



2022

INFORMATIVE INVENTORY REPORT OF GEORGIA 1990-2020

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
NH ₃	– Ammonia
Ni	– Nickel
NMVOC	– Non-methane volatile organic compounds
NO ₂	– Nitrogen dioxide
NO _x	– 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
SO _x	– Sulphur oxides, all sulphur compounds expressed as sulphur dioxide
TSP	– Total suspended particulates
Zn	– Zinc

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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 NO_x, NMVOC, SO₂, NH₃, PM_{2.5}, PM₁₀, TSP, BC, 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 period from 1990 to 2020.

The pollutants reported by Georgia show the following trends:

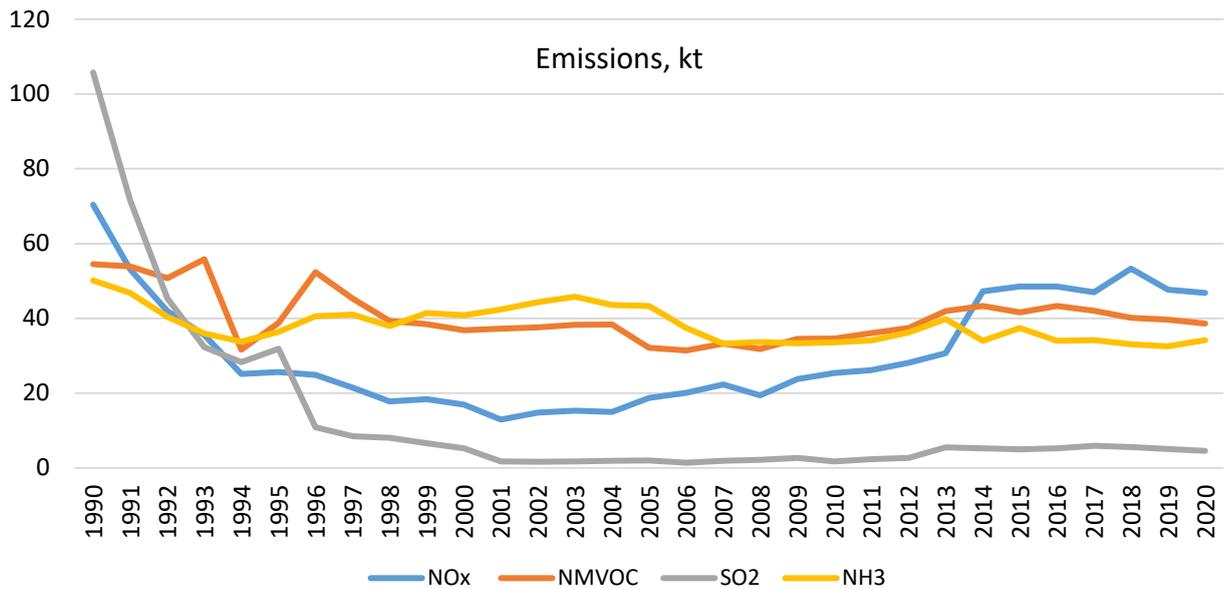


Figure 1.1 Trends of main pollutants, 1990-2020

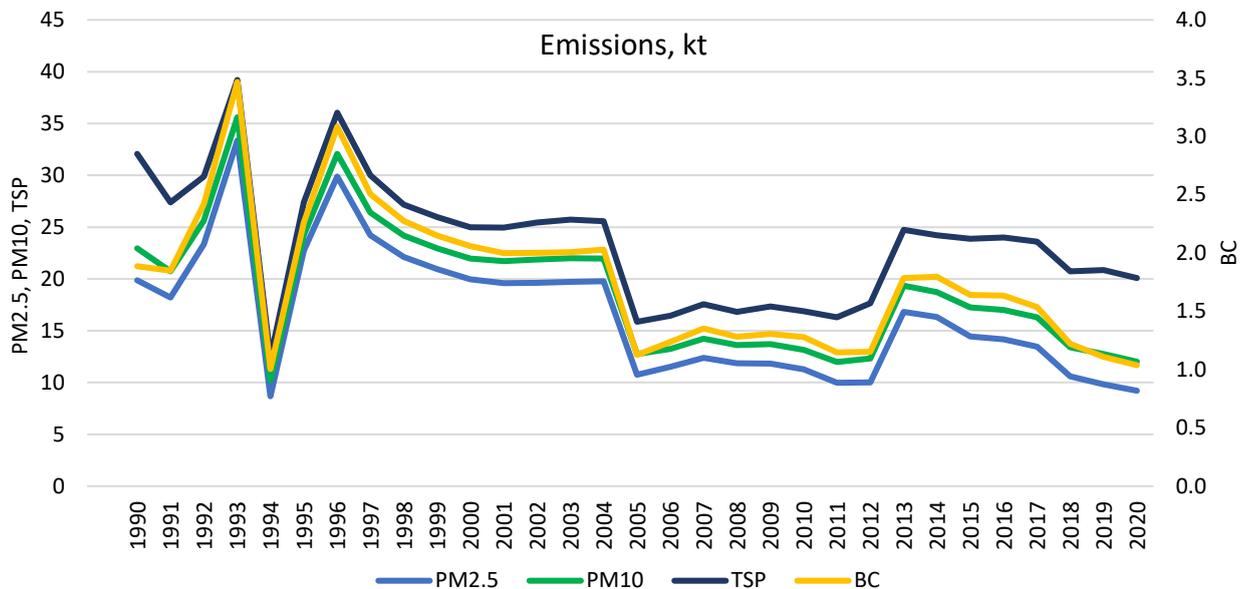


Figure 1.2 Trends of particulate matters, 1990-2020

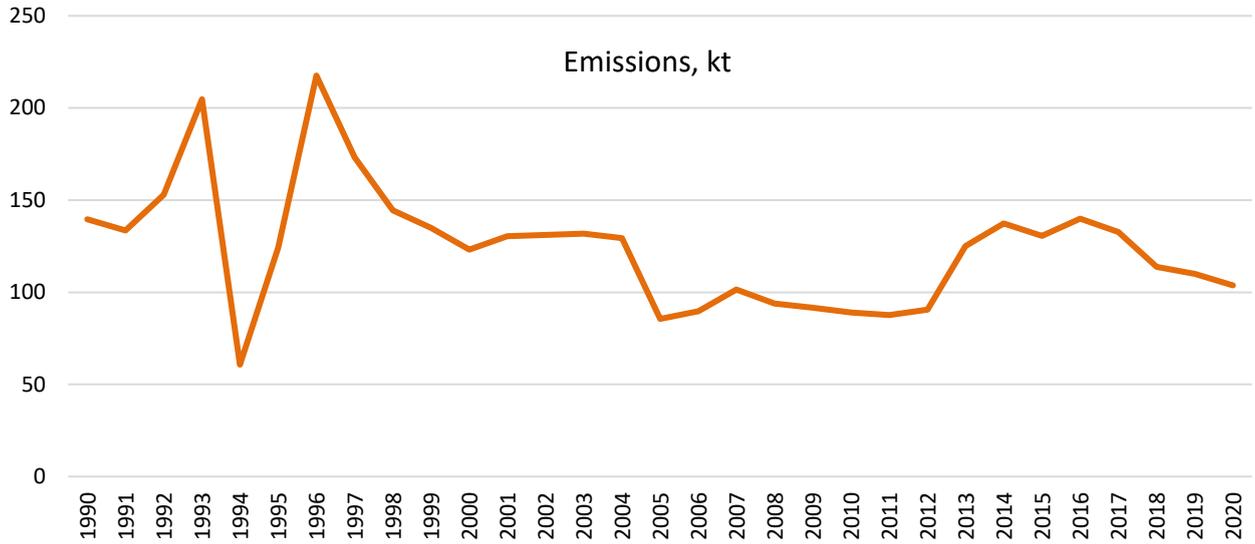


