvements in the next period.

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

Methodology

The methodology used in this inventory for the emission calculation for this category is in accordance with the EMEP/EEA Emission Inventory Guidebook 2019.

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

Due to missing activity data, it was made extrapolation for year 2019.

Recalculations and other changes

No recalculations were performed.

Planned improvements

No planned improvements in the next period.

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

Methodology

The methodology used in this inventory for the emission calculation for this category is in accordance with the EMEP/EEA Emission Inventory Guidebook 2019.

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

Due to missing activity data, it was made extrapolation for year 2019.

Recalculations and other changes

No recalculations were performed.

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 2019.

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.

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

Table 71. Total amount of fuel consumption in railway sector in Serbia in time period 1990 – 2019.

Activity data

For the calculation, activity data were obtained from the Statistical office of Serbia from 1990 to 2019.

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 2019.

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 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	2005	17000
1991	27000	2006	18000
1992	26000	2007	17000
1993	5000	2008	18000
1994	6000	2009	17000
1995	8000	2010	14000
1996	19000	2011	11000
1997	23000	2012	7600
1998	25000	2013	8000
1999	16000	2014	8000
2000	19000	2015	9000
2001	19000	2016	9000
2002	19000	2017	7000
2003	18000	2018	6000
2004	17000	2019	6000

Table 72. Activity data for category 1 A 3 d ii National navigation(Shipping) in Serbia in time period 1990 - 2019

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 2019.

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 – 2019. Data from 2014 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 2019.

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 National Energy balance for period 1990 – 2019. Data from 2014 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.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 2019.

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 2005 - 2010. Data from 2011 were obtained from Statistical Office of Serbia, which is now responsible for development of National energy balances. All missing data were collected to fill time series.

Recalculations and other changes

No recalculations were performed.

Planned improvements

No planned improvements.

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

This category is NE.

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 2019.

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

Table 73. Total amount of coal mined in Serbia in the time period 1990 – 2019.

Emission factors

Emission factors used in emission calculation from coal mining and handling are Tier 1 emission factors attained from EMEP/EEA Inventory Guidebook 2019, 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 category 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. 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 Guidebook 2019.

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

Table 74. Total amount of oil explored, product and transport in Serbia in the time period 1990 – 2019.

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 2019, 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

No recalculations were performed.

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 2019.

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

Table 75. Activity data for category 1.B.2.a.iv Refining / storage in Serbia in time period 1990 - 2018

Emission factors

Emission factors used in emission calculation for this category are Tier 1 emission factors attained from EMEP/EEA Inventory Guidebook 2019.

Activity data

The activity data for this category are obtained from National Energy balance for period 1990 - 2019.

Recalculations and other changes

No recalculations were performed.

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 2019.

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

Table 76. Activity data for category 1.B.2.a.v Distribution of oil products in Serbia in time period 1990 - 2019

Emission factors

Emission factors used in emission calculation for this category are Tier 1 emission factors attained from EMEP/EEA Inventory Guidebook 2019.

Activity data

Activity data for this category is SORS.

Recalculations and other changes

No recalculations were performed.

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 2019.

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 2019.

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	2005	282000000
1991	749000000	2006	280000000
1992	846000000	2007	270000000
1993	962000000	2008	275000000
1994	823000000	2013	279000000
1995	907000000	2010	424000000
1996	670000000	2011	616381000
1997	688000000	2012	672137000
1998	731000000	2013	660406000
1999	679000000	2014	630868000

2000	729000000	2015	626118000
2001	507000000	2016	595346000
2002	400000000	2017	548000000
2003	364000000	2018	506000000
2004	317000000	2019	477000000

Table 77. Total amount of natural gas explored, product and transport in Serbia in the period 1990 – 2019

Recalculations and other changes

No recalculations were performed.

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 2019.

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

Table 78. Activity data for category Venting and flaring (m₃)

Emission factors

Emission factors used in emission calculation for this category are Tier 1 emission factors attained from EMEP/EEA Inventory Guidebook 2019.

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.

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 is 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 2019.

2.A.1			
Cement production			
1990	2577423	2005	2162200
1991	2290216	2006	2436750
1992	1933946	2007	2542200
1993	1034010	2008	2700850
1994	1531852	2013	2111850
1995	1611584	2010	2023500
1996	2094644	2011	1989854
1997	1910761	2012	1739175
1998	2140018	2013	1512117
1999	1496184	2014	1525164
2000	2011150	2015	1571701
2001	2297100	2016	1710807
2002	2276200	2017	1812305
2003	1971250	2018	1987876
2004	2128000	2019	2043898

Table 79. Total amount of clinker production in Serbia in the time period 1990 – 2019.

Emission factors

Emission factors used in emission calculation from clinker production are Tier 1 emission factors attained from EMEP/EEA Inventory Guidebook 2019.

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

A recalculation was made for clinker content in portland cement according to the IPCC 2006 methodology, where it was stated that it is good practice to use the default value of 95 percent clinker, and so far we have used 97

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 2019.

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

Table 80. Total amount of lime production in Serbia in the time period 1990– 2019

Emission factors

Emission factors used in emission calculation for this category are Tier 1 emission factors attained from EMEP/EEA Inventory Guidebook 2019.

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 2019.

Emission factors

Emission factors used in emission calculation for this category are Tier 1 emission factors attained from EMEP/EEA Inventory Guidebook 2019.

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	2005	47900
1991	157140	2006	48900
1992	134077	2007	64700
1993	91220	2008	54500
1994	76007	2013	42400
1995	88256	2010	42200
1996	85439	2011	35565
1997	70542	2012	26361
1998	72605	2013	33937
1999	44391	2014	48992
2000	63000	2015	49286
2001	64000	2016	44151
2002	62000	2017	49837
2003	47000	2018	48726
2004	50200	2019	55169

Table 81. Total amount of lime production in Serbia in the time period 1990– 2019

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 2019.

Emission factors

Emission factors used in emission calculation for this category are Tier 1 emission factors attained from EMEP/EEA Inventory Guidebook 2019.

2.A.5 a			
Quarrying and mining of minerals other than coal (t)			
1990	26483000	2005	10661013
1991	25758000	2006	11061591
1992	23085000	2007	12165978
1993	18189000	2008	14404154
1994	17935000	2013	4455598
1995	21038657	2010	14538052
1996	21286987	2011	16480621
1997	21878747	2012	18604862

1998	21545986	2013	20525373
1999	16591350	2014	20799735
2000	14057685	2015	21252026
2001	8046340	2016	22171687
2002	8652308	2017	21747781
2003	6253038	2018	19977040
2004	8609540	2019	20719494

Table 82. Total amount of quarrying and mining of minerals other than coal in Serbia in the time period 1990– 2019

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 (Mg asphalt)			
1990	3204702	2005	1319767
1991	2156830	2006	1393052
1992	1860111	2007	1422055
1993	1365006	2008	1554431
1994	1260746	2013	1405891
1995	1055803	2010	1333653
1996	1082499	2011	1266883
1997	1049590	2012	1038503
1998	908380	2013	935175
1999	922431	2014	810301
2000	853719	2015	749064
2001	865515	2016	782841
2002	896002	2017	1018066
2003	1185141	2018	1336000
2004	1299132	2019	1962000

2.A.5 b Construction and demolition

Methodology

The methodology used in this inventory for this category is in accordance with the EMEP/EEA Emission Inventory Guidebook 2019.

Table 83. Total amount of asphalt for road paving in Serbia in the time period 1990 – 2019

Emission factors

Emission factors used in emission calculation for this category are Tier 1 emission factors attained from EMEP/EEA Inventory Guidebook 2016. The emission factor for PM_{2.5} is 0.0086, for PM₁₀ 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 2019.

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

Table 84. Total amount of Storage, handling and transport of mineral products in the time period 1990 – 2019

Emission factors

Emission factors used in emission calculation for this category are Tier 2 emission factors attained from EMEP/EEA Inventory Guidebook 2019.

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 NH ₃)			
1990	178745	2005	135000
1991	170237	2006	97000
1992	147748	2007	104000
1993	99897	2008	57000
1994	158518	2013	64000
1995	135401	2010	102000
1996	235070	2011	161000
1997	235183	2012	170000
1998	171640	2013	202000
1999	56645	2014	109000
2000	70000	2015	89000
2001	80000	2016	73000
2002	140000	2017	207990
2003	74000	2018	108911
2004	167000	2019	0

2.B.1 Ammonia production

Table 85. The ammonia production in Serbia in the time period 1990 –2019

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 2019.

Emission factors

Emission factors used in NO_x, CO and NH₃ emission calculation are Tier 1 emission factors attained from EMEP/EEA Inventory Guidebook 2019. 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, 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 2019.

2.B.2			
Nitric acid production (Mg prod., 100% Acid)			
1990	236245	2005	171000
1991	188775	2006	95000
1992	167742	2007	152000
1993	116010	2008	72000
1994	156192	2013	69000
1995	148795	2010	126000
1996	229379	2011	171000
1997	240292	2012	188000
1998	185374	2013	202000
1999	79039	2014	133000
2000	76000	2015	98000
2001	81000	2016	81000
2002	133000	2017	137075
2003	87000	2018	119735
2004	173000	2019	0.008

Table 86. Total amount of nitric acid production in Serbia in the time period 1990 – 2019.

Emission factors

Emission factors used in NO_x emission calculation are Tier 1 emission factors attained from EMEP/EEA Inventory Guidebook 2019.

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.

Planned improvements

No planned improvements in the next period.

2.B.3 Adipic acid production and 2.B.4 Carbide production

These two 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 2019.

2.B.10.a			
Sulphuric acid production (Mg)			
1990	874246	2005	98500
1991	579097	2006	76900
1992	289045	2007	71900
1993	75034	2008	75900
1994	22856	2013	49800
1995	84953	2010	77300
1996	230514	2011	77679
1997	177271	2012	95000
1998	211309	2013	99000

1999	30486	2014	83365
2000	79900	2015	192000
2001	52000	2016	298000
2002	73700	2017	319000
2003	23100	2018	298000
2004	53900	2019	360498

Table 87. Total amount of sulphuric acid production in Serbia in the time period 1990 – 2019.

Emission factors

Emission factors used in this category is Tier 2 emission factors attained from EMEP/EEA Inventory Guidebook 2019. National emission factors have not been developed.

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.

- 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 2019.

Emission factors

Emission factors used in this category is Tier 2 emission factors attained from EMEP/EEA Inventory Guidebook 2019. 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	2005	199600
1991	220627	2006	115000
1992	193297	2007	186200
1993	130835	2008	88600
1994	183943	2013	81200
1995	170276	2010	150400
1996	263429	2011	205043
1997	281778	2012	227492
1998	217236	2013	242623
1999	96130	2014	158399
2000	87700	2015	118314
2001	97300	2016	73000
2002	152100	2017	131495
2003	129800	2018	144714
2004	204600	2019	

Table 88. Total amount of ammonium nitrate production in Serbia in the time period 2000 – 2019

Recalculations and other changes

In 2019, 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 2019

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

Table 89. Total amount of urea production in Serbia in the time period 1990 – 2018

Emission factors

Emission factors used in this category is Tier 2 emission factors attained from EMEP/EEA Inventory Guidebook 2019.

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, 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 2019.

Emission factors

Emission factors used in this category is Tier 2 emission factors attained from EMEP/EEA Inventory Guidebook 2019. 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	2005	8100
1991	169616	2006	2200
1992	121751	2007	46400
1993	38473	2008	24100
1994	19115	2013	5200
1995	16616	2010	6900
1996	101606	2011	5703
1997	72255	2012	9435
1998	56211	2013	51687
1999	21589	2014	51755
2000	25000	2015	34741
2001	35000	2016	44638
2002	9000	2017	43116
2003	13500	2018	41594
2004	7300	2019	62373

Table 90. Total amount of phosphate fertilizers production in Serbia in the time period 1990 – 2019

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 2019.

2.B.10.a			
Ethylene (kton produced)			
1990	258	2005	251
1991	210	2006	254
1992	110	2007	266
1993	0	2008	229
1994	0	2013	156
1995	0	2010	191
1996	101	2011	227
1997	243	2012	71
1998	242	2013	231
1999	85	2014	166
2000	132	2015	113
2001	120	2016	212
2002	174	2017	158
2003	162	2018	144
2004	243		

Table 91. Total amount of ethylene and propylene production in Serbia in the time period 1990 – 2019.

Emission factors

Emission factors used in this category is Tier 2 emission factors attained from EMEP/EEA Inventory Guidebook 2019. 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 2019, there is no production of Ethylene in Serbia.

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 2019.

Emission factors

Emission factors used in this category is Tier 2 emission factors attained from EMEP/EEA Inventory Guidebook 2019. National emission factors have not been developed.

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

Table 92. Total amount of polyethylene low density production in Serbia in the time period 1990 – 2019.

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 2019.

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

Table 93. Total amount of polyethylene high density production in Serbia in the time period 1990 – 2018.

Emission factors

Emission factors used in this category is Tier 2 emission factors attained from EMEP/EEA Inventory Guidebook 2019.

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 2019.

Emission factors

Emission factors used in this category is Tier 2 emission factors attained from EMEP/EEA Inventory Guidebook 2016. National emission factors have not been developed.

2.B.10.a			
Polypropylene (ton produced)			
1990	31122	2005	32100
1991	33292	2006	30600
1992	21077	2007	32700
1993	163	2008	30000
1994	1431	2013	11000
1995	437	2010	25600
1996	16004	2011	32224
1997	31270	2012	17217
1998	34267	2013	34719
1999	13208	2014	29881

2000	21200	2015	32229
2001	31000	2016	34119
2002	28900	2017	31860
2003	28700	2018	45015
2004	32200	2019	

Table 94. Total amount of polypropylene production in Serbia in the time period 1990 – 2019.

Activity data

The source for activity data for this category is SORS.

Recalculations and other changes

In 2019, there is no production of Polypropylene in Serbia.

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 2019.

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

Table 95. Total amount of styrene-butadiene rubber (SBR) production in period 1990 – 2018.

Emission factors

Emission factors used in this category is Tier 2 emission factors attained from EMEP/EEA Inventory Guidebook 2019.

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. We'll put in an improvement plan and we'll 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	
Sinter production		Pellet production.	
g/Mg sinter		g/Mg pellet	
2004	941349	641095	
2005	1094502	889273	
2006	1341834	1542287	
2007	1137976	1338261	
2008	1215427	1393685	
2013	690020	973477	
2010	773848	1208049	
2011	967194	1058133	
2012	336994	207266	
2013	413968	235919	
2014	624035	327470	
2015	884550	623097	
2016	384081	802219	
2017	773232	1431960	
2018	1113352	1552507	
2019	1203368	1265650	

Table 96. Total amount of sinter and pellet production in period 1990 – 2019.

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 2019.

Emission factors

Emission factors used in emissions calculation for this category are Tier 2 emission factors attained from EMEP/EEA Inventory Guidebook 2019.

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	2005	1208118
1991	1266000	2006	1698446
1992	511000	2007	1485126
1993	62000	2008	1582118
1994	22000	2013	1007986
1995	108000	2010	1234633
1996	565000	2011	1258181
1997	907000	2012	346107
1998	850000	2013	402026

1999	139000	2014	595549
2000	598000	2015	969831
2001	456000	2016	1296634
2002	485000	2017	1341326
2003	635000	2018	1708153
2004	1003135	2019	1681527

Table 97. Total amount of pig iron production in period 1990 – 2019.

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 2019.

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

Table 98. Total amount of Al production in Serbia in the period 1990 – 2019

Emission factors

Emission factors used in emissions calculation for this category are Tier 2 emission factors attained from EMEP/EEA Inventory Guidebook 2019.

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

No recalculations were performed.

