2021

INFORMATIVE INVENTORY REPORT OF GEORGIA

1990-2019

Ministry of Environmental Protection and Agriculture of Georgia
Ambient Air Division

Submitted under the Convention on Long-Range Transboundary Air Pollution

LIST OF ABBREVIATIONS

MEPA	– Ministry of Environmental Protection and Agriculture of Georgia
EMEP	– The European Monitoring and Evaluation Programme
EEA	– European Economic Area
GEOSTAT	– National Statistics Office of Georgia
IPCC	– Intergovernmental Panel on Climate Change
CLRTAP	– Convention on Long-Range Transboundary Air Pollution
COPERT 4	– Road transport database
CNG	– Compressed natural gas
IIR	– Informative Inventory Report (UNECE)
LPS	– Large point sources, equals to the definition of E-PRTR installations
NFR	– Nomenclature for reporting (IPCC code of categories)
QA/QC	– Quality assurance/quality control:
UNECE	– United Nations Economic Commission for Europe

Pollutants

As	– Arsenic
Cd	– Cadmium
Cr	– Chromium
Cu	– Copper
CO	– Carbon monoxide
HCB	– Hexachlorobenzene
Hg	– Mercury
HM	– Heavy metals
NH3	– Ammonia
Ni	– Nickel
NMVOC	– Non-methane volatile organic compounds
NO2	– Nitrogen dioxide
NOx	– Nitrogen oxides, nitric oxide and nitrogen dioxide, expressed as nitrogen dioxide
PAH	– Polyaromatic hydrocarbons expressed as the sum of benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene and indeno(1,2,3,-cd)pyrene
Pb	– Lead
PCDD/PCDF	– Dioxins and furans: 1,2,3,7,8-PeCDD; 2,3,4,7,8-PeCDF; 1,2,3,4,7,8-HxCDF; 1,2,3,6,7,8-HxCDF

PCB – Polychlorinated biphenyls

PCP – Pentachlorophenol

PFCs – Perfluorocarbons

PM2.5 – Particulate matter; particles on the order of ~ 2.5 micrometers or less

PM10 – Particulate matter; particles on the order of ~10 micrometers or less

POP – Persistent organic pollutants

Se – Selenium

SO_2 – Sulphur dioxide

SOx – Sulphur oxides, all sulphur compounds expressed as sulphur dioxide

TSP – Total suspended particulates

Zn – Zinc

Contents

Executive Summary

Georgia is a party to the 1979 Geneva Convention on Long-range Transboundary Air Pollution since 1999. The present report is the sixth Informative Inventory Report (IIR) submitted by Georgia under the Convention on Long-Range Transboundary Air Pollution. The first IIR was submitted in 2015. The report provides background information on Georgia's emission inventory data.

Georgia reports emissions of NOx, NMVOC, SO2, NH3, PM2.5, PM10, TSP, CO, Pb, Cd, Hg, As, Cr, Cu, Ni, Se, Zn, PCDD/ PCDF, benzo(a) pyrene, benzo(b) fluoranthene, benzo(k) fluoranthene, Indeno (1,2,3-cd) pyrene, HCB, PCBs, in the following sectors: Energy, Industrial Processes and Product Use, Agriculture and Waste. Georgia also reports emission data from large point sources. The report covers time period from 1990 to 2019.

The main pollutants reported by Georgia show the following trends:

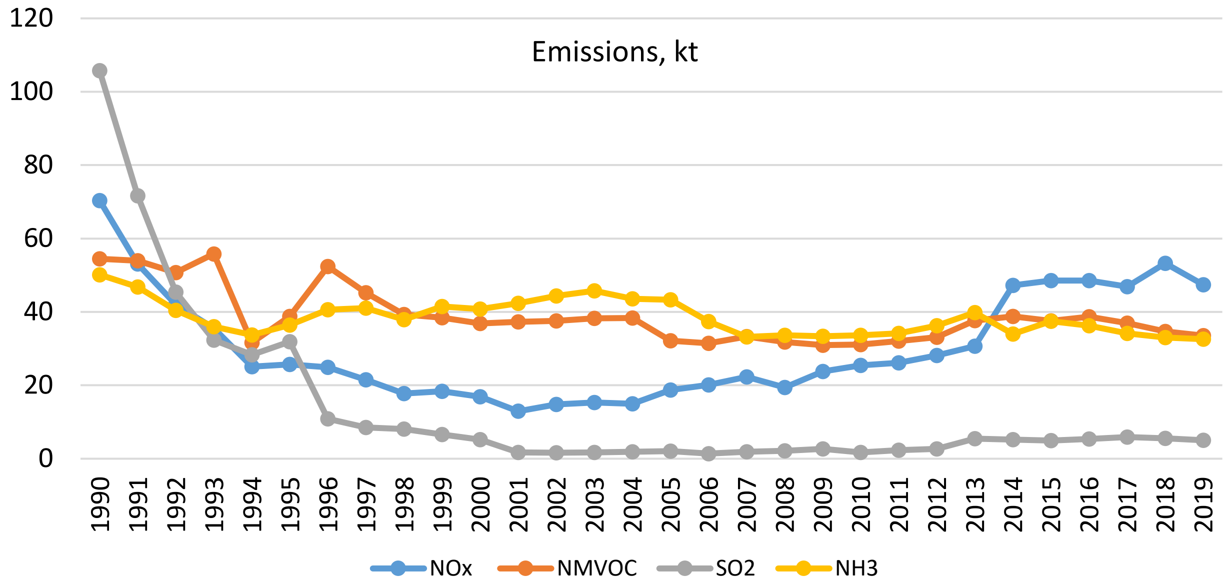

Figure 1.1 Trends of main pollutants, 1990-2019

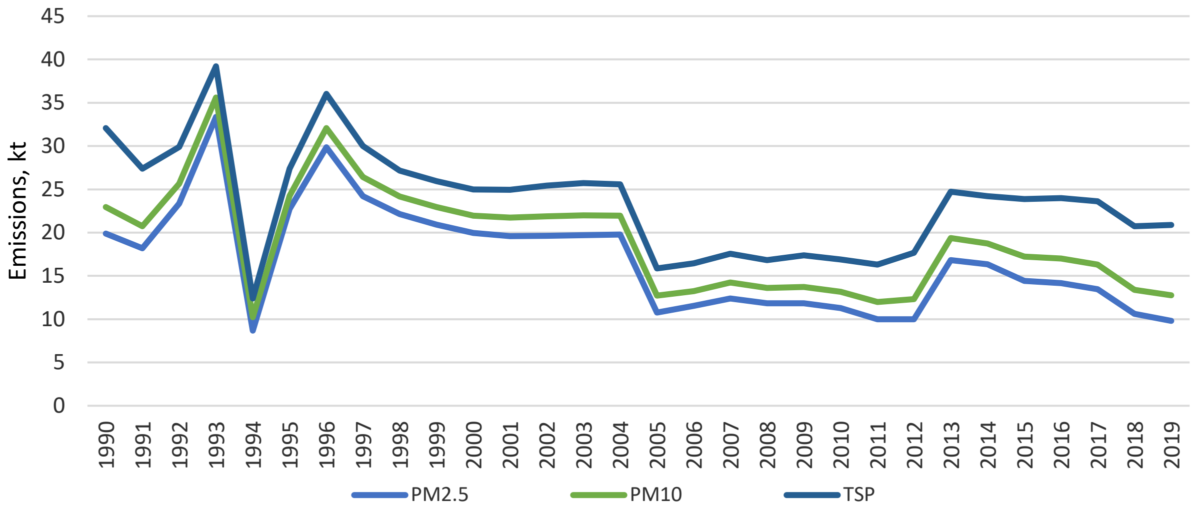

Figure 1.2 Trends of particulate matters, 1990-2019

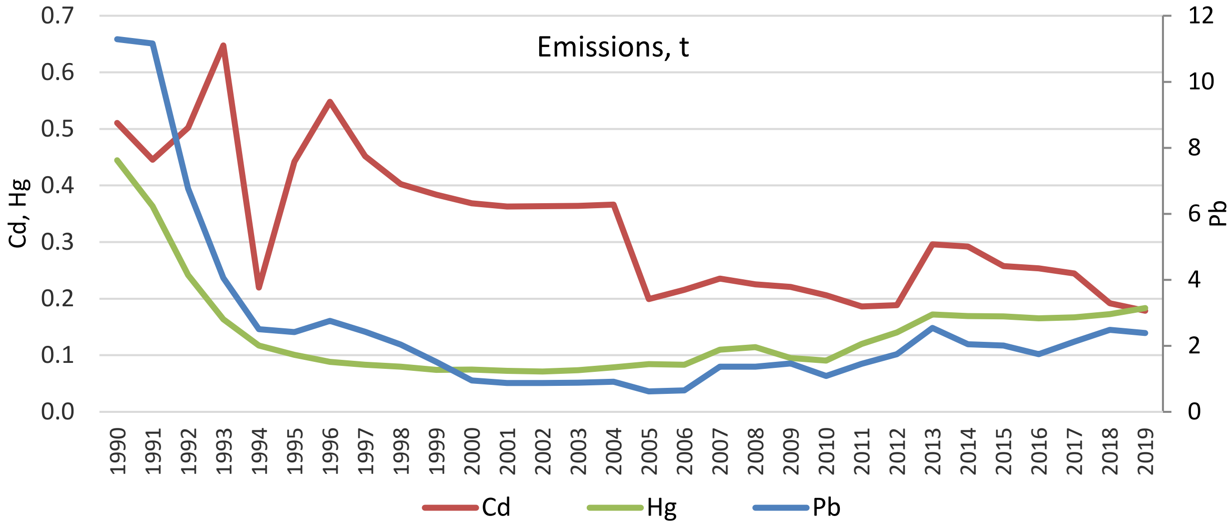

Figure 1.3 Trends of priority heavy metals, 1990-2019

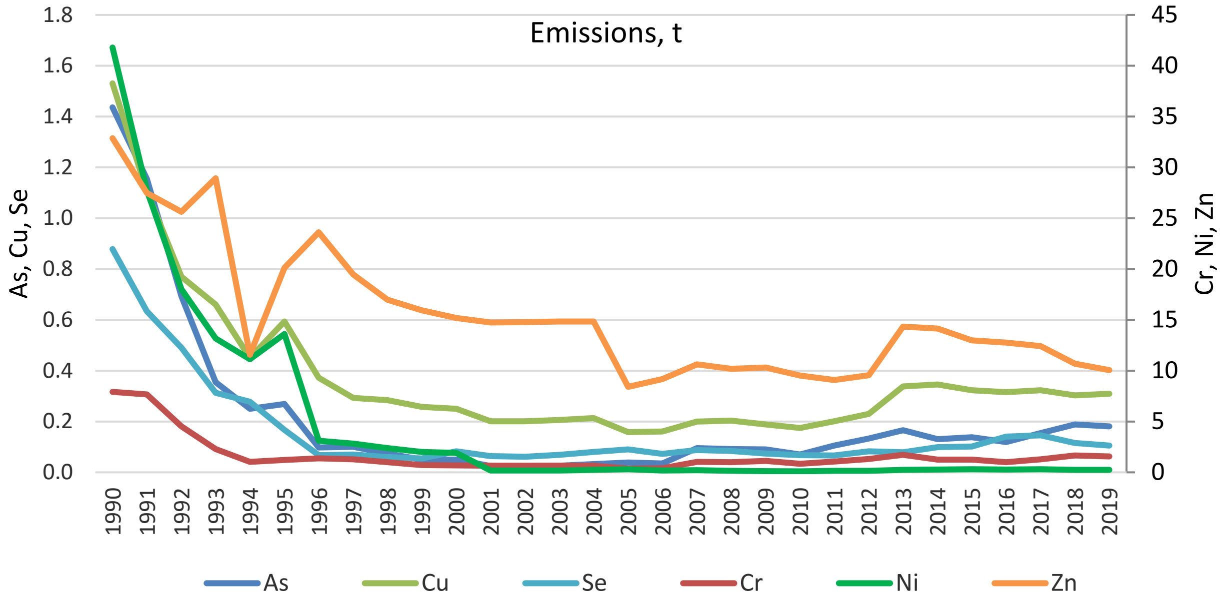

Figure 1.4 Trends of additional heavy metals, 1990-2019

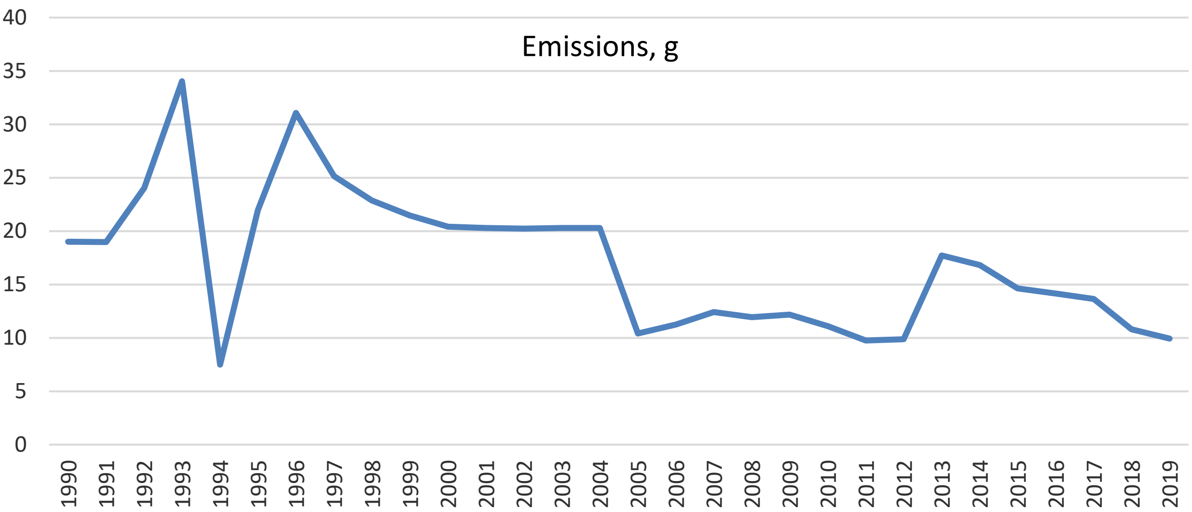

Figure 1.5 Trends of PCDD/ PCDF, 1990-2019

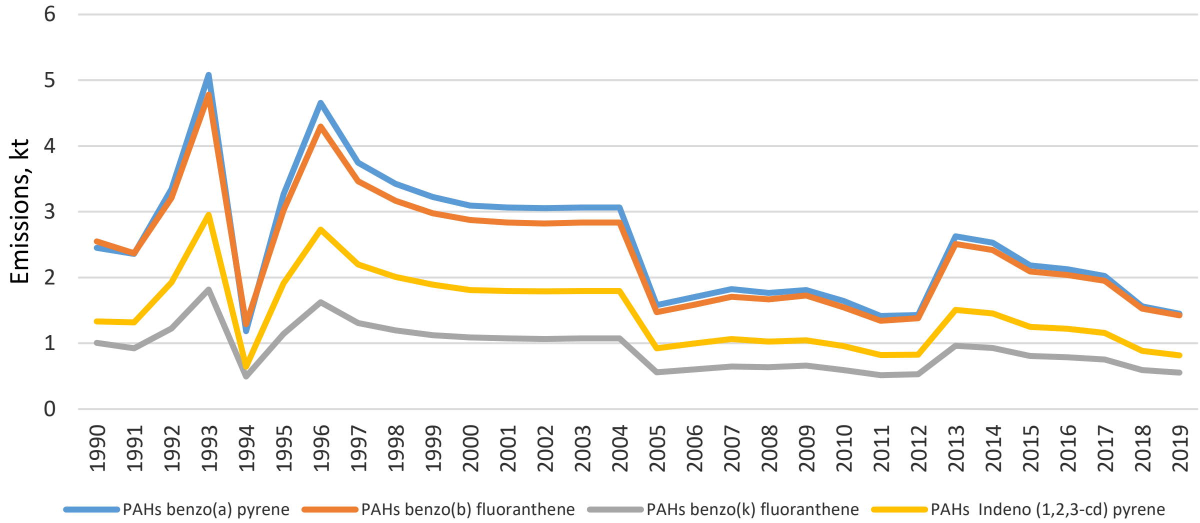

Figure 1.6 Trends of PAHs, 1990-2019

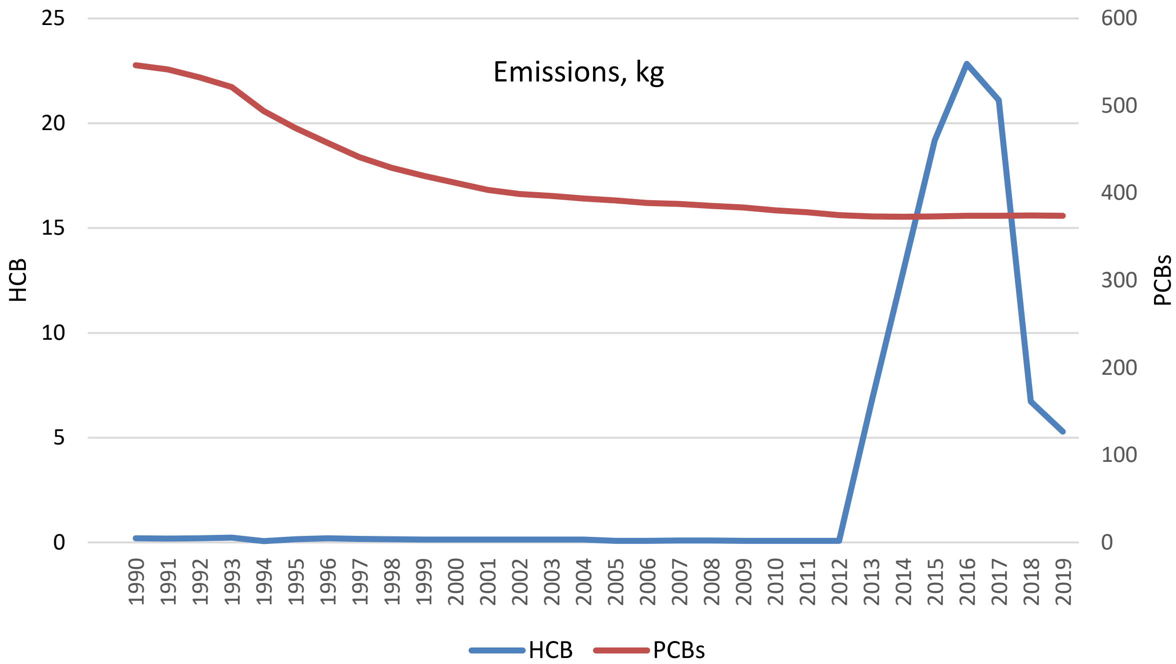

Figure 1.7 Trends of HCB and PCBs, 1990-2019

1. Introduction

1.1. National Inventory Background

Georgia joined the Convention on Long-Range Transboundary Pollution in 1999. Georgia annually provides a national inventory of air pollutants. The following pollutants are covered:

Table 1.1 List of pollutants by sector

Sector	Pollutant / 1990-2019					
Energy	Main Pollutants	PM	CO	Priority Heavy Metals	Additional Heavy Metals	POPs
Industrial Processes and Product Use	Main Pollutants	PM	CO	Priority Heavy Metals	Additional Heavy Metals	POPs
Agriculture	Main Pollutants[1]	PM[2]				
Waste	Main Pollutants	PM	CO	Priority Heavy Metals	Additional Heavy Metals[3]	

1.2. Institutional Arrangements

In Georgia, the Ministry of Environmental Protection and Agriculture (MEPA) is responsible for preparation of the inventory. This task is located within the Ambient Air Division, which collects activity data from GEOSTAT (the Statistical Office), Ministry of Internal Affairs of Georgia (car fleet) and from various companies. MEPA carries out the emission calculation based on the collected data. Quality checking/control is also carried out by MEPA. MEPA is responsible for reporting emission data to the UNECE as well. The responsibilities for preparing the inventory are described in the following figure.

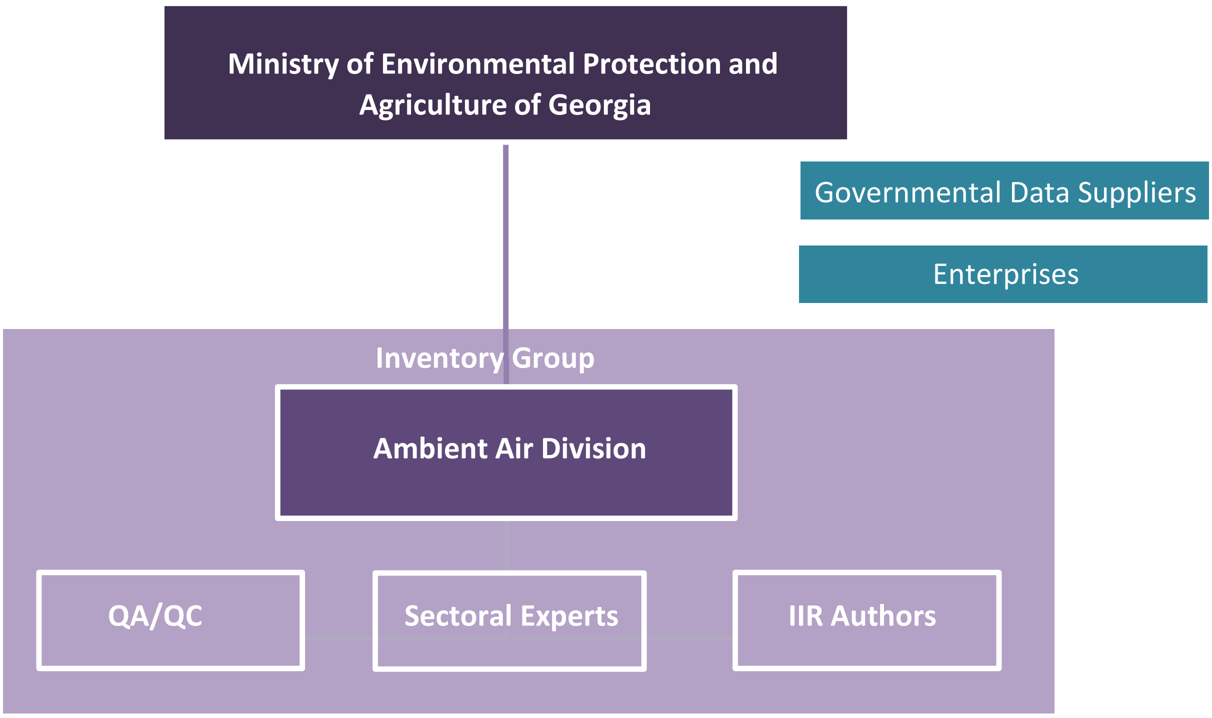

Figure 1.9 Responsibilities for preparing of emission inventory

[1] Except for SOx
[2] Except for BC
[3] Except for Se and Zn

1.3. Inventory preparation process

In the first step of inventory preparation, MEPA obtains data from the Statistical office and other data suppliers. Information on county's car fleet are received from the Ministry of Internal Affairs of Georgia. Data on wastewater handling are provided by the Integrated Management Division of MEPA.

Emissions are calculated on the base of the standard methods and procedures, such as: EMEP/EEA Guidebook, National Methodology, Country-specific EF, COPERT.

Activity data and emission factors are stored in Excel files. Data is backed-up and archived at MEPA (Ambient Air Division) in different computers and virtual server.

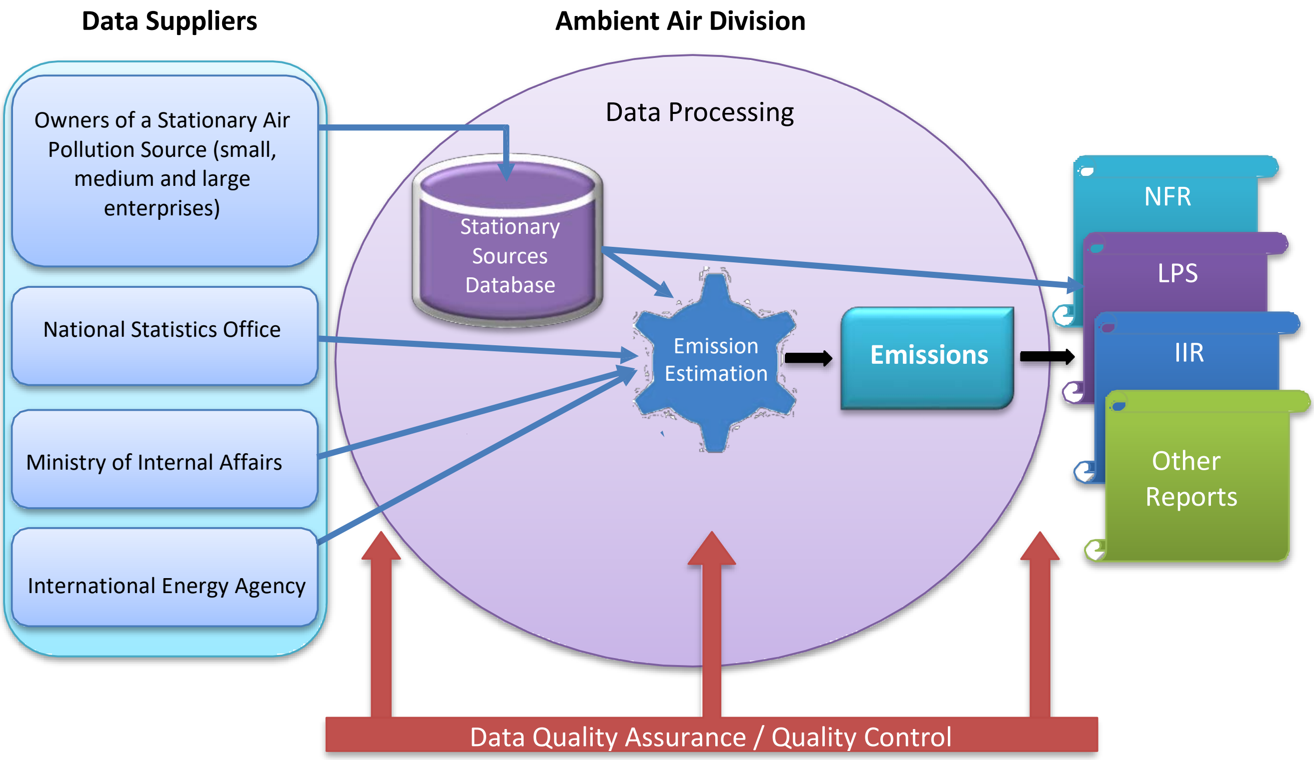

Figure 1.10 Emission inventory structure

1.4. Methods and data sources

Emissions from the Transport and Agriculture sectors are calculated based on Tier 1 EMEP/EEA methodology, along with the recommended Tier 1 emission factors from GB2019. To estimate emissions from Energy and Industrial sectors Tier 1 and Tier 2 EMEP/EEA methodology were used. For the subcategory 2A6 (concrete and brick production) a national methodology[4] is applied. Emissions from Waste sector Tier 1 EMEP/EEA methodology and plant specific emissions from state reporting system.