Figure 1.3 Trend of Carbon Monoxide, 1990-2020

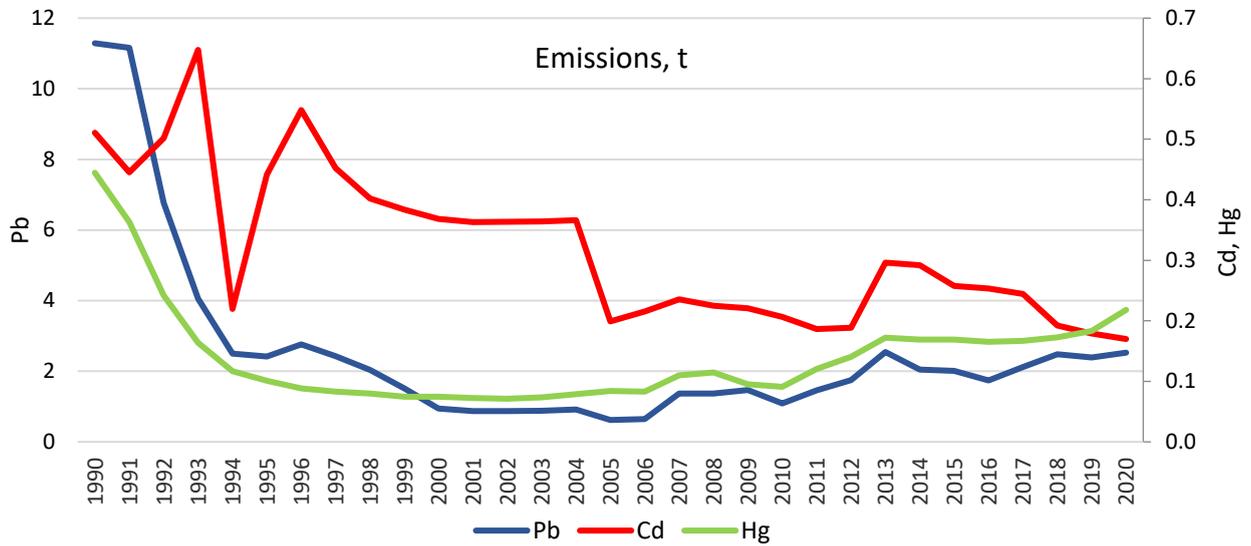


Figure 1.4 Trends of priority heavy metals, 1990-2020

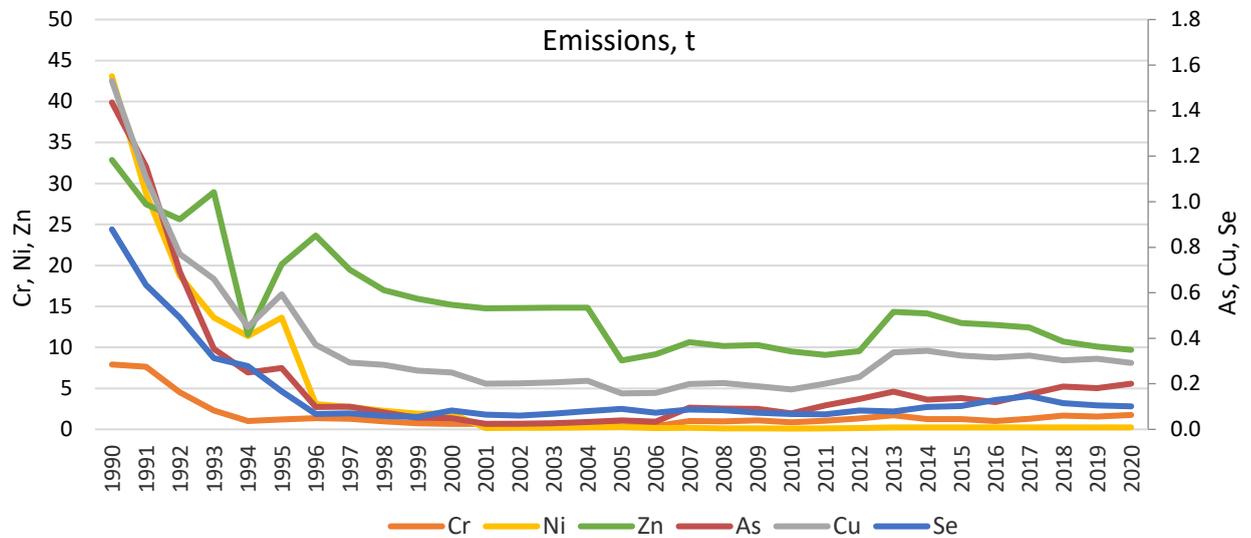


Figure 1.5 Trends of additional heavy metals, 1990-2020

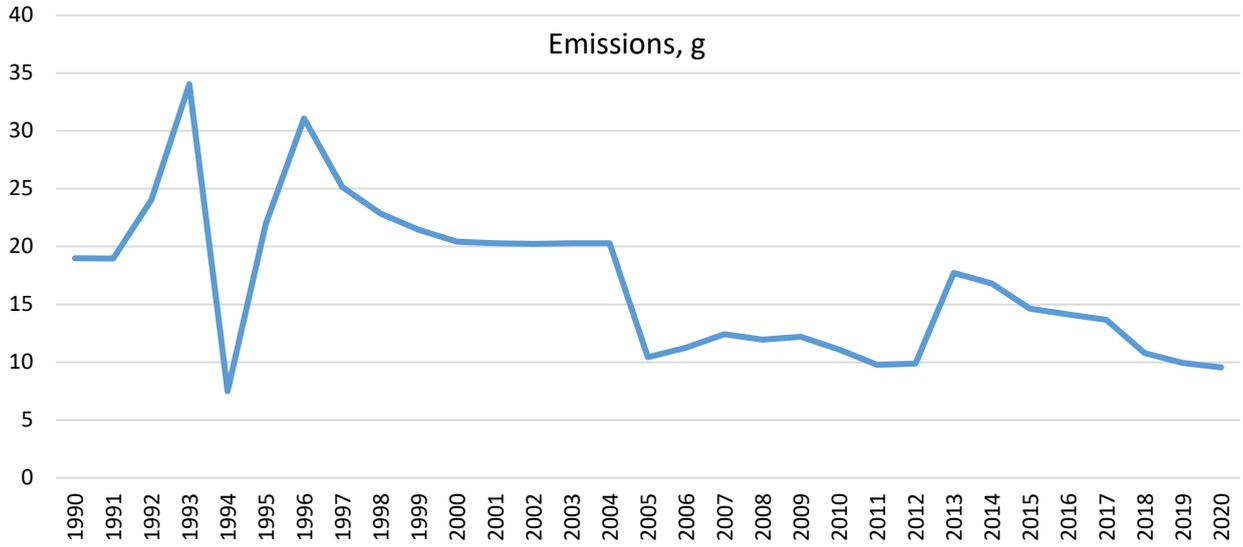


Figure 1.6 Trend of PCDD/PCDF, 1990-2020