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 2019.

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 and 2002-2004.

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

Table 99. Total amount of Mg production in Serbia in the period 1990 – 2019

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 2019.

Emission factors

Emission factors used in emission calculation for lead production is Tier 2 emission factors attained from EMEP/EEA Inventory Guidebook 2019.

Table 100. Total amount of lead production in Serbia in the period 1990 – 2019

Year	Secondary lead	Primary lead	Year	Secondary lead	Primary lead
	Mg lead			Mg lead	
1990	5565	6000	2005	4666	0
1991	1629	51000	2006	6434	0
1992	475	78000	2007	8106	0
1993	284	8000	2008	12000	0
1994	2748	13000	2009	14036	0
1995	2415	19000	2010	24032	0
1996	3488	44000	2011	26148	0
1997	5025	42000	2012	18383	0
1998	4845	36000	2013	7546	0
1999	4077	4000	2014	0	0
2000	5145	5000	2015	0	0
2001	5143	5000	2016	0	0
2002	5272	5000	2017	0	0
2003	4893	5000	2018	0	0
2004	5395	0	2019		

Activity data

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

Recalculations and other changes

No recalculations were performed.

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 2019.

Table 101. 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

No recalculations were performed.

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 calculati-on for copper production is in accordance with the EMEP/EEA Emission Inventory Guidebook 2019.

Table 102. Total amount of copper production in Serbia in the period 1990 – 2018

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

Emission factors

Emission factors used in emission calculation for copper production is Tier 2 emission factors attained from EMEP/EEA Inventory Guidebook 2019, 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

No recalculations were performed.

Planned improvements

No planned improvements in the next period.

2 D Other Industry

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 2019.

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 2019.

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	2005	308943
1991	335604	2006	345565
1992	135259	2007	350634
1993	17935	2008	291890
1994	32736	2013	204734
1995	47537	2010	197325
1996	122470	2011	172005
1997	118360	2012	123824
1998	98481	2013	107243
1999	40911	2014	300462
2000	73082	2015	456629
2001	86538	2016	489080
2002	124560	2017	418577
2003	92486	2018	496915
2004	233153	2019	657988

Table 103. Total amount of asphalt for road paving in Serbia in the period 1990 – 2019

Recalculations and other changes

No recalculations were performed.

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 2019.

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. According 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 and 2019 is 0.

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

Table 104. Total amount of asphalt for asphalt roofing in Serbia in the period 1990 – 2019

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 2019.

Emission factors

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

Table 105. Total amount of products for category 2.D.3.d in Serbia in the period 1990 – 2019

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

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.

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.

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.

Table 106. Total amount of products for category 2.D.3.g in Serbia in the period 1990 – 2019

2 D 3 g					
Chemical products					
Year	Rubber	Asphalt	Shoes	Raw hide	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	300462	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

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.

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 2019.

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.

Table 107. Total amount of products for category 2.D.3.i in Serbia in the period 1990 – 2018

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

Recalculations and other changes

No recalculations were performed.

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, Tobacco 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.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 2019.

Emission factors

Emission factors used in this category is Tier 1 emission factors attained from EMEP/EEA Inventory Guidebook 2019. 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	2005	231500
1991	308214	2006	224300
1992	253020	2007	270700
1993	128813	2008	293900
1994	137085	2009	275300
1995	163245	2010	329200
1996	148718	2011	383567
1997	139463	2012	404331
1998	169907	2013	444577
1999	136006	2014	429944
2000	182900	2015	444271
2001	190400	2016	484665
2002	185700	2017	470027
2003	149000	2018	464753
2004	233400	2019	502080

Table 108. Total amount of pulp and paper production in Serbia in the time period 1990 – 2019.

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 2019.

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 2019.

Table 109. – Total amount of food and drink production in Serbia in the time period 1990-2019

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	0	108499	210185
2017	74639	5433229	332828	1208126	27298	528417	0	148679	171312
2018	72986	5650625	295200	1361650	27437	361746	0	162510	167787
2019	72154	5734217	278216	1487115	25739	247194	0	16345	342535

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 2019.

Emission factors

Emission factors used in emission calculation for emissions from wood processing is Tier 1 emission factors attained from EMEP/EEA Inventory Guidebook 2019.

2.I			
Wood processing (Mg wood product)			
1990	243788	2005	62941
1991	219309	2006	67766
1992	212364	2007	83984
1993	134171	2008	66332
1994	123509	2009	31060
1995	132074	2010	208814
1996	133407	2011	252256
1997	130007	2012	287682
1998	127720	2013	276564
1999	96265	2014	361879
2000	119295	2015	349501
2001	83383	2016	342788
2002	36425	2017	369853
2003	41083	2018	412884
2004	73285	2019	332296

Table 110. Total amount of wood production in Serbia in the time period 1990 – 2019

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 2019.

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
- 4.D.1.a Synthetic N-fertilizers

This chapter provides information on the estimated ammonia (NH₃) and nitric oxide (NO) emissions and emissions of particulate matter (PM₁₀, 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

Category Field burning of agricultural wastes include the burning of crop residues and wastes from crops in situ. This inventory doesn't include this category, because burning of agricultural residues in the fields in Serbia is legally restricted. For this reason, activity data are not available.

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 2019. For the calculation of NH₃ 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 2019. 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/asses 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 111. Activity data for category 3.B Animal Husbandry and Manure Management in Serbia in the time period 1990 – 2018

3.B Animal Husbandry and Manure Management											
Year	Dairy cattle	Non - Dairy cattle	Fattening 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

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 2019.

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	2005	245487662
1991	18496193	2006	237073390
1992	21942000	2007	289453652
1993	16572000	2008	257989388
1994	23250000	2013	332070220
1995	40740000	2010	191248900
1996	49205000	2011	220631640
1997	76922000	2012	327196080
1998	67299000	2013	293019650
1999	41201000	2014	198181460
2000	45101000	2015	208354610
2001	77133000	2016	265880720
2002	173193618	2017	244025123
2003	132456976	2018	151079842
2004	265249444	2019	147451663

Table 112. Activity data for category 3Da1 Agricultural Soils in Serbia in the time period 1990 – 2019

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 2019.

3.D.c..			
Year	Area Ha	Year	Area Ha
1990	3619561	2005	3607565
1991	3618051	2006	3537002
1992	3616540	2007	3572865
1993	3615030	2008	3603637
1994	3613520	2013	3518046
1995	3612009	2010	3520871
1996	3610499	2011	3528258
1997	3608989	2012	3462215
1998	3607478	2013	3490632
1999	3605968	2014	3506830
2000	3604458	2015	3468519
2001	3604729	2016	3439887

2002	3605000	2017	3438130
2003	3605272	2018	3486908
2004	3605543	2019	3481567

Table 113. 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 2019.

3.D.e			
Year	Area Ha	Year	Area Ha
1990	3619561	2005	3607565
1991	3618051	2006	3537002
1992	3616540	2007	3572865
1993	3615030	2008	3603637
1994	3613520	2013	3518046
1995	3612009	2010	3520871
1996	3610499	2011	3528258
1997	3608989	2012	3462215
1998	3607478	2013	3490632
1999	3605968	2014	3506830
2000	3604458	2015	3468519
2001	3604729	2016	3439887
2002	3605000	2017	3438130
2003	3605272	2018	3486908
2004	3605543	2019	3481567

Table 114. Activity data for category 3.D e. Cultivated crops

in Serbia in the time period 1990 – 2019

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 wastes

Methodology

The methodology used in this inventory for the emission calculation for this category is in accordance with the EMEP/EEA Emission Inventory Guidebook 2019.

3. F			
Year	Field burning of agricultural residues	Year	Field burning of agricultural residues
1990	1052288197	2005	1602122051
1991	1857631234	2006	1385901200
1992	1034822396	2007	1425534800
1993	1042094135	2008	1468869600
1994	1189673782	2013	1435701600
1995	1357732011	2010	1417261000
1996	1162012523	2011	1455639400
1997	1578655278	2012	1217330458
1998	1254006485	2013	1232990137
1999	1416188140	2014	1299775944
2000	778719440	2015	1246195800
2001	1426153956	2016	1248144200
2002	1332128887	2017	1224765000
2003	892877083	2018	1158986200
2004	1579491657	2019	1093207400

Table 115. 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

This is the first time we have done this category in the inventory because we found data on the Field burning of agricultural residues and harmonized it to be equal to the GHG inventory.

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	2005	44758
1991	24680	2006	46178
1992	26258	2007	47590
1993	27784	2008	49003
1994	29263	2009	50392
1995	30715	2010	54662
1996	32142	2011	58948
1997	33540	2012	62489
1998	34918	2013	66179
1999	36269	2014	69609
2000	37607	2015	72756
2001	38984	2016	74468
2002	40436	2017	70974
2003	41889	2018	63641
2004	43330	2019	59059

Table 115. The amount of landfill gas calculated in Serbia for period 1990 – 2019.

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

No recalculations were performed.

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 2019.

Emission factors

National emission factors have not been developed.

Table 116. The number of cremated bodies in Serbia for period 1990 – 2019.

5.C.1 bv			
Cremation (No of bodies)			
1990	717	2005	2333
1991	902	2006	2467
1992	859	2007	2608
1993	1153	2008	2633
1994	1019	2009	2747
1995	1112	2010	2900
1996	1101	2011	2784
1997	1196	2012	2818
1998	2215	2013	3063
1999	2350	2014	3044
2000	2363	2015	2687
2001	2177	2016	3090
2002	2315	2017	3357
2003	2514	2018	3400
2004	2355	2019	3451

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 2019.

Emission factors

Emission factors used in this category are emission factors attained from the EMEP/EEA Emission Inventory Guidebook 2019.

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 2019.

Emission factors

Emission factors used in this category are emission factors attained from the EMEP/EEA Emission

Inventory Guidebook 2019.

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 2019 methodology.

7. OTHER AND NATURAL EMISSIONS (NFR 11)

11.A Natural sources

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 2019.

Emission factors

Emission factors used in this category is emission factors attained from EMEP/EEA Inventory Guidebook 2019. 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

Table 117. The area and mass of timber burned in forest fires in Serbia for period 1990 – 2018.

Recalculations and other changes

No recalculations were performed.

Planned improvements

No planned improvements in the next period.

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:

1 A 1 a Public electricity and heat production - For subcategories Heavy Fuel Oil and Light oil-gas Oil, we changed the whole period because we used to use only 1A1aiii Heat plants, now we have entered quantities from 1A1a electricity and Heat.

For subcategory Gaseous fuels we changed the whole period because we used gross value value before, now we have entered net value value.

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 we have changed the emission factor for SO_x for 2015, 2016, 2017, 2018 and 2019.

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 four years for SO_x.

1.A.1.c Manufacture of solid fuels and other energy industries - We changed the data for Combustion in industry using gaseous fuels from 2018. and Combustion in industry using liquid fuels from 2016. because the data in the Energy Balance changed.

1.A.2.d Stationary combustion in manufacturing industries and construction: Pulp, Paper and Print - We changed the data for Combustion in industry using gaseous fuels from 2018 and Combustion in industry using liquid fuels from 2017. because the data in the Energy Balance changed.

1.A.2.e Stationary combustion in manufacturing industries and construction: Food processing, beverages and tobacco - We changed the data for Combustion in industry using gaseous fuels from 2018 and Combustion in industry using liquid fuels from 2017. because the data in the Energy Balance changed.

1 A 2 gv iii Stationary combustion in manufacturing industries and construction: Other - We have changed quantities because they have changed in the Energy Balance for Gaseous fuels since 2016.

1.B.2.c Venting and flaring - From 2019, these data are included in category 1A1a Public electricity and heat production.

2.A.1 Cement production - A recalculation was made for clinker content in portland cement according to the IPCC 2006 methodology, where it was stated that it is good practice to use the default value of 95 percent clinker, and so far we have used 97

2.B.1 Ammonia production - In 2019, there is no production of ammonia in Serbia.

2.B.2 Nitric acid production - In 2019, the production of nitric acid was significantly reduced.

2.B.10.a Other chemical industry - In 2019, there is no production of ammonium nitrate in Serbia. Also in 2019 there is no production of Urea, Ethylene and Polypropylene in Serbia.

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 by May 1

11. EMISSION TRENDS PER SECTOR

 Table 115. Emission trends for NO_x (kt) 1990-2019

NO _x	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	17.9782	6.8737	1.1361	0.0263	49.3183	8.9636	0.0006	1.1946	183.1798
1991	87.7269	17.2890	5.4525	0.8373	0.0294	48.0269	7.4387	0.0007	1.0795	167.8810
1992	81.1191	18.4387	6.4813	0.5688	0.0250	43.9833	5.3479	0.0007	1.1657	157.1305
1993	75.5511	12.2430	6.3424	0.2634	0.0266	31.0406	3.8019	0.0010	0.9887	130.2586
1994	69.2235	12.3892	5.7617	0.3200	0.0208	44.4823	3.6486	0.0008	1.1646	137.0116
1995	87.7568	10.9205	4.2460	0.2898	0.0202	43.5880	3.2040	0.0009	1.8717	151.8979
1996	85.1231	16.3828	5.3919	0.5701	0.0181	42.8326	6.2663	0.0009	2.2065	158.7924
1997	92.0873	17.4557	5.4537	0.7689	0.0153	43.1936	6.6135	0.0010	3.3301	168.9191
1998	91.6409	16.9141	6.3470	0.7295	0.0220	43.2303	6.8479	0.0018	2.9494	168.6829
1999	68.3998	12.9091	5.9372	0.1972	0.0192	38.2825	4.6618	0.0019	1.8403	132.2491
2000	77.2337	12.9477	6.0374	0.2417	0.0239	43.8025	4.4458	0.0019	1.9654	146.7001
2001	75.9003	15.1328	5.8956	0.6206	0.0226	45.8723	4.9645	0.0018	3.2368	151.6472
2002	79.5642	16.6714	6.2073	0.7884	0.0256	44.8116	6.6430	0.0019	7.0814	161.7949
2003	83.2911	16.3399	6.4114	0.9054	0.0259	45.4910	7.0213	0.0021	5.4785	164.9665
2004	85.6461	18.7146	6.6030	0.9435	0.0272	45.1423	11.9756	0.0019	10.8222	179.8765
2005	74.4850	17.2249	5.9601	0.7496	0.0312	44.8415	12.2386	0.0019	10.0545	165.5873
2006	78.6576	17.7264	4.5519	0.7542	0.0329	43.2882	12.6627	0.0020	9.7354	167.4113
2007	78.4898	17.5726	7.3493	0.7819	0.0383	43.7389	14.1800	0.0022	11.8241	173.9772
2008	81.3023	18.0169	6.8053	0.7604	0.0376	43.6962	9.8005	0.0022	10.5668	170.9880
2009	74.9015	13.3852	7.2484	0.6932	0.0369	41.5340	10.1799	0.0023	13.5350	161.5161
2010	68.4840	16.1285	7.7006	0.6875	0.0394	38.5274	8.6251	0.0024	7.9200	148.1150
2011	76.9945	18.3380	9.3223	0.5675	0.0492	37.3025	10.4301	0.0023	9.0821	162.0885
2012	72.0887	18.7282	7.5808	0.5152	0.0489	30.2346	10.0578	0.0023	13.3265	152.5830
2013	76.2285	15.6305	6.0875	0.6605	0.0429	29.9274	12.2439	0.0025	12.0350	152.8587
2014	60.0298	13.4715	5.7318	0.6279	0.0379	29.9071	7.7359	0.0025	8.2443	125.7888
2015	73.3104	13.7194	5.9281	0.7053	0.0601	35.2210	7.7451	0.0022	8.6382	145.3299
2016	72.6041	14.6973	6.6022	0.7459	0.0748	23.2438	7.9379	0.0025	10.9372	136.8456
2017	73.6140	14.6124	6.1025	0.8011	0.0827	23.7591	7.0424	0.0028	10.0410	136.0581
2018	69.0835	14.7909	6.0187	0.8549	0.0763	24.2745	6.7394	0.0028	6.3764	128.2174
2019	69.3495	4.0459	6.0005	0.7539	0.0722	24.7899	4.8341	0.0028	0.3449	84.5778