1. ENERGY

1A1a Tier 1/2 method, EMEP/EEA Guidebook – 2019[5].
1A2b, 1A2d, 1A2e, 1A2f: Tier 2 method, EMEP/EEA Guidebook - 2019.
1A3b (i-vi), 1A3c and 1A3dii: Tier 1 method, EMEP/EEA Guidebook – 2019.
1A2a, 1A4ai, 1A4bi, 1A4ci, 1A4cii, 1B1a, 1B1b, 1B2ai, 1B2aiv, 1B2av, 1B2b, 1B2c: Tier 1 method, EMEP/EEA Guidebook – 2019.

2. INDUSTRIAL PROCESSES AND PRODUCT USE

2A1, 2A2, 2A3, 2A5a, 2B1, 2B2, 2C1, 2C2, 2D3a, 2D3b, 2H1, 2I, 2K: Tier 1 method, EMEP/EEA Guidebook - 2019.

2A6: National Methodology for emission calculation from concrete and brick production.

2B10a, 2C3, 2C5, 2H2: Tier 2 method, EMEP/EEA Guidebook - 2019.

3. AGRICULTURE

3B1a, 3B1b, 3B2, 3B3, 3B4a, 3B4d, 3B4e, 3B4gi, 3B4gii, 3B4giii, 3B4giv, 3Da1, 3Da2a, 3Da3, 3Dc, 3De: Tier 1 method, EMEP/EEA Guidebook-2019.

4. WASTE

5A, 5D1, 5D2: Tier 1 method, EMEP/EEA Guidebook - 2019.

5C1bi, 5C1biii: Tier 1 and 3 (plant specific emissions from state reporting system) method, EMEP/EEA Guidebook - 2019.

Data sources for the inventory comprise the National Statistical Office, the Ministry of Internal Affairs and the Integrated Management Division. Data on fuel consumption was obtained from International Energy Agency. In addition, information for point sources is provided in reports by companies, verified by Department for Environmental Assessment of MEPA. Data on CH_4 emissions from solid waste disposal on land were obtained from Georgia's Biennial Update Reports to the UNFCCC.

1.5. Key categories

This chapter presents the results of key sources analyses.

It is good practice for each country to identify its national key categories in a systematic and objective way. This can be achieved by a quantitative analysis of the relationship between the magnitude of emissions in any one year (level) and the change in the emissions year to year (trend) of each category's emissions compared to the total national emissions.

[4] N435 Order of the Government on instrumental method for determination of actual amounts of emissions into ambient air from stationary pollution source, standard list of emission measuring equipment, and methodology for calculation of actual amounts of emissions into ambient air from stationary pollution source according to technological processes (31/12/13)

[5] Only Tier 2 methods are applied for emissions since 2012

Key sources analysis is prepared based on methodology described in Chapter 2 of the EMEP/EEA air pollutant emission inventory Guidebook 2019. The methodology covers Approaches 1 and 2 for both level and trend assessment. Both approaches identify key categories in terms of their contribution to the absolute level of the national emissions.

In Approach 1: the 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.

In Approach 2: the key categories can be derived by inventory compilers if category uncertainties or parameter uncertainties are available. Under Approach 2 the categories are sorted according to their contribution to uncertainty.

For identification of the key categories for level and trend assessment, approach 1 has been selected.

Level assessment

The contribution of each source category to the total national inventory level is calculated according to equation (1) (level assessment (Approach 1)):

Key category level assessment = source category estimate / total contribution

$L_{x,t} = E_{x,t} / \sum E_t$

Where:

$L_{x,t}$ = level assessment for source x in latest inventory year (year Gg)

$E_{x,t}$ = value of emission estimate of source category x in year Gg

$\sum E_t$ = total contribution, which is the sum of the emissions in year Gg, calculated using the aggregation level chosen by the country for key category analysis.

Key categories according to equation (1) are those that, when summed together in descending order of magnitude, add up to 80 % of the sum of all $L_{x,t}$. Tables 1.2 - 1.26 present the source category, sorted by largest contribution to national total.

Table 1.2 Key categories for NOx emissions for the year 2019

Level Assessment

NFR Category Code	NFR Category	Latest Year (2019) Estimate [Gg] $E_{x,t}$	Level Assessment $L_{x,t}$	Cumulative Total of $L_{x,t}$
3Da2a	Animal manure applied to soils	12.629	26.6%	26.6%
1A3biii	Road transport: Heavy duty vehicles and buses	11.770	24.8%	51.4%
1A3bi	Road transport: Passenger cars	6.379	13.4%	64.9%
2B2	Nitric acid production	4.249	9.0%	73.8%
1A4bi	Residential: Stationary	2.323	4.9%	78.7%
3Da1	Inorganic N-fertilizers (includes also urea application)	2.147	4.5%	83.2%

Trend Assessment

NFR Category Code	NFR Category	Base Year (1990) Estimate [Gg] $E_{x,0}$	Latest Year (2019) Estimate [Gg] $E_{x,t}$	Trend Assessment $L_{x,t}$	% Contribution to the trend	Cumulative Total of $L_{x,t}$
1A3biii	Road transport: Heavy duty vehicles and buses	13.02	11.770	14.786	30.5%	30.5%
3Da2a	Animal manure applied to soils	NE	12.629	9.507	19.6%	50.0%
1A3bi	Road transport: Passenger cars	5.68	6.379	6.756	13.9%	63.9%
2B2	Nitric acid production	NO	4.249	4.146	8.5%	72.5%
3Da1	Inorganic N-fertilizers (includes also urea application)	3.36	2.147	3.061	6.3%	78.8%
1A4bi	Residential: Stationary	3.84	2.0	2.123	4.4%	83.2%

Table 1.3 Key categories for NMVOC emissions for the year 2019

Level Assessment

NFR Category Code	NFR Category	Latest Year (2019) Estimate [Gg] $E_{x,t}$	Level Assessment $L_{x,t}$	Cumulative Total of $L_{x,t}$
1A3bi	Road transport: Passenger cars	6.942	20.7%	20.7%
1A4bi	Residential: Stationary	6.130	18.3%	39.0%
2D3a	Domestic solvent use including fungicides	4.468	13.3%	52.3%
3B1a	Manure management - Dairy cattle	3.555	10.6%	62.9%
2H2	Food and beverages industry	2.749	8.2%	71.1%
1A3bv	Road transport: Gasoline evaporation	2.353	7.0%	78.1%
3B1b	Manure management - Non-dairy cattle	1.541	4.6%	82.7%

Trend Assessment

NFR Category Code	NFR Category	Base Year (1990) Estimate [Gg] $E_{x,0}$	Latest Year (2019) Estimate [Gg] $E_{x,t}$	Trend Assessment $L_{x,t}$	% Contribution to the trend	Cumulative Total of $L_{x,t}$
1A4bi	Residential: Stationary	8.92	6.130	9.868	26.3%	26.3%
1A3bi	Road transport: Passenger cars	6.45	6.942	7.000	18.6%	44.9%

2D3a	Domestic solvent use including fungicides	6.49	4.468	4.466	11.9%	56.8%
3B1a	Manure management - Dairy cattle	4.44	3.555	4.386	11.7%	68.5%
2H2	Food and beverages industry	10.03	2.749	2.804	7.5%	75.9%
1A3bv	Road transport: Gasoline evaporation	1.00	0.5	1.861	5.0%	80.9%

Table 1.4 Key categories for SOx emissions for the year 2019

Level Assessment

NFR Category Code	NFR Category	Latest Year (2019) Estimate [Gg] $E_{x,t}$	Level Assessment $L_{x,t}$	Cumulative Total of $L_{x,t}$
1A2a	Stationary combustion in manufacturing industries and construction: Iron and steel	3.791	74.8%	74.8%
1A2f	Stationary combustion in manufacturing industries and construction: Non-metallic minerals	0.700	13.8%	88.6%

Trend Assessment

NFR Category Code	NFR Category	Base Year (1990) Estimate [Gg] $E_{x,0}$	Latest Year (2019) Estimate [Gg] $E_{x,t}$	Trend Assessment $L_{x,t}$	% Contribution to the trend	Cumulative Total of $L_{x,t}$
1A2a	Stationary combustion in manufacturing industries and construction: Iron and steel	7.55	3.791	3.474	69.7%	69.7%
1A2f	Stationary combustion in manufacturing industries and construction: Non-metallic minerals	0.77	0.700	0.661	13.3%	83.0%

Table 1.5 Key categories for NH_3 emissions for the year 2019

Level Assessment

NFR Category Code	NFR Category	Latest Year (2019) Estimate [Gg] $E_{x,t}$	Level Assessment $L_{x,t}$	Cumulative Total of $L_{x,t}$
3B1a	Manure management - Dairy cattle	8.416	25.8%	25.8%
3Da2a	Animal manure applied to soils	7.809	24.0%	49.8%
3Da3	Urine and dung deposited by grazing animals	3.782	11.6%	61.4%
5D1	Domestic wastewater handling	3.067	9.4%	70.8%
3B1b	Manure management - Non-dairy cattle	2.908	8.9%	79.8%
3B4gii	Manure management - Broilers	2.092	6.4%	86.2%

Trend Assessment

NFR Category Code	NFR Category	Base Year (1990) Estimate [Gg] $E_{x,0}$	Latest Year (2019) Estimate [Gg] $E_{x,t}$	Trend Assessment $L_{x,t}$	% Contribution to the trend	Cumulative Total of $L_{x,t}$
3B1a	Manure management - Dairy cattle	10.51	8.416	10.382	27.7%	27.7%
3Da2a	Animal manure applied to soils	13.15	7.809	8.891	23.7%	51.5%
3Da3	Urine and dung deposited by grazing animals	6.36	3.782	4.346	11.6%	63.1%

5D1	Domestic wastewater handling	NE	3.067	3.323	8.9%	71.9%
3B1b	Manure management - Non-dairy cattle	5.08	2.908	3.040	8.1%	80.1%

Table 1.6 Key categories for PM2.5 emissions for the year 2019

Level Assessment

NFR Category Code	NFR Category	Latest Year (2019) Estimate [Gg] $E_{x,t}$	Level Assessment $L_{x,t}$	Cumulative Total of $L_{x,t}$
1A4bi	Residential: Stationary	7.519	76.6%	76.6%
1A2a	Stationary combustion in manufacturing industries and construction: Iron and steel	0.456	4.6%	81.2%

Trend Assessment

NFR Category Code	NFR Category	Base Year (1990) Estimate [Gg] $E_{x,0}$	Latest Year (2019) Estimate [Gg] $E_{x,t}$	Trend Assessment $L_{x,t}$	% Contribution to the trend	Cumulative Total of $L_{x,t}$
1A4bi	Residential: Stationary	10.86	7.519	12.139	84.1%	84.1%

Table 1.7 Key categories for PM10 emissions for the year 2019

Level Assessment

NFR Category Code	NFR Category	Latest Year (2019) Estimate [Gg] $E_{x,t}$	Level Assessment $L_{x,t}$	Cumulative Total of $L_{x,t}$
1A4bi	Residential: Stationary	7.721	60.5%	60.5%
2A5a	Quarrying and mining of minerals other than coal	1.047	8.2%	68.7%
2A2	Lime production	0.511	4.0%	72.7%
1A2a	Stationary combustion in manufacturing industries and construction: Iron and steel	0.494	3.9%	76.5%
1A3biii	Road transport: Heavy duty vehicles and buses	0.332	2.6%	79.1%
2A1	Cement production	0.330	2.6%	81.7%

Trend Assessment

NFR Category Code	NFR Category	Base Year (1990) Estimate [Gg] $E_{x,0}$	Latest Year (2019) Estimate [Gg] $E_{x,t}$	Trend Assessment $L_{x,t}$	% Contribution to the trend	Cumulative Total of $L_{x,t}$
1A4bi	Residential: Stationary	11.15	7.721	12.466	72.3%	72.3%
2A5a	Quarrying and mining of minerals other than coal	1.32	1.047	0.874	5.1%	77.4%
2A2	Lime production	0.44	0.511	0.481	2.8%	80.2%

Table 1.8 Key categories for TSP emissions for the year 2019

Level Assessment

NFR Category Code	NFR Category	Latest Year (2019) Estimate [Gg] $E_{x,t}$	Level Assessment $L_{x,t}$	Cumulative Total of $L_{x,t}$

1A4bi	Residential: Stationary	8.125	38.9%	38.9%
2A6	Other mineral products (please specify in the IIR)	3.154	15.1%	54.1%
2A5a	Quarrying and mining of minerals other than coal	2.136	10.2%	64.3%
2A2	Lime production	1.249	6.0%	70.3%
3B4gii	Manure management - Broilers	1.069	5.1%	75.4%
2D3b	Road paving with asphalt	0.842	4.0%	79.4%
3B1a	Manure management - Dairy cattle	0.610	2.9%	82.4%

Trend Assessment

NFR Category Code	NFR Category	Base Year (1990) Estimate [Gg] $E_{x,0}$	Latest Year (2019) Estimate [Gg] $E_{x,t}$	Trend Assessment $L_{x,t}$	% Contribution to the trend	Cumulative Total of $L_{x,t}$
1A4bi	Residential: Stationary	11.74	8.125	13.121	54.9%	54.9%
2A6	Other mineral products (please specify in the IIR)	1.94	3.154	2.138	9.0%	63.9%
2A5a	Quarrying and mining of minerals other than coal	2.69	2.136	1.782	7.5%	71.4%
2A2	Lime production	1.09	1.249	1.175	4.9%	76.3%
3B4gii	Manure management - Broilers	2.50	1.069	0.955	4.0%	80.3%

Table 1.9 Key categories for BC emissions for the year 2019

Level Assessment

NFR Category Code	NFR Category	Latest Year (2019) Estimate [Gg] $E_{x,t}$	Level Assessment $L_{x,t}$	Cumulative Total of $L_{x,t}$
1A4bi	Residential: Stationary	0.750	67.7%	67.7%
1A3biii	Road transport: Heavy duty vehicles and buses	0.176	15.9%	83.5%

Trend Assessment

NFR Category Code	NFR Category	Base Year (1990) Estimate [Gg] $E_{x,0}$	Latest Year (2019) Estimate [Gg] $E_{x,t}$	Trend Assessment $L_{x,t}$	% Contribution to the trend	Cumulative Total of $L_{x,t}$
1A4bi	Residential: Stationary	1.08	0.750	1.212	73.9%	73.9%
1A3biii	Road transport: Heavy duty vehicles and buses	0.19	0.176	0.221	13.5%	87.4%

Table 1.10 Key categories for CO emissions for the year 2019

Level Assessment

NFR Category Code	NFR Category	Latest Year (2019) Estimate [Gg] $E_{x,t}$	Level Assessment $L_{x,t}$	Cumulative Total of $L_{x,t}$
1A3bi	Road transport: Passenger cars	55.356	51.0%	51.0%
1A4bi	Residential: Stationary	41.372	38.1%	89.1%

Trend Assessment

NFR Category Code	NFR Category	Base Year (1990) Estimate [Gg] $E_{x,0}$	Latest Year (2019) Estimate [Gg] $E_{x,t}$	Trend Assessment $L_{x,t}$	% Contribution to the trend	Cumulative Total of $L_{x,t}$
1A4bi	Residential: Stationary	61.16	41.372	66.165	50.7%	50.7%
1A3bi	Road transport: Passenger cars	53.59	55.356	52.891	40.5%	91.2%

Table 1.11 Key categories for Pb emissions for the year 2019

Level Assessment

NFR Category Code	NFR Category	Latest Year (2019) Estimate [Gg] $E_{x,t}$	Level Assessment $L_{x,t}$	Cumulative Total of $L_{x,t}$
2C1	Iron and steel production	1.187	49.6%	49.6%
1A2a	Stationary combustion in manufacturing industries and construction: Iron and steel	0.564	23.6%	73.2%
1A4bi	Residential: Stationary	0.274	11.4%	84.6%

Trend Assessment

NFR Category Code	NFR Category	Base Year (1990) Estimate [Gg] $E_{x,0}$	Latest Year (2019) Estimate [Gg] $E_{x,t}$	Trend Assessment $L_{x,t}$	% Contribution to the trend	Cumulative Total of $L_{x,t}$
2C1	Iron and steel production	6.75	1.187	0.729	36.2%	36.2%
1A2a	Stationary combustion in manufacturing industries and construction: Iron and steel	1.12	0.564	0.516	25.6%	61.8%
1A4bi	Residential: Stationary	0.44	0.274	0.444	22.0%	83.9%

Table 1.12 Key categories for Cd emissions for the year 2019

Level Assessment

NFR Category Code	NFR Category	Latest Year (2019) Estimate [Gg] $E_{x,t}$	Level Assessment $L_{x,t}$	Cumulative Total of $L_{x,t}$
1A4bi	Residential: Stationary	0.131	73.5%	73.5%
1A2f	Stationary combustion in manufacturing industries and construction: Non-metallic minerals	0.011	6.3%	79.8%
2A3	Glass production	0.008	4.4%	84.1%

Trend Assessment

NFR Category Code	NFR Category	Base Year (1990) Estimate [Gg] $E_{x,0}$	Latest Year (2019) Estimate [Gg] $E_{x,t}$	Trend Assessment $L_{x,t}$	% Contribution to the trend	Cumulative Total of $L_{x,t}$
1A4bi	Residential: Stationary	0.19	0.131	0.213	82.5%	82.5%

Table 1.13 Key categories for Hg emissions for the year 2019

Level Assessment

NFR Category Code	NFR Category	Latest Year (2019) Estimate [Gg] $E_{x,t}$	Level Assessment $L_{x,t}$	Cumulative Total of $L_{x,t}$

1A2f	Stationary combustion in manufacturing industries and construction: Non-metallic minerals	0.069	37.7%	37.7%
2K	Consumption of POPs and heavy metals (e.g. electrical and scientific equipment)	0.037	20.3%	58.1%
1A2a	Stationary combustion in manufacturing industries and construction: Iron and steel	0.034	18.4%	76.4%
2C1	Iron and steel production	0.026	14.1%	90.5%

Trend Assessment

NFR Category Code	NFR Category	Base Year (1990) Estimate [Gg] $E_{x,0}$	Latest Year (2019) Estimate [Gg] $E_{x,t}$	Trend Assessment $L_{x,t}$	% Contribution to the trend	Cumulative Total of $L_{x,t}$
1A2f	Stationary combustion in manufacturing industries and construction: Non-metallic minerals	0.04	0.069	0.068	40.5%	40.5%
2K	Consumption of POPs and heavy metals (e.g. electrical and scientific equipment)	0.05	0.037	0.037	22.0%	62.5%
1A2a	Stationary combustion in manufacturing industries and construction: Iron and steel	0.07	0.034	0.031	18.2%	80.7%

Table 1.14 Key categories for As emissions for the year 2019

Level Assessment

NFR Category Code	NFR Category	Latest Year (2019) Estimate [Gg] $E_{x,t}$	Level Assessment $L_{x,t}$	Cumulative Total of $L_{x,t}$
2C1	Iron and steel production	0.103	56.9%	56.9%
1A2f	Stationary combustion in manufacturing industries and construction: Non-metallic minerals	0.037	20.6%	77.5%
1A2a	Stationary combustion in manufacturing industries and construction: Iron and steel	0.017	9.3%	86.8%

Trend Assessment

NFR Category Code	NFR Category	Base Year (1990) Estimate [Gg] $E_{x,0}$	Latest Year (2019) Estimate [Gg] $E_{x,t}$	Trend Assessment $L_{x,t}$	% Contribution to the trend	Cumulative Total of $L_{x,t}$
2C1	Iron and steel production	0.59	0.103	0.063	46.0%	46.0%
1A2f	Stationary combustion in manufacturing industries and construction: Non-metallic minerals	0.02	0.037	0.037	26.8%	72.9%
1A2a	Stationary combustion in manufacturing industries and construction: Iron and steel	0.03	0.017	0.015	11.2%	84.1%

Table 1.15 Key categories for Cr emissions for the year 2019

Level Assessment

NFR Category Code	NFR Category	Latest Year (2019) Estimate [Gg] $E_{x,t}$	Level Assessment $L_{x,t}$	Cumulative Total of $L_{x,t}$

2C1	Iron and steel production	1.161	74.6%	74.6%
1A4bi	Residential: Stationary	0.232	14.9%	89.6%

Trend Assessment

NFR Category Code	NFR Category	Base Year (1990) Estimate [Gg] $E_{x,0}$	Latest Year (2019) Estimate [Gg] $E_{x,t}$	Trend Assessment $L_{x,t}$	% Contribution to the trend	Cumulative Total of $L_{x,t}$
2C1	Iron and steel production	6.60	1.161	0.713	56.8%	56.8%
1A4bi	Residential: Stationary	0.34	0.232	0.376	30.0%	86.8%

Table 1.16 Key categories for Cu emissions for the year 2019

Level Assessment

NFR Category Code	NFR Category	Latest Year (2019) Estimate [Gg] $E_{x,t}$	Level Assessment $L_{x,t}$	Cumulative Total of $L_{x,t}$
1A2f	Stationary combustion in manufacturing industries and construction: Non-metallic minerals	0.091	29.5%	29.5%
1A2a	Stationary combustion in manufacturing industries and construction: Iron and steel	0.074	23.8%	53.3%
1A4bi	Residential: Stationary	0.061	19.7%	73.0%
1A3bi	Road transport: Passenger cars	0.027	8.7%	81.7%

Trend Assessment

NFR Category Code	NFR Category	Base Year (1990) Estimate [Gg] $E_{x,0}$	Latest Year (2019) Estimate [Gg] $E_{x,t}$	Trend Assessment $L_{x,t}$	% Contribution to the trend	Cumulative Total of $L_{x,t}$
1A4bi	Residential: Stationary	0.10	0.061	0.099	30.4%	30.4%
1A2f	Stationary combustion in manufacturing industries and construction: Non-metallic minerals	0.06	0.091	0.090	27.9%	58.4%
1A2a	Stationary combustion in manufacturing industries and construction: Iron and steel	0.15	0.074	0.067	20.8%	79.2%
1A3bi	Road transport: Passenger cars	0.03	0.027	0.025	7.8%	87.0%

Table 1.17 Key categories for Ni emissions for the year 2019

Level Assessment

NFR Category Code	NFR Category	Latest Year (2019) Estimate [Gg] $E_{x,t}$	Level Assessment $L_{x,t}$	Cumulative Total of $L_{x,t}$
1A2f	Stationary combustion in manufacturing industries and construction: Non-metallic minerals	0.069	29.2%	29.2%
1A2a	Stationary combustion in manufacturing industries and construction: Iron and steel	0.055	23.1%	52.3%
2C1	Iron and steel production	0.036	15.2%	67.6%
2A3	Glass production	0.029	12.4%	79.9%

1A4bi	Residential: Stationary	0.020	8.6%	88.5%

Trend Assessment

NFR Category Code	NFR Category	Base Year (1990) Estimate [Gg] $E_{x,0}$	Latest Year (2019) Estimate [Gg] $E_{x,t}$	Trend Assessment $L_{x,t}$	% Contribution to the trend	Cumulative Total of $L_{x,t}$
1A4ai	Commercial/institutional: Stationary	1.21	0.005	0.079	26.0%	26.0%
1A2f	Stationary combustion in manufacturing industries and construction: Non-metallic minerals	0.04	0.069	0.068	22.6%	48.7%
1A2a	Stationary combustion in manufacturing industries and construction: Iron and steel	0.11	0.055	0.050	16.6%	65.3%
1A4bi	Residential: Stationary	0.03	0.020	0.033	10.9%	76.1%
2A3	Glass production	0.10	0.029	0.027	9.1%	85.2%

Table 1.18 Key categories for Se emissions for the year 2019

Level Assessment

NFR Category Code	NFR Category	Latest Year (2019) Estimate [Gg] $E_{x,t}$	Level Assessment $L_{x,t}$	Cumulative Total of $L_{x,t}$
2A3	Glass production	0.048	45.7%	45.7%
1A2f	Stationary combustion in manufacturing industries and construction: Non-metallic minerals	0.036	34.1%	79.8%
1A2a	Stationary combustion in manufacturing industries and construction: Iron and steel	0.008	7.3%	87.1%

Trend Assessment

NFR Category Code	NFR Category	Base Year (1990) Estimate [Gg] $E_{x,0}$	Latest Year (2019) Estimate [Gg] $E_{x,t}$	Trend Assessment $L_{x,t}$	% Contribution to the trend	Cumulative Total of $L_{x,t}$
2A3	Glass production	0.16	0.048	0.045	43.9%	43.9%
1A2f	Stationary combustion in manufacturing industries and construction: Non-metallic minerals	0.02	0.036	0.035	34.6%	78.6%
1A4bi	Residential: Stationary	0.06	0.007	0.010	10.0%	88.6%

Table 1.19 Key categories for Zn emissions for the year 2019

Level Assessment

NFR Category Code	NFR Category	Latest Year (2019) Estimate [Gg] $E_{x,t}$	Level Assessment $L_{x,t}$	Cumulative Total of $L_{x,t}$
1A4bi	Residential: Stationary	5.172	51.5%	51.5%
1A3bi	Road transport: Passenger cars	1.411	14.0%	65.5%
2C1	Iron and steel production	1.032	10.3%	75.7%
1A2a	Stationary combustion in manufacturing industries and construction: Iron and steel	0.843	8.4%	84.1%