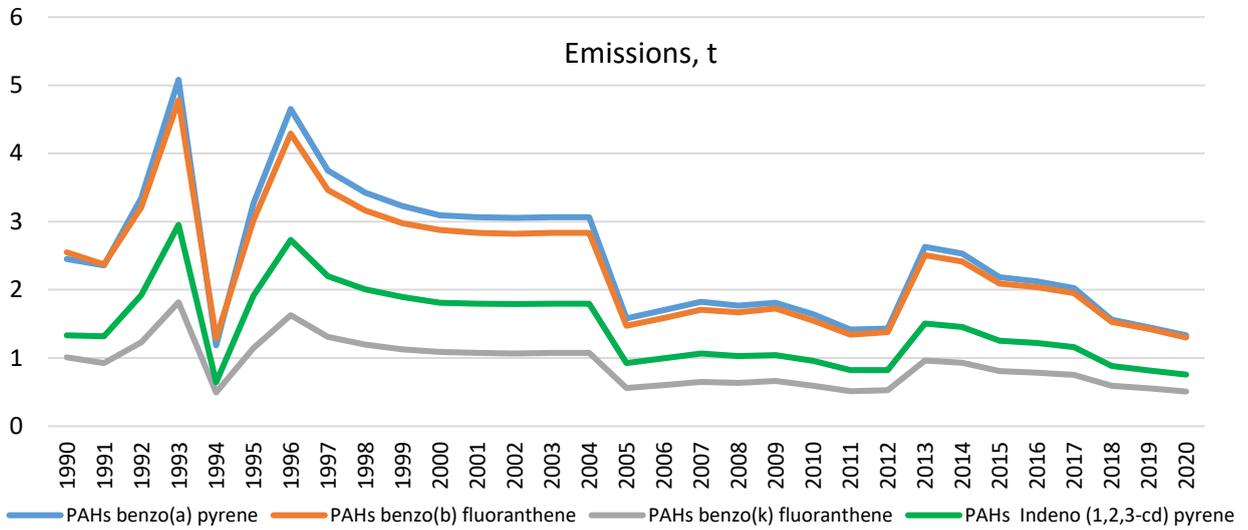


Figure 1.7 Trends of PAHs, 1990-2020

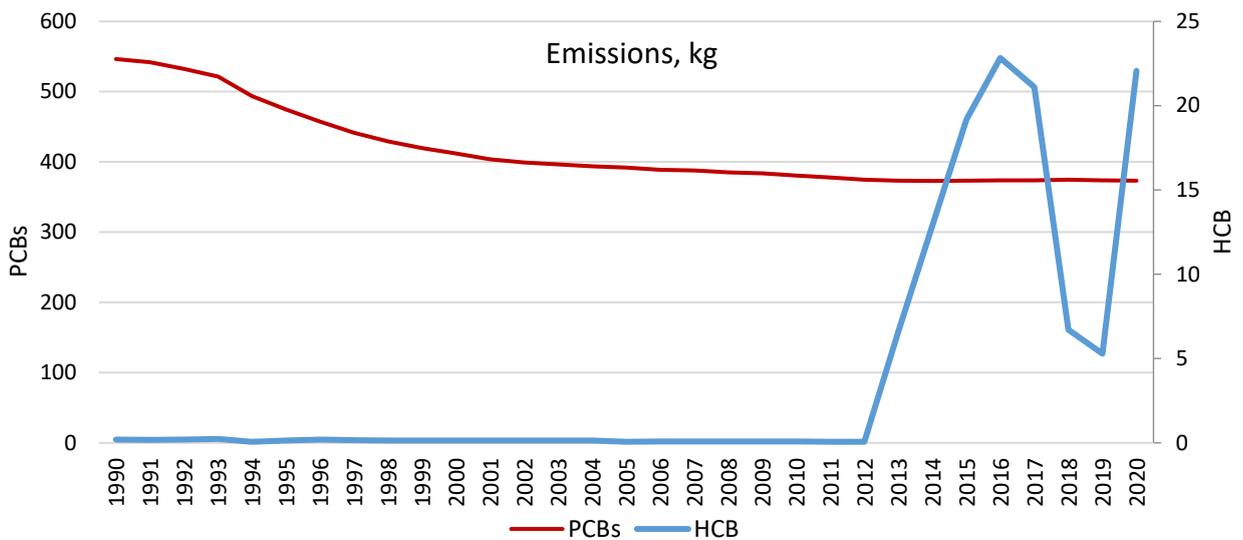


Figure 1.8 Trends of HCB and PCBs, 1990-2020

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 / 1990-2020					
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.