Table 116. Emission trends for NMVOC (kt) 1990-2019

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	15.8539	38.8170	41.2610	23.6752	36.8884	0.6932	0.0001	33.3968	191.1995
1991	0.5908	14.8424	31.4097	29.7676	21.6440	35.1548	0.5962	0.0002	32.7893	166.7949
1992	0.5581	14.0074	29.5498	34.8059	20.2969	32.8379	0.3811	0.0002	29.9815	162.4189
1993	0.4858	15.8984	29.5074	30.8802	19.0689	21.5815	0.3656	0.0002	30.6534	148.4414
1994	0.4398	8.4042	27.7685	31.7056	18.6348	32.2094	0.3468	0.0002	27.5471	147.0564
1995	0.5486	7.4681	23.6473	33.8077	18.3034	30.8332	0.2748	0.0002	30.3113	145.1947
1996	0.5426	9.1565	25.8642	32.2378	18.4477	30.5721	0.5442	0.0002	30.3803	147.7457
1997	0.5930	7.5024	25.9498	37.8633	18.5237	31.8345	0.5584	0.0002	29.9593	152.7846
1998	0.5762	7.6508	28.1709	37.5388	18.6655	33.6301	0.5730	0.0002	29.4110	156.2164
1999	0.4346	7.3391	27.4843	24.9469	17.7608	30.1250	0.3977	0.0002	29.4862	137.9748
2000	0.4842	9.4097	28.8522	28.3162	17.9876	35.2062	0.3542	0.0002	28.3384	148.9490
2001	0.4861	9.4391	28.3480	28.4576	17.9436	34.6655	0.4082	0.0002	26.7256	146.4739
2002	0.5116	10.0714	29.3715	29.7985	17.6840	33.2589	0.5899	0.0003	26.0804	147.3663
2003	0.5356	9.7228	29.9570	31.4582	17.6247	35.1062	0.6360	0.0003	25.8430	150.8839
2004	0.5623	11.6165	30.1941	33.4826	17.9444	32.6389	1.1842	0.0040	25.5432	153.1703
2005	0.4790	10.4740	28.3350	33.8864	18.0872	30.9157	1.2138	0.0040	25.2168	148.6119
2006	0.4962	11.4850	24.6996	35.1602	18.0602	29.1014	1.2525	0.0041	25.8269	146.0861
2007	0.5009	11.5193	29.0391	35.4271	17.9319	28.5875	1.7750	0.0041	25.2001	149.9849
2008	0.5163	12.1769	26.0683	36.5509	18.0121	26.6757	0.9864	0.0036	23.8402	144.8304
2009	0.4781	10.6129	30.4546	35.8410	17.5407	24.4851	1.1101	0.0037	23.5804	144.1066
2010	0.4470	11.3969	29.7365	35.3123	17.2789	18.4762	1.1671	0.0035	22.3300	136.1486
2011	0.5000	11.3920	29.0509	37.4389	17.2025	16.8348	1.4982	0.0032	22.0075	135.9282
2012	0.4746	10.3286	29.2525	34.9425	17.0610	15.5231	1.2557	0.0030	21.2788	130.1198
2013	0.4998	12.2804	24.8013	37.8595	17.5922	13.6272	1.7206	0.0030	21.0634	129.4476
2014	0.4049	11.6942	25.2342	29.3845	17.3439	12.2495	0.9382	0.0024	21.5288	118.7807
2015	0.4894	9.9177	24.9196	36.1602	17.4816	14.0258	0.7690	0.0026	21.4690	125.2349
2016	0.4848	12.2992	27.1433	36.9166	18.1874	6.9378	0.7719	0.0027	20.9498	123.6936
2017	0.4947	12.3487	25.2545	38.0440	17.3903	6.9734	0.6922	0.0024	20.8040	122.0042
2018	0.4688	10.8669	25.7329	36.7974	17.3973	7.0090	0.6554	0.0024	20.7905	119.7206
2019	0.4683	7.3958	26.4923	36.6773	17.0445	7.0556	0.4546	0.0015	17.7295	106.2638

Table 117 Emission trends for SO_x (kt) 1990-2019

SO _x	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	519.0920	30.0329	22.0086	2.9316	NA	1.7353	0.8420	0.0001	NA	576.6425
1991	458.9473	31.2535	14.9363	2.1617	NA	1.6474	0.5758	0.0001	NA	509.5221
1992	421.7496	40.9117	25.1438	1.4663	NA	1.5000	0.5356	0.0001	NA	491.3070
1993	400.1567	30.6897	25.3482	0.6775	NA	1.0082	0.1108	0.0001	NA	457.9913
1994	367.7904	26.6199	22.0683	0.8241	NA	1.4949	0.1294	0.0001	NA	418.9270
1995	468.2358	17.1717	11.3939	0.7464	NA	1.4733	0.1872	0.0001	NA	499.2085
1996	452.0946	28.5385	17.6437	1.4702	NA	1.4739	0.4063	0.0001	NA	501.6273
1997	487.9212	31.4094	17.7504	1.9838	NA	1.5303	0.4885	0.0001	NA	541.0836
1998	488.3078	33.2656	23.9329	1.8820	NA	1.5739	0.5293	0.0003	NA	549.4918
1999	363.6756	30.3947	22.1210	0.5074	NA	1.4149	0.3325	0.0003	NA	418.4464
2000	411.7386	27.6065	21.2169	0.6215	NA	1.5773	0.3993	0.0003	NA	463.1605
2001	402.3085	32.5554	20.1432	1.6001	NA	1.6976	0.4038	0.0002	NA	458.7088
2002	420.8572	36.1974	22.4217	2.0329	NA	1.6951	0.4100	0.0003	NA	483.6145
2003	440.6086	39.5069	23.7635	2.3355	NA	1.7268	0.3936	0.0003	NA	508.3352
2004	450.2567	38.8283	24.3208	2.4336	NA	1.7252	0.3848	0.0003	NA	517.9497
2005	394.2935	26.1125	20.2215	1.9330	NA	1.6981	0.3863	0.0003	NA	444.6452
2006	418.4635	28.7791	10.6464	1.9448	NA	1.6460	0.4106	0.0003	NA	461.8907
2007	416.3026	27.2150	23.5422	2.0169	NA	1.5893	0.4588	0.0003	NA	471.1251
2008	431.6630	25.6865	19.7226	1.9607	NA	1.5224	0.4581	0.0003	NA	481.0136
2009	397.1408	18.0691	14.8789	1.7880	NA	1.4309	0.4356	0.0003	NA	433.7437
2010	361.2132	21.7007	17.1426	1.7734	NA	1.0041	0.3664	0.0003	NA	403.2008
2011	406.5258	26.8147	22.1193	1.4640	NA	0.8379	0.3287	0.0003	NA	458.0907
2012	379.2109	25.5350	14.5192	1.3293	NA	0.6885	0.2603	0.0003	NA	421.5436
2013	401.3513	20.3275	11.8212	1.7044	NA	0.6946	0.2873	0.0003	NA	436.1868
2014	313.5305	18.3063	8.7963	1.6210	NA	0.7154	0.2544	0.0003	NA	343.2243
2015	330.8988	20.4865	8.9776	1.8209	NA	0.8660	0.2705	0.0003	NA	363.3207
2016	327.7101	27.7801	12.2712	1.9253	NA	1.4418	0.2703	0.0003	NA	371.3991
2017	331.5835	21.6879	10.8618	2.0676	NA	1.5604	0.2267	0.0004	NA	367.9882
2018	310.3007	22.3841	9.5813	2.2068	NA	1.6789	0.2169	0.0004	NA	346.3692
2019	361.7756	4.5569	9.8742	1.9465	NA	1.7975	0.2072	0.0004	NA	376.4142

Table 118. Emission trends for NH₃ (kt) 1990-2019

NH ₃	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	NA	8.5014	3.4316	0.0130	0.0631	0.0268	0.0008	8.6285	105.3415	126.0068
1991	NA	6.7533	2.9727	0.0071	0.0693	0.0255	0.0008	8.5512	104.8722	123.2520
1992	NA	5.9298	2.2125	0.0102	0.0589	0.0437	0.0005	8.4586	93.9474	110.6615
1993	NA	4.0239	2.2124	0.0083	0.0621	0.0274	0.0005	8.3679	96.8037	111.5063
1994	NA	5.6449	2.1614	0.0080	0.0487	0.0451	0.0005	8.2383	87.5170	103.6638
1995	NA	5.2096	2.1591	0.0068	0.0473	0.0488	0.0004	8.1074	99.1134	114.6928
1996	NA	8.0858	2.1603	0.0087	0.0425	0.0605	0.0007	7.9570	102.5246	120.8401
1997	NA	8.6217	2.1604	0.0097	0.0361	0.0757	0.0007	7.8030	100.8103	119.5174
1998	NA	6.6626	2.1616	0.0093	0.0514	0.0977	0.0007	7.6321	97.9401	114.5556
1999	NA	2.9264	2.1612	0.0060	0.0448	0.1025	0.0005	7.4822	98.7494	111.4731
2000	NA	2.6857	2.3570	0.0063	0.0559	0.1382	0.0004	7.3008	94.3067	106.8510
2001	NA	2.9601	2.3567	0.0081	0.0531	0.1456	0.0005	7.1583	89.0399	101.7223
2002	NA	4.6772	2.3573	0.0092	0.0604	0.1778	0.0008	6.7440	92.2218	106.2485
2003	NA	3.9662	2.3577	0.0100	0.0610	0.2043	0.0009	6.6428	90.0739	103.3168
2004	NA	6.2987	2.3578	0.0104	0.0642	0.2335	0.0017	6.4601	94.4129	109.8392
2005	NA	6.1064	2.3567	0.0080	0.0734	0.2488	0.0017	6.2502	91.7410	106.7862
2006	NA	3.5122	2.3508	0.0077	0.0779	0.2675	0.0018	6.1427	92.3116	104.6722
2007	NA	5.6650	2.3493	0.0075	0.0904	0.2941	0.0027	6.0270	91.9938	106.4298
2008	NA	2.6933	1.9631	0.0076	0.0887	0.3012	0.0018	5.8150	85.3050	96.1758
2009	NA	2.5892	2.9183	0.0063	0.0866	0.3226	0.0019	5.4436	89.5065	100.8749
2010	NA	4.5761	2.8175	0.0070	0.0924	0.3772	0.0015	5.2732	78.3741	91.5190
2011	NA	6.3614	2.5653	0.0065	0.1144	0.3787	0.0020	5.0366	77.7343	92.1993
2012	NA	6.9990	2.7737	0.0059	0.1132	0.3426	0.0020	5.1275	80.1557	95.5197
2013	NA	7.5591	2.3537	0.0067	0.0995	0.3480	0.0025	4.8618	76.9851	92.2163
2014	NA	4.9137	2.5031	0.0047	0.0881	0.3549	0.0014	4.7013	73.9357	86.5029
2015	NA	3.7008	2.4888	0.0054	0.1392	0.4076	0.0014	4.6319	74.5804	85.9556
2016	NA	2.3331	2.5648	0.0063	0.1732	0.2650	0.0014	4.3705	74.7434	84.4577
2017	NA	4.1386	2.3606	0.0071	0.1908	0.2640	0.0013	4.2462	73.0277	84.2363
2018	NA	4.5611	2.4699	0.0068	0.1759	0.2631	0.0012	4.1337	67.3563	78.9680
2019	NA	0.2031	2.5558	0.0059	0.1663	0.2621	0.0009	3.8568	59.0211	65.6376

Table 119. Emission trends for PM2,5 (kt) 1990-2018

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	1.4548	4.7792	44.1754	0.3678	0.6197	2.1499	0.2824	0.0000	0.8539	54.6830
1991	1.5122	3.3027	36.4507	0.2198	0.6986	2.0668	0.2181	0.0000	0.8401	45.3090
1992	1.3591	4.5410	32.3086	0.3277	0.5946	1.9035	0.2043	0.0000	0.7820	42.0206
1993	1.1276	3.6610	32.2879	0.3012	0.6187	1.3802	0.0609	0.0000	0.7964	40.2340
1994	1.0144	3.4477	30.6412	0.2987	0.5306	1.9339	0.0620	0.0000	0.7332	38.6618
1995	1.2590	2.8223	27.1088	0.2944	0.5408	1.9145	0.0731	0.0000	0.7886	34.8015
1996	1.3113	3.5589	29.0322	0.2950	0.4768	1.9125	0.1461	0.0000	0.7860	37.5188
1997	1.4764	3.6756	29.0998	0.3233	0.4650	1.9029	0.1676	0.0000	0.7780	37.8885
1998	1.3411	3.8400	31.0241	0.3241	0.5694	1.8842	0.1779	0.0001	0.7668	39.9276
1999	1.0716	3.1782	30.4347	0.2329	0.4642	1.6565	0.1178	0.0001	0.7669	37.9229
2000	1.1575	3.1196	32.2330	0.2527	0.5020	1.8742	0.1309	0.0001	0.7448	40.0151
2001	1.1425	3.3171	31.8119	0.2536	0.4609	1.9927	0.1342	0.0001	0.7135	39.8265
2002	1.0870	3.6453	32.6714	0.2643	0.5635	1.9474	0.1418	0.0001	0.6980	41.0188
2003	1.1391	3.7974	33.1649	0.2802	0.5870	1.9835	0.1380	0.0001	0.6927	41.7828
2004	1.1405	4.0732	33.3649	0.2873	0.5895	1.9966	0.1523	0.0001	0.6898	42.2942
2005	1.1639	2.9600	31.8059	0.2636	0.6619	2.0110	0.1521	0.0001	0.6833	39.7018
2006	1.1805	3.0886	28.6660	0.2682	0.6593	1.9923	0.1592	0.0001	0.6957	36.7098
2007	1.1855	3.0770	32.3106	0.2645	0.7132	2.0425	0.5947	0.0001	0.6853	40.8733
2008	1.1841	3.2009	28.3924	0.2752	0.7479	2.0784	0.5271	0.0001	0.6595	37.0658
2009	1.1438	2.2813	35.4616	0.2553	0.7603	2.0370	0.5020	0.0001	0.6429	43.0843
2010	1.0313	3.0085	34.6148	0.2658	0.7461	1.9174	0.3704	0.0001	0.6181	42.5725
2011	1.1047	3.6615	33.2752	0.2828	0.8752	1.9389	0.4744	0.0001	0.6123	42.2251
2012	1.0582	3.2945	33.9190	0.2620	0.8820	1.6227	0.4775	0.0001	0.5998	42.1157
2013	1.0748	3.7022	28.7287	0.2759	0.7854	1.6344	0.5599	0.0001	0.5968	37.3582
2014	0.8617	2.8023	29.5159	0.1927	0.7265	1.6518	0.3371	0.0001	0.6079	36.6961
2015	1.0543	3.1808	29.2345	0.2391	1.0658	2.1265	0.3425	0.0001	0.6042	37.8477
2016	1.0441	3.7152	31.3305	0.2544	1.4439	1.6323	0.3373	0.0001	0.5927	40.3507
2017	1.0506	3.4430	28.9873	0.2703	1.5761	1.7615	0.3184	0.0001	0.5880	37.9953
2018	0.9908	3.3403	29.7375	0.2510	1.4821	1.8907	0.3191	0.0001	0.5929	38.6044
2019	0.9530	2.3435	30.7094	0.1944	0.3776	2.0199	0.2564	0.0001	0.3802	35.2145