Trend Assessment						
NFR Category Code	NFR Category	Base Year (1990) Estimate [Gg] $E_{x,0}$	Latest Year (2019) Estimate [Gg] $E_{x,t}$	Trend Assessment $L_{x,t}$	% Contribution to the trend	Cumulative Total of $L_{x,t}$
1A4bi	Residential: Stationary	7.44	5.172	8.377	64.5%	64.5%
1A3bi	Road transport: Passenger cars	1.37	1.411	1.344	10.4%	74.9%
1A2a	Stationary combustion in manufacturing industries and construction: Iron and steel	1.70	0.843	0.775	6.0%	80.9%

Table 1.20 Key categories for PCDD/ PCDF emissions for the year 2019

Level Assessment				
NFR Category Code	NFR Category	Latest Year (2019) Estimate [Gg] $E_{x,t}$	Level Assessment $L_{x,t}$	Cumulative Total of $L_{x,t}$
1A4bi	Residential: Stationary	8.141	81.9%	81.9%

Trend Assessment						
NFR Category Code	NFR Category	Base Year (1990) Estimate [Gg] $E_{x,0}$	Latest Year (2019) Estimate [Gg] $E_{x,t}$	Trend Assessment $L_{x,t}$	% Contribution to the trend	Cumulative Total of $L_{x,t}$
1A4bi	Residential: Stationary	11.94	8.141	13.136	89.7%	89.7%

Table 1.21 Key categories for benzo(a)pyrene emissions for the year 2019

Level Assessment				
NFR Category Code	NFR Category	Latest Year (2019) Estimate [Gg] $E_{x,t}$	Level Assessment $L_{x,t}$	Cumulative Total of $L_{x,t}$
1A4bi	Residential: Stationary	1.224	84.5%	84.5%

Trend Assessment						
NFR Category Code	NFR Category	Base Year (1990) Estimate [Gg] $E_{x,0}$	Latest Year (2019) Estimate [Gg] $E_{x,t}$	Trend Assessment $L_{x,t}$	% Contribution to the trend	Cumulative Total of $L_{x,t}$
1A4bi	Residential: Stationary	1.83	1.224	1.982	90.8%	90.8%

Table 1.22 Key categories for benzo(b)fluoranthene emissions for the year 2019

Level Assessment				
NFR Category Code	NFR Category	Latest Year (2019) Estimate [Gg] $E_{x,t}$	Level Assessment $L_{x,t}$	Cumulative Total of $L_{x,t}$
1A4bi	Residential: Stationary	1.124	78.8%	78.8%
1A2a	Stationary combustion in manufacturing industries and construction: Iron and steel	0.250	17.5%	96.3%

Trend Assessment						
NFR Category Code	NFR Category	Base Year (1990) Estimate [Gg] $E_{x,0}$	Latest Year (2019) Estimate [Gg] $E_{x,t}$	Trend Assessment $L_{x,t}$	% Contribution to the trend	Cumulative Total of $L_{x,t}$

1A4bi	Residential: Stationary	1.73	1.124	1.820	87.0%	87.0%

Table 1.23 Key categories for benzo(k)fluoranthene emissions for the year 2019

Level Assessment

NFR Category Code	NFR Category	Latest Year (2019) Estimate [Gg] $E_{x,t}$	Level Assessment $L_{x,t}$	Cumulative Total of $L_{x,t}$
1A4bi	Residential: Stationary	0.425	76.7%	76.7%
1A2a	Stationary combustion in manufacturing industries and construction: Iron and steel	0.101	18.1%	94.9%

Trend Assessment

NFR Category Code	NFR Category	Base Year (1990) Estimate [Gg] $E_{x,0}$	Latest Year (2019) Estimate [Gg] $E_{x,t}$	Trend Assessment $L_{x,t}$	% Contribution to the trend	Cumulative Total of $L_{x,t}$
1A4bi	Residential: Stationary	0.66	0.425	0.689	85.3%	85.3%

Table 1.24 Key categories for Indeno(1,2,3-cd)pyrene emissions for the year 2019

Level Assessment

NFR Category Code	NFR Category	Latest Year (2019) Estimate [Gg] $E_{x,t}$	Level Assessment $L_{x,t}$	Cumulative Total of $L_{x,t}$
1A4bi	Residential: Stationary	0.718	87.9%	87.9%

Trend Assessment

NFR Category Code	NFR Category	Base Year (1990) Estimate [Gg] $E_{x,0}$	Latest Year (2019) Estimate [Gg] $E_{x,t}$	Trend Assessment $L_{x,t}$	% Contribution to the trend	Cumulative Total of $L_{x,t}$
1A4bi	Residential: Stationary	1.07	0.718	1.163	92.9%	92.9%

Table 1.25 Key categories for HCB emissions for the year 2019

Level Assessment

NFR Category Code	NFR Category	Latest Year (2019) Estimate [Gg] $E_{x,t}$	Level Assessment $L_{x,t}$	Cumulative Total of $L_{x,t}$
2C3	Aluminum production	5.219	98.7%	98.7%

Trend Assessment

NFR Category Code	NFR Category	Base Year (1990) Estimate [Gg] $E_{x,0}$	Latest Year (2019) Estimate [Gg] $E_{x,t}$	Trend Assessment $L_{x,t}$	% Contribution to the trend	Cumulative Total of $L_{x,t}$
2C3	Aluminum production	NO	5.219	19.100	99.5%	99.5%

Table 1.26 Key categories for PCB emissions for the year 2019

Level Assessment

NFR Category Code	NFR Category	Latest Year (2019) Estimate [Gg] $E_{x,t}$	Level Assessment $L_{x,t}$	Cumulative Total of $L_{x,t}$
2K	"Consumption of POPs and heavy metals (e.g. electrical and scientific equipment)"	372.346	99.6%	99.6%

Trend Assessment

NFR Category Code	NFR Category	Base Year (1990) Estimate [Gg] $E_{x,0}$	Latest Year (2019) Estimate [Gg] $E_{x,t}$	Trend Assessment $L_{x,t}$	% Contribution to the trend	Cumulative Total of $L_{x,t}$
2K	"Consumption of POPs and heavy metals (e.g. electrical and scientific equipment)"	541.00	372.346	372.192	99.7%	99.7%

Trend assessment

The purpose of the trend assessment is to identify categories that may not be large enough to be identified by the level assessment, but whose trend contributes significantly to the trend of the overall inventory, and should therefore receive particular attention. The trend assessment is calculated according to equation (2) (level assessment (Approach 1)):

$$T_{x,} = (E_{x,} - E_{x,0})/(\sum i\, E_{i,t} - \sum i\, E_{i,0})$$

Where:

$T_{x,}$ = trend assessment of source category x in year t as compared to the base year (year 0) or starting year of the inventory

$E_{x,} - E_{x,0}$ = values of estimates of source category x in year t and 0 respectively

$\sum i\, E_{i,} - \sum i\, E_{i,0}$ = sum of emissions across all n source categories (i = 1, …x, n) (total inventory estimates) in years t and 0, respectively

The trend of a category refers to the change in the source category emissions over time. It is computed as an absolute value for the source category x by subtracting value of the base year, or the starting year (year 0), estimate for source category x from the latest inventory year (year t) estimate and dividing by the overall difference between the target year (year t) and the base year (year 0) total inventories (the inventory trend). The percentage contribution from category x for year t to the trend is then calculated by dividing Tx, by the sum of the trend assessment of all categories of the inventory.

The trend assessment then sorts categories by magnitude (highest to lowest) of their contribution to the trend, regardless of whether category trend is increasing or decreasing. Categories whose cumulative percentage contribution is greater than 80% should be identified as key. The results of trend assessment are given in second sub-tables in Tables 1.2 - 1.26.

1.6. QA/QC and verification methods

The following quality control measures are carried out:

Check for transcription errors and data comparison

For point sources, the first check is made during the approval of the submitted annual reports, and then in process of the data analysis. Statistical data is compared to data available from previous years. In case of discrepancies, data from other sources (e.g. from companies) are used. If the data available to the Ministry shows higher levels than the statistical data, the levels available to the Ministry are used.

Check of calculated emissions

A staff member who did not make a specific calculation checks the colleague's approach and results. All results are compared to the values of previous years.

In addition, the following measure is carried out:

Review of methods and emission factors

Emission factors are updated when new EMEP/EEA-Guidebooks are published. Other guidebooks are monitored. The national methodology is also updated continuously.

1.7. General assessment of completeness

List of notation keys

In the following table, notation keys are listed (as defined in the UNFCCC reporting guidelines (ECE/EB.AIR/125):

(a) "NE" (not estimated), for activity data and/or emissions by sources of pollutants which have not been estimated but for which a corresponding activity may occur within a Party. Where NE is used in an inventory to report emissions of pollutants, the Party should indicate why such emissions have not been estimated;

(b) "IE" (included elsewhere), for emissions by sources of pollutants estimated but included elsewhere in the inventory instead of under the expected source category. Where IE is used in an inventory, the Party should indicate where in the inventory the emissions for the displaced source category have been included, and the Party should explain such a deviation from the inclusion under the expected category;

(c) "C" (confidential information), for emissions by sources of pollutants of which the reporting could lead to the disclosure of confidential information. The source category where these emissions are included should be indicated;

(d) "NA" (not applicable), for activities under a given source category that do occur within the Party but do not result in emissions of a specific pollutant;

(e) "NO" (not occurring), for categories or processes within a particular source category that do not occur within a Party;

(f) "NR" (not relevant). According to paragraph 37 in the Guidelines, emission inventory reporting for the main pollutants should cover all years from 1990 onwards if data are available. However, NR is introduced to ease the reporting where reporting of emissions is not strictly required by the different protocols, e.g., emissions for some Parties prior to agreed base years.

Sources not estimated

The following categories have not been estimated:
List of important sectors with "NE" and short justification why these sectors have not been estimated.

Table 1.14 Sources not estimated (NE)

NFR14 code	Substance(s)	Reason for not estimated
1A1a	NH_3, PCBs, PCDD/F, HCB	Emission occur, but have not been estimated due to lack of emission factors in methodology (EMEP-EEA guidebook – 2019)
1A2a	NH_3	
1A2b	All except for NOx and SOx	
1A2c	All	Emission occur, but have not been estimated due to lack of statistic data and emission factors in national methodology
1A2d	NH_3	Emission occur, but have not been estimated due to lack of emission factors in methodology (EMEP-EEA guidebook – 2019)
1A2f	NH_3	
1A3ai(i)	NOx, NMVOC, SOx, PMs CO	Emission occur, but have not been estimated due to lack of statistic data
1A3aii(i)	NOx, NMVOC, SOx, PMs CO	
1A3bi	Hg, As, PCDD/F, HCB, PCBs	Emissions occur, but have not been estimated due to lack of emission factors in methodology (COPERT 4 version v11.2 fills NFR table (including notation keys NE)).
1A3bii	Hg, As, PCDD/F, HCB, PCBs	
1A3biii	Hg, As, PCDD/F, HCB, PCBs	
1A3biv	All	Emission occur, but have not been estimated due to lack of statistic data and emission factors in methodology (COPERT 4 version v11.2 fills NFR table (including notation keys NE)).
1A3bv	PAHs except for total, HCB, PCBs	Emissions occur, but have not been estimated due to lack of emission factors in methodology (COPERT 4 version v11.2 fills NFR table (including notation keys NE)).
1A3bvi	HMs, PAHs, HCB, PCBs	
1A3bvii	HMs, PAHs, HCB, PCBs	
1A3c	BC, Pb, Hg, As, PCDD/PCDF, Benzo(k)fluoranthene, Indeno(1,2,3-cd)pyrene	Emission occur, but have not been estimated due to lack of emission factors in methodology (EMEP-EEA guidebook – 2019)
1A3dii	NH_3	
1A3ei	All	Emission occur, but have not been estimated due to lack of statistic data
1A4aii	All	
1A4bii	All	
1A4cii	Hg, As, PCDD/PCDF, Benzo(k)fluoranthene, Indeno(1,2,3-cd)pyrene, HCB, PCBs	Emission occur, but have not been estimated due to lack of emission factors in methodology (EMEP-EEA guidebook – 2019)

1A4ciii	All	
1B1a	BC, HMs	
1B2ai	SOx, PCDD/PCDF	
1B2av	SOx, PCDD/PCDF	
1B2b	SOx, PCDD/PCDF	
1B2c	NH_3, TSP, PM_{10}, $PM_{2.5}$, BC, HMs, PCDD/F, PAHs	
2A1	All except for PMs and PCBs	
2A2	NOx, NMVOC, SOx, CO, Pb, Cd, Hg	
2A3	Main Pollutants, CO, POPs except for PCBs	
2A5b	TSP, $PM_{2.5}$, PM_{10}	Emission occur, but have not been estimated due to lack of statistic data
2A5c	TSP, $PM_{2.5}$, PM_{10}	
2A6	$PM_{2.5}$, PM_{10}, BC, benzo(a) pyrene	Emission occur, but have not been estimated due to lack of emission factors in national methodology
2B1	NMVOC, SOx, $PM_{2.5}$	Emission occur, but have not been estimated due to lack of emission factors in methodology (EMEP-EEA guidebook – 2019)
2B2	NH_3, $PM_{2.5}$	
2B10a	All except for NH_3 and TSP	
2C1	NH_3, PAHs except for total	
2C2	Main Pollutants, CO, HMs, PCDD/F, PAHs	
2C3	Main Pollutants, CO, HMs, PAHs	
2C5	NMVOC, NH_3, BC, CO, Hg, Cr, Cu, Ni, Se, PAHs, HCB	
2C7d	TSP, $PM_{2.5}$, PM_{10}	Emission occur, but have not been estimated due to lack of statistic data
2D3a	TSP, $PM_{2.5}$, PM_{10}	Emission occur, but have not been estimated due to lack of emission factors in methodology (EMEP-EEA guidebook – 2019)
2D3b	NOx, SOx, CO, POPs except for PCBs	
2D3c	NOx, NMVOC, PMs, CO, Pb, Cd, Hg, POPs except for PCBs	Emission occur, but have not been estimated due to lack of statistic data and emission factors in methodology (EMEP-EEA guidebook – 2019)
2D3d	NMVOC	Emission occur, but have not been estimated due to lack of statistic data
2D3e	NMVOC, $PM_{2.5}$	Emission occur, but have not been estimated due to lack of statistic data and emission factors in methodology (EMEP-EEA guidebook – 2019)
2D3f	NMVOC, $PM_{2.5}$	
2D3g	All	
2D3h	NMVOC, $PM_{2.5}$, BC	
2D3i	All	
2G	All	
2H1	NH_3, PAHs, HCB	Emission occur, but have not been estimated due to lack of emission factors in methodology (EMEP-EEA guidebook – 2019)
2H2	PMs	
2I	Main Pollutants, CO, PM_{10}, $PM_{2.5}$, BC, As, Cu	
2K	HMs except for Hg, HCB	

3B4f	NOx, NMVOC, NH_3, $PM_{2.5}$, PM_{10}, TSP	Emission occur, but have not been estimated due to lack of statistic data
3Da1	TSP	Emission occur, but have not been estimated due to lack of emission factors in methodology (EMEP-EEA guidebook – 2019)
3Da2b	NH_3, NOx	Emission occur, but have not been estimated due to lack of statistic data
3Da2c	NH_3, NOx	
3Da3	NOx	
3Da4	NH_3, NOx	Emission occur, but have not been estimated due to lack of emission factors in methodology (EMEP-EEA guidebook – 2019)
3Db	NOx	
3De	NH_3	
3Df	HCB	Emission occur, but have not been estimated due to lack of statistic data
3F	All	Emission occur, but have not been estimated due to lack of statistic data and emission factors in methodology (EMEP-EEA guidebook – 2019)
3I	NH_3	Emission occur, but have not been estimated due to lack of statistic data
5A	NH_3, $PM_{2.5}$, PM_{10}, TSP, CO, Hg	Emission occur, but have not been estimated due to lack of statistic data and emission factors in methodology (EMEP-EEA guidebook – 2019)
5B1	Main Pollutants, PMs, CO	
5C1a	All	Emission occur, but have not been estimated due to lack of statistic data
5C1bi	NH_3, Cd, Cu, Ni, Se, Zn, POPs except for PCBs	Emission occur, but have not been estimated due to lack of emission factors in national or international methodology (EMEP-EEA guidebook – 2019)
5C1bii	All except for PCBs	Emission occur, but have not been estimated due to lack of statistic data and emission factors in methodology (EMEP-EEA guidebook – 2019)
5C1biii	NH_3, $PM_{2.5}$, PM_{10}, Se, Zn, POPs	Emission occur, but have not been estimated due to lack of statistic data and emission factors in national or international methodology (EMEP-EEA guidebook – 2019)
5C1biv	All	Emission occur, but have not been estimated due to lack of statistic data and emission factors in national or international methodology (EMEP-EEA guidebook – 2019)
5C2	All except for PCBs	
5D1	TSP, PM_{10}, $PM_{2.5}$, BC, HMs	Emission occur, but have not been estimated due to lack of emission factors in methodology (EMEP-EEA guidebook – 2019)
5D2	NH_3, TSP, PM_{10}, $PM_{2.5}$, HMs	
5E	All	Emission occur, but have not been estimated due to lack of statistic data and emission factors in methodology (EMEP-EEA guidebook – 2019)

Sources included elsewhere

List of important categories with "IE" and short explanation in which category they are included.

Table 1.15 Sources included elsewhere (IE)

NFR14 code	Substance(s)	Included in NFR code

1A2f	$PM_{2.5}$, PM_{10}, TSP, BC	2A1, 2A2, 2A3 and 2A6
2C1	NOx, SOx, CO	1A2a
2C5	NOx, SOx	1A2a
3B4a	NOx, NMVOC, NH_3, $PM_{2.5}$, PM_{10}, TSP	3B1b
3B4gi	NOx, NMVOC, NH_3, $PM_{2.5}$, PM_{10}, TSP	3B4gii

2. Explanation of key trends

In Georgia, ambient air pollution is mainly caused by emissions from motor vehicles, the energy, industrial and agriculture sectors. Trends of emissions of main pollutants are presented in figure 2.1.

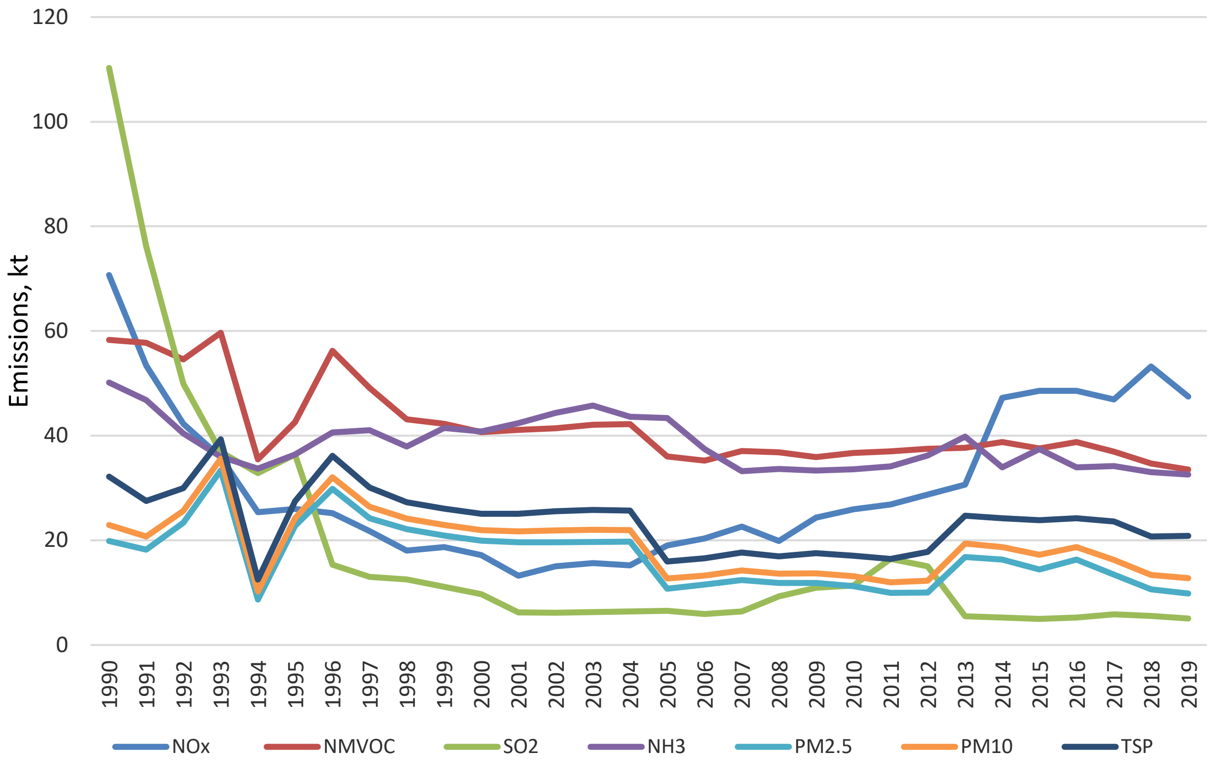

Figure 2.1 Main pollutants, trends over time, 1990-2019.

- The general economic activity decreased in 1990s due to economic crisis caused by dissolution of Soviet Union. Subsequently, emissions of main pollutants declined sharply. Increased economic activity from the middle of 2000s led to increased emissions of most pollutants, but these trends were disproportionate as the latter lagged behind economic trend. The main reason of this was an application of cleaner technologies that abated pollution from various sectors.
- Intense rise in emissions of NOx from millennium (as well as SOx until 2013) was caused by rapid increase of car fleet in Georgia that remains one of the main sources of nitrogen oxides. Also, sharp jump in 2014 was related to application of livestock manures to agricultural soils, for which activity data before 2014 is not available.
- Dramatic drop of SOx emissions in 2013 was caused, on one hand, by desulphurisation of automotive fuel and decreased consumption of coal and, on the other hand, by launching of national energy balance and switching on the more detailed methodological approaches.

- A sudden growth of particulates emissions in 2013 was caused by launching of national energy balance that provided slightly different and more precise activity data for stationary combustion.

Nitrogen Oxides

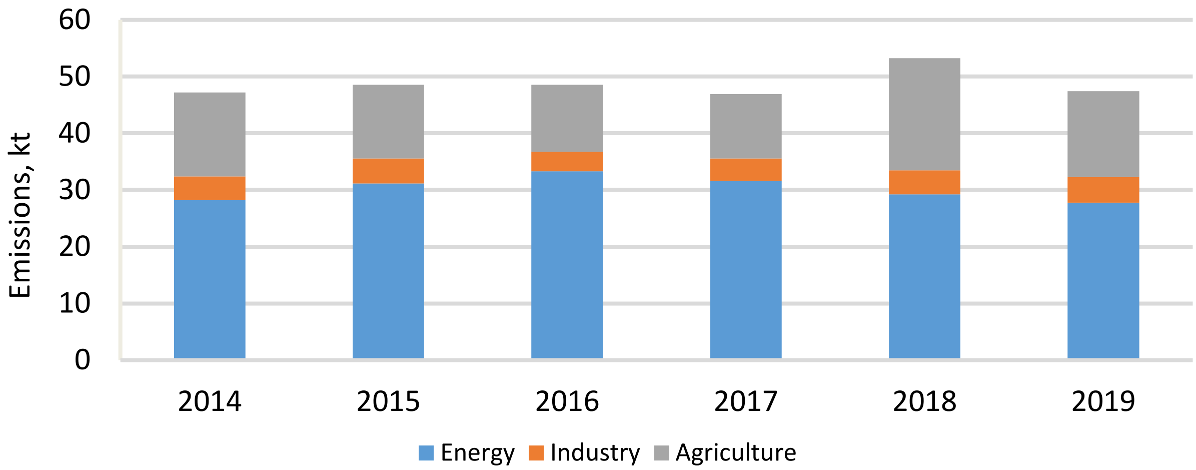

Figure 2.2 Trend of NOx emissions 2014-2019

Energy sector has the biggest share in total NOx emissions (about 59%).

Approximately 43% of total NOx emissions comes from road transport.

Growth of NOx emissions in 2018 from agriculture sector is related to application of bigger amount of livestock manures to agricultural soils.

Emissions of NOx decreased by 11% in 2019 compared to previous year mainly due to reduced emissions from agriculture and motor transport caused by less amount of manures applied to soil, decreased import of vehicles and increasing share of new and clean transport types in import of vehicles. Cut in import was caused by increased prices of petrol and diesel due to rising excise duties for their import, and also by increased taxes for the importation of old and dirty car. While increasing share of new and clean transport types in import of vehicles was conditioned by reduction of excise duties for import of cleaner vehicles (electric/hybrid).

Non-methane volatile compounds

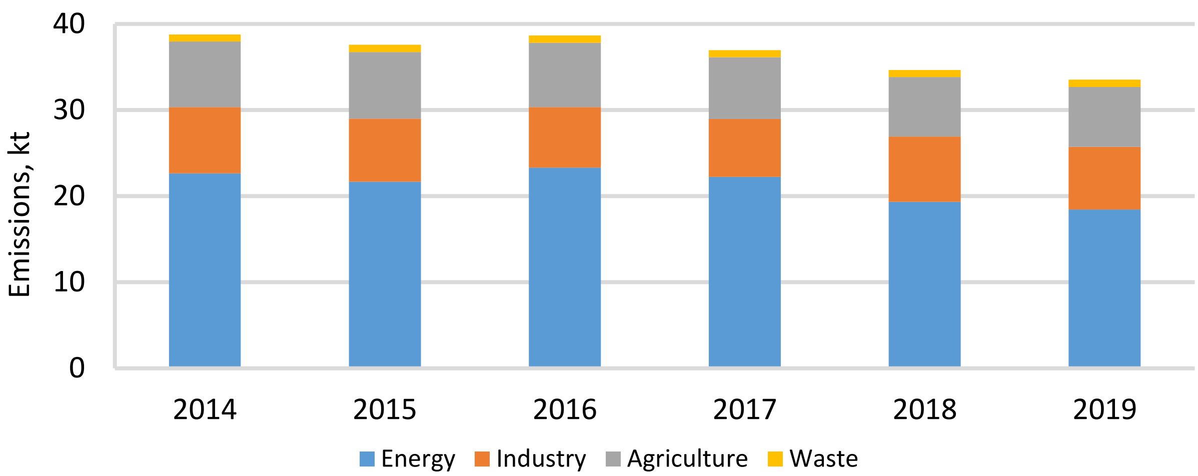

Figure 2.3 Trend of NMVOC emissions 2014-2019

Since 2016 NMVOC emissions have decreased stably by 13% due to reduced emissions in Energy sector. Energy sector is the main sources of pollution regarding NMVOC (about 55%). Road transport within energy sector accounts for 30% of total emissions.