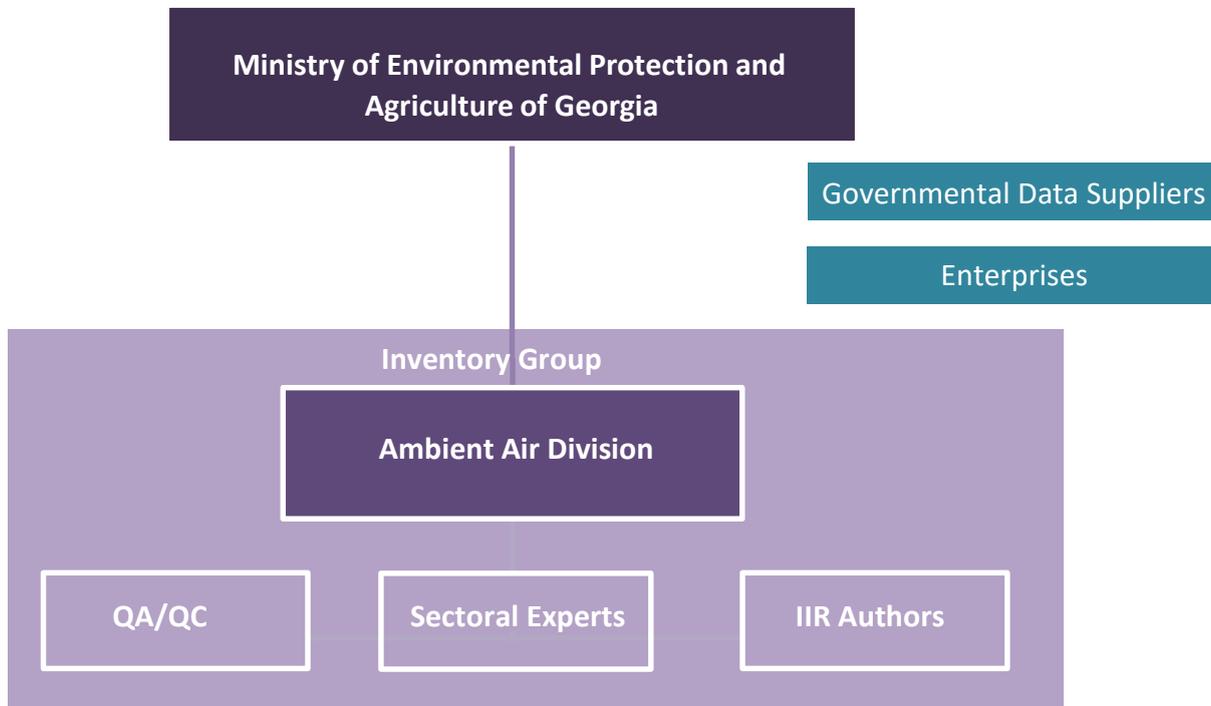


Figure 1.9 Responsibilities for preparing of emission inventory

¹ Except for SO_x

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.

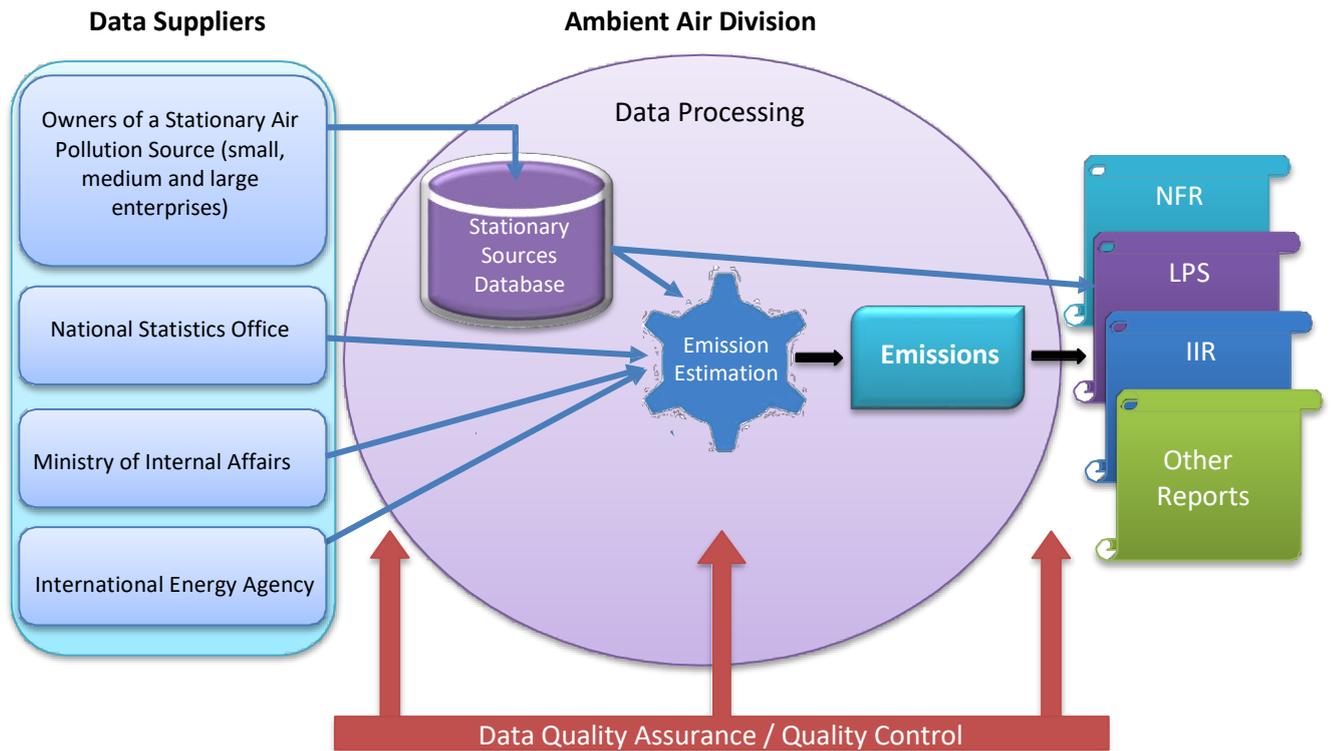


Figure 1.10 Emission inventory structure

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 methodology⁴ 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 – 2019⁵.