Table 120. Emission trends for PM10 (kt) 1990-2018

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	3.3141	10.6249	45.3133	2.1932	0.7323	2.5266	0.3085	0.0000	8.2314	73.2445
1991	3.2026	8.3021	37.4093	1.4323	0.8274	2.4328	0.2371	0.0000	8.2520	62.0956
1992	2.9032	9.0364	33.1248	1.9362	0.7041	2.2477	0.2226	0.0000	7.9673	58.1423
1993	2.5576	6.6717	33.1066	1.8012	0.7284	1.6227	0.0651	0.0000	8.0054	54.5586
1994	2.3241	6.5733	31.4203	1.8292	0.6400	2.2833	0.0666	0.0000	7.7631	52.8999
1995	2.9195	6.0802	27.8044	1.8969	0.6597	2.2586	0.0790	0.0000	8.0306	49.7289
1996	2.9363	7.3443	29.7783	1.8165	0.5795	2.2562	0.1588	0.0000	8.0956	52.9655
1997	3.2442	7.5197	29.8464	2.0224	0.5826	2.2586	0.1825	0.0000	8.0268	53.6834
1998	3.0792	7.9405	31.8203	2.0503	0.6889	2.2488	0.1940	0.0001	7.9988	56.0209
1999	2.3830	6.1214	31.2166	1.4281	0.5526	1.9859	0.1283	0.0001	8.0112	51.8271
2000	2.6303	6.0446	33.0632	1.5823	0.5740	2.2515	0.1431	0.0001	7.8200	54.1092
2001	2.5831	5.9955	32.6344	1.5384	0.5220	2.4130	0.1465	0.0001	7.6722	53.5051
2002	2.5680	6.7168	33.5106	1.5810	0.6529	2.3768	0.1541	0.0001	7.6288	55.1891
2003	2.6896	6.5838	34.0140	1.6709	0.6865	2.4303	0.1497	0.0001	7.6177	55.8427
2004	2.7183	7.3669	34.2183	1.7125	0.6803	2.4615	0.1634	0.0001	7.5807	56.9020
2005	2.5872	6.4403	32.6293	1.6805	0.7590	2.4982	0.1632	0.0001	7.5787	54.3366
2006	2.6795	6.7469	29.4128	1.7455	0.7423	2.5113	0.1709	0.0001	7.6135	51.6226
2007	2.6786	6.6053	33.1553	1.7450	0.7822	2.6043	0.6057	0.0001	7.6063	55.7827
2008	2.7219	6.6104	29.1014	1.8164	0.8401	2.6645	0.5387	0.0001	7.4594	51.7529
2009	2.5727	4.5604	36.4182	1.7617	0.8639	2.6222	0.5129	0.0001	7.4497	56.7617
2010	2.3246	5.9119	35.5656	1.7722	0.8234	2.4965	0.3796	0.0001	7.3016	56.5754
2011	2.5468	6.8572	34.2046	1.9245	0.9439	2.5335	0.4817	0.0001	7.2597	56.7519
2012	2.4094	6.1321	34.8307	1.7893	0.9563	2.1380	0.4827	0.0001	7.0851	55.8236
2013	2.4934	6.6797	29.4946	1.8859	0.8564	2.1694	0.5653	0.0001	7.1321	51.2770
2014	1.9737	5.8376	30.2990	1.3647	0.8052	2.2101	0.3425	0.0001	7.2319	50.0649
2015	2.4171	6.6898	30.0175	1.7165	1.1481	2.8212	0.3486	0.0001	7.1861	52.3450
2016	2.3935	7.6570	32.1587	1.7745	1.6046	2.3704	0.3434	0.0001	7.0805	55.3827
2017	2.4143	7.0262	29.7432	1.8402	1.7436	2.6119	0.3233	0.0001	7.0108	52.7135
2018	2.2680	7.0960	30.5142	1.7295	1.6511	2.8533	0.3234	0.0001	7.1252	53.5609
2019	2.2281	5.6609	31.5126	1.6329	0.5663	3.0947	0.2609	0.0001	1.6476	43.5095

Table 121. Emission trends for TSP (kt) 1990-2019

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	4.8780	77.5659	48.0503	4.7033	5.8847	0.7354	0.3078	0.0000	16.0197	158.1453
1991	4.6885	62.4302	39.5970	3.0508	4.9405	0.7138	0.2375	0.0000	16.1801	131.8384
1992	4.2503	54.6888	35.2609	4.1685	2.4003	0.6723	0.2245	0.0000	15.0755	116.7412
1993	3.7618	36.5570	35.2397	3.8833	1.0167	0.4745	0.0658	0.0000	15.2105	96.2094
1994	3.4210	47.4316	33.4171	3.9357	1.0550	0.6812	0.0673	0.0000	14.3450	104.3539
1995	4.3016	44.7323	29.4619	4.0695	1.3095	0.6703	0.0780	0.0000	15.5520	100.1752
1996	4.3167	65.8529	31.6173	3.8990	2.1176	0.6696	0.1584	0.0000	16.0347	124.6663
1997	4.7634	69.7988	31.6924	4.3322	2.0814	0.6928	0.1819	0.0000	15.5837	129.1268
1998	4.5340	57.6741	33.8490	4.3904	1.9504	0.7092	0.1933	0.0001	15.4902	118.7907
1999	3.5021	29.4354	33.1892	3.0743	1.1025	0.6409	0.1286	0.0001	15.7482	86.8213
2000	3.8711	27.8106	35.1222	3.4008	1.4990	0.7326	0.1426	0.0001	14.8605	87.4395
2001	3.7990	29.3961	34.6518	3.3008	1.6012	0.8135	0.1457	0.0001	14.1874	87.8957
2002	3.7850	41.9063	35.6124	3.3907	2.2072	0.8306	0.1531	0.0001	14.0124	101.8978
2003	3.9642	36.6456	36.1640	3.5820	1.8626	0.8628	0.1485	0.0001	13.9714	97.2012
2004	4.0064	54.1553	36.3875	3.6708	3.5387	0.8956	0.1620	0.0001	13.8055	116.6217
2005	3.8018	53.3869	34.6454	3.5920	4.5311	0.9383	0.1616	0.0001	13.7118	114.7690
2006	3.9441	37.3364	31.1302	3.7268	4.9445	0.9983	0.1689	0.0001	14.0938	96.3431
2007	3.9403	51.2243	35.2158	3.7217	5.0358	1.0790	0.6036	0.0001	13.8839	114.7044
2008	4.0080	30.9423	30.9729	3.8757	4.4042	1.1247	0.5365	0.0001	13.0188	88.8831
2009	3.7830	25.5062	38.5201	3.7504	3.3898	1.1245	0.5108	0.0001	13.6568	90.2417
2010	3.4137	41.2768	37.6211	3.7806	3.2428	1.1152	0.3774	0.0001	12.9146	103.7424
2011	3.7446	53.3102	36.2324	4.1063	3.0538	1.1450	0.4793	0.0001	12.6963	114.7680
2012	3.5397	56.2907	36.8497	3.8173	2.4917	0.9899	0.4801	0.0001	12.2193	116.6785
2013	3.6634	60.0513	31.2063	4.0196	2.1906	1.0296	0.5627	0.0001	12.1399	114.8636
2014	2.8943	44.1562	32.0240	2.8979	0.8576	1.0738	0.3391	0.0001	12.5531	96.7962
2015	3.5464	38.6563	31.7175	3.6449	1.2030	1.3382	0.3452	0.0001	12.6485	93.1001
2016	3.5115	31.1215	34.0299	3.7737	1.7116	1.6712	0.3400	0.0001	12.2282	88.3878
2017	3.5426	41.4763	31.4851	3.9182	1.8552	2.0041	0.3200	0.0001	12.0232	96.6247
2018	3.3247	45.1493	32.2800	3.6765	1.7637	2.3370	0.3194	0.0001	12.0370	100.8878
2019	3.2791	14.6603	33.3330	3.4601	0.6922	2.6700	0.2568	0.0001	6.5420	62.2236

Table 122. Emission trends for BC (kt) 1990-2019

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	0.0248	0.1060	4.1311	0.0630	0.0018	0.0002	0.0012	NA	NA	4.3281
1991	0.0350	0.0899	3.4629	0.0263	0.0020	0.0002	0.0011	NA	NA	3.6173
1992	0.0302	0.1082	2.9073	0.0615	0.0017	0.0001	0.0007	NA	NA	3.1097
1993	0.0194	0.0847	2.9060	0.0571	0.0018	0.0001	0.0006	NA	NA	3.0698
1994	0.0166	0.0764	2.7815	0.0526	0.0014	0.0001	0.0006	NA	NA	2.9293
1995	0.0193	0.0498	2.5554	0.0444	0.0014	0.0001	0.0005	NA	NA	2.6709
1996	0.0242	0.0792	2.6785	0.0489	0.0012	0.0001	0.0009	NA	NA	2.8331
1997	0.0298	0.0846	2.6828	0.0497	0.0010	0.0001	0.0010	NA	NA	2.8490
1998	0.0218	0.0927	2.8059	0.0483	0.0015	0.0002	0.0010	NA	NA	2.9714
1999	0.0205	0.0828	2.7682	0.0414	0.0013	0.0001	0.0007	NA	NA	2.9151
2000	0.0200	0.0749	2.9579	0.0420	0.0016	0.0002	0.0006	NA	NA	3.0971
2001	0.0201	0.0882	2.9310	0.0427	0.0015	0.0002	0.0007	NA	NA	3.0844
2002	0.0144	0.1004	2.9860	0.0451	0.0017	0.0002	0.0010	NA	NA	3.1489
2003	0.0152	0.1105	3.0176	0.0476	0.0017	0.0002	0.0011	NA	NA	3.1939
2004	0.0139	0.1149	3.0303	0.0488	0.0018	0.0002	0.0020	NA	NA	3.2119
2005	0.0223	0.0637	2.9306	0.0369	0.0021	0.0002	0.0020	NA	NA	3.0578
2006	0.0207	0.0713	2.7282	0.0347	0.0022	0.0002	0.0021	NA	NA	2.8593
2007	0.0211	0.0778	2.9636	0.0320	0.0026	0.0002	0.2830	NA	NA	3.3802
2008	0.0192	0.1367	2.5993	0.0337	0.0025	0.0002	0.2478	NA	NA	3.0395
2009	0.0209	0.1268	3.4094	0.0251	0.0025	0.0002	0.2330	NA	NA	3.8180
2010	0.0180	0.1871	3.3185	0.0314	0.0027	0.0002	0.1605	NA	NA	3.7185
2011	0.0169	0.2202	3.1692	0.0317	0.0033	0.0003	0.2347	NA	NA	3.6763
2012	0.0174	0.2392	3.2702	0.0290	0.0033	0.0002	0.2475	NA	NA	3.8068
2013	0.0154	0.2764	2.7622	0.0294	0.0029	0.0002	0.2937	NA	NA	3.3801
2014	0.0130	0.2130	2.8705	0.0151	0.0026	0.0002	0.1636	NA	NA	3.2781
2015	0.0161	0.2265	2.8481	0.0175	0.0041	0.0003	0.1636	NA	NA	3.2761
2016	0.0159	0.2150	3.0110	0.0230	0.0051	0.0004	0.1592	NA	NA	3.4295
2017	0.0157	0.2268	2.7800	0.0280	0.0056	0.0004	0.1554	NA	NA	3.2120
2018	0.0150	0.2363	2.8682	0.0233	0.0051	0.0005	0.1592	NA	NA	3.3076
2019	0.0133	0.2566	2.9587	0.0199	0.0049	0.0006	0.1250	NA	NA	3.3536

Table 123. Emission trends for CO (kt) 1990-2019

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	20.3909	286.0574	1.3950	0.8047	203.5089	1.4480	0.0001	NA	517.9258
1991	4.3545	15.4384	226.7071	0.7185	0.9001	195.8315	1.3058	0.0001	NA	445.2560
1992	4.2585	18.6553	227.8617	1.1597	0.7661	167.9281	0.8995	0.0001	NA	421.5290
1993	3.5094	13.6177	227.4613	0.9776	0.8153	106.8649	0.5125	0.0002	NA	353.7590
1994	3.1426	13.0905	212.0495	0.9290	0.6363	160.5050	0.4627	0.0001	NA	390.8158
1995	3.8551	9.8707	172.5320	0.7917	0.6181	162.9824	0.7046	0.0002	NA	351.3547
1996	3.8384	15.4983	193.8862	0.9653	0.5539	164.0968	0.9190	0.0002	NA	379.7579
1997	4.2027	16.6571	194.7019	1.0528	0.4687	167.9950	0.9730	0.0002	NA	386.0513
1998	4.0576	19.3421	216.0483	1.0168	0.6741	169.7497	0.9953	0.0003	NA	411.8842
1999	3.0441	13.9222	209.4368	0.7101	0.5865	147.6170	0.5855	0.0003	NA	375.9026
2000	3.3751	16.4290	217.6316	0.7359	0.7308	160.6049	0.6642	0.0003	NA	400.1718
2001	3.4870	16.6870	212.8232	0.8899	0.6909	166.6089	0.7636	0.0003	NA	401.9509
2002	3.7867	18.1644	222.5956	0.9895	0.7850	155.3222	0.9532	0.0003	NA	402.5969
2003	3.9635	19.2424	228.1931	1.0721	0.7921	163.6719	1.0222	0.0004	NA	417.9576
2004	4.2983	39.1265	230.4788	1.1038	0.8324	157.3312	1.4625	0.0003	NA	434.6339
2005	3.4218	34.5897	212.7193	0.8477	0.9546	149.3755	1.4901	0.0003	NA	403.3989
2006	3.4930	41.3631	177.9232	0.8163	1.0065	131.9934	1.5776	0.0003	NA	358.1735
2007	3.5770	38.1907	218.8782	0.7844	1.1739	120.0394	20.5042	0.0004	NA	403.1481
2008	3.7026	41.2210	199.4026	0.8029	1.1501	112.9900	6.8419	0.0004	NA	366.1115
2009	3.4152	26.1620	217.9768	0.6454	1.1286	100.4683	9.8482	0.0004	NA	359.6448
2010	3.2954	30.2470	213.9304	0.7412	1.2070	81.2390	17.7397	0.0004	NA	348.4002
2011	3.7077	33.7402	213.5119	0.7009	1.5057	68.4027	23.7624	0.0004	NA	345.3319
2012	3.5595	21.1855	209.8603	0.6386	1.4966	57.0285	14.6754	0.0004	NA	308.4448
2013	3.7751	23.4652	177.8054	0.6990	1.3131	51.9667	25.1698	0.0004	NA	284.1948
2014	3.1552	25.8097	177.7596	0.4680	1.1616	47.9613	10.9035	0.0004	NA	267.2193
2015	3.7654	32.3927	175.1581	0.5338	1.8391	51.6860	3.9872	0.0004	NA	269.3628
2016	3.7301	24.9810	194.3304	0.6327	2.2912	21.6988	3.2270	0.0004	NA	250.8917
2017	3.8416	32.2736	181.0333	0.7309	2.5330	20.0496	3.3442	0.0005	NA	243.8066
2018	3.6823	39.2125	182.7646	0.6787	2.3348	18.4004	3.3734	0.0005	NA	250.4472
2019	3.6753	36.5615	188.3112	0.5889	2.2086	16.7512	3.0202	0.0005	NA	231.5687