Sulphur Dioxide

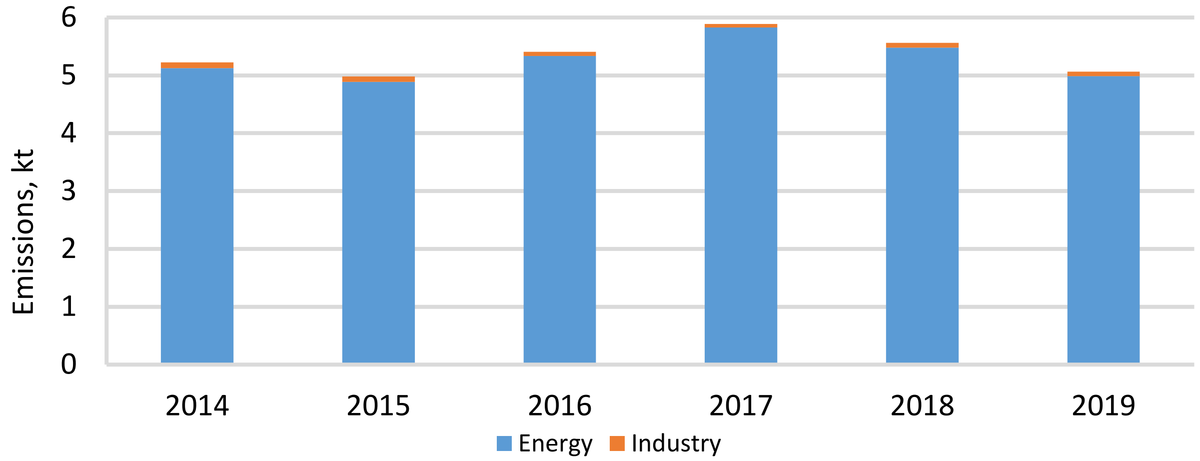

Figure 2.4 Trend of SO_2 emissions 2014-2019

Stationary combustion in manufacturing industries and construction accounted for nearly 93% of SOx emissions in 2019.

Significant increase since 2016 was caused by resumed consumption of coal for public electricity and heat production (2016-2018) and increased consumption of coal in subsector of iron and steel production (since 2017).

Ammonia

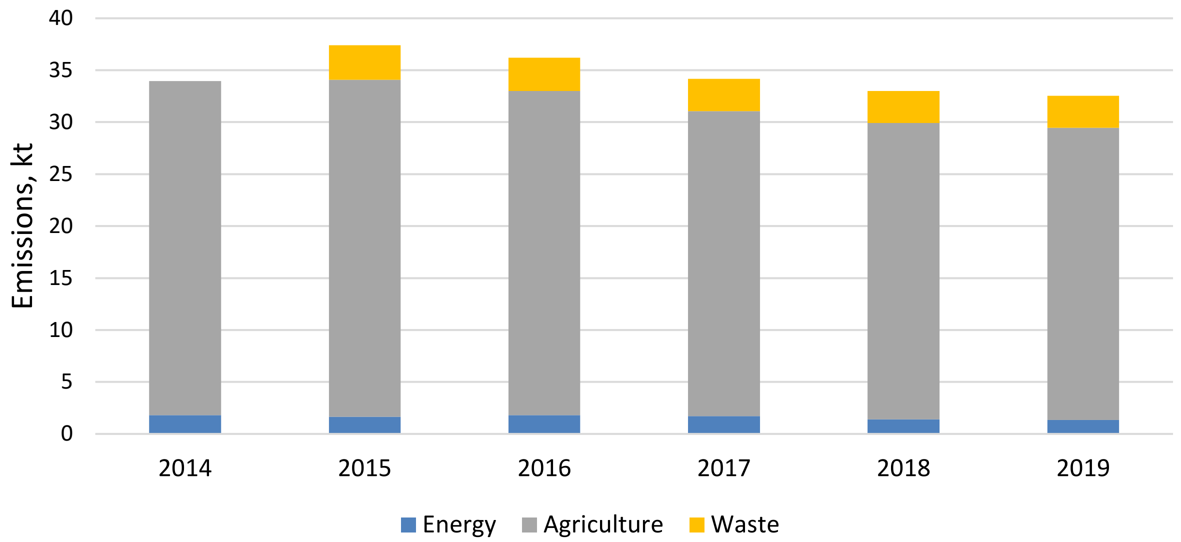

Figure 2.5 Trend of NH_3 emissions 2014-2019

Substantial increase of emissions in 2015 was caused by calculation of NH_3 emissions from domestic wastewater handling which previously was not able due to absence of relevant activity data for past years. Since 2015 NH_3 emissions started decreasing from all sectors and have decreased by 13% in 4-year term. Agriculture sector accounts for 86% of total NH_3 emissions as of 2019.

Particulates

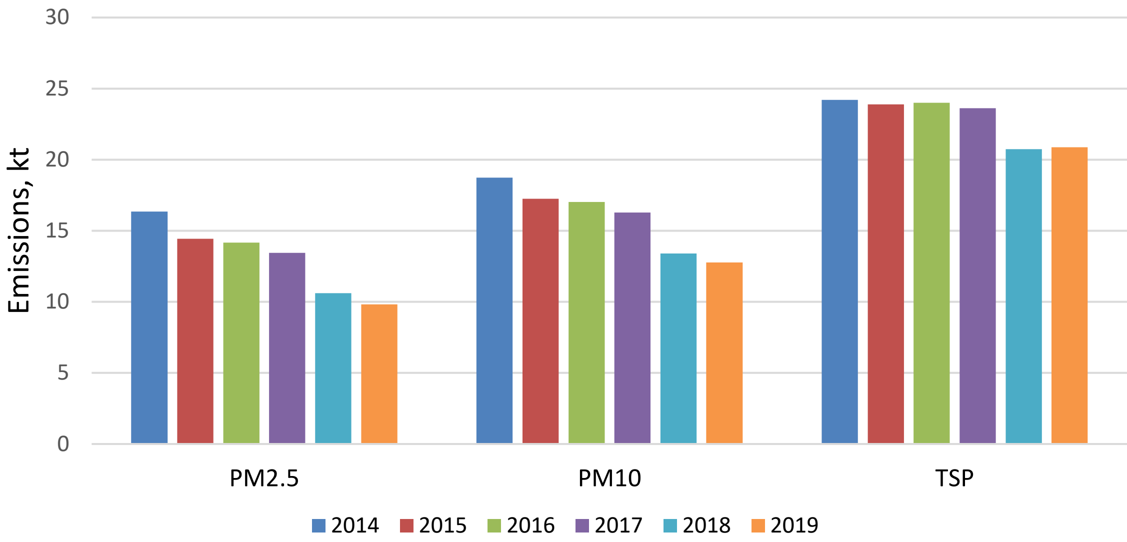

Figure 2.6 Trend of PM2.5, PM10 and TSP emissions 2014-2019

Total emissions of PM2.5 decreased by 40% from 2014 to 2019 , PM10 – by 32% and TSP – by 14%. The sharp reduction of particulate matter's emissions since 2014 was mostly achieved by decreasing biomass consumption in households.

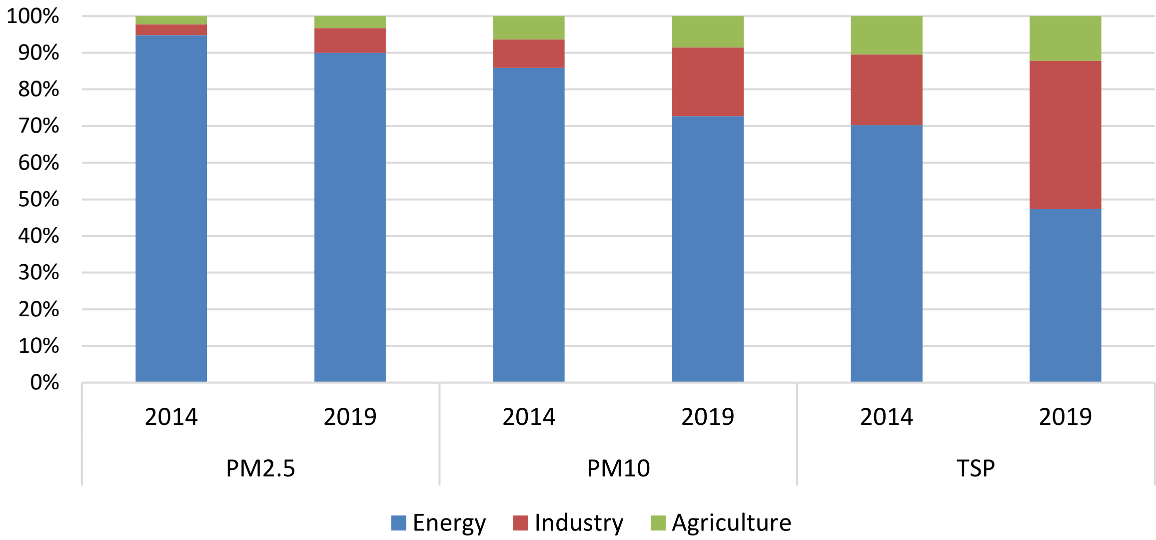

Figure 2.7 Sources of PM2.5, PM10 and TSP emissions in 2014 and 2019

In contrast, PM emissions from industry have rising trend. TSP emissions increased by 81% in 2014-2019 mainly due to increased lime, concrete and asphalt production and quarrying of bigger amount of minerals other than coal.

Energy sector remains as a main source of PM emissions as 90% of PM2.5 emissions, 73% of PM10 emissions and 47% of TSP emissions came from energy sector in 2019. Industry is second biggest polluter responsible for about 7% of PM2.5 emissions, 18% of PM10 emissions and 40% of TSP emissions as of 2019. The share of energy sector in PM emissions decreases year by year due to alteration of solid fuel consumption in residential sector by natural gas, while industry's share increases as a result of increased production and lack of application of modern clean technologies in the sector.

Black Carbon

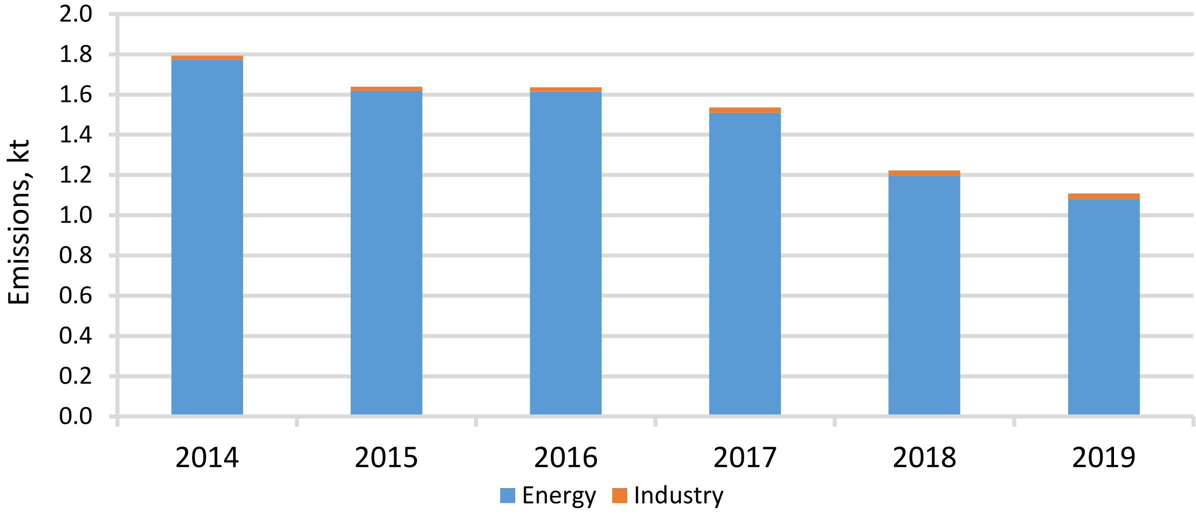

Figure 2.8 Trend of BC emissions 2014-2019

Emissions of BC have decreased since 2014 due to reduced emissions from residential combustion that is a result of wider application of cleaner energy sources and less consumption of solid fuels by households.

Energy sector is a source for about 98% of BC emissions, while only residential stationary combustion within energy sector is responsible for 68% of total emissions.

Carbon Monoxide

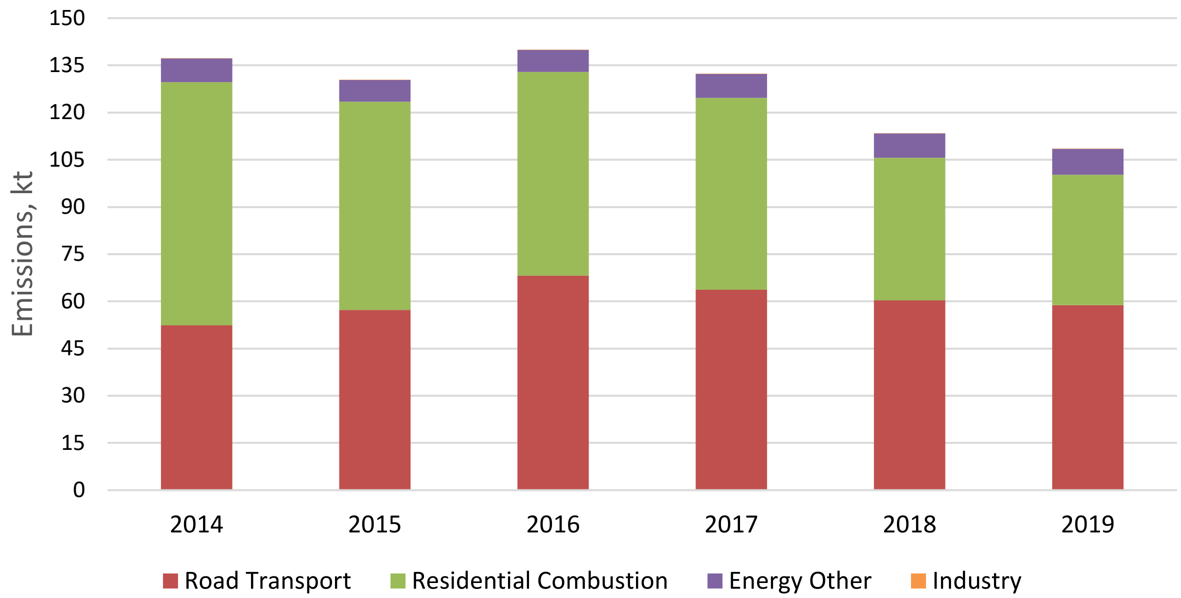

Figure 2.9 Trend of CO emissions 2014-2019

CO emissions were reduced by 21% in 2019 compared to 2014. The reduction of CO emissions was a results its decreased discharge from residential sector as emissions from residential combustion have decreased by 46% in 2014-2019. CO emissions from road transport have variable trend: it increases from 2014 to 2016 and decreases from 2017. The reduction was caused by decrease of vehicles import and growing share of new and fuel-efficient vehicles in import that was supported through economic and financial instruments since 2017.

Energy sector is a main source of CO emissions. In 2014 the shares of emissions from road transport and residential combustion sources were 38% and 56%, since that emissions from road transport outnumbered emissions from residential sources and by 2019 the shares are following: 54% to 38%.

Priority Heavy Metals

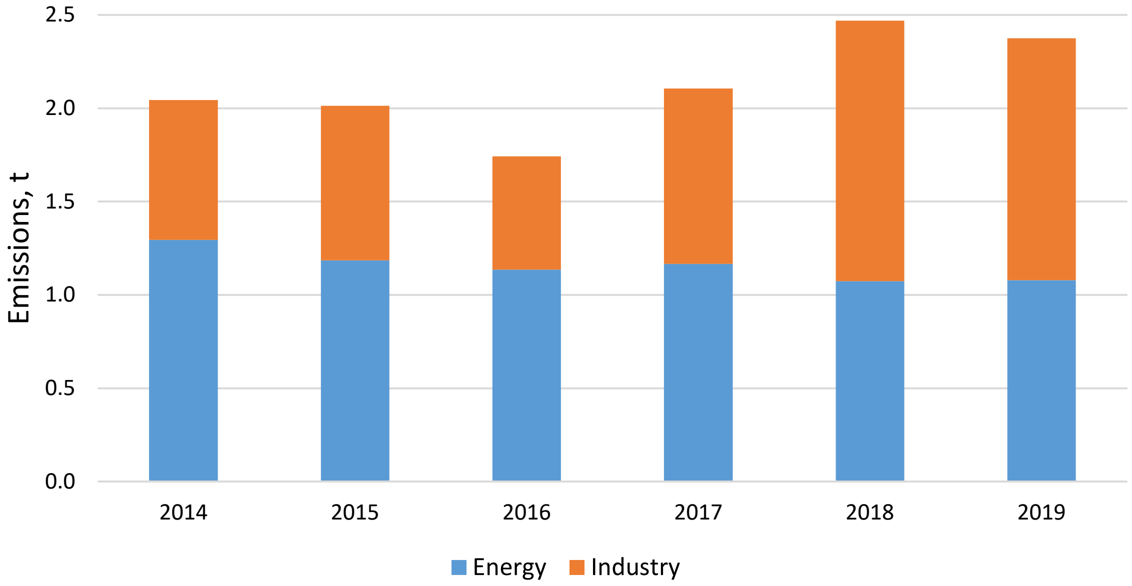

Figure 2.10 Trend of Pb emissions 2014-2019

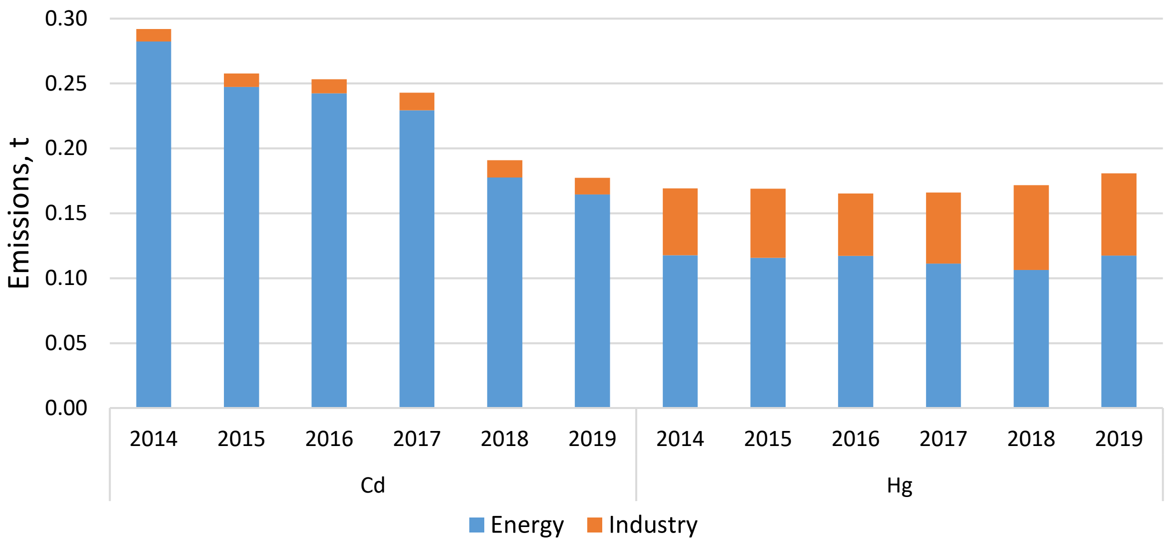

Figure 2.11 Trend of Cd and Hg emissions 2014-2019

There are different trends among priority heavy metals emissions over 5 year period. Pb emissions increased by 19%, while Cd emissions were reduced by 39% and Hg emissions remains stable. The main reason for growth of Pb emissions is increased iron and steel production since 2017. In case of Cd emissions, reduction was caused by decreased wood consumption in households that triggered shrank of emissions by 47% in 2014-2019.

The main source of Pb emissions is iron and steel production (both combustion and industry sectors) that accounted for 73% of total emissions in 2019. Emissions from energy sector decreased by 9%, while emissions from industry increased by 73% in 2019 compared to 2014.

73% of Cd emissions came from residential stationary combustion in 2019, thought the share was even more in 2014 – 85%. Energy sector, mainly combustion in cement and iron and steel production, is a source for 64% of Hg emissions.

Additional Heavy Metals

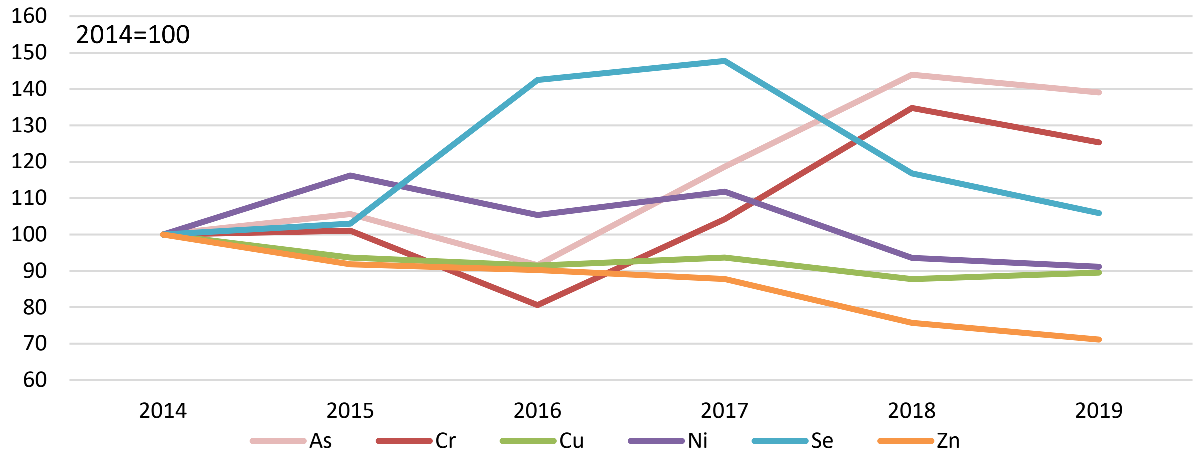

Figure 2.12 Trend of additional heavy metals emissions 2014-2019

In 2019 compared to 2014 emissions of As and Cr increased by 40% and 25% respectively, while emissions of Zn and Cu decreased by 30 and 10%. Emissions of Ni and Se have variable trend. They are rising in 2015-2017 and reducing in 2018-2019.

Rising emissions of As and Cr is connected with the increased production of iron and steel since 2014. Reductions of Cu and Zn emissions are the result of sharply diminished biomass consumption in residential sector. Variability of Se emissions was mainly conditioned by changeable amount of produced glass and also by consuming coal for public electricity and heat production in 2016-2018, while variable Ni emissions is due to rise in oil consumption in commercial stationary combustion in 2015-2017 and reducing trend of biomass consumption by households.

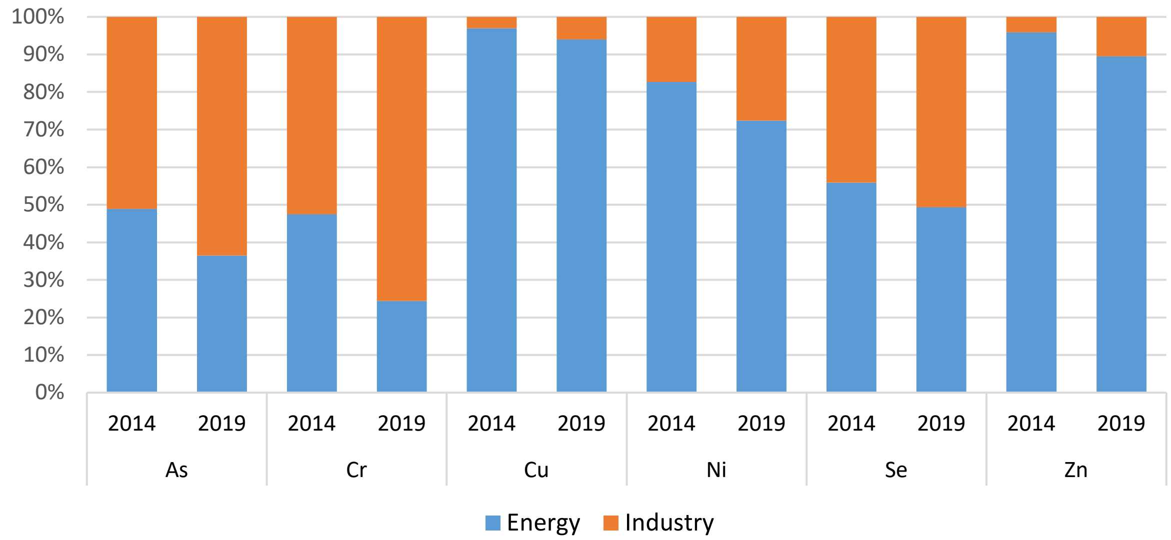

Figure 2.13 Sources of additional heavy metals emissions in 2014 and 2019

As outlined in figure 2.13 the share of energy sector in emissions of additional heavy metals is decreasing year by year, while industry is becoming dominant.