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, 1A4ai⁶, 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, 2D3d⁷, 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, 3Da2a⁸, 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 CH₄ 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

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

⁶ Tier 2 methods are applied for Ni

⁷ 1990-2008 have not been estimated due to lack of statistic data

⁸ 1990-2013 have not been estimated due to lack of statistic data

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.

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.

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Table 1.2 Key categories for NO_x emissions for the year 2020

Level Assessment						
NFR Category Code	NFR Category	Latest Year (2020) Estimate [Gg] E _{x,t}		Level Assessment L _{x,t}	Cumulative Total of L _{x,t}	
3Da2a	Animal manure applied to soils	12.530		26.8%	26.8%	
1A3biii	Road transport: Heavy duty vehicles and buses	11.496		24.6%	51.3%	
1A3bi	Road transport: Passenger cars	6.186		13.2%	64.5%	
2B2	Nitric acid production	4.196		9.0%	73.5%	
3Da1	Inorganic N-fertilizers (includes also urea application)	2.711		5.8%	79.3%	
1A4bi	Residential: Stationary	2.534		5.4%	84.7%	
Trend Assessment						
NFR Category Code	NFR Category	Base Year (1990) Estimate [Gg] E _{x,0}	Latest Year (2020) Estimate [Gg] E _{x,t}	Trend Assessment L _{x,t}	% Contribution to the trend	Cumulative Total of L _{x,t}
1A1a	Public electricity and heat production	27.68	1.045	0.558	57.0%	57.0%
1A3biii	Road transport: Heavy duty vehicles and buses	13.02	11.496	0.091	9.3%	66.3%
1A3bi	Road transport: Passenger cars	5.68	6.186	0.077	7.9%	74.2%
1A4ai	Commercial/institutional: Stationary	27.68	1.045	0.558	57.0%	57.0%

Table 1.3 Key categories for NMVOC emissions for the year 2020

Level Assessment						
NFR Category Code	NFR Category	Latest Year (2020) Estimate [Gg] E _{x,t}		Level Assessment L _{x,t}	Cumulative Total of L _{x,t}	
1A3bi	Road transport: Passenger cars	6.755		17.5%	17.5%	
1A4bi	Residential: Stationary	5.768		14.9%	32.4%	
2D3d	Coating applications	5.021		13.0%	45.4%	
2D3a	Domestic solvent use including fungicides	4.460		11.5%	57.0%	
3B1a	Manure management - Dairy cattle	3.628		9.4%	66.4%	
2H2	Food and beverages industry	3.115		8.1%	74.4%	
1A3bv	Road transport: Gasoline evaporation	2.481		6.4%	80.9%	
Trend Assessment						
NFR Category Code	NFR Category	Base Year (1990) Estimate [Gg] E _{x,0}	Latest Year (2020) Estimate [Gg] E _{x,t}	Trend Assessment L _{x,t}	% Contribution to the trend	Cumulative Total of L _{x,t}
2H2	Food and beverages industry	10.03	3.115	0.146	30.6%	30.6%
1A3bi	Road transport: Passenger cars	6.45	6.755	0.080	16.7%	47.3%
1A3bv	Road transport: Gasoline evaporation	1.00	2.481	0.065	13.5%	60.8%
1B1a	Fugitive emission from solid fuels: Coal mining and handling	2.09	0.079	0.051	10.7%	71.6%

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1A4cii	Agriculture/Forestry/Fishing: Off-road vehicles and other machinery	1.70	0.159	0.038	8.0%	79.5%
3B4gii	Manure management - Broilers	2.97	1.1	0.027	5.7%	85.2%