Table 124. Emission trends for Pb (kt) 1990-2019

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	9.3226	4.4439	0.8251	NA	351.8605	0.0072	0.0000	NA	372.2089
1991	5.0774	6.6615	3.2538	0.3522	NA	328.6130	0.0049	0.0000	NA	343.9627
1992	4.6690	8.0620	4.4598	0.7945	NA	285.6732	0.0047	0.0000	NA	303.6632
1993	4.4378	4.1727	4.4910	0.7321	NA	181.6423	0.0009	0.0000	NA	195.4769
1994	4.0800	4.1210	3.9944	0.6756	NA	278.6388	0.0011	0.0000	NA	291.5108
1995	5.1957	3.7046	2.4362	0.5708	NA	273.5494	0.0014	0.0000	NA	285.4582
1996	5.0117	6.8001	3.3504	0.6334	NA	272.0703	0.0034	0.0000	NA	287.8694
1997	5.4057	8.2899	3.3655	0.6482	NA	284.6442	0.0041	0.0000	NA	302.3578
1998	5.4170	8.1065	4.2697	0.6299	NA	291.1375	0.0045	0.0001	NA	309.5653
1999	4.0306	3.9331	4.0052	0.5301	NA	259.4003	0.0029	0.0001	NA	271.9022
2000	4.5651	5.7670	3.9438	0.5386	NA	181.9144	0.0034	0.0001	NA	196.7324
2001	4.4603	5.2440	3.7880	0.5565	NA	188.0509	0.0034	0.0001	NA	202.1032
2002	4.6719	5.5426	4.1191	0.5905	NA	176.5603	0.0034	0.0001	NA	191.4879
2003	4.8913	5.8867	4.3143	0.6249	NA	219.9895	0.0032	0.0001	NA	235.7101
2004	4.9998	23.8597	4.3954	0.6402	NA	214.7996	0.0031	0.0001	NA	248.6977
2005	4.3695	28.7376	3.7998	0.4844	NA	197.3268	0.0031	0.0001	NA	234.7212
2006	4.6420	44.9785	2.3997	0.4572	NA	170.9155	0.0032	0.0001	NA	223.3962
2007	4.6179	38.8287	4.1668	0.4228	NA	161.5695	0.0031	0.0001	NA	209.6088
2008	4.7919	41.0979	3.5510	0.4444	NA	145.1722	0.0032	0.0001	NA	195.0607
2009	4.4094	27.6887	3.2257	0.3335	NA	127.9662	0.0031	0.0001	NA	163.6266
2010	4.0088	33.7880	3.5138	0.4143	NA	63.9534	0.0025	0.0001	NA	105.6809
2011	4.5139	31.9407	4.1326	0.4156	NA	8.0347	0.0020	0.0001	NA	49.0395
2012	4.2088	9.0418	3.0788	0.3791	NA	6.4875	0.0014	0.0001	NA	23.1976
2013	4.4590	10.0191	2.5411	0.3872	NA	6.4049	0.0014	0.0001	NA	23.8128
2014	3.4838	12.8828	2.1648	0.2056	NA	6.5447	0.0014	0.0001	NA	25.2832
2015	4.2672	21.5598	2.1805	0.2377	NA	7.6080	0.0016	0.0001	NA	35.8549
2016	4.2256	24.8704	2.6831	0.3077	NA	0.7363	0.0016	0.0001	NA	32.8248
2017	4.2758	39.7729	2.4077	0.3729	NA	0.7771	0.0013	0.0001	NA	47.6079
2018	4.0024	45.1531	2.2647	0.3142	NA	0.8179	0.0011	0.0001	NA	52.5536
2019	4.0171	9.7294	2.3347	0.2691	NA	0.8587	0.0011	0.0001	NA	16.0824

Table 125. Emission trends for Cd (kt) 1990-2019

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	2.4843	0.6736	0.0389	0.0789	0.0155	0.0011	0.0000	NA	3.9895
1991	0.6236	2.1780	0.5769	0.0239	0.0882	0.0150	0.0009	0.0000	NA	3.5067
1992	0.5721	2.2346	0.4531	0.0265	0.0751	0.0139	0.0009	0.0000	NA	3.3762
1993	0.5383	0.9020	0.4536	0.0189	0.0799	0.0096	0.0003	0.0000	NA	2.0026
1994	0.4942	1.2053	0.4384	0.0191	0.0624	0.0140	0.0003	0.0000	NA	2.2336
1995	0.6282	1.2786	0.4194	0.0165	0.0606	0.0138	0.0003	0.0000	NA	2.4175
1996	0.6094	1.7360	0.4307	0.0235	0.0543	0.0138	0.0006	0.0000	NA	2.8683
1997	0.6595	1.8986	0.4309	0.0279	0.0459	0.0141	0.0006	0.0000	NA	3.0776
1998	0.6560	1.6074	0.4420	0.0268	0.0661	0.0146	0.0007	0.0000	NA	2.8136
1999	0.4908	0.8739	0.4388	0.0139	0.0575	0.0130	0.0005	0.0000	NA	1.8883
2000	0.5538	0.8275	0.4735	0.0149	0.0716	0.0149	0.0005	0.0000	NA	1.9568
2001	0.5414	0.6527	0.4716	0.0232	0.0677	0.0163	0.0005	0.0000	NA	1.7734
2002	0.5630	0.7026	0.4756	0.0273	0.0769	0.0165	0.0005	0.0000	NA	1.8624
2003	0.5895	0.3949	0.4779	0.0303	0.0776	0.0172	0.0005	0.0000	NA	1.5880
2004	0.6015	0.4585	0.4789	0.0314	0.0816	0.0178	0.0005	0.0000	NA	1.6701
2005	0.5322	0.7372	0.4718	0.0245	0.0936	0.0185	0.0005	0.0000	NA	1.8783
2006	0.5639	0.9915	0.4539	0.0241	0.0987	0.0195	0.0005	0.0000	NA	2.1521
2007	0.5612	0.7902	0.4753	0.0241	0.1151	0.0210	0.0005	0.0000	NA	1.9873
2008	0.5808	0.8327	0.3991	0.0240	0.1127	0.0218	0.0005	0.0000	NA	1.9716
2009	0.5368	0.6515	0.5693	0.0206	0.1106	0.0217	0.0004	0.0000	NA	1.9109
2010	0.4865	0.6409	0.5551	0.0219	0.1183	0.0215	0.0004	0.0000	NA	1.8447
2011	0.5456	0.7232	0.5196	0.0195	0.1476	0.0217	0.0003	0.0000	NA	1.9775
2012	0.5097	0.6409	0.5426	0.0177	0.1467	0.0190	0.0002	0.0000	NA	1.8768
2013	0.5378	0.6858	0.4588	0.0209	0.1287	0.0194	0.0002	0.0000	NA	1.8517
2014	0.4206	0.6426	0.4814	0.0169	0.1138	0.0202	0.0003	0.0000	NA	1.6959
2015	0.5155	0.8801	0.4791	0.0191	0.1802	0.0244	0.0003	0.0000	NA	2.0987
2016	0.5103	1.1775	0.4986	0.0212	0.2245	0.0035	0.0003	0.0000	NA	2.4360
2017	0.5162	1.3833	0.4578	0.0236	0.2482	0.0037	0.0002	0.0000	NA	2.6330
2018	0.4832	1.4005	0.4757	0.0236	0.2288	0.0039	0.0002	0.0000	NA	2.6160
2019	0.4846	1.4066	0.4915	0.0207	0.2165	0.0041	0.0002	0.0000	NA	2.3830

Table 126. Emission trends for Hg (kt) 1990-2019

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	1.1077	1.4080	0.1639	0.0494	0.0438	NA	0.0008	0.0011	NA	2.7747
1991	0.9727	0.7699	0.1187	0.0283	0.0438	NA	0.0005	0.0013	NA	1.9353
1992	0.8962	1.4134	0.1840	0.0368	0.0439	NA	0.0005	0.0013	NA	2.5760
1993	0.8553	1.2353	0.1837	0.0285	0.0439	NA	0.0001	0.0017	NA	2.3486
1994	0.7868	1.1676	0.1609	0.0279	0.0440	NA	0.0001	0.0015	NA	2.1887
1995	1.0025	0.9910	0.0895	0.0240	0.0440	NA	0.0002	0.0017	NA	2.1528
1996	0.9643	1.1567	0.1358	0.0317	0.0439	NA	0.0004	0.0016	NA	2.3344
1997	1.0384	1.1721	0.1369	0.0363	0.0438	NA	0.0005	0.0018	NA	2.4297
1998	1.0444	1.1648	0.1792	0.0349	0.0437	NA	0.0005	0.0033	NA	2.4709
1999	0.7749	0.9774	0.1650	0.0208	0.0436	NA	0.0003	0.0035	NA	1.9854
2000	0.8792	1.0159	0.1602	0.0219	0.0434	NA	0.0004	0.0035	NA	2.1245
2001	0.8592	1.0539	0.1536	0.0303	0.0433	NA	0.0004	0.0032	NA	2.1440
2002	0.9039	1.1024	0.1680	0.0348	0.0420	NA	0.0004	0.0034	NA	2.2550
2003	0.9463	1.1469	0.1768	0.0383	0.0419	NA	0.0004	0.0037	NA	2.3543
2004	0.9689	1.3495	0.1819	0.0396	0.0418	NA	0.0003	0.0035	NA	2.5856
2005	0.8405	1.1217	0.1551	0.0307	0.0417	NA	0.0003	0.0035	NA	2.1934
2006	0.8945	1.2454	0.0900	0.0299	0.0415	NA	0.0004	0.0037	NA	2.3053
2007	0.8898	1.1623	0.1764	0.0294	0.0413	NA	0.0003	0.0039	NA	2.3034
2008	0.9249	1.2191	0.1424	0.0296	0.0412	NA	0.0004	0.0039	NA	2.3614
2009	0.8498	0.7540	0.1310	0.0248	0.0410	NA	0.0003	0.0041	NA	1.8050
2010	0.7729	1.1118	0.1504	0.0272	0.0408	NA	0.0003	0.0043	NA	2.1078
2011	0.8720	1.2116	0.1855	0.0248	0.0406	NA	0.0002	0.0041	NA	2.3389
2012	0.8125	0.8461	0.1248	0.0226	0.0403	NA	0.0002	0.0042	NA	1.8506
2013	0.8623	0.7998	0.1018	0.0258	0.0401	NA	0.0002	0.0046	NA	1.8346
2014	0.6738	0.5153	0.0808	0.0194	0.0399	NA	0.0002	0.0045	NA	1.3339
2015	0.8251	0.7237	0.0840	0.0220	0.0397	NA	0.0002	0.0040	NA	1.6987
2016	0.8170	0.9750	0.1057	0.0250	0.0395	NA	0.0002	0.0046	NA	1.9670
2017	0.8271	0.8903	0.0937	0.0282	0.0393	NA	0.0001	0.0050	NA	1.8838
2018	0.7743	0.9252	0.0862	0.0275	0.0391	NA	0.0001	0.0051	NA	1.8575
2019	0.7781	0.2308	0.0884	0.0240	0.0388	NA	0.0001	0.0051	NA	1.1415

Table 127. Emission trends for As (kt) 1990-2019

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	2.1258	0.0769	0.0515	0.0002	NA	0.0272	0.0000	NA	7.7619
1991	4.8360	1.6614	0.0552	0.0292	0.0002	NA	0.0184	0.0000	NA	6.6003
1992	4.4485	1.9628	0.0863	0.0388	0.0001	NA	0.0177	0.0000	NA	6.5542
1993	4.2300	1.0519	0.0870	0.0304	0.0000	NA	0.0034	0.0000	NA	5.4028
1994	3.8891	1.1319	0.0759	0.0296	0.0000	NA	0.0041	0.0000	NA	5.1307
1995	4.9529	1.0671	0.0403	0.0254	0.0000	NA	0.0054	0.0000	NA	6.0912
1996	4.7757	1.5858	0.0625	0.0333	0.0001	NA	0.0129	0.0000	NA	6.4704
1997	5.1500	1.8062	0.0628	0.0379	0.0001	NA	0.0156	0.0000	NA	7.0726
1998	5.1633	1.6677	0.0840	0.0365	0.0000	NA	0.0170	0.0000	NA	6.9686
1999	3.8403	0.9762	0.0776	0.0222	0.0000	NA	0.0109	0.0000	NA	4.9271
2000	4.3506	1.1237	0.0748	0.0233	0.0000	NA	0.0129	0.0000	NA	5.5855
2001	4.2512	1.0537	0.0716	0.0317	0.0000	NA	0.0129	0.0000	NA	5.4211
2002	4.4557	1.1162	0.0787	0.0363	0.0001	NA	0.0129	0.0000	NA	5.7000
2003	4.6650	1.0495	0.0830	0.0399	0.0000	NA	0.0122	0.0000	NA	5.8497
2004	4.7698	1.2481	0.0850	0.0412	0.0001	NA	0.0116	0.0000	NA	6.1559
2005	4.1630	1.2684	0.0721	0.0319	0.0002	NA	0.0116	0.0000	NA	5.5472
2006	4.4226	1.5803	0.0397	0.0311	0.0002	NA	0.0122	0.0000	NA	6.0861
2007	4.3996	1.3359	0.0835	0.0305	0.0002	NA	0.0116	0.0000	NA	5.8613
2008	4.5659	1.4292	0.0820	0.0308	0.0001	NA	0.0122	0.0000	NA	6.1204
2009	4.1984	0.9604	0.0724	0.0256	0.0001	NA	0.0116	0.0000	NA	5.2685
2010	3.8199	1.1378	0.0830	0.0282	0.0001	NA	0.0095	0.0000	NA	5.0786
2011	4.3029	1.3223	0.1147	0.0258	0.0001	NA	0.0075	0.0000	NA	5.7733
2012	4.0120	0.8326	0.0747	0.0235	0.0001	NA	0.0052	0.0000	NA	4.9480
2013	4.2509	0.8235	0.0571	0.0268	0.0001	NA	0.0054	0.0000	NA	5.1639
2014	3.3211	0.7551	0.0465	0.0199	NA	NA	0.0054	0.0000	NA	4.1480
2015	4.0673	1.0525	0.0488	0.0226	NA	NA	0.0061	0.0000	NA	5.1974
2016	4.0280	1.3981	0.0594	0.0258	NA	NA	0.0061	0.0000	NA	5.5175
2017	4.0763	1.4835	0.0518	0.0292	NA	NA	0.0048	0.0000	NA	5.6457
2018	3.8154	1.6756	0.0472	0.0283	NA	NA	0.0041	0.0000	NA	5.5706
2019	3.8318	1.4244	0.0470	0.0247	NA	NA	0.0041	0.0000	NA	5.3074