Dioxins/ Furans

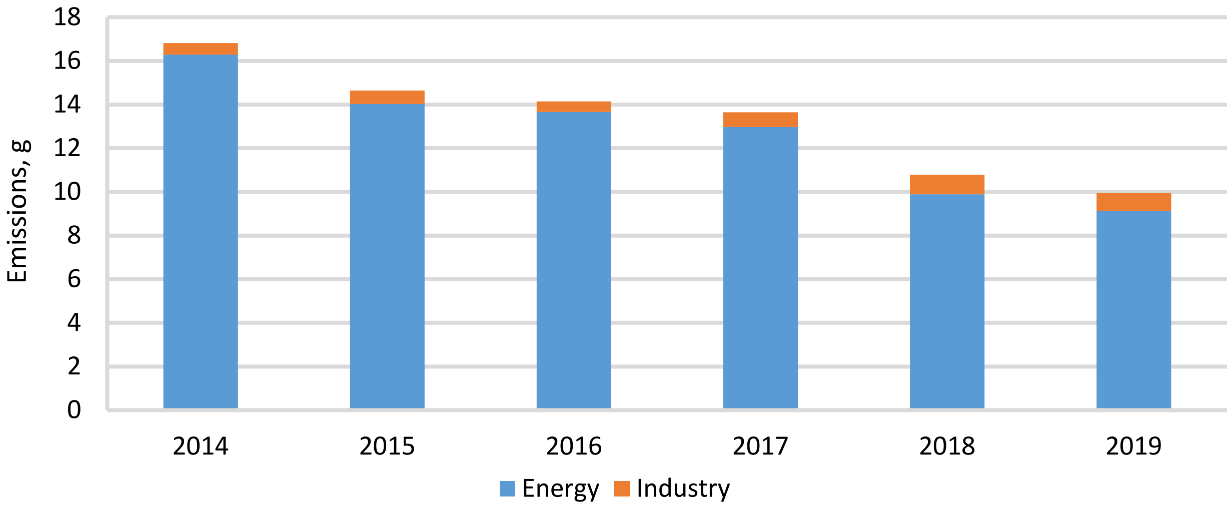

Figure 2.14 Trend of PCDD/ PCDF emissions 2014-2019

PCDD/ PCDF emissions were reduced by 41% in 2019 compared to 2014. The reduction of PCDD/ PCDF emissions was a results its decreased discharge from residential sector as emissions from residential combustion have decreased by 47% in 2014-2019. Unlike energy sector, emissions of PCDD/ PCDF from industry have increasing trend as it increased by 56% in the mentioned period due to rise in iron and steel production, which constitutes major industrial source of PCDD/ PCDF emissions in Georgia.

PAHs / benzo(a)pyrene

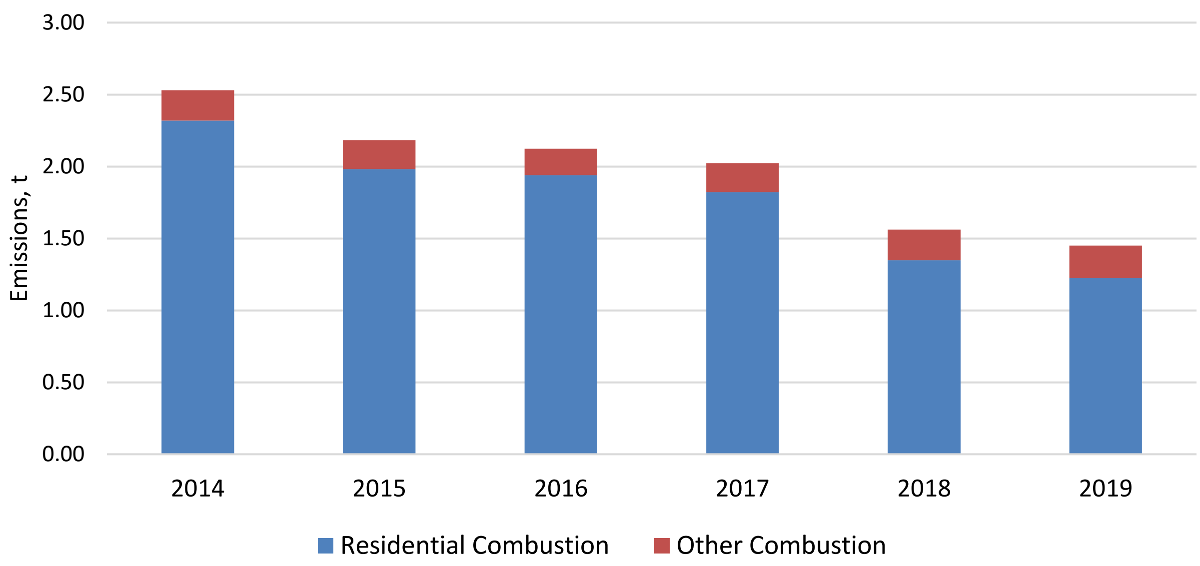

Figure 2.15 Trend of BaP emissions 2014-2019

Benzo(a)pyrene (BaP) emissions were reduced by 43% in 2019 compared to 2014. The reduction of BaP emissions was a results its decreased discharge from residential sector as emissions from residential combustion have decreased by 47% in 2014-2019 due to diminished firewood consumption in households. BaP is basically emitted from energy sector.

HCB and PCBs

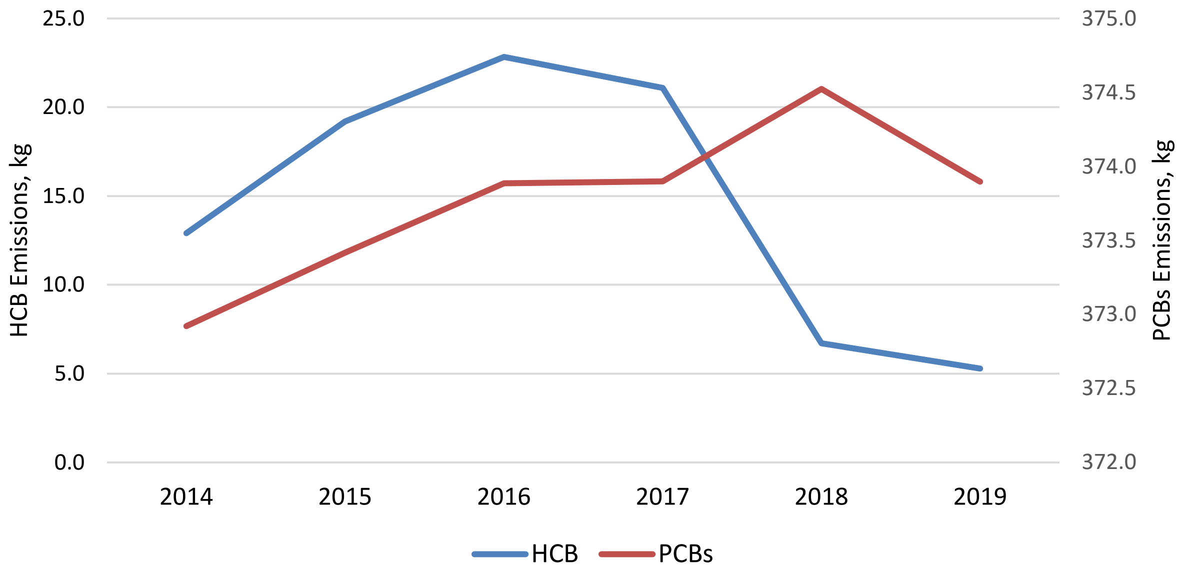

Figure 2.15 Trend of HCB and PCBs emissions 2014-2019

PCBs emissions slightly increased in 2014-2019 due to increased demand by population for POPs and heavy metals. Variability of HCB emissions trend in caused by changeable amount of aluminum production in the mentioned period, which is responsible for about 99% of emissions.

3. Energy (NFR sector 1)

In previous submissions emission data in energy sector was incomplete containing information only from 2007 even for limited categories for 2007-2012. In 2020, in the framework of Swedish International Development Cooperation Agency (SIDA) funded project "Enhancing air quality management capacities in Georgia", Georgia managed to calculate missing data before 2007 and additional categories for 2007-2012. Also, since 2013 GEOSTAT prepares yearly National Energy Balance, which gives more precise activity data in the energy sector to calculate emissions. Consequently, present submission includes emission data from activities 1A1a, 1A2a, 1A2b, 1A2d, 1A2e, 1A2f, 1A3b (i-iii, v-vii), 1A3c, 1A3dii, 1A4ai, 1A4bi, 1A4ci, 1A4cii, 1B1a, 1B1b, 1B2ai, 1B2aiv, 1B2av, 1B2b, 1B2c in 1990-2019.

Emissions in energy sector commonly come from fuel combustion. Minor fugitive emissions from fuel exploration generated as well. This sector covers five key activities: public electricity and heat production, combustion in manufacturing industries and construction, transport, small combustion and fugitive emissions. The energy sector is the main source of NOx, SO_2, NMVOC, CO and TSP emissions in Georgia. In 2019, this sector contributed 58.5% of total NOx emissions and 98.4% of total SO_2 emissions, 55% of total NMVOC emissions and 47.3% of total TSP emissions, also 99.9% of total CO emissions.

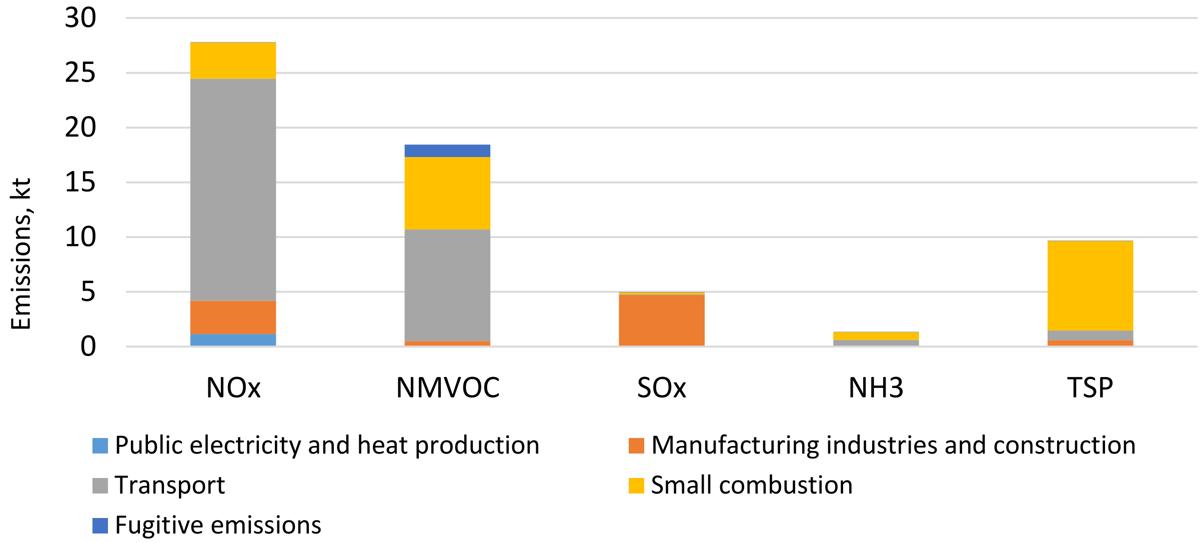

Figure 3.1 Emissions from energy sector in 2019

Transport is the major contributor of NOx (73%) and NMVOC (55.3%) emissions in the energy sector. Share of industrial combustion in total SO_2 emissions in energy sector is 94.6%. Small combustion is responsible for the 84.7% of PM and 53.2% of NH_3 emissions in this sector.

Energy industries (1A1)

Source category description

Emissions in this category mostly come from natural gas consumption.

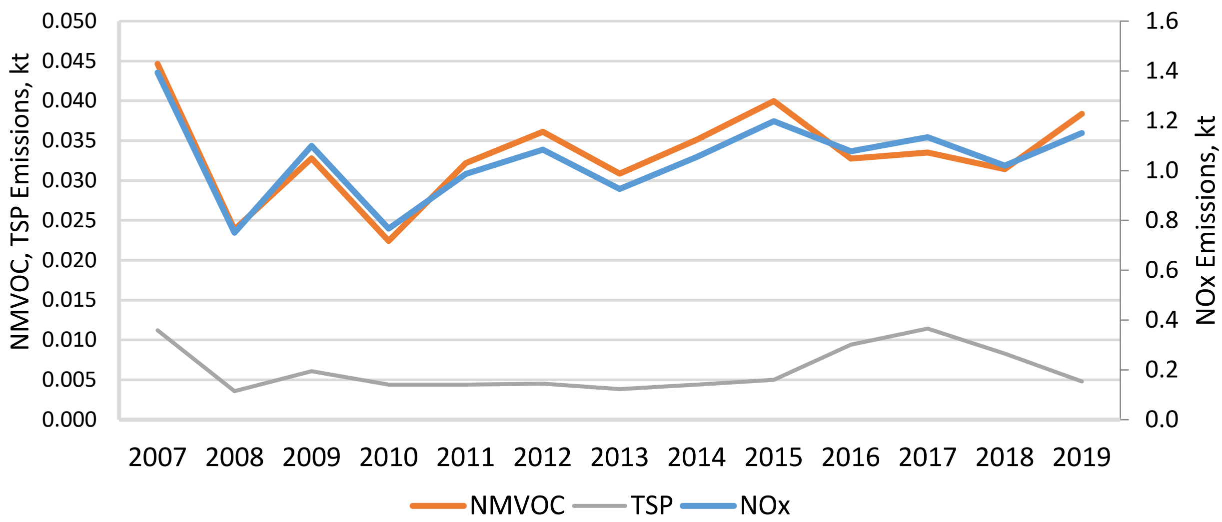

Figure 3.2 Emissions from public electricity and heat production 2007-2019

Temporary Increase of TSP emissions in 2016-2018 is related to consumption of coal by thermal power plant at that time.

Methodology

Emissions are estimated for 1990-2019 using EMEP/EEA Guidebook – 2019, Tier 1/2 approach based on data from International Energy Agency (1990-2018) and from National Energy Balance (2019).

Manufacturing industries and construction (1A2)

Source category description

This category covers emissions occurred by combustion processes in industrial sector. The main emission sources in this category are metallurgy and production of mineral materials.

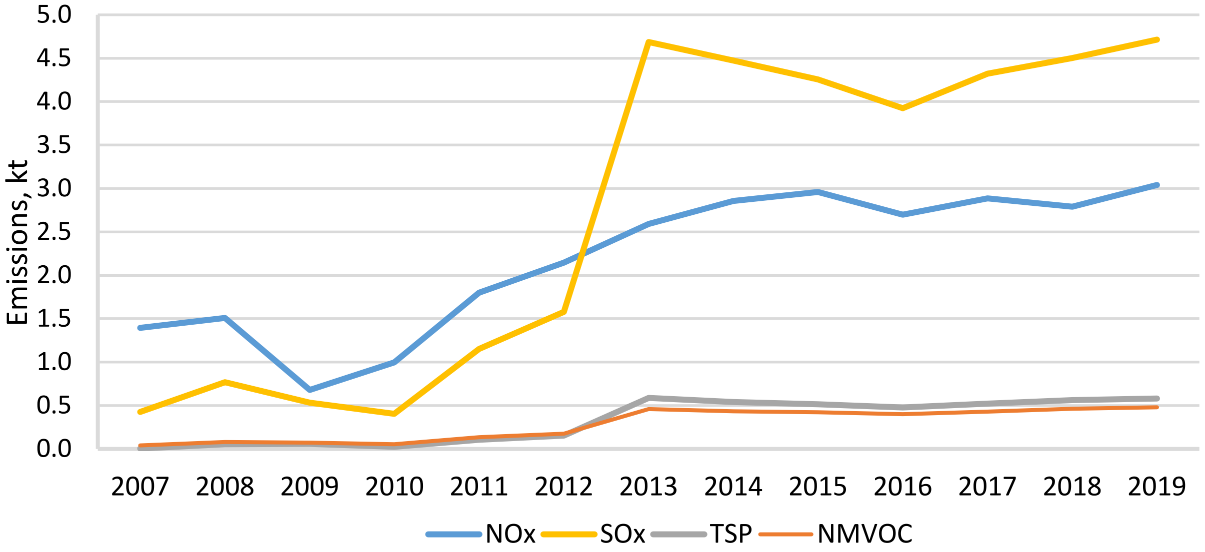

Figure 3.3 Emissions from combustion in manufacturing industries 2007-2019

Increasing trend of SO_2 emissions from 2010 is resulted from increased coal fuel consumption in industry sector (mostly in iron and steel production) and partially by rising cement production, while increase in NOx emissions is caused mainly by expansion in cement production that tripled in 2009-2019, and slightly by increased coal consumption in iron and steel production. Decreasing emissions of SO_2 in 2014-2016 related to the reduced consumption of coal and heavy oil within those years, mainly caused by shifting back from coal to natural gas in iron and steel industry. Switching from coal with low Sulphur content to high Sulphur coal in production of non-metallic minerals (mostly in cement production) is a main reason of further increase of SO_2 emissions since 2016.

Significant increase of TSP and NMVOC emissions from 2011 is also a result of increased coal fuel consumption in iron and steel production. Dramatic rise in SO_2, TSP and NMVOC emissions in 2013 is also related to introduction of national energy balance, which provides detailed information on fuel consumption in categories that was not available before.

Methodology

Emissions are estimated for 1990-2019 using EMEP/EEA Guidebook – 2019, Tier 1/2 approach based on data from International Energy Agency (1A2a, 1A2d, 1A2e - 1990-2018) and from National Energy Balance (1A2a, 1A2d, 1A2e - 2019), national inventory of stationary emission sources (1A2b, 1A2f – 2013-2019), and production data provided by GEOSTAT and GHG emissions reports (1A2f – before 2013).

Transport (1A3)

Source category description

This category includes railways, national navigation (shipping) and all types of vehicles (passenger cars, light duty vehicles, heavy-duty trucks, buses, motorcycles[6]) except off-road transport (agricultural and industrial machinery, etc.). Road transport is the main source of air pollution in Georgia. The number of transport vehicles has doubled within the last decade.

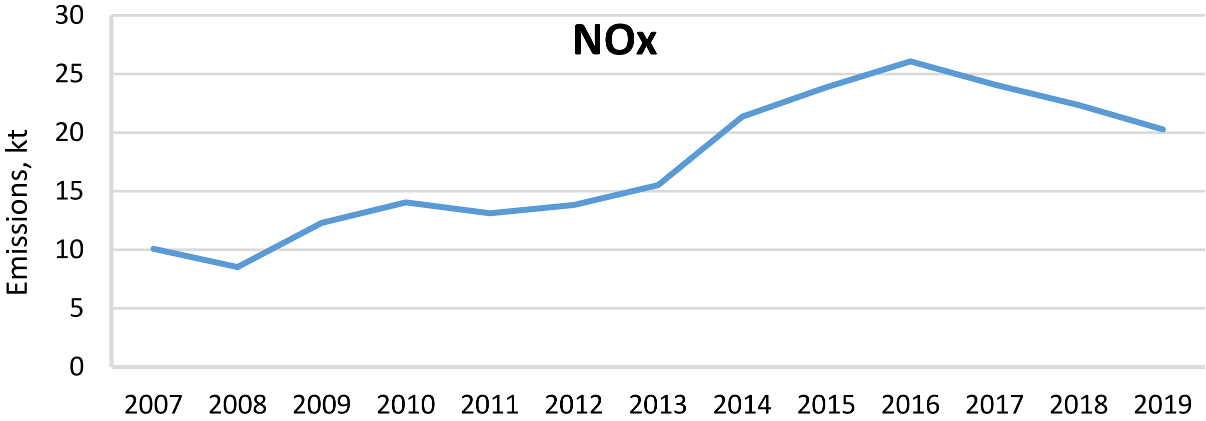

Figure 3.4 Emissions of NOx from transport 2007-2019

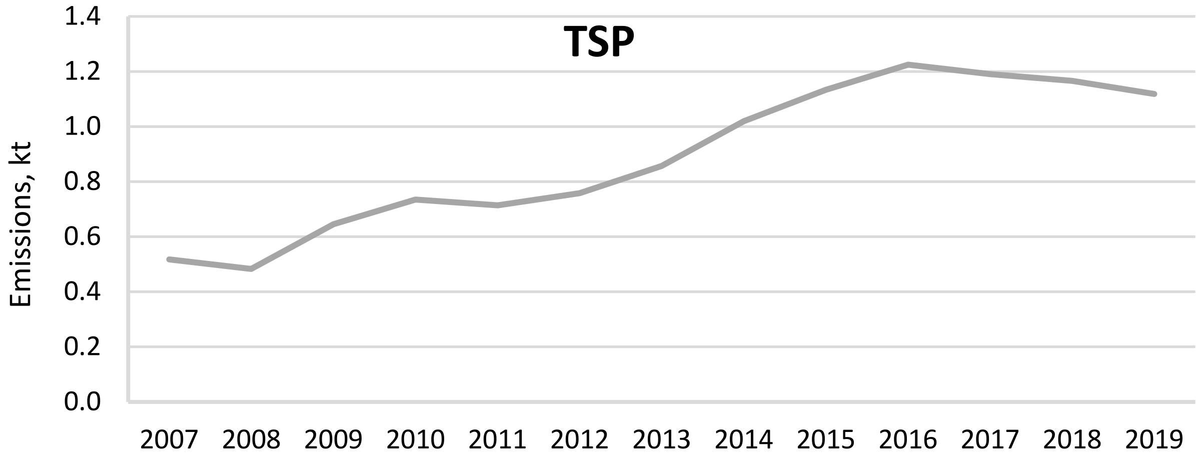

Figure 3.5 Emissions of TSP from transport 2007-2019

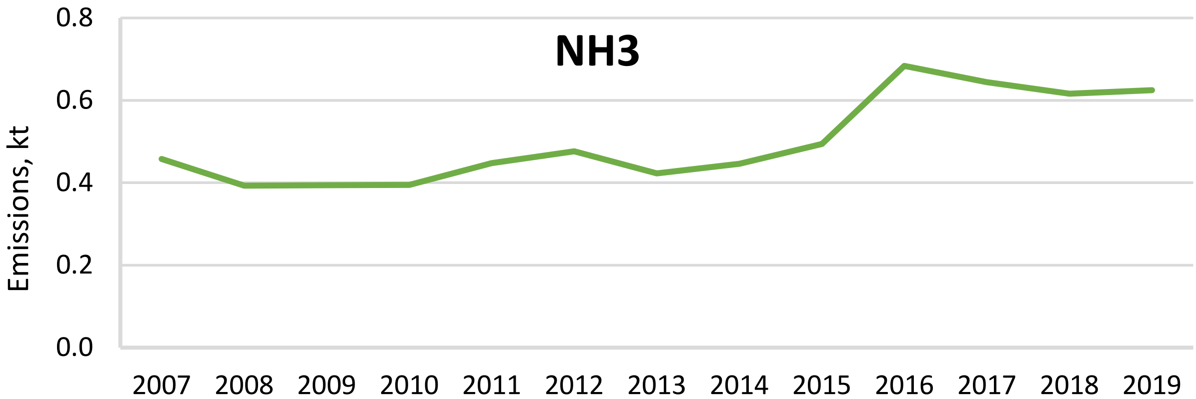

Figure 3.6 Emissions of NH_3 from transport 2007-2019

[6] 1Abiv is not estimated.

Emission trends of NOx, TSP and NH_3 from this sector is gradually increasing (peaked in 2016) alongside growing number of vehicle in the country. From 2007 to 2019 emissions of NOx was increased by 100.7%, PM by 116.1% and emissions of NH_3 by 36.5 %.

Stable trends of NOx and TSP emissions since 2016 are results of environmental policy in the transport sector. In particular, promotion of cleaner technologies (hybrid and electric vehicles) and increased environmental taxes for the import of fuel and old vehicles.

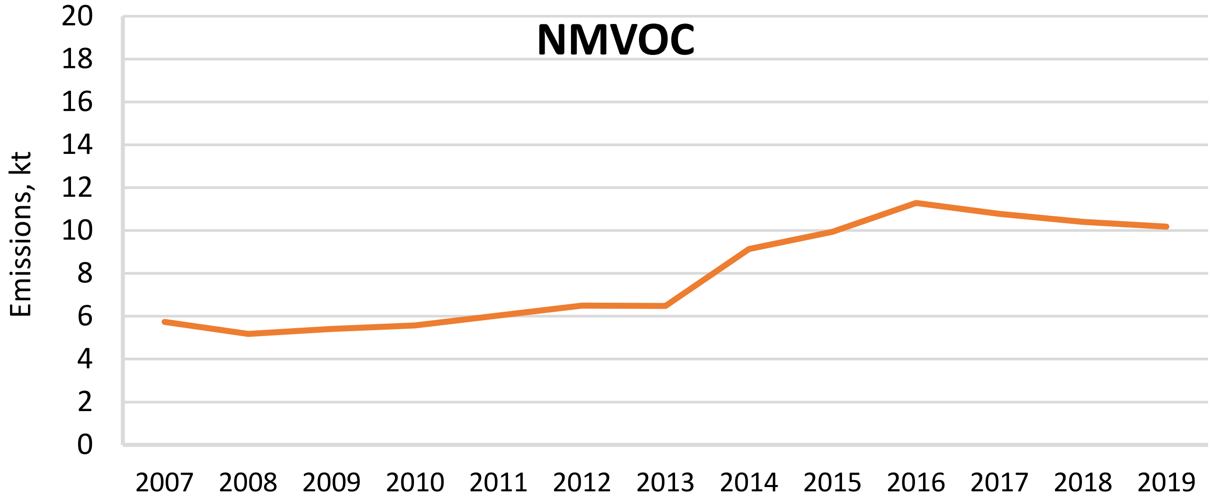

Figure 3.7 Emissions of NMVOC from transport 2007-2019

Decreasing NMVOC emissions in 2013 compared to 2012 was caused by reduction of petrol consumption due to switching of passenger cars from petrol fuel to compressed natural gas (CNG). Increasing emissions since 2014 is related to growing petrol consumption in these years caused by increasing car fleet and partially by switching back to petrol from CNG of passenger cars due to increased price of CNG.