Table 1.4 Key categories for SO_x emissions for the year 2020

Level Assessment						
NFR Category Code	NFR Category	Latest Year (2020) 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	3.413		75.7%	75.7%	
1A2f	Stationary combustion in manufacturing industries and construction: Non-metallic minerals	0.726		16.1%	91.8%	
Trend Assessment						
NFR Category Code	NFR Category	Base Year (1990) Estimate [Gg] E _{x,0}	Latest Year (2020) Estimate [Gg] E _{x,t}	Trend Assessment L _{x,t}	% Contribution to the trend	Cumulative Total of L _{x,t}
1A1a	Public electricity and heat production	82.05	0.006	18.158	44.4%	44.4%
1A2a	Stationary combustion in manufacturing industries and construction: Iron and steel	7.55	3.413	16.068	39.3%	83.6%

Table 1.5 Key categories for NH₃ emissions for the year 2020

Level Assessment						
NFR Category Code	NFR Category	Latest Year (2020) Estimate [Gg] E _{x,t}		Level Assessment L _{x,t}	Cumulative Total of L _{x,t}	
3B1a	Manure management - Dairy cattle	8.588		25.2%	25.2%	
3Da2a	Animal manure applied to soils	8.178		24.0%	49.1%	
3Da3	Urine and dung deposited by grazing animals	3.963		11.6%	60.7%	
3B1b	Manure management - Non-dairy cattle	3.230		9.5%	70.2%	
5D1	Domestic wastewater handling	2.968		8.7%	78.9%	
3B4gii	Manure management - Broilers	2.246		6.6%	85.5%	
Trend Assessment						
NFR Category Code	NFR Category	Base Year (1990) Estimate [Gg] E _{x,0}	Latest Year (2020) Estimate [Gg] E _{x,t}	Trend Assessment L _{x,t}	% Contribution to the trend	Cumulative Total of L _{x,t}
3B3	Manure management - Swine	4.87	0.784	0.109	1146.0%	1146.0%

Table 1.6 Key categories for PM_{2.5} emissions for the year 2020

Level Assessment					
NFR Category Code	NFR Category	Latest Year (2020) Estimate [Gg] E _{x,t}		Level Assessment L _{x,t}	Cumulative Total of L _{x,t}

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1A4bi	Residential: Stationary	7.068	76.7%	76.7%
1A2a	Stationary combustion in manufacturing industries and construction: Iron and steel	0.410	4.5%	81.2%

Trend Assessment						
NFR Category Code	NFR Category	Base Year (1990) Estimate [Gg] E _{x,0}	Latest Year (2020) Estimate [Gg] E _{x,t}	Trend Assessment L _{x,t}	% Contribution to the trend	Cumulative Total of L _{x,t}
1A1a	Public electricity and heat production	5.33	0.004	0.577	44.0%	44.0%
1A4bi	Residential: Stationary	10.86	7.068	0.477	36.3%	80.3%

Table 1.7 Key categories for PM10 emissions for the year 2020

Level Assessment				
NFR Category Code	NFR Category	Latest Year (2020) Estimate [Gg] E _{x,t}	Level Assessment L _{x,t}	Cumulative Total of L _{x,t}
1A4bi	Residential: Stationary	7.258	60.4%	60.4%
2A5a	Quarrying and mining of minerals other than coal	0.910	7.6%	68.0%
2A2	Lime production	0.495	4.1%	72.1%
1A2a	Stationary combustion in manufacturing industries and construction: Iron and steel	0.444	3.7%	75.8%
2A1	Cement production	0.361	3.0%	78.8%
3Dc	Farm-level agricultural operations including storage, handling and transport of agricultural products	0.327	2.7%	81.6%

Trend Assessment						
NFR Category Code	NFR Category	Base Year (1990) Estimate [Gg] E _{x,0}	Latest Year (2020) Estimate [Gg] E _{x,t}	Trend Assessment L _{x,t}	% Contribution to the trend	Cumulative Total of L _{x,t}
1A1a	Public electricity and heat production	3.85	0.004	0.320	37.5%	37.5%
1A4bi	Residential: Stationary	11.15	7.258	0.227	26.6%	64.2%
2A2	Lime production	0.44	0.495	0.042	4.9%	69.1%
3Dc	Farm-level agricultural