Table 128. Emission trends for Cr (kt) 1990-2019

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	6.1076	1.4051	0.3825	0.0025	0.2136	0.0303	0.0000	NA	11.6275
1991	3.0756	4.6695	1.1663	0.1674	0.0020	0.2080	0.0214	0.0000	NA	9.3101
1992	2.8286	4.9599	1.0493	0.3621	0.0008	0.1956	0.0207	0.0000	NA	9.4169
1993	2.6904	1.9764	1.0527	0.3306	0.0001	0.1384	0.0045	0.0000	NA	6.1930
1994	2.4737	2.2891	0.9928	0.3060	0.0002	0.1989	0.0050	0.0000	NA	6.2657
1995	3.1505	2.3998	0.8505	0.2588	0.0003	0.1958	0.0065	0.0000	NA	6.8622
1996	3.0378	4.2315	0.9350	0.2900	0.0007	0.1956	0.0146	0.0000	NA	8.7052
1997	3.2759	5.2016	0.9362	0.2990	0.0007	0.2018	0.0174	0.0000	NA	9.9326
1998	3.2844	4.7408	1.0195	0.2904	0.0006	0.2065	0.0188	0.0000	NA	9.5609
1999	2.4429	2.0187	0.9953	0.2394	0.0002	0.1860	0.0122	0.0000	NA	5.8948
2000	2.7675	2.9930	1.0469	0.2438	0.0004	0.2137	0.0142	0.0000	NA	7.2797
2001	2.7039	2.5483	1.0332	0.2562	0.0005	0.2385	0.0143	0.0000	NA	6.7950
2002	2.8335	2.6356	1.0627	0.2734	0.0007	0.2435	0.0143	0.0000	NA	7.0638
2003	2.9666	2.4915	1.0802	0.2902	0.0006	0.2537	0.0136	0.0000	NA	7.0964
2004	3.0327	4.8784	1.0875	0.2974	0.0014	0.2643	0.0129	0.0000	NA	9.5747
2005	2.6480	5.8593	1.0345	0.2255	0.0019	0.2772	0.0129	0.0000	NA	10.0592
2006	2.8134	8.6747	0.9051	0.2133	0.0021	0.2951	0.0136	0.0000	NA	12.9173
2007	2.7986	7.2425	1.0700	0.1983	0.0021	0.3192	0.0129	0.0000	NA	11.6436
2008	2.9044	7.8469	0.8923	0.2077	0.0018	0.3330	0.0135	0.0000	NA	12.1996
2009	2.6710	5.3491	1.1526	0.1573	0.0012	0.3315	0.0127	0.0000	NA	9.6755
2010	2.4296	6.2780	1.1530	0.1934	0.0012	0.3232	0.0106	0.0000	NA	10.3892
2011	2.7366	6.2964	1.1399	0.1926	0.0010	0.3331	0.0084	0.0000	NA	10.7081
2012	2.5514	2.3232	1.0978	0.1757	0.0007	0.2869	0.0059	0.0000	NA	6.4417
2013	2.7035	2.5420	0.9237	0.1810	0.0006	0.2975	0.0062	0.0000	NA	6.6546
2014	2.1119	3.0241	0.9322	0.0993	NA	0.3107	0.0062	0.0000	NA	6.4845
2015	2.5867	4.7849	0.9306	0.1146	NA	0.3891	0.0070	0.0000	NA	8.8129
2016	2.5616	6.0906	0.9970	0.1464	NA	0.2844	0.0070	0.0000	NA	10.0870
2017	2.5922	8.2428	0.9099	0.1762	NA	0.3003	0.0055	0.0000	NA	12.2270
2018	2.4262	9.5893	0.9287	0.1506	NA	0.3162	0.0049	0.0000	NA	13.4160
2019	2.4360	6.2883	0.9597	0.1292	NA	0.3321	0.0049	0.0000	NA	9.6890

Table 129. Emission trends for Cu (kt) 1990-2019

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	10.0190	0.8002	0.1253	0.0789	3.9889	0.1010	0.0000	NA	15.5832
1991	0.4537	8.4519	0.5909	0.0600	0.0882	3.8875	0.1001	0.0000	NA	13.6324
1992	0.4022	9.0560	0.7705	0.1109	0.0751	3.6606	0.0988	0.0000	NA	14.1740
1993	0.3401	4.0467	0.7738	0.0973	0.0799	2.5836	0.0352	0.0000	NA	7.9566
1994	0.3070	5.1739	0.6939	0.0912	0.0624	3.7176	0.0313	0.0000	NA	10.0775
1995	0.3828	5.3319	0.4491	0.0775	0.0606	3.6627	0.0355	0.0000	NA	10.0001
1996	0.3954	7.0223	0.5900	0.0906	0.0543	3.6642	0.0544	0.0000	NA	11.8710
1997	0.4433	7.5805	0.5929	0.0961	0.0459	3.7938	0.0577	0.0000	NA	12.6102
1998	0.4068	6.4893	0.7327	0.0931	0.0661	3.8877	0.0585	0.0000	NA	11.7341
1999	0.3230	3.8011	0.6914	0.0706	0.0575	3.5097	0.0421	0.0000	NA	8.4954
2000	0.3549	3.5564	0.6873	0.0725	0.0716	4.0301	0.0425	0.0000	NA	8.8153
2001	0.3480	2.9116	0.6616	0.0818	0.0677	4.5049	0.0442	0.0000	NA	8.6198
2002	0.3330	3.1531	0.7156	0.0892	0.0769	4.6059	0.0459	0.0000	NA	9.0197
2003	0.3480	1.9789	0.7472	0.0957	0.0776	4.7986	0.0446	0.0000	NA	8.0907
2004	0.3483	4.2186	0.7602	0.0983	0.0816	5.0043	0.0451	0.0000	NA	10.5564
2005	0.3569	5.8801	0.6629	0.0751	0.0935	5.2497	0.0434	0.0000	NA	12.3616
2006	0.3635	8.8392	0.4441	0.0717	0.0986	5.5987	0.0446	0.0000	NA	15.4605
2007	0.3635	7.4721	0.7174	0.0679	0.1150	6.0521	0.0421	0.0000	NA	14.8302
2008	0.3636	7.8163	0.6377	0.0702	0.1127	6.3187	0.0415	0.0000	NA	15.3608
2009	0.3516	5.6321	0.5826	0.0550	0.1106	6.2822	0.0386	0.0000	NA	13.0527
2010	0.3095	6.4332	0.6162	0.0651	0.1183	6.1680	0.0365	0.0000	NA	13.7467
2011	0.3324	6.3512	0.7074	0.0630	0.1476	6.3462	0.0311	0.0000	NA	13.9789
2012	0.3172	3.4530	0.5623	0.0574	0.1467	5.4703	0.0243	0.0000	NA	10.0312
2013	0.3218	3.5904	0.4663	0.0611	0.1287	5.6600	0.0252	0.0000	NA	10.2536
2014	0.2557	3.5408	0.4145	0.0376	0.1138	5.9076	0.0255	0.0000	NA	10.2956
2015	0.3141	5.3945	0.4135	0.0431	0.1802	7.4060	0.0285	0.0000	NA	13.7799
2016	0.3107	7.1957	0.4984	0.0527	0.2245	5.9867	0.0285	0.0000	NA	14.2973
2017	0.3125	9.7726	0.4541	0.0620	0.2482	6.3173	0.0260	0.0000	NA	17.1927
2018	0.2935	10.1010	0.4343	0.0555	0.2288	6.6479	0.0264	0.0000	NA	17.7876
2019	0.2865	4.8692	0.4463	0.0480	0.2165	6.9786	0.0281	0.0000	NA	5.6302

Table 130. Emission trends for Ni (kt) 1990-2019

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	8.3445	0.4024	0.2771	0.0606	0.0430	1.2821	0.0000	NA	16.8968
1991	8.8085	9.5884	0.2904	0.1234	0.0609	0.0416	0.8667	0.0000	NA	19.7798
1992	7.5965	8.6500	0.4150	0.2591	0.0443	0.0389	0.8347	0.0000	NA	17.8386
1993	5.0979	4.1141	0.4180	0.2350	0.0408	0.0272	0.1612	0.0000	NA	10.0943
1994	4.4027	3.9320	0.3700	0.2180	0.0326	0.0394	0.1930	0.0000	NA	9.1877
1995	5.1948	4.0237	0.2182	0.1845	0.0327	0.0388	0.2571	0.0000	NA	9.9497
1996	6.3260	6.1803	0.3072	0.2083	0.0333	0.0388	0.6093	0.0000	NA	13.7032
1997	7.6697	7.6700	0.3087	0.2159	0.0289	0.0402	0.7372	0.0000	NA	16.6706
1998	5.8017	5.1470	0.3968	0.2095	0.0380	0.0411	0.8011	0.0000	NA	12.4352
1999	5.3387	4.6548	0.3710	0.1702	0.0308	0.0370	0.5129	0.0000	NA	11.1155
2000	5.2711	2.2654	0.3633	0.1736	0.0395	0.0424	0.6088	0.0000	NA	8.7640
2001	5.2537	4.7054	0.3481	0.1847	0.0382	0.0471	0.6088	0.0000	NA	11.1861
2002	3.9286	4.8861	0.3804	0.1979	0.0447	0.0480	0.6089	0.0000	NA	10.0947
2003	4.1310	5.0121	0.3994	0.2105	0.0434	0.0501	0.5769	0.0000	NA	10.4235
2004	3.8079	11.3865	0.4073	0.2158	0.0524	0.0520	0.5450	0.0000	NA	16.4671
2005	5.7592	15.9665	0.3492	0.1638	0.0622	0.0544	0.5449	0.0000	NA	22.9003
2006	5.3905	24.6653	0.2128	0.1553	0.0666	0.0576	0.5769	0.0000	NA	31.1250
2007	5.4656	20.8208	0.3852	0.1448	0.0751	0.0620	0.5449	0.0000	NA	27.4984
2008	5.0188	18.5439	0.3297	0.1513	0.0710	0.0646	0.5768	0.0000	NA	24.7561
2009	5.2995	14.1923	0.2888	0.1154	0.0655	0.0644	0.5447	0.0000	NA	20.5706
2010	4.5955	15.7399	0.3176	0.1408	0.0690	0.0629	0.4488	0.0001	NA	21.3746
2011	4.3929	13.9407	0.3808	0.1395	0.0824	0.0643	0.3527	0.0000	NA	19.3533
2012	4.4760	5.3266	0.2761	0.1272	0.0795	0.0558	0.2438	0.0000	NA	10.5851
2013	3.9527	4.9583	0.2271	0.1319	0.0697	0.0576	0.2566	0.0001	NA	9.6540
2014	3.2494	6.2591	0.1892	0.0740	0.0569	0.0600	0.2566	0.0001	NA	10.1453
2015	4.0227	9.6269	0.1908	0.0853	0.0901	0.0745	0.2887	0.0000	NA	14.3791
2016	3.9856	12.3108	0.2392	0.1080	0.1123	0.0439	0.2887	0.0001	NA	17.0885
2017	3.9527	19.3852	0.2143	0.1294	0.1241	0.0464	0.2247	0.0001	NA	24.0768
2018	3.7001	21.0027	0.1993	0.1116	0.1144	0.0488	0.1928	0.0001	NA	25.3698
2019	3.5106	1.8375	0.2053	0.0959	0.1082	0.0512	0.1928	0.0001	NA	5.7464

Table 131. Emission trends for Se (kt) 1990-2019

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	0.4916	0.0526	0.0578	0.0002	0.0038	0.0087	0.0000	NA	17.7404
1991	14.9785	0.5583	0.0410	0.0319	0.0002	0.0037	0.0061	0.0000	NA	15.6196
1992	13.7962	0.8099	0.0489	0.0450	0.0001	0.0034	0.0059	0.0000	NA	14.7093
1993	13.2109	0.6690	0.0494	0.0362	0.0000	0.0024	0.0012	0.0000	NA	13.9691
1994	12.1586	0.5922	0.0445	0.0349	0.0000	0.0035	0.0014	0.0000	NA	12.8352
1995	15.5028	0.3860	0.0293	0.0299	0.0000	0.0035	0.0018	0.0000	NA	15.9534
1996	14.8931	0.6010	0.0387	0.0382	0.0001	0.0034	0.0042	0.0000	NA	15.5787
1997	16.0250	0.6133	0.0387	0.0429	0.0001	0.0036	0.0050	0.0000	NA	16.7286
1998	16.1453	0.7304	0.0478	0.0413	0.0000	0.0037	0.0054	0.0000	NA	16.9740
1999	11.9660	0.6217	0.0452	0.0263	0.0000	0.0034	0.0035	0.0000	NA	12.6662
2000	13.5891	0.6706	0.0452	0.0276	0.0000	0.0039	0.0041	0.0000	NA	14.3405
2001	13.2725	0.7204	0.0438	0.0360	0.0000	0.0043	0.0041	0.0000	NA	14.0812
2002	13.9745	0.7988	0.0468	0.0409	0.0001	0.0043	0.0041	0.0000	NA	14.8695
2003	14.6299	0.8456	0.0485	0.0447	0.0000	0.0045	0.0039	0.0000	NA	15.5772
2004	14.9736	0.8762	0.0493	0.0461	0.0001	0.0047	0.0037	0.0000	NA	15.9538
2005	12.9727	0.6086	0.0440	0.0356	0.0002	0.0049	0.0037	0.0000	NA	13.6697
2006	13.8129	0.6467	0.0303	0.0345	0.0002	0.0052	0.0039	0.0000	NA	14.5337
2007	13.7356	0.6280	0.0494	0.0337	0.0002	0.0057	0.0037	0.0001	NA	14.4564
2008	14.2816	0.6807	0.0468	0.0341	0.0001	0.0060	0.0039	0.0001	NA	15.0533
2009	13.1037	0.4436	0.0490	0.0281	0.0001	0.0059	0.0037	0.0001	NA	13.6342
2010	11.9274	0.5871	0.0532	0.0314	0.0001	0.0058	0.0031	0.0001	NA	12.6080
2011	13.4674	0.7955	0.0665	0.0290	0.0001	0.0059	0.0024	0.0001	NA	14.3669
2012	12.5407	0.5674	0.0495	0.0264	0.0001	0.0052	0.0017	0.0001	NA	13.1910
2013	13.3178	0.4946	0.0390	0.0297	0.0001	0.0055	0.0018	0.0001	NA	13.8884
2014	10.3948	0.4128	0.0353	0.0214	NA	0.0056	0.0018	0.0001	NA	10.8717
2015	12.7304	0.4823	0.0364	0.0243	NA	0.0060	0.0020	0.0001	NA	13.2815
2016	12.6070	0.6737	0.0412	0.0281	NA	0.0057	0.0020	0.0001	NA	13.3578
2017	12.7614	0.5381	0.0365	0.0320	NA	0.0061	0.0016	0.0001	NA	13.3756
2018	11.9425	0.5844	0.0351	0.0306	NA	0.0064	0.0014	0.0001	NA	12.6005
2019	12.0082	0.0768	0.0354	0.0267	NA	0.0067	0.0014	0.0001	NA	12.1219