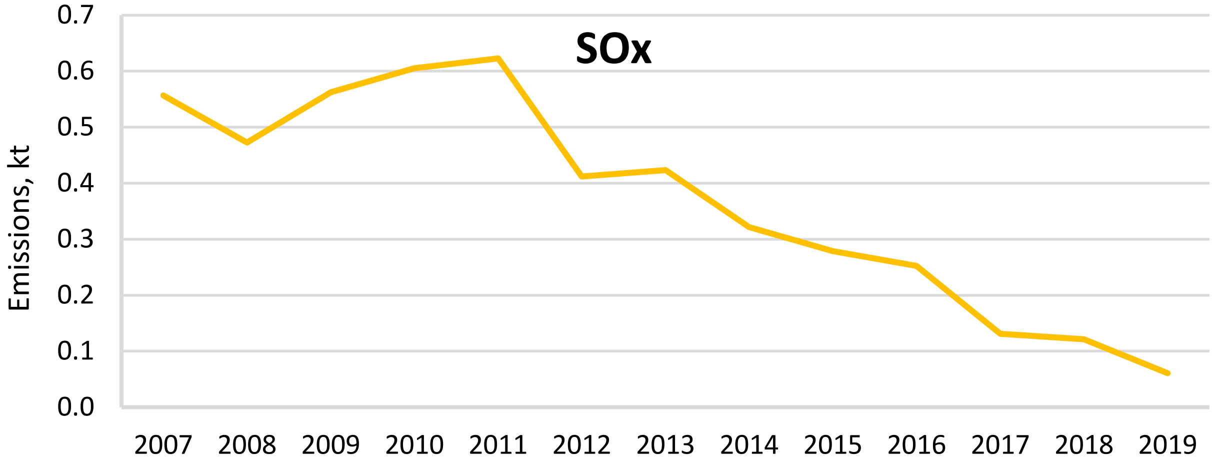

Figure 3.8 Emissions of SOx from transport 2007-2019

Emissions of SOx are gradually decreasing in parallel with reduction of sulphur content limits in national standards for petrol and diesel (for petrol: from 500 ppm to 10 ppm and for diesel: from 500 ppm to 50 ppm).

Methodology

Road transport emissions are calculated by software tool COPERT 4 (Tier 1 method of the EMEP/EEA Guidebook). Emissions from railways and national navigation (shipping) are estimated using EMEP/EEA Guidebook – 2019, Tier 1 approaches.

Small combustion (1A4)

Source category description

Emissions in this category come from stationary combustion in commercial/institutional, residential and agriculture/forestry/fishing, plus from off-road vehicles and other machinery of agriculture/forestry/fishing.

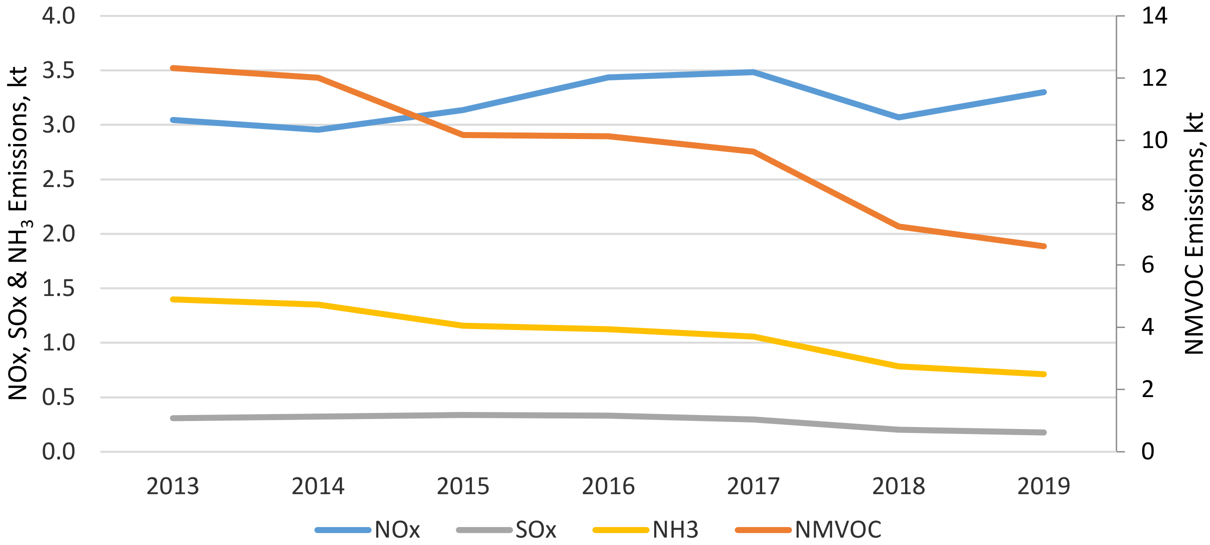

Figure 3.9 Emissions of main pollutants from small combustion in 2013-2019

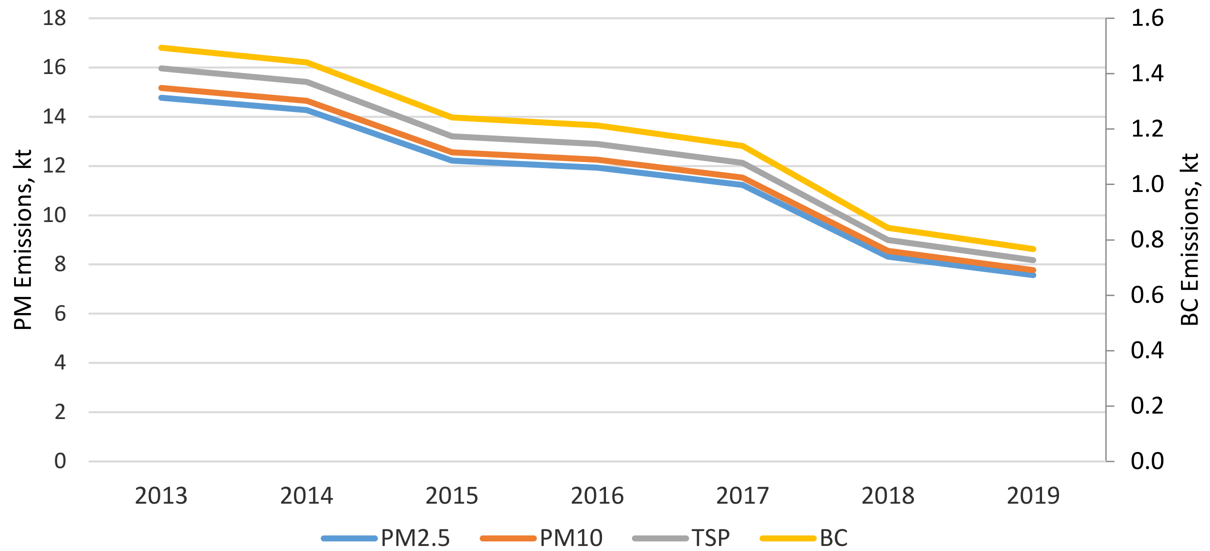

Figure 3.10 Emissions of particulate matters from small combustion in 2013-2019

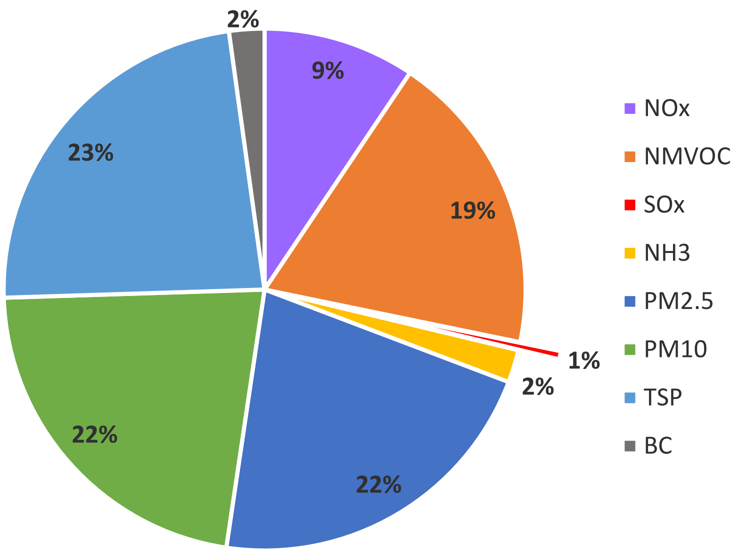

Figure 3.11 Share of emissions of main pollutants from small combustion in 2019

PM and NMVOC have the biggest share in total emissions of the main pollutants from this category.

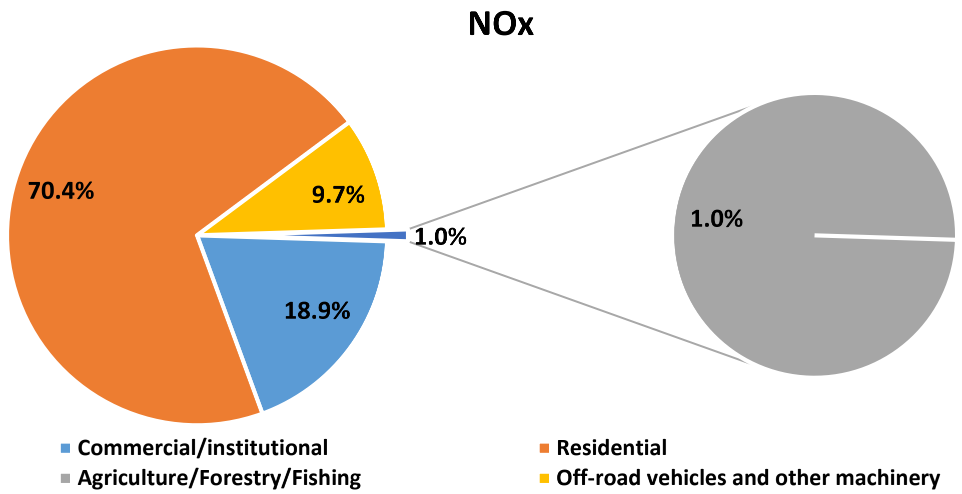

Figure 3.13 NMVOC emissions by sources of pollution in 2019

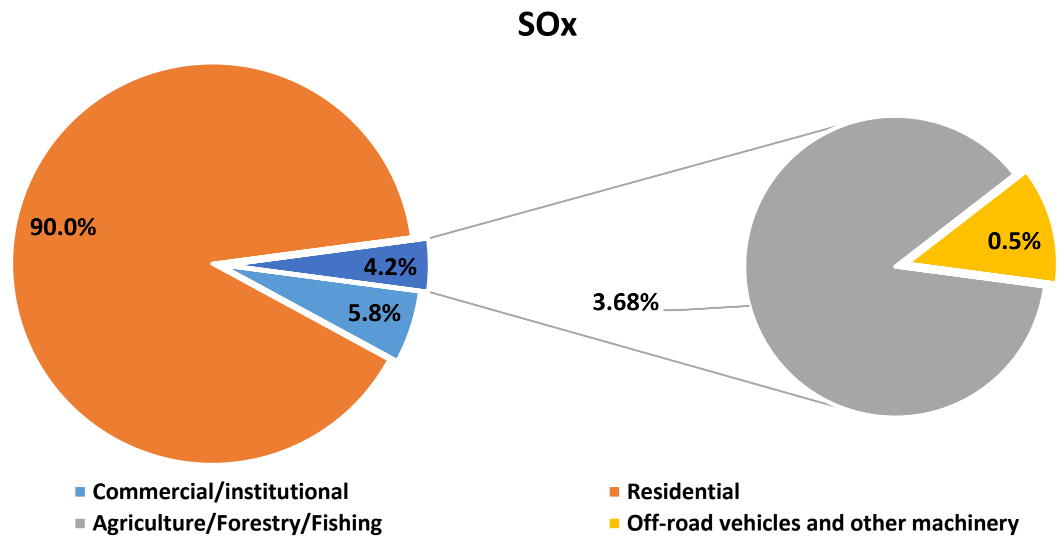

Figure 3.14 SOx emissions by sources of pollution in 2019

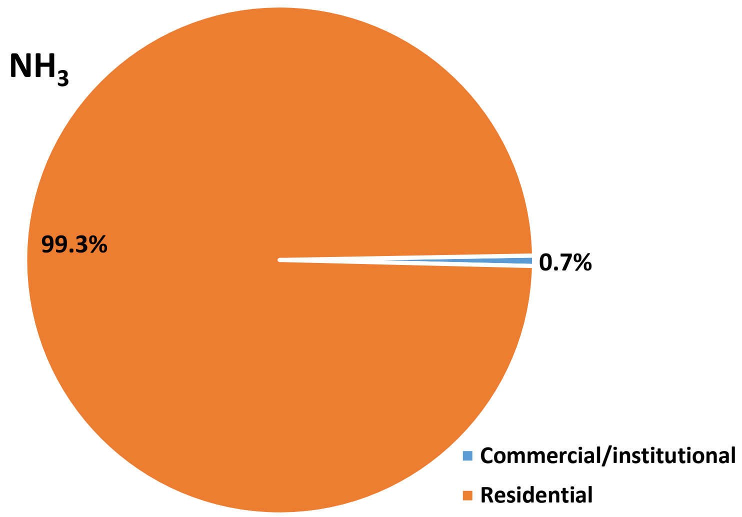

Figure 3.15 NH_3 emissions by sources of pollution in 2019

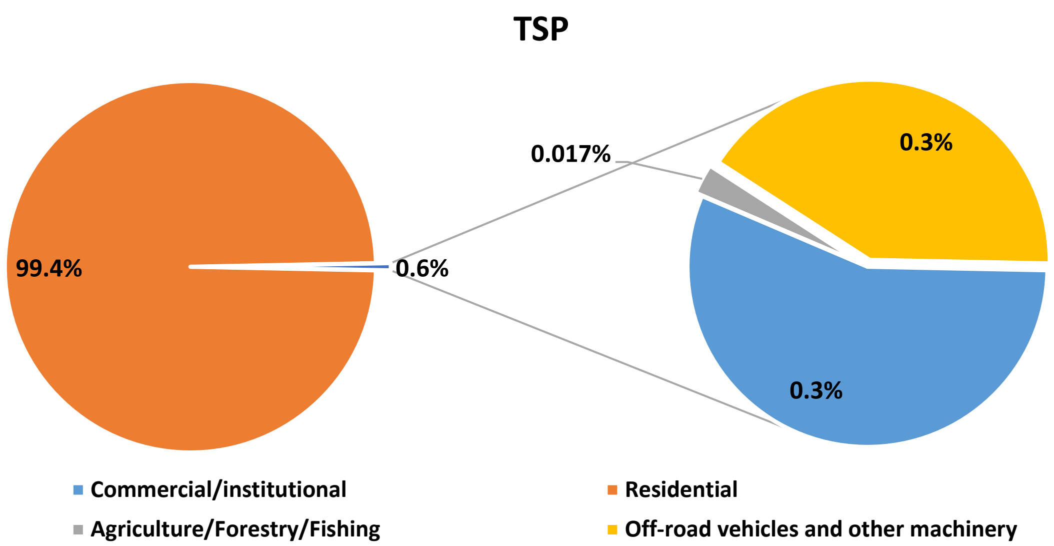

Figure 3.16 TSP emissions by sources of pollution in 2019

Residential stationary combustion is a main emission source for all pollutants as it is shown in figures 3.10-3.14. Due to reduction in biomass and coal consumption in residential sector, emissions of NMVOC, SOx, NH_3, PM and BC have decreased, however emissions of NOx kept stability since increased consumption of alternative fuels (mainly gas) still constitutes source for significant amount of NOx.

Methodology

Emissions are estimated by EMEP/EEA Guidebook – 2019, Tier 1 approach based on the activity data from International Energy Agency and National Energy Balance.

Fugitive emissions from fuels (1B)

This category covers fugitive emissions from coal mining and handling, solid fuel transformation, oil and natural gas exploration.

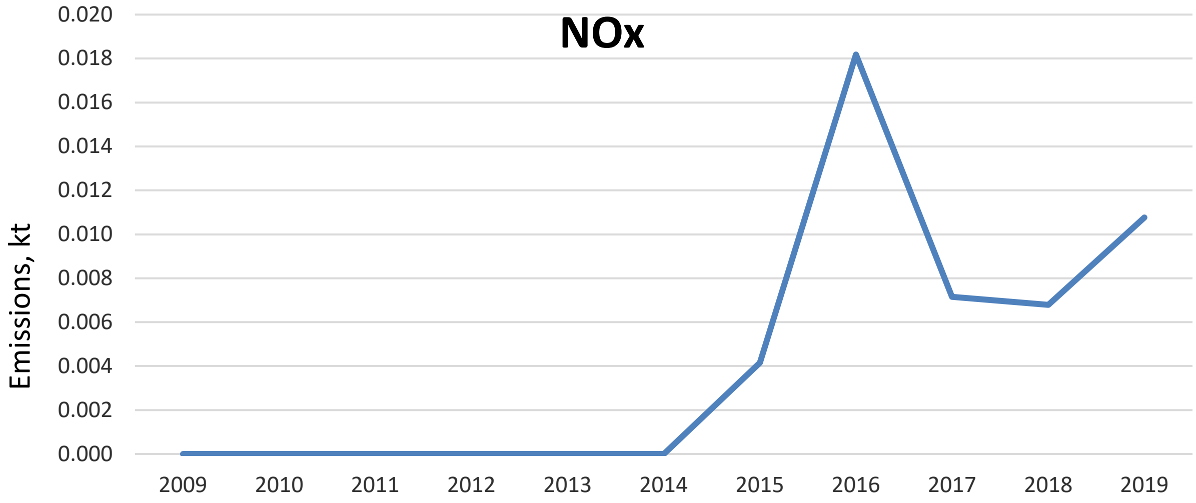

Figure 3.17 Fugitive emissions of NOx from fuels 2007-2019

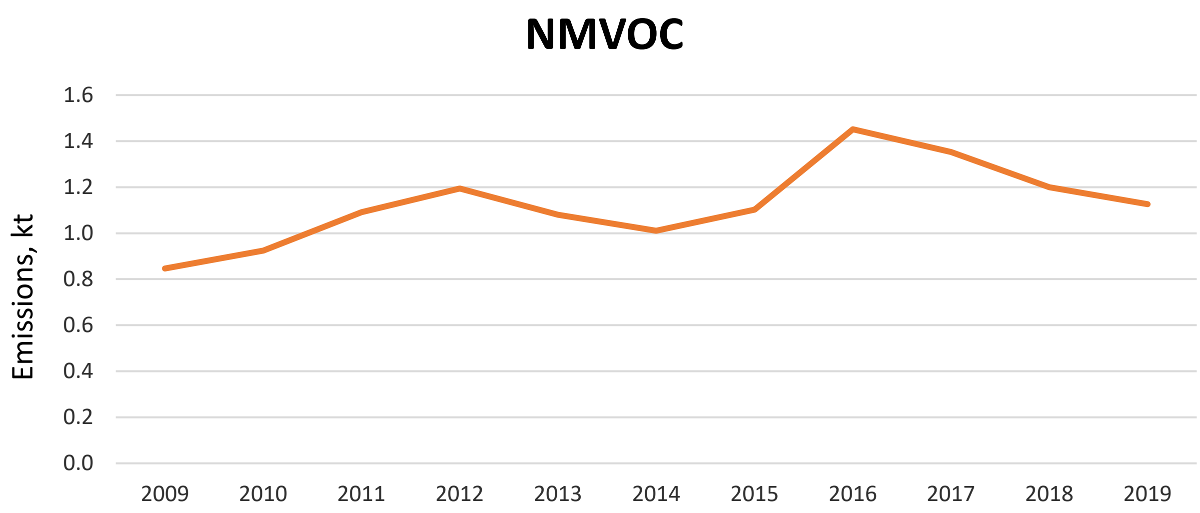

Figure 3.18 Fugitive emissions of NMVOC from fuels 2007-2019

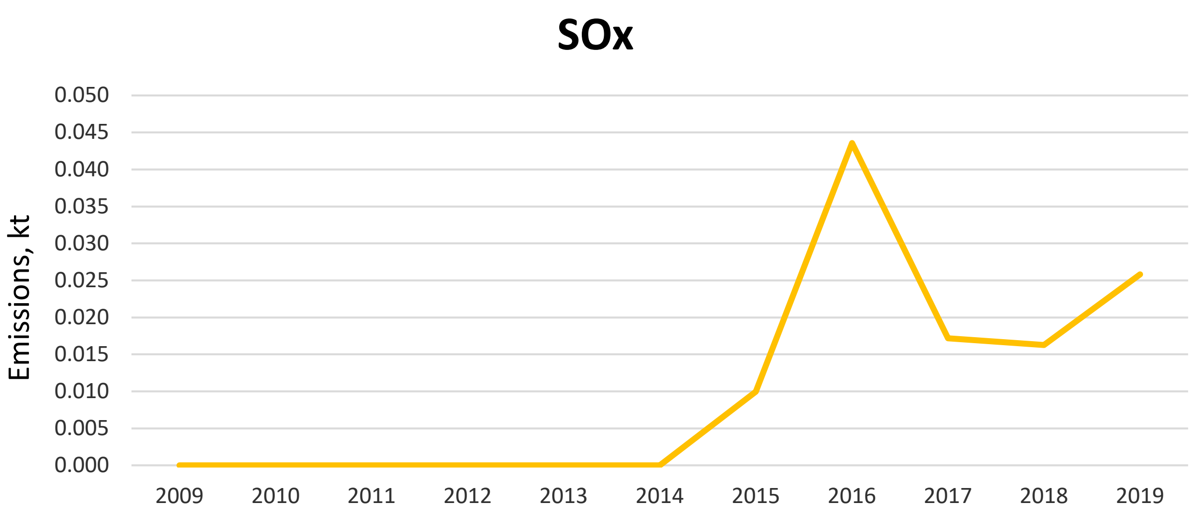

Figure 3.19 Fugitive emissions of SOx from fuels 2007-2019

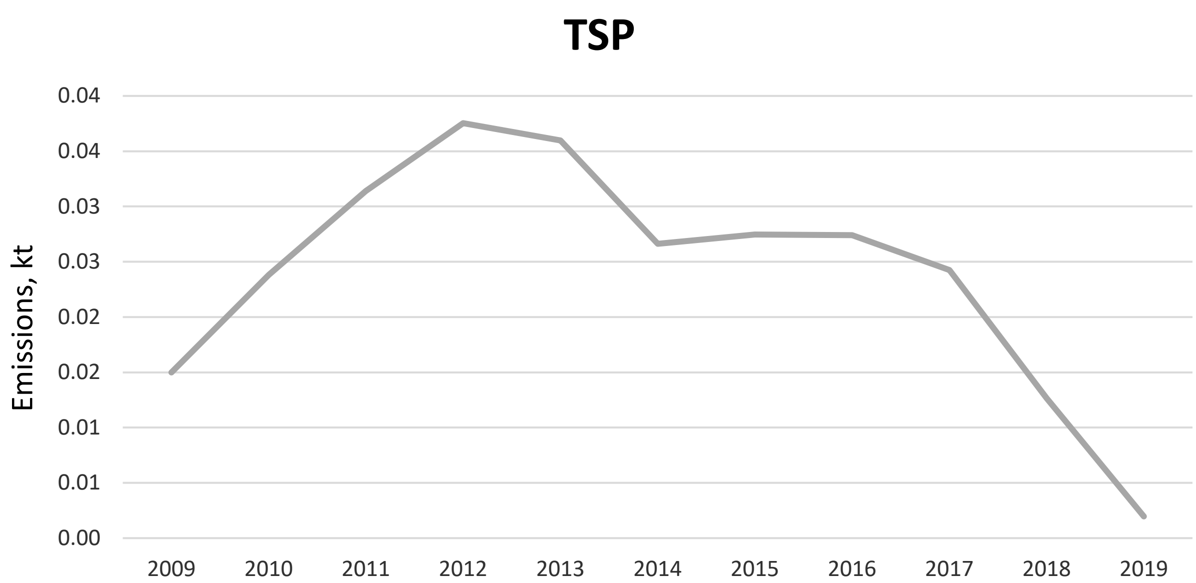

Figure 3.20 Fugitive emissions of TSP from fuels 2007-2019

Emissions of in NOx and SOx from 2015 is related to resumed oil refining and gas flaring in oil refineries in Georgia. While significant reduction in TSP emissions is caused by decreased amount of produced coal.

Methodology

Emissions are estimated by EMEP/EEA Guidebook – 2019, Tier 1 approach based on the activity data from International Energy Agency, National Energy Balance and from GEOSTAT.

4. Industrial processes and product use (NFR sector 2)

Dissolution of the Soviet Union accompanied with the collapse of the economy in the 1990s resulted in a significant decrease of industrial activities in Georgia. There has been some growth in this sector in more recent years. The main activities in this sector are manufacturing of mineral products, chemical industry, metal production as well as paper, wood and food industries.

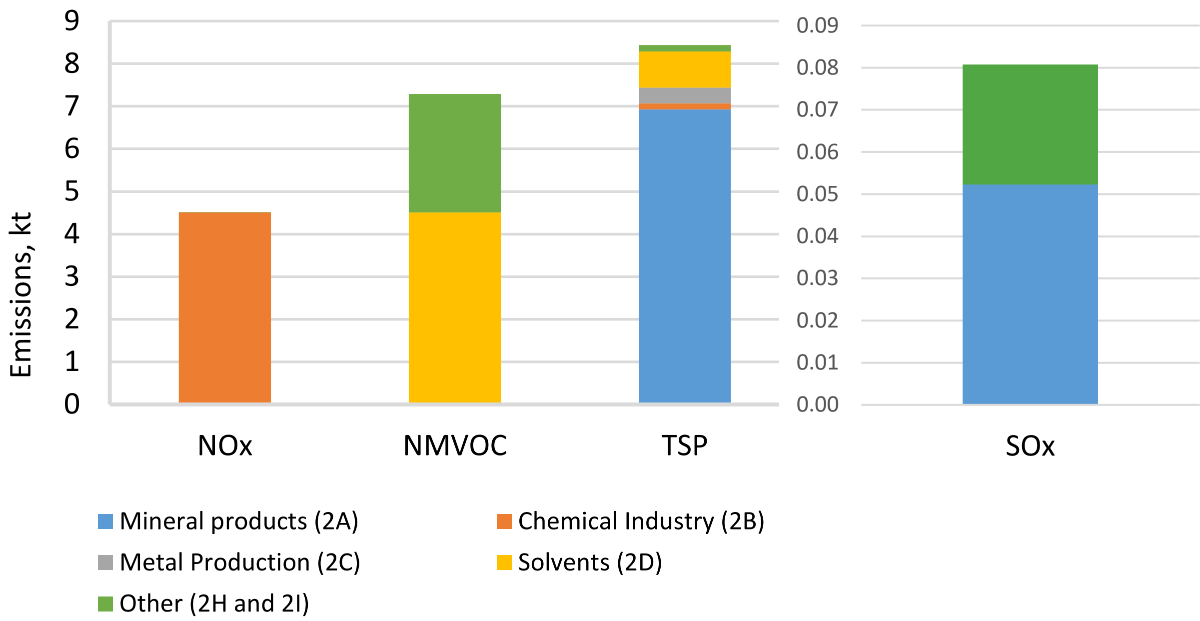

Figure 4.1 Emissions from industry sector in 2019

Share of chemical industry in total NOx emissions in industry sector is 99.4%. Solvent subsector is responsible for 61.3% of NMVOC emissions. Manufacturing of mineral products is the major contributor of SOx (64.8%) and TSP (82.1%) emissions from this sector.

Mineral Products (2A)

Source category description

In this category, cement production, lime production, bricks, concrete, gravel and glass production are reported.

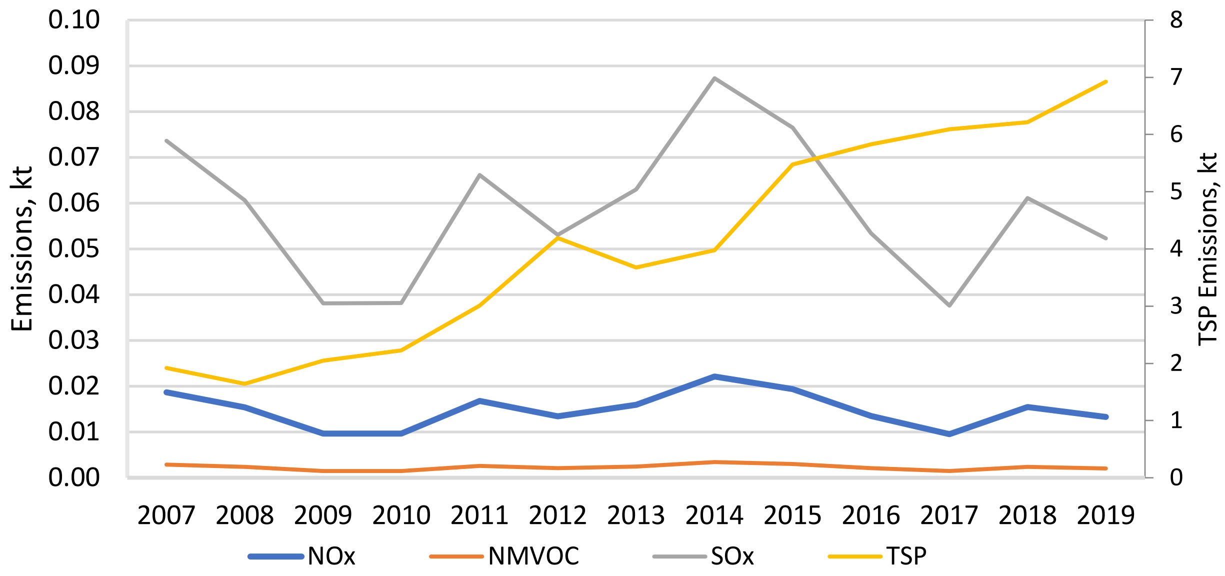

Figure 4.2 Emissions from mineral products 2007-2019

The most important pollutant emitted from this category is particulate matters. Increasing trend of this pollutant's emissions since 2008 is caused by rising amount gravel and concrete production.

Methodology

Emissions are estimated based on EMEP/EEA Guidebook – 2019, Tier 1 approach (2A1, 2A2, 2A3, 2A5) and national methodology (2A6). In case of cement production abatement coefficients were defined considering country and plant specifics. Activity data came from GEOSTAT, state reporting system for stationary sources and GHG emissions reports.

Chemical Industry (2B)

Source category description

This category covers emissions from ammonia, nitric acid and fertilizer production.

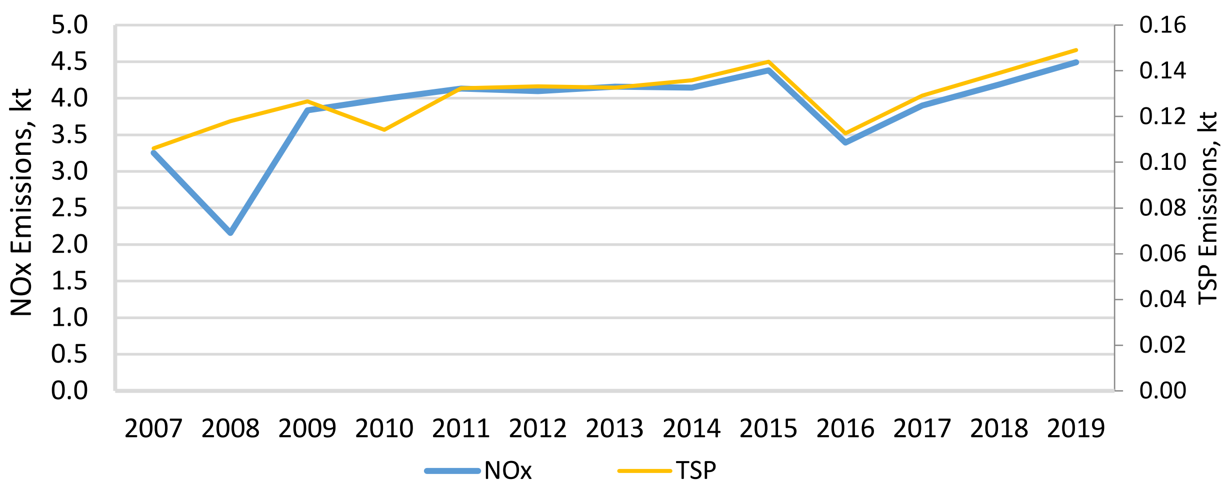

Figure 4.3 Emissions from chemical industry 2007-2019

Significant decrease of emissions in 2016 was caused by switching to production data which is retrieved from state reporting system for stationary sources.

Methodology

Emissions are estimated based on EMEP/EEA Guidebook – 2019, Tier 1 approach. Activity data came from GEOSTAT (1990-2005), state reporting system for stationary sources (2016-2019), GHG emissions reports (2005-2013) and trough extrapolation (2014-2015).

Metal Production (2C)

Source category description

In Georgia, there is ferroalloys and secondary iron/steel, lead and aluminum production.

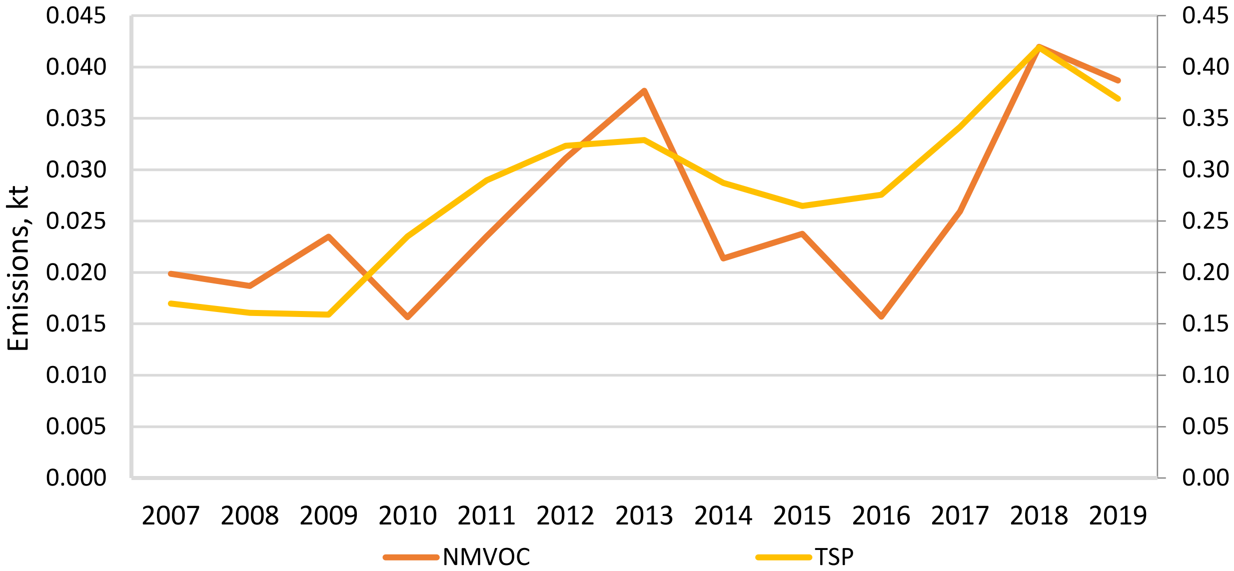

Figure 4.4 Emissions from metal production 2010-2019

Ferroalloys production is main source of TSP emissions, while iron and steel production is an only source for NMVOC in this category. Therefore, increased TSP emissions from 2015 is caused by rising ferroalloys production in Georgia.

Iron and steel production is a key source of heavy metals emissions especially Pb (49.6%), As (56.9%) and Cr (74.6%). Aluminum production is responsible for 99% of HCB emissions in Georgia.

Methodology

Emissions from are estimated using EMEP/EEA Guidebook – 2019, Tier 1/2 approaches. In case of aluminum and lead abatement coefficients were defined considering country and plant specifics. Activity data came from GEOSTAT, state reporting system for stationary sources and GHG emissions reports.

Solvents (2D)

Source category description

This category covers only two activities - road paving with asphalt and domestic solvent use including fungicides.

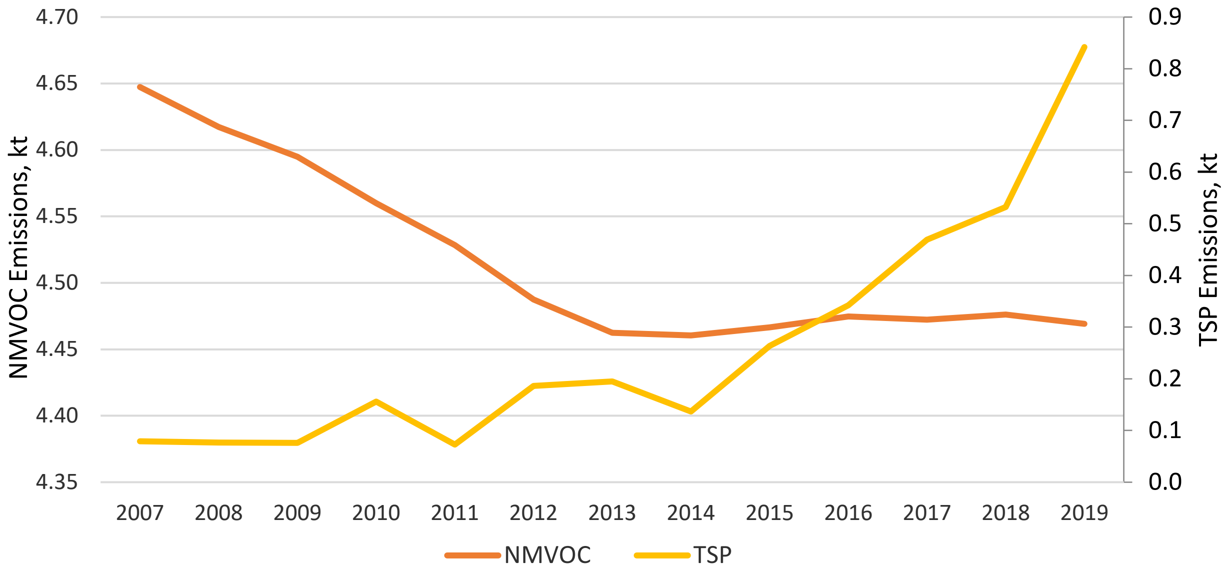

Figure 4.5 Emissions from solvents 2007-2019

NMVOC is the most important pollutant from this category that mostly comes from domestic solvent use.

Source of emissions of another important pollutant TSP is asphalt production. TSP emissions increases from 2014 as a result of increased production of asphalt for road paving.

Methodology

Emissions from are estimated using EMEP/EEA Guidebook – 2019, Tier 1 approach. In case of road paving with asphalt abatement coefficients are defined considering country and plant specifics. Activity data came from GEOSTAT and state reporting system for stationary sources.

Other (2H, 2I and 2K)

Source category description

This category covers pulp and paper, food and drink industry, wood processing and consumption of POPs and heavy metals.

In Georgia, there is secondary paper processing only. Food comprises bread production, sugar production, margarine production, flour production, coffee processing, fish processing, meat processing. Under drink production, beer, wine, spirits and brandy are included.

In the past large wood processing companies existed in Georgia. Nowadays small plants remain which process logs and produce wooden boards etc.

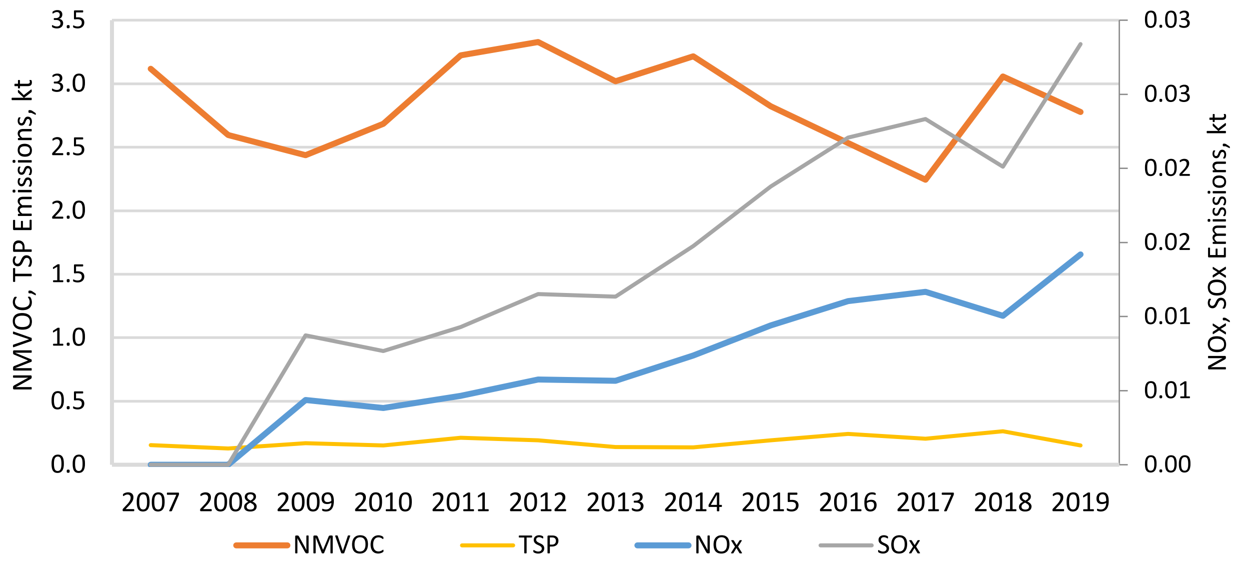

Figure 4.6 Emissions from other industrial processes 2007-2019

Reductions of emissions from this sector in 2008 related to the global economic crisis. Further reduction of NMVOC emissions since 2015 is caused by a sharp decline in sugar production, which was reduced to zero in 2017. Sharp increase in 2018 resulted from the reintroduction of sugar production. Rising NOx and SOx emissions from the category is caused by increased secondary paper processing.

Additionally, consumption of POPs and heavy metals is a source for 99.6% of total PCBs emissions.

Methodology

Emissions from are estimated using EMEP/EEA Guidebook – 2019, Tier 1 (2H1, 2I, 2K) and Tier 2 (2H2) approaches. In case of wood processing abatement coefficients are defined considering national methodology. Activity data came from GEOSTAT and state reporting system for stationary sources. Activity data to estimate emissions from consumption of POPs and heavy metals is a number of population in Georgia.

5. Agriculture (NFR sector 3)

Emission inventory from agriculture sector includes animal husbandry, the application of inorganic and organic fertilizers, farm-level agricultural operations and crops cultivation.

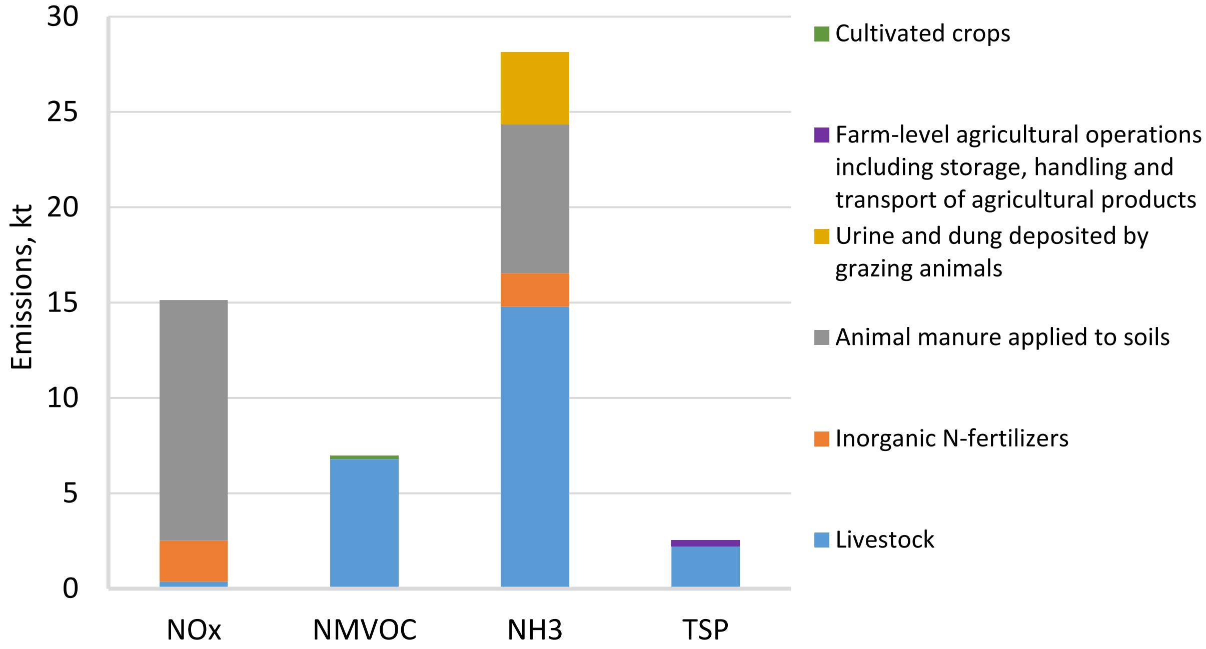

Figure 5.1 Emissions from agriculture sector in 2019

Agriculture sector is the main emitter of ammonia in the country.

Manure Management (3B)

Source category description

Manure management is the most significant source of ammonia emissions.

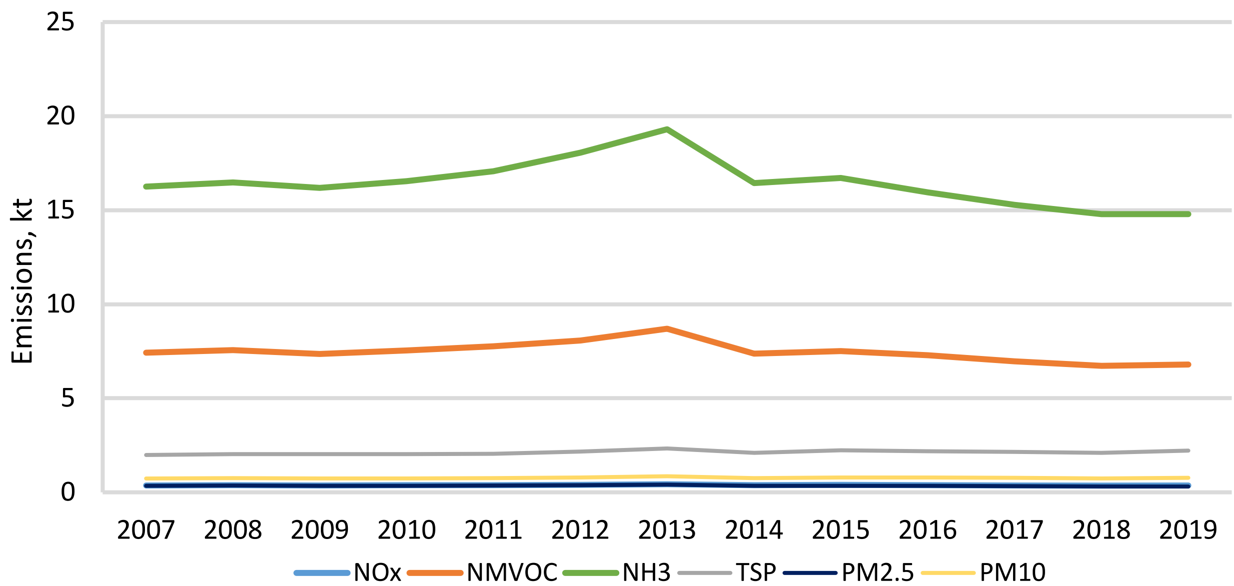

Figure 5.2 Emissions from livestock manure management 2007-2019

Drop of trend in 2014 is related with recalculations of activity data in agriculture sector by GEOSTAT.

Methodology

Emissions are calculated using the EMEP/EEA Guidebook – 2019, tier 1 approach.

Agricultural Soils (3D)

Source category description

Under this category, NOx and NH_3 emissions from application of inorganic and organic fertilizers and particulate matters emissions from farm-level agricultural operations (storage, handling and transport of agricultural product) are provided. Additionally, emissions of NMVOC have occurred from grain fields.