Table 132. Emission trends for Zn (kt) 1990-2019

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	10.6205	30.2015	0.4879	0.0394	4.1025	0.0780	0.0001	NA	49.9018
1991	4.8558	7.9199	25.1628	0.2114	0.0441	3.9488	0.0714	0.0001	NA	42.2143
1992	4.2850	9.3808	22.0607	0.4650	0.0375	3.6769	0.0702	0.0001	NA	39.9763
1993	3.3561	5.6206	22.1036	0.4262	0.0400	2.5594	0.0230	0.0002	NA	34.1289
1994	2.9895	5.0814	20.9591	0.3940	0.0312	3.7202	0.0212	0.0002	NA	33.1967
1995	3.6679	4.2780	18.4316	0.3331	0.0303	3.6648	0.0246	0.0002	NA	30.4305
1996	3.9822	7.8779	19.9008	0.3718	0.0271	3.6585	0.0408	0.0002	NA	35.8593
1997	4.5811	9.6925	19.9282	0.3822	0.0230	3.7711	0.0446	0.0002	NA	38.4227
1998	3.9543	9.1926	21.3837	0.3712	0.0330	3.8649	0.0460	0.0004	NA	38.8462
1999	3.2874	5.5979	20.9558	0.3086	0.0287	3.4778	0.0322	0.0004	NA	33.6888
2000	3.4704	6.9652	22.1705	0.3140	0.0358	3.9742	0.0338	0.0004	NA	36.9642
2001	3.4241	7.6954	21.9117	0.3277	0.0339	4.3803	0.0348	0.0003	NA	37.8082
2002	3.0545	8.0170	22.4585	0.3489	0.0385	4.4518	0.0358	0.0004	NA	38.4053
2003	3.2020	8.9240	22.7795	0.3699	0.0388	4.6383	0.0346	0.0004	NA	39.9874
2004	3.1345	20.9837	22.9122	0.3790	0.0408	4.8067	0.0344	0.0004	NA	52.2916
2005	3.5675	23.8807	21.9279	0.2871	0.0468	5.0128	0.0334	0.0004	NA	54.7566
2006	3.5396	37.0009	19.6376	0.2714	0.0493	5.2856	0.0346	0.0004	NA	65.8193
2007	3.5575	32.1632	22.4689	0.2517	0.0575	5.7044	0.0326	0.0004	NA	64.2363
2008	3.4699	33.4080	19.1100	0.2640	0.0564	5.9136	0.0328	0.0004	NA	62.2551
2009	3.4317	23.4956	24.8354	0.1993	0.0553	5.9085	0.0306	0.0004	NA	57.9569
2010	3.0425	28.8146	24.5881	0.2460	0.0591	5.8349	0.0279	0.0005	NA	62.6136
2011	3.1611	27.3186	24.0019	0.2457	0.0738	5.9300	0.0234	0.0004	NA	60.7549
2012	3.0740	9.5548	23.7164	0.2241	0.0733	5.1856	0.0178	0.0005	NA	41.8465
2013	3.0035	11.2995	19.9845	0.2301	0.0643	5.3502	0.0186	0.0005	NA	39.9512
2014	2.4087	12.0552	20.4052	0.1246	0.0569	5.5561	0.0187	0.0005	NA	40.6260
2015	2.9622	18.6866	20.3171	0.1439	0.0901	6.6660	0.0209	0.0004	NA	48.8873
2016	2.9339	22.9224	21.6521	0.1848	0.1123	2.2336	0.0209	0.0005	NA	50.0605
2017	2.9393	34.1723	19.8504	0.2231	0.1241	2.3645	0.0185	0.0005	NA	59.6928
2018	2.7586	38.1697	20.3463	0.1896	0.1144	2.4953	0.0183	0.0005	NA	64.0928
2019	2.6650	11.2323	21.0040	0.1626	0.1082	2.6261	0.0193	0.0006	NA	34.9212

Table 133. Emission trends for PCDD/PCDF (kt) 1990-2019

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	3.8599	3.5145	55.0742	6.3509	0.0015	0.5326	0.0188	0.0000	NA	69.3525
1991	3.3915	2.4076	44.0430	2.6599	0.0016	0.4975	0.0127	0.0000	NA	53.0138
1992	3.1198	4.0501	43.1696	6.1905	0.0014	0.4631	0.0122	0.0000	NA	57.0066
1993	2.9643	3.0455	43.1262	5.7422	0.0015	0.3160	0.0024	0.0000	NA	55.1981
1994	2.7250	2.7006	40.3269	5.2876	0.0012	0.4652	0.0028	0.0000	NA	51.5093
1995	3.4695	1.7834	33.2833	4.4649	0.0011	0.4595	0.0038	0.0000	NA	43.4655
1996	3.3445	3.0219	37.1050	4.9185	0.0010	0.4662	0.0089	0.0000	NA	48.8661
1997	3.6059	3.3362	37.2410	5.0072	0.0009	0.4908	0.0108	0.0000	NA	49.6927
1998	3.6167	3.6294	41.0703	4.8683	0.0012	0.5109	0.0118	0.0001	NA	53.7086
1999	2.6885	2.6227	39.8984	4.1567	0.0011	0.4679	0.0075	0.0001	NA	49.8429
2000	3.0494	2.9983	41.5948	4.2177	0.0013	0.5360	0.0089	0.0001	NA	52.4065
2001	2.9810	2.9408	40.7509	4.3047	0.0013	0.5970	0.0089	0.0001	NA	51.5846
2002	3.1283	3.2677	42.4713	4.5487	0.0014	0.6045	0.0089	0.0001	NA	54.0310
2003	3.2745	3.6948	43.4579	4.8034	0.0014	0.6301	0.0085	0.0001	NA	55.8707
2004	3.3519	11.6400	43.8557	4.9183	0.0015	0.6625	0.0080	0.0001	NA	64.4380
2005	2.9201	11.0337	40.7360	3.7167	0.0017	0.6886	0.0080	0.0001	NA	59.1049
2006	3.0999	13.5718	34.5172	3.5009	0.0018	0.7279	0.0085	0.0001	NA	55.4280
2007	3.0851	12.2133	41.8082	3.2255	0.0021	0.7948	0.0080	0.0001	NA	61.1371
2008	3.2020	13.2278	37.6560	3.3990	0.0021	0.8348	0.0085	0.0001	NA	58.3302
2009	2.9449	7.7797	42.4425	2.5334	0.0020	0.8396	0.0080	0.0001	NA	56.5502
2010	2.6816	9.3335	41.6891	3.1723	0.0022	0.8436	0.0066	0.0001	NA	57.7289
2011	3.0219	11.0562	41.3345	3.1994	0.0027	0.8573	0.0052	0.0001	NA	59.4772
2012	2.8176	5.5728	40.7508	2.9192	0.0027	0.7744	0.0036	0.0001	NA	52.8412
2013	2.9902	6.3965	34.5104	2.9617	0.0024	0.8103	0.0038	0.0001	NA	47.6753
2014	2.3399	7.5491	34.6523	1.5329	0.0021	0.8406	0.0038	0.0001	NA	46.9207
2015	2.8638	10.0795	34.2030	1.7747	0.0033	1.0167	0.0042	0.0001	NA	49.9454
2016	2.8362	6.6299	37.6635	2.3217	0.0042	1.0639	0.0042	0.0001	NA	50.5236
2017	2.8705	9.5858	34.9865	2.8289	0.0046	1.1202	0.0033	0.0001	NA	51.3998
2018	2.6894	12.4654	35.4289	2.3578	0.0042	1.2042	0.0028	0.0001	NA	54.1530
2019	2.6922	2.6074	36.5388	2.0162	0.0040	1.2882	0.0028	0.0001	NA	41.8414

Table 134. Emission trends for benzo a pyren (kt) 1990-2019

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	0.3722	10.4307	0.3373	0.0016	0.0092	0.0009	0.0000	NA	11.1524
1991	0.0004	0.2340	7.9795	0.1408	0.0018	0.0084	0.0012	0.0000	NA	8.3661
1992	0.0004	0.4430	8.8833	0.3294	0.0015	0.0077	0.0012	0.0000	NA	9.6666
1993	0.0004	0.4339	8.8677	0.3059	0.0016	0.0052	0.0005	0.0000	NA	9.6152
1994	0.0004	0.3759	8.1563	0.2816	0.0013	0.0078	0.0004	0.0000	NA	8.8237
1995	0.0005	0.1919	6.1835	0.2378	0.0012	0.0077	0.0005	0.0000	NA	6.6230
1996	0.0004	0.3125	7.2431	0.2616	0.0011	0.0079	0.0005	0.0000	NA	7.8272
1997	0.0005	0.3169	7.2826	0.2661	0.0009	0.0083	0.0005	0.0000	NA	7.8758
1998	0.0005	0.4259	8.3480	0.2587	0.0036	0.0086	0.0005	0.0000	NA	9.0458
1999	0.0004	0.3885	8.0218	0.2214	0.0024	0.0079	0.0004	0.0000	NA	8.6428
2000	0.0004	0.3772	8.2103	0.2246	0.0026	0.0092	0.0003	0.0000	NA	8.8247
2001	0.0004	0.3737	7.9701	0.2288	0.0023	0.0107	0.0004	0.0000	NA	8.5863
2002	0.0004	0.4390	8.4581	0.2416	0.0021	0.0109	0.0004	0.0000	NA	9.1525
2003	0.0004	0.5091	8.7372	0.2550	0.0022	0.0117	0.0004	0.0000	NA	9.5160
2004	0.0005	0.5217	8.8484	0.2611	0.0027	0.0125	0.0004	0.0000	NA	9.6474
2005	0.0004	0.1228	7.9635	0.1973	0.0025	0.0132	0.0004	0.0000	NA	8.3002
2006	0.0004	0.1236	6.2319	0.1858	0.0025	0.0147	0.0004	0.0000	NA	6.5593
2007	0.0004	0.2008	8.2417	0.1710	0.0027	0.0166	0.0004	0.0000	NA	8.6336
2008	0.0004	0.2497	7.7297	0.1803	0.0030	0.0177	0.0003	0.0000	NA	8.1812
2009	0.0005	0.1477	7.5785	0.1342	0.0025	0.0183	0.0003	0.0000	NA	7.8821
2010	0.0005	0.1994	7.4829	0.1683	0.0029	0.0175	0.0003	0.0000	NA	7.8718
2011	0.0005	0.1679	7.7346	0.1699	0.0037	0.0189	0.0003	0.0000	NA	8.0957
2012	0.0005	0.3122	7.3258	0.1550	0.0035	0.0178	0.0003	0.0000	NA	7.8151
2013	0.0006	0.2844	6.2041	0.1571	0.0033	0.0196	0.0003	0.0000	NA	6.6694
2014	0.0005	0.2472	6.0395	0.0810	0.0031	0.0212	0.0003	0.0000	NA	6.3927
2015	0.0006	0.2614	5.9200	0.0938	0.0043	0.0264	0.0003	0.0000	NA	6.3068
2016	0.0006	0.2837	6.7895	0.1229	0.0046	0.0282	0.0003	0.0000	NA	7.2297
2017	0.0006	0.2201	6.3564	0.1499	0.0051	0.0288	0.0003	0.0000	NA	6.7612
2018	0.0006	0.1530	6.3203	0.1247	0.0047	0.0314	0.0003	0.0000	NA	6.6350
2019	0.0006	0.1751	6.5006	0.1066	0.0044	0.0340	0.0004	0.0000	74.0101	

Table 135. Emission trends for benzo b fluoranthen (kt) 1990-2019

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	0.5057	11.8677	0.4216	0.0007	0.0243	0.0015	0.0000	NA	12.8357
1991	0.0124	0.3347	8.7637	0.1760	0.0007	0.0235	0.0020	0.0000	NA	9.3130
1992	0.0114	0.6032	10.7285	0.4118	0.0006	0.0220	0.0020	0.0000	NA	11.7795
1993	0.0109	0.5751	10.7037	0.3824	0.0007	0.0156	0.0009	0.0000	NA	11.6893
1994	0.0100	0.4970	9.7353	0.3520	0.0005	0.0224	0.0007	0.0000	NA	10.6180
1995	0.0128	0.2641	6.9309	0.2972	0.0005	0.0219	0.0008	0.0000	NA	7.5282
1996	0.0123	0.4357	8.4326	0.3270	0.0005	0.0217	0.0009	0.0000	NA	9.2307
1997	0.0132	0.4454	8.4897	0.3326	0.0004	0.0225	0.0009	0.0000	NA	9.3048
1998	0.0133	0.5839	10.0005	0.3234	0.0017	0.0227	0.0008	0.0000	NA	10.9463
1999	0.0099	0.5253	9.5372	0.2768	0.0011	0.0204	0.0007	0.0000	NA	10.3714
2000	0.0112	0.5124	9.6355	0.2808	0.0012	0.0233	0.0006	0.0000	NA	10.4649
2001	0.0110	0.5079	9.2919	0.2860	0.0010	0.0262	0.0006	0.0000	NA	10.1247
2002	0.0115	0.5922	9.9889	0.3020	0.0009	0.0265	0.0007	0.0000	NA	10.9227
2003	0.0121	0.6839	10.3871	0.3188	0.0009	0.0274	0.0007	0.0000	NA	11.4309
2004	0.0124	0.7092	10.5456	0.3264	0.0012	0.0285	0.0007	0.0000	NA	11.6240
2005	0.0107	0.1882	9.2817	0.2466	0.0011	0.0299	0.0007	0.0000	NA	9.7588
2006	0.0114	0.1907	6.8255	0.2322	0.0011	0.0318	0.0007	0.0000	NA	7.2933
2007	0.0113	0.2971	9.6748	0.2138	0.0012	0.0346	0.0006	0.0000	NA	10.2333
2008	0.0118	0.4311	9.3203	0.2254	0.0013	0.0363	0.0006	0.0000	NA	10.0268
2009	0.0108	0.2637	8.2282	0.1678	0.0011	0.0364	0.0005	0.0000	NA	8.7085
2010	0.0098	0.3478	8.1643	0.2104	0.0012	0.0334	0.0006	0.0000	NA	8.7676
2011	0.0111	0.3359	8.7353	0.2124	0.0015	0.0356	0.0005	0.0000	NA	9.3324
2012	0.0104	0.5608	8.0040	0.1938	0.0015	0.0307	0.0004	0.0000	NA	8.8015
2013	0.0110	0.4436	6.7775	0.1964	0.0014	0.0329	0.0004	0.0000	NA	7.4633
2014	0.0086	0.3985	6.4208	0.1012	0.0013	0.0351	0.0005	0.0000	NA	6.9660
2015	0.0105	0.4123	6.2559	0.1172	0.0018	0.0446	0.0005	0.0000	NA	6.8428
2016	0.0104	0.4310	7.4320	0.1536	0.0019	0.0455	0.0005	0.0000	NA	8.0749
2017	0.0105	0.3443	7.0021	0.1873	0.0021	0.0474	0.0005	0.0000	NA	7.5943
2018	0.0099	0.2522	6.8555	0.1558	0.0019	0.0499	0.0006	0.0000	NA	7.3259
2019	0.0099	0.1909	7.0323	0.1332	0.0018	0.0525	0.0006	0.0000	NA	7.2337

136. Emission trends for benzo k fluoranthen (kt) 1990-2019

benzo k 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	0.0112	0.2023	4.5932	0.2108	0.0007	0.0202	NA	0.0000	NA	5.0383
1991	0.0098	0.1330	3.3814	0.0880	0.0007	0.0197	NA	0.0000	NA	3.6326
1992	0.0090	0.2409	4.1753	0.2059	0.0006	0.0187	NA	0.0000	NA	4.6505
1993	0.0086	0.2307	4.1658	0.1912	0.0007	0.0138	NA	0.0000	NA	4.6107
1994	0.0079	0.1994	3.7850	0.1760	0.0005	0.0192	NA	0.0000	NA	4.1879
1995	0.0100	0.1055	2.6782	0.1486	0.0005	0.0188	NA	0.0000	NA	2.9616
1996	0.0097	0.1740	3.2712	0.1635	0.0005	0.0187	NA	0.0000	NA	3.6375
1997	0.0104	0.1778	3.2937	0.1663	0.0004	0.0190	NA	0.0000	NA	3.6675
1998	0.0105	0.2336	3.8902	0.1617	0.0017	0.0191	NA	0.0000	NA	4.3168
1999	0.0078	0.2105	3.7073	0.1384	0.0011	0.0171	NA	0.0000	NA	4.0822
2000	0.0088	0.2052	3.7409	0.1404	0.0012	0.0199	NA	0.0000	NA	4.1164
2001	0.0086	0.2034	3.6055	0.1430	0.0010	0.0226	NA	0.0000	NA	3.9842
2002	0.0090	0.2373	3.8803	0.1510	0.0009	0.0230	NA	0.0000	NA	4.3016
2003	0.0095	0.2742	4.0374	0.1594	0.0009	0.0239	NA	0.0000	NA	4.5053
2004	0.0097	0.2841	4.0999	0.1632	0.0012	0.0249	NA	0.0000	NA	4.5830
2005	0.0084	0.0746	3.6015	0.1233	0.0011	0.0264	NA	0.0000	NA	3.8353
2006	0.0090	0.0755	2.6321	0.1161	0.0011	0.0285	NA	0.0000	NA	2.8623
2007	0.0089	0.1181	3.7582	0.1069	0.0012	0.0310	NA	0.0000	NA	4.0243
2008	0.0092	0.1483	3.6249	0.1127	0.0013	0.0327	NA	0.0000	NA	3.9293
2009	0.0085	0.0866	3.1725	0.0839	0.0011	0.0330	NA	0.0000	NA	3.3856
2010	0.0077	0.1115	3.1512	0.1052	0.0012	0.0306	NA	0.0000	NA	3.4075
2011	0.0087	0.1003	3.3838	0.1062	0.0015	0.0328	NA	0.0000	NA	3.6334
2012	0.0081	0.1784	3.0875	0.0969	0.0015	0.0278	NA	0.0000	NA	3.4002
2013	0.0086	0.1558	2.6139	0.0982	0.0014	0.0297	NA	0.0000	NA	2.9077
2014	0.0067	0.1369	2.4687	0.0506	0.0013	0.0317	NA	0.0000	NA	2.6959
2015	0.0082	0.1430	2.4045	0.0586	0.0018	0.0405	NA	0.0000	NA	2.6567
2016	0.0082	0.1532	2.8663	0.0768	0.0019	0.0422	NA	0.0000	NA	3.1485
2017	0.0083	0.1212	2.7012	0.0937	0.0021	0.0457	NA	0.0000	NA	2.9720
2018	0.0077	0.0850	2.6405	0.0779	0.0019	0.0492	NA	0.0000	NA	2.8622
2019	0.0078	0.0684	2.7082	0.0666	0.0018	0.0527	NA	0.0000	NA	2.7844