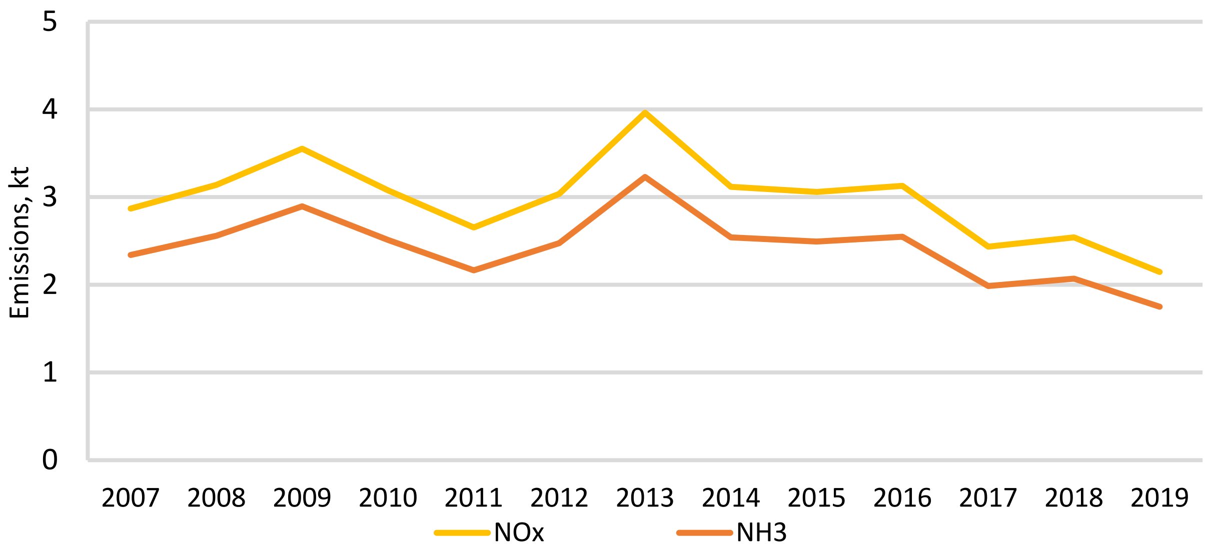

Figure 5.3 Emissions from use of inorganic N-fertilizers 2007-2019

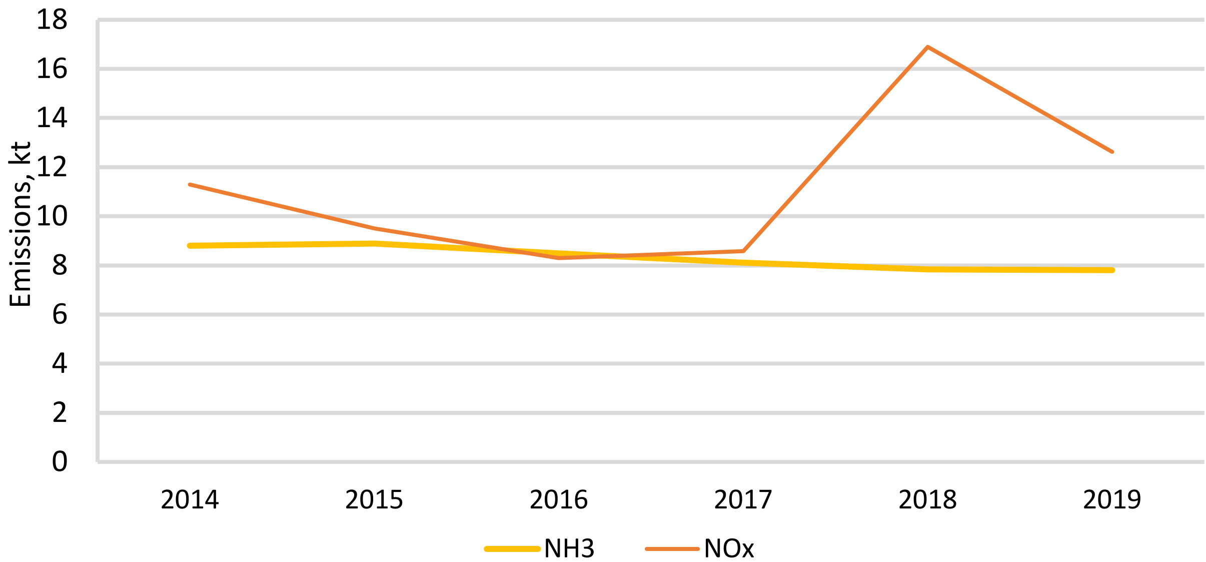

Figure 5.4 Emissions from application of animal manure to soils 2014-2019

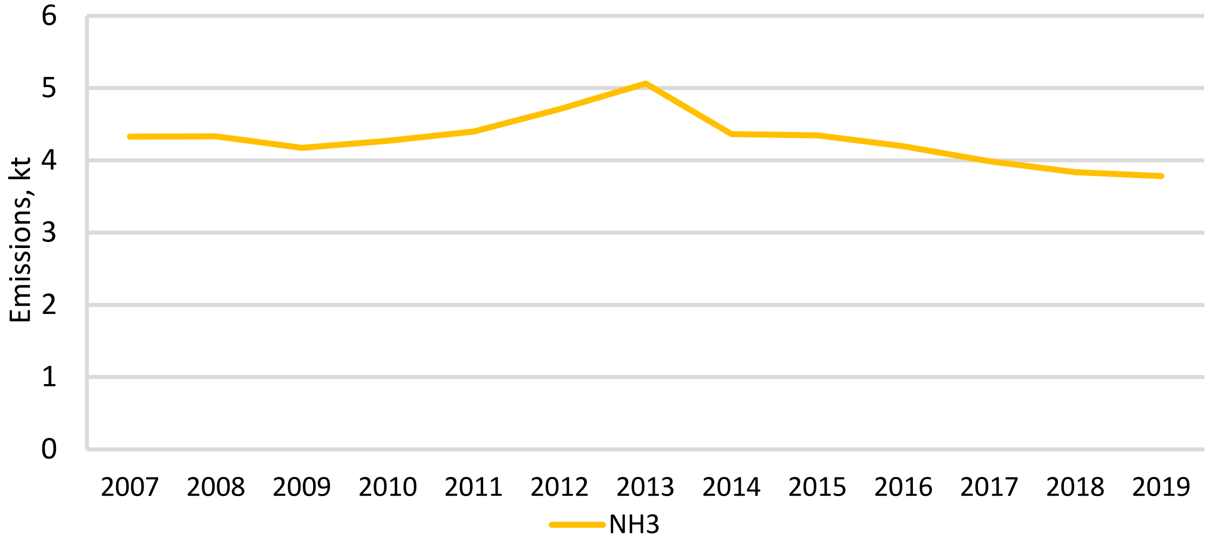

Figure 5.5 Emissions from urine and dung deposited by grazing animals 2007-2019

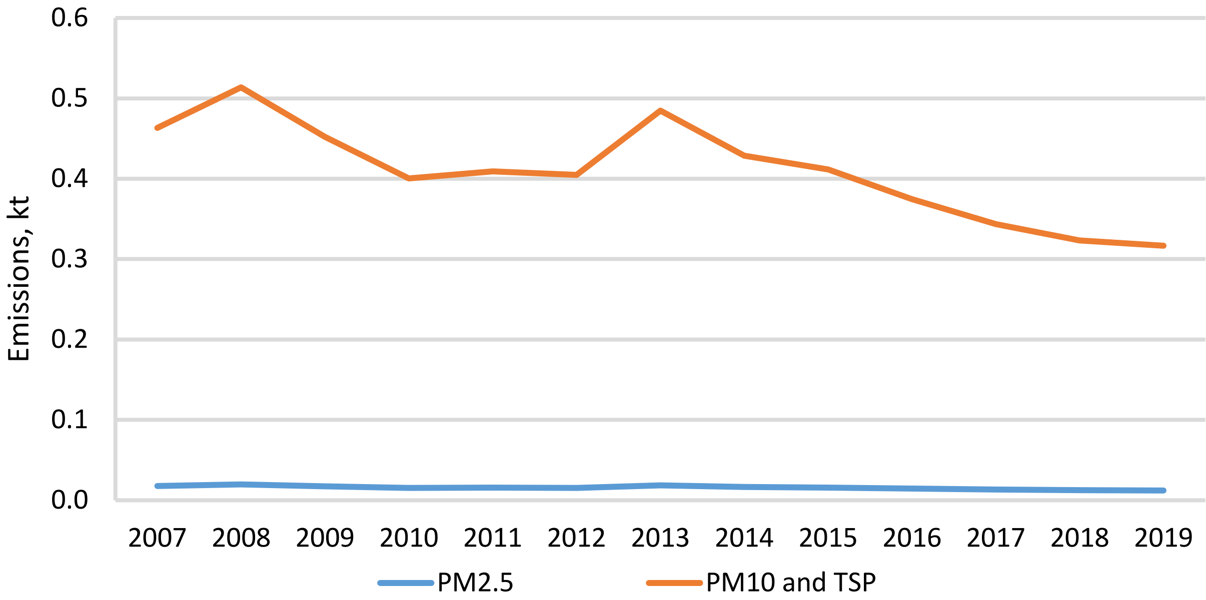

Figure 5.6 Emissions from farm-level agricultural operations including storage, handling and transport of agricultural products 2007-2019

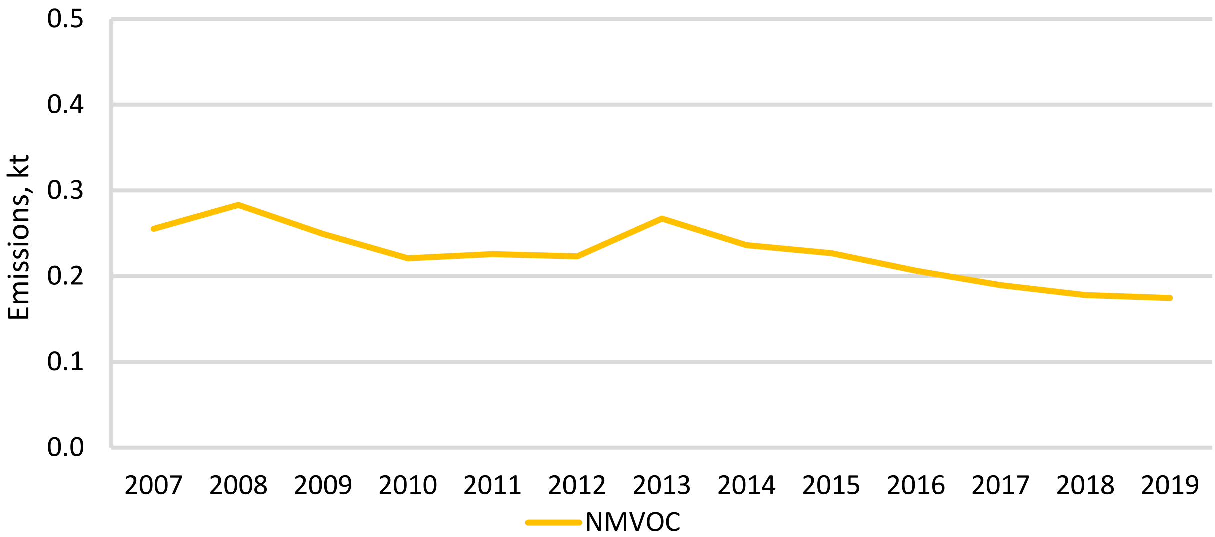

Figure 5.7 Emissions from cultivated crops 2007-2019

Drop of emissions in 2014 is related with recalculations of activity data in agriculture sector by GEOSTAT. Further decrease of NOx emissions in 2017 are resulted by sharp reduction of use of fertilizers.

Methodology

Emissions are calculated using the EMEP/EEA Guidebook – 2019, tier 1 approach.

6. Waste (NFR sector 5)

This sector covers solid waste disposal on land, waste incineration and wastewater handling categories. The biggest polluting category in this sector is solid waste disposal on land from where comes about 99.6% of NMVOC emissions.

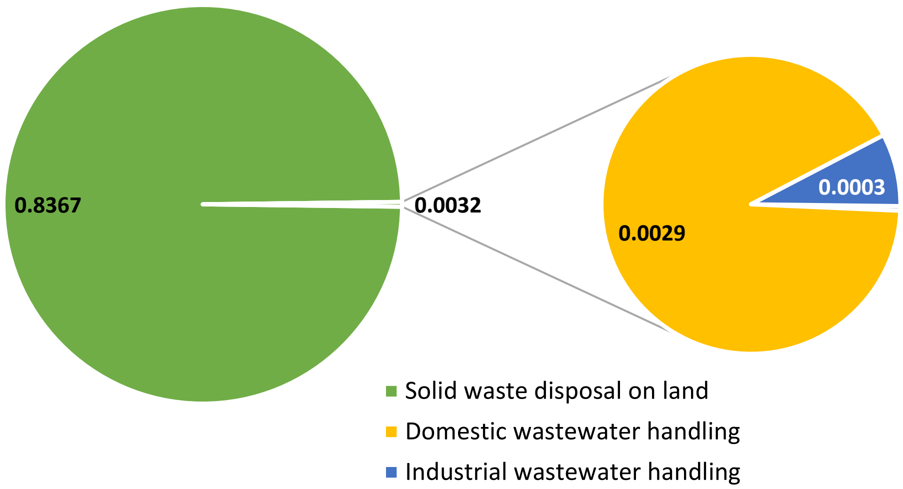

Figure 6.1 Emissions of NMVOC from waste sector in 2019 (kt)

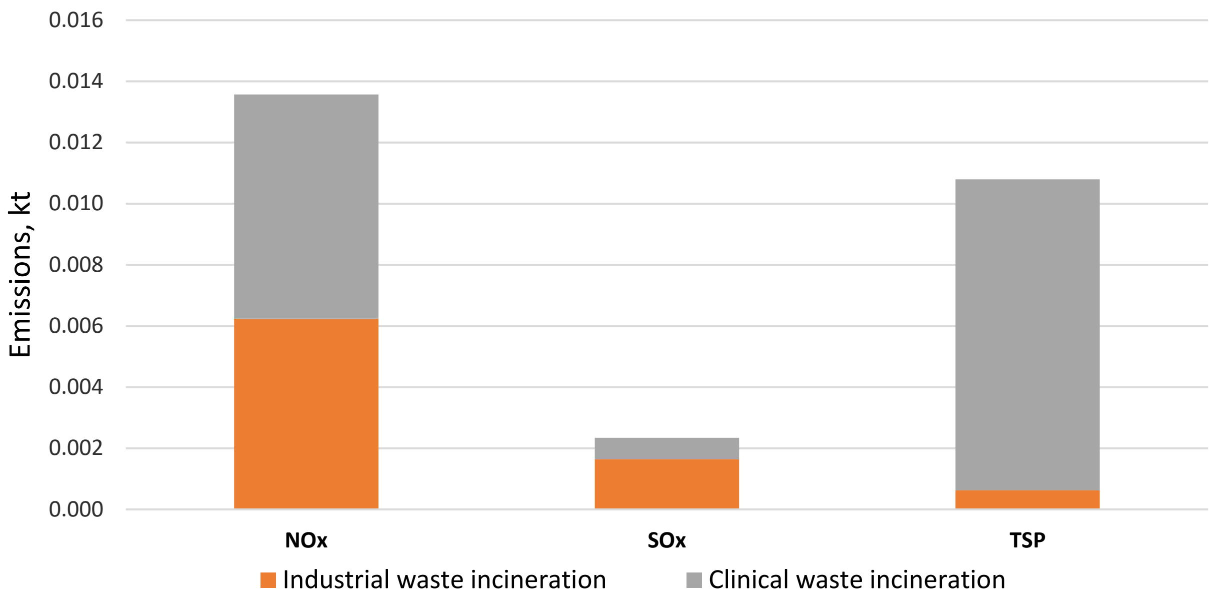

Figure 6.2 Emissions of NOx, SOx and TSP from waste sector in 2019

Solid waste disposal on land (5A)

Source category description

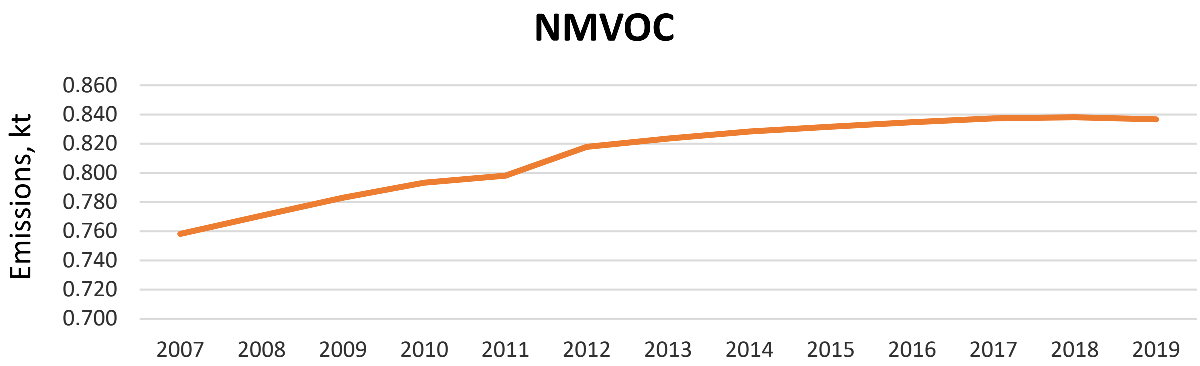

Figure 6.3 Emissions from solid waste disposal on land 2014-2019

In general, emissions of NMVOC from solid waste disposal is rising due to increased accumulation of wastes on landfills.

Methodology

Emissions are calculated using EMEP/EEA Guidebook – 2019, Tier 1 approach. Data on CH_4 emissions from solid waste disposal on land were obtained from Georgia's Biennial Update Reports (BUR) to the UNFCCC. Emissions for 2018-2019 were extrapolated, since data on CH_4 emissions in BUR is available until 2018.

Waste incineration (5C)

Source category description

This category includes industrial waste incineration and clinical waste incineration. Due to lack of activity data emissions from this category were estimated only from 2013.

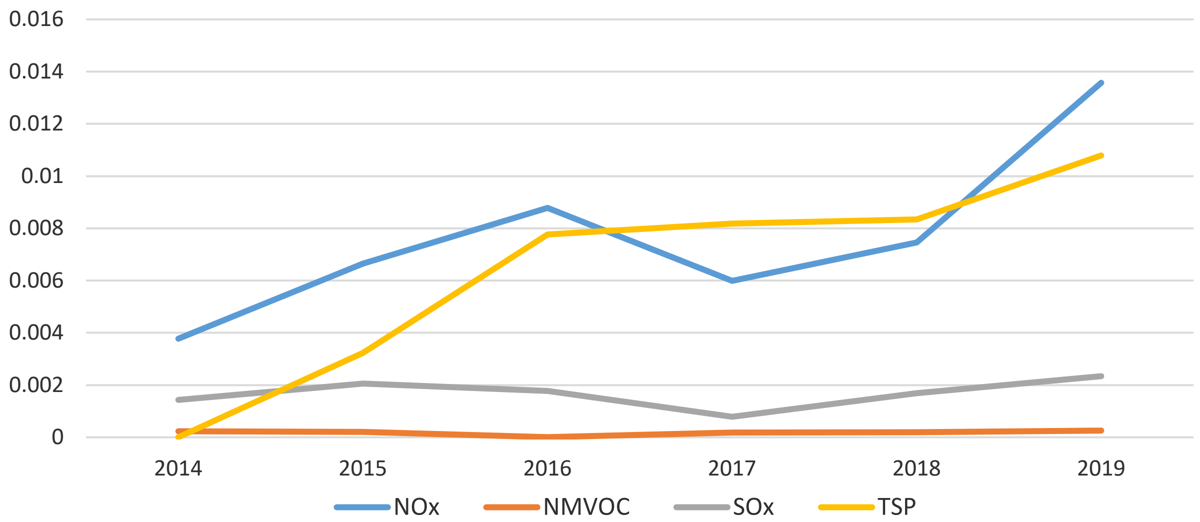

Figure 6.4 Emissions from waste incineration 2014-2019

Increased emissions from 2015 is resulted by installing of new incinerators and consequently, increased amount of waste incinerated.

Methodology

Emissions are estimated based on plant specific emissions (from state reporting system for stationary sources).

Wastewater handling (5D)

Source category description

This category covers industrial domestic wastewater handling and industrial wastewater handling.

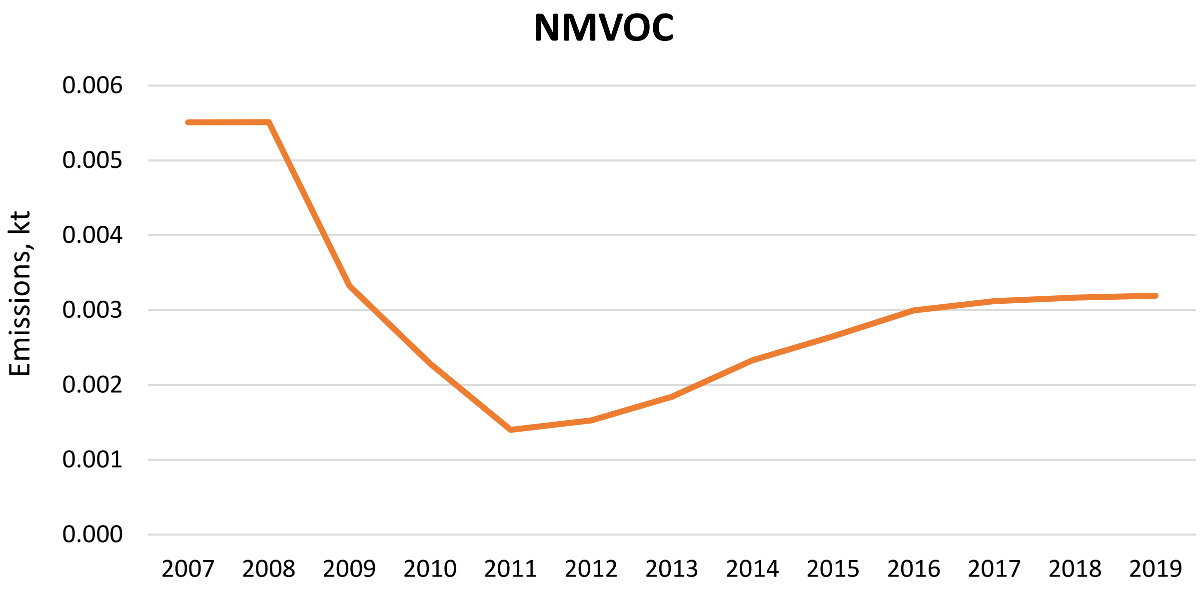

Figure 6.5 Emissions from wastewater handling 2014-2019

Until 2012 wastewater treatment infrastructure in Georgia had been gradually demolished. Since 2012 new WWTPs were built and in parallel, amount of treated wastewater were increased. As a result, emissions of MNVOC from this category start increasing and increased by 130% from 2011 to 2019.

Methodology

Emissions are calculated using EMEP/EEA Guidebook – 2019, Tier 1 approach. Activity data were gained from the Integrated Management Division of MEPA.

7. Recalculations and improvements

Recalculations

In previous submissions emission data was incomplete containing information only from 2007 even for limited categories for 2007-2012. In 2020, in the framework of Swedish International Development Cooperation Agency (SIDA) funded project "Enhancing air quality management capacities in Georgia", Georgia managed to calculate all missing data before 2007 and missing data for 2007-2012 in all category of energy sector.

In order to ensure consistency and comparability of data for trend assessment single approach (mainly Tier 1) were applied for all years. Due to unavailability and low quality of activity data in 1990s for certain categories, advanced approaches were replaced by simple ones (mostly Tier 2 by Tier 1). Also, sources for activity data were changed in energy sector and energy consumption data from International Energy Agency were applied for some categories. For these reasons emissions from subcategories 1A1a, 1A2a, 1A2d, 1A2e, 1A2f (also partially due to replacing national methodology by Tier 2 approach to calculate emissions from combustion for gypsum production), 1A3b, 1A3dii, 1A4bi, 1B2av (2007-2012), 2A3, 2B10a, 2D3b were recalculated.

SOx emissions in 1A3c were recalculated for all years presented in previous submissions due to differentiation and specification of sulphur content in gas oil and fuel oil.

Once subcategories within 1A2 were calculated for 2007-2012, emission data in 1A2gviii which gave sum of emissions from stationary combustion in manufacturing industries and construction were nullified and indicated as NA in 1990-2012.

The activity data for 1B1a were taken from a single source – GEOSTAT. Previously it was also taken from state reporting system for stationary sources. Therefore emissions from this category were recalculated in 2007-2018.

Solid fuel transformation does not occur in Georgia since 1998, thereby all emissions were nullified in 1B1b category after 1997.

1B2ai were recalculated in 2007-2018 due to application of international Tier 1 approach instead of national methodology used before.

Due to obtaining information of gas flaring (not occurring in 2006-2014) emissions from 1B2c were estimated for 1990-2005 and 2015-2019.

2A1, 2A2, 2A5a were recalculated in 2007-2018 due to application of international Tier 1 approach instead of national methodology used before.

The activity data for 2A6 were taken from a single source – GEOSTAT. Previously it was also taken from state reporting system for stationary sources. Therefore, emissions from this category were recalculated in 2007-2018.

Due to obtaining information on ammonia and nitric acid production emissions from 2B1 and 2B2 were estimated for all years.
Due to obtaining information on iron and steel production emissions from 2C1 were estimated for 1990-2000 and 2007-2012 (NO in 2001-2006), while it was recalculated for 2013.

2C2 was recalculated for 2010-2018 as a result of application of international Tier 1 approach instead of national methodology and calculated for 1990-2009 due to obtaining relevant activity data.

HCB emissions from 2C3 were corrected in 2013-2018 as it was wrongly estimated before.

PCBs emissions from 2C5 were corrected in 2013-2018 as it was wrongly estimated before.

2H1 was recalculated for 2010-2018 as a result of application of international Tier 1 approach instead of national methodology and calculated for 1990-2009 (NO in 2002-2008) due to obtaining relevant activity data.

2H2 and 2I were recalculated for 2007-2018 due to switching to international Tier 2 approach from national methodology used before and calculated for 1990-2006 due to obtaining relevant activity data.

3B4e was calculated and NH_3 emissions from 3Da2a and 3Da3 were recalculated due to obtaining yearly data on population of horses in Georgia for 2007-2018.

5A was recalculated due to recalculations of CH_4 emissions under Georgia's Biennial Update Report (BUR) to the UNFCCC.

Emissions from 5C1bi in 2017 were recalculated because activity data was incorrectly taken from one of the incinerator which did not conduct waste incineration at that time and performed other activity instead.

Planned improvements

For the next year, it is planned to calculate emissions from aviation and recalculate emissions from road transport using more modern software tool COPERT 5.

8. IIR References

1. Mareckova, K.; Wankmüller, R.; Moosmann, L.; Pinterits, M.; Tista, M. Inventory Review 2014. Review of emission data reported under the LRTAP Convention and NEC Directive. Stage 1 and Review. Status of gridded and LPS data. Technical Report CEIP 2014/1. http://www.ceip.at/review_proces_intro/review_reports/;

2. UNECE, 2014. Guidelines for Reporting Emission Data under the Convention on Long-range Transboundary Air Pollution (ECE/EB.AIR/125);

3. Annexes to UNECE reporting guidelines (ECE/EB.AIR/125) http://www.ceip.at/fileadmin/inhalte/emep/2014_Guidelines/Annexes_revised_140417.zip

4. UNECE, 2013. Decision 2013/4 reporting of emissions and projections data under the Convention and its protocols in force (ECE/EB.AIR/122/Add.1.);

5. # 435 Order of the Government on instrumental method for determination of actual amounts of emissions into ambient air from stationary pollution source, standard list of emission measuring equipment, and methodology for calculation of actual amounts of emissions into ambient air from stationary pollution source according to technological processes (31/12/13);

6. EMEP/EEA air pollutant emission inventory guidebook – 2019: http://www.eea.europa.eu/publications/emep-eea-guidebook-2019;

7. Energy Balance of Georgia, 2013;
8. Energy Balance of Georgia, 2014;
9. Energy Balance of Georgia, 2015;
10. Energy Balance of Georgia, 2016;
11. Energy Balance of Georgia, 2017;
12. Energy Balance of Georgia, 2018;
13. Energy Balance of Georgia, 2019;
14. AGRICULTURE OF GEORGIA - Statistical Publications 2007;
15. AGRICULTURE OF GEORGIA - Statistical Publications 2008;
16. AGRICULTURE OF GEORGIA - Statistical Publications 2009;
17. AGRICULTURE OF GEORGIA - Statistical Publications 2010;
18. AGRICULTURE OF GEORGIA - Statistical Publications 2011;
19. AGRICULTURE OF GEORGIA - Statistical Publications 2012;
20. AGRICULTURE OF GEORGIA - Statistical Publications 2013;
21. AGRICULTURE OF GEORGIA - Statistical Publications 2014;
22. AGRICULTURE OF GEORGIA - Statistical Publications 2015;
23. AGRICULTURE OF GEORGIA - Statistical Publications 2016;
24. AGRICULTURE OF GEORGIA - Statistical Publications 2017;
25. AGRICULTURE OF GEORGIA - Statistical Publications 2018.
26. AGRICULTURE OF GEORGIA - Statistical Publications 2019.
27. International Energy Agency, Energy data and statistics: https://www.iea.org/data-and-statistics/data-browser?country=WORLD&fuel=Energy%20supply&indicator=TPESbySource
28. Georgia's 2nd Biennial Update Report: https://unfccc.int/sites/default/files/resource/2019.06.13_BUR2_2019_Eng.pdf