Table 137. Emission trends for Indeno 1,2,3 pyren (kt) 1990-2019

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	0.1620	5.6140	0.1476	0.0007	0.0152	NA	0.0000	NA	5.9403
1991	0.0009	0.1077	4.3582	0.0616	0.0007	0.0141	NA	0.0000	NA	4.5433
1992	0.0008	0.1924	4.6400	0.1441	0.0006	0.0129	NA	0.0000	NA	4.9909
1993	0.0007	0.1827	4.6313	0.1338	0.0007	0.0087	NA	0.0000	NA	4.9580
1994	0.0006	0.1578	4.2854	0.1232	0.0005	0.0128	NA	0.0000	NA	4.5804
1995	0.0008	0.0850	3.3553	0.1040	0.0005	0.0127	NA	0.0000	NA	3.5583
1996	0.0008	0.1403	3.8525	0.1145	0.0005	0.0128	NA	0.0000	NA	4.1214
1997	0.0009	0.1438	3.8716	0.1164	0.0004	0.0134	NA	0.0000	NA	4.1465
1998	0.0008	0.1869	4.3721	0.1132	0.0017	0.0138	NA	0.0000	NA	4.6885
1999	0.0006	0.1676	4.2185	0.0969	0.0011	0.0126	NA	0.0000	NA	4.4973
2000	0.0007	0.1635	4.3470	0.0983	0.0012	0.0141	NA	0.0000	NA	4.6248
2001	0.0007	0.1622	4.2327	0.1001	0.0010	0.0159	NA	0.0000	NA	4.5126
2002	0.0007	0.1887	4.4644	0.1057	0.0009	0.0159	NA	0.0000	NA	4.7764
2003	0.0007	0.2177	4.5967	0.1116	0.0009	0.0164	NA	0.0000	NA	4.9441
2004	0.0007	0.2264	4.6494	0.1142	0.0012	0.0172	NA	0.0000	NA	5.0092
2005	0.0007	0.0622	4.2291	0.0863	0.0011	0.0177	NA	0.0000	NA	4.3971
2006	0.0007	0.0631	3.4129	0.0813	0.0011	0.0190	NA	0.0000	NA	3.5781
2007	0.0007	0.0970	4.3559	0.0748	0.0012	0.0206	NA	0.0000	NA	4.5502
2008	0.0007	0.1219	4.0541	0.0789	0.0013	0.0214	NA	0.0000	NA	4.2783
2009	0.0007	0.0709	4.1514	0.0587	0.0011	0.0217	NA	0.0000	NA	4.3045
2010	0.0006	0.0901	4.0784	0.0736	0.0012	0.0197	NA	0.0000	NA	4.2637
2011	0.0007	0.0836	4.1415	0.0743	0.0015	0.0207	NA	0.0000	NA	4.3223
2012	0.0007	0.1446	4.0060	0.0678	0.0015	0.0191	NA	0.0000	NA	4.2396
2013	0.0007	0.1258	3.3954	0.0687	0.0014	0.0206	NA	0.0000	NA	3.6126
2014	0.0005	0.1102	3.3501	0.0354	0.0013	0.0220	NA	0.0000	NA	3.5196
2015	0.0007	0.1148	3.2884	0.0410	0.0018	0.0273	NA	0.0000	NA	3.4740
2016	0.0007	0.1226	3.7169	0.0538	0.0019	0.0286	NA	0.0000	NA	3.9243
2017	0.0007	0.0981	3.4759	0.0656	0.0021	0.0302	NA	0.0000	NA	3.6726
2018	0.0006	0.0693	3.4809	0.0545	0.0019	0.0326	NA	0.0000	NA	3.6399
2019	0.0006	0.0555	3.5828	0.0466	0.0018	0.0351	NA	0.0000	NA	3.6389

Table 138. Emission trends for Total 1-4 PAH (kt) 1990-2019

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	7.0351	32.5056	1.1172	0.0036	0.0690	0.0024	0.0000	NA	40.7597
1991	0.0235	3.9807	24.4827	0.4664	0.0040	0.0658	0.0031	0.0000	NA	29.0263
1992	0.0216	2.7638	28.4271	1.0913	0.0034	0.0614	0.0031	0.0000	NA	32.3717
1993	0.0206	1.5793	28.3684	1.0134	0.0036	0.0434	0.0014	0.0000	NA	31.0300
1994	0.0189	1.2865	25.9620	0.9328	0.0028	0.0623	0.0011	0.0000	NA	28.2664
1995	0.0241	0.9183	19.1479	0.7876	0.0028	0.0612	0.0012	0.0000	NA	20.9430
1996	0.0232	2.4819	22.7994	0.8666	0.0025	0.0612	0.0014	0.0000	NA	26.2361
1997	0.0250	3.3617	22.9376	0.8814	0.0021	0.0633	0.0014	0.0000	NA	27.2724
1998	0.0251	3.5651	26.6107	0.8570	0.0087	0.0643	0.0013	0.0000	NA	31.1321
1999	0.0186	1.6416	25.4848	0.7335	0.0058	0.0581	0.0010	0.0000	NA	27.9435
2000	0.0211	2.7603	25.9337	0.7441	0.0061	0.0666	0.0009	0.0000	NA	29.5328
2001	0.0207	2.3931	25.1002	0.7579	0.0054	0.0755	0.0010	0.0000	NA	28.3537
2002	0.0217	2.6756	26.7918	0.8003	0.0049	0.0764	0.0010	0.0000	NA	30.3717
2003	0.0227	3.2794	27.7584	0.8448	0.0050	0.0795	0.0010	0.0000	NA	31.9908
2004	0.0232	4.5440	28.1433	0.8650	0.0064	0.0832	0.0011	0.0000	NA	33.6662
2005	0.0202	3.8102	25.0758	0.6535	0.0058	0.0873	0.0010	0.0000	NA	29.6539
2006	0.0215	5.1212	19.1024	0.6153	0.0057	0.0940	0.0010	0.0000	NA	24.9613
2007	0.0214	4.7832	26.0306	0.5666	0.0062	0.1027	0.0010	0.0000	NA	31.5117
2008	0.0222	5.2888	24.7290	0.5973	0.0070	0.1081	0.0009	0.0000	NA	30.7533
2009	0.0205	3.3074	23.1306	0.4447	0.0057	0.1093	0.0008	0.0000	NA	27.0190
2010	0.0187	4.0813	22.8767	0.5576	0.0066	0.1012	0.0009	0.0000	NA	27.6429
2011	0.0210	4.1374	23.9953	0.5629	0.0083	0.1080	0.0008	0.0000	NA	28.8337
2012	0.0196	2.1660	22.4233	0.5136	0.0078	0.0954	0.0007	0.0000	NA	25.2264
2013	0.0209	2.1431	18.9909	0.5205	0.0076	0.1028	0.0007	0.0000	NA	21.7864
2014	0.0164	2.5750	18.2792	0.2682	0.0070	0.1099	0.0007	0.0000	NA	21.2564
2015	0.0200	3.6315	17.8689	0.3106	0.0096	0.1388	0.0008	0.0000	NA	21.9803
2016	0.0198	4.3597	20.8046	0.4070	0.0102	0.1417	0.0008	0.0000	NA	25.7439
2017	0.0201	4.3850	19.5357	0.4964	0.0113	0.1513	0.0008	0.0000	NA	24.6005
2018	0.0188	5.1851	19.2972	0.4130	0.0104	0.1647	0.0009	0.0000	NA	25.0901
2019	0.0187	0.4602	19.8230	0.3530	0.0099	0.1781	0.0010	0.0000	NA	20.3029

Table 139. Emission trends for HCB (kt) 1990-2019

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	0.0437	0.2595	NA	NA	NA	0.0056	0.0001	NA	2.8696
1991	2.2258	0.0534	0.2221	NA	NA	NA	0.0038	0.0001	NA	2.5052
1992	2.0485	0.0990	0.1747	NA	NA	NA	0.0036	0.0001	NA	2.3260
1993	1.9642	0.0764	0.1748	NA	NA	NA	0.0007	0.0002	NA	2.2163
1994	1.8081	0.0676	0.1690	NA	NA	NA	0.0008	0.0002	NA	2.0456
1995	2.3059	0.0357	0.1616	NA	NA	NA	0.0011	0.0002	NA	2.5046
1996	2.2136	0.0666	0.1659	NA	NA	NA	0.0027	0.0002	NA	2.4490
1997	2.3808	0.0691	0.1660	NA	NA	NA	0.0032	0.0002	NA	2.6193
1998	2.4010	0.0926	0.1703	NA	NA	NA	0.0035	0.0003	NA	2.6677
1999	1.7783	0.0825	0.1690	NA	NA	NA	0.0022	0.0004	NA	2.0324
2000	2.0224	0.0998	0.1824	NA	NA	NA	0.0027	0.0004	NA	2.3076
2001	1.9748	0.0984	0.1816	NA	NA	NA	0.0027	0.0003	NA	2.2578
2002	2.0811	0.1092	0.1832	NA	NA	NA	0.0027	0.0003	NA	2.3765
2003	2.1782	0.1145	0.1841	NA	NA	NA	0.0025	0.0004	NA	2.4797
2004	2.2302	0.1607	0.1845	NA	NA	NA	0.0024	0.0004	NA	2.5781
2005	1.9306	0.1220	0.1817	NA	NA	NA	0.0024	0.0003	NA	2.2369
2006	2.0551	0.1522	0.1748	NA	NA	NA	0.0025	0.0004	NA	2.3849
2007	2.0434	0.1399	0.1828	NA	NA	NA	0.0024	0.0004	NA	2.3690
2008	2.1247	0.1691	0.1531	NA	NA	NA	0.0025	0.0004	NA	2.4498
2009	1.9484	0.1073	0.2182	NA	NA	NA	0.0024	0.0004	NA	2.2768
2010	1.7735	0.1414	0.2125	NA	NA	NA	0.0020	0.0004	NA	2.1297
2011	2.0036	0.1915	0.1979	NA	NA	NA	0.0015	0.0004	NA	2.3949
2012	1.8652	0.1039	0.2076	NA	NA	NA	0.0011	0.0004	NA	2.1782
2013	1.9822	0.1163	0.1759	NA	NA	NA	0.0011	0.0005	NA	2.2759
2014	1.5471	0.1058	0.1846	NA	NA	NA	0.0011	0.0005	NA	1.8391
2015	1.8944	0.1328	0.1836	NA	NA	NA	0.0013	0.0004	NA	2.2125
2016	1.8762	0.1491	0.1912	NA	NA	NA	0.0013	0.0005	NA	2.2182
2017	1.8992	0.1650	0.1757	NA	NA	NA	0.0010	0.0005	NA	2.2414
2018	1.7775	0.1921	0.1826	NA	NA	NA	0.0008	0.0005	NA	2.1535
2019	1.7865	0.0283	0.1888	NA	NA	NA	0.0008	0.0005	NA	2.0049

Table 140. Emission trends for PCB (kt) 1990-2019

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	840.1467	4.0584	NA	NA	NA	0.0228	0.0003	NA	844.2295
1991	0.0011	924.5349	2.7357	NA	NA	NA	0.0154	0.0004	NA	927.2875
1992	0.0010	975.1504	4.6852	NA	NA	NA	0.0148	0.0004	NA	979.8519
1993	0.0010	808.6092	4.7241	NA	NA	NA	0.0029	0.0005	NA	813.3376
1994	0.0009	822.2565	4.1060	NA	NA	NA	0.0034	0.0004	NA	826.3672
1995	0.0011	834.9340	2.0897	NA	NA	NA	0.0046	0.0005	NA	837.0298
1996	0.0011	908.5120	3.2700	NA	NA	NA	0.0108	0.0005	NA	911.7944
1997	0.0012	916.8933	3.2901	NA	NA	NA	0.0131	0.0005	NA	920.1981
1998	0.0012	880.6074	4.4579	NA	NA	NA	0.0143	0.0009	NA	885.0817
1999	0.0009	799.6687	4.1158	NA	NA	NA	0.0091	0.0010	NA	803.7955
2000	0.0010	812.2328	3.9394	NA	NA	NA	0.0108	0.0010	NA	816.1850
2001	0.0010	811.6581	3.7366	NA	NA	NA	0.0108	0.0009	NA	815.4074
2002	0.0010	782.6530	4.1670	NA	NA	NA	0.0108	0.0009	NA	786.8328
2003	0.0011	779.5570	4.4204	NA	NA	NA	0.0103	0.0010	NA	783.9898
2004	0.0011	771.1445	4.5255	NA	NA	NA	0.0097	0.0010	NA	775.6818
2005	0.0010	770.6204	3.7513	NA	NA	NA	0.0097	0.0010	NA	774.3834
2006	0.0010	776.9250	1.9428	NA	NA	NA	0.0103	0.0010	NA	778.8801
2007	0.0010	777.0229	4.2240	NA	NA	NA	0.0097	0.0011	NA	781.2588
2008	0.0011	785.4316	3.6307	NA	NA	NA	0.0103	0.0011	NA	789.0747
2009	0.0012	778.7991	2.7091	NA	NA	NA	0.0097	0.0011	NA	781.5202
2010	0.0012	802.3542	3.1225	NA	NA	NA	0.0080	0.0012	NA	805.4870
2011	0.0013	811.1578	4.0334	NA	NA	NA	0.0063	0.0011	NA	815.1999
2012	0.0012	780.0377	2.5891	NA	NA	NA	0.0043	0.0012	NA	782.6335
2013	0.0015	751.7765	2.1095	NA	NA	NA	0.0046	0.0013	NA	753.8933
2014	0.0013	724.2531	1.5506	NA	NA	NA	0.0046	0.0012	NA	725.8109
2015	0.0016	723.6331	1.5747	NA	NA	NA	0.0051	0.0011	NA	725.2157
2016	0.0016	721.4554	2.1916	NA	NA	NA	0.0051	0.0013	NA	723.6551
2017	0.0016	715.6078	1.9426	NA	NA	NA	0.0040	0.0014	NA	717.5573
2018	0.0016	716.5106	1.7037	NA	NA	NA	0.0034	0.0014	NA	718.2207
2019	0.0009	23.9119	1.7529	NA	NA	NA	0.0034	0.0014	NA	25.6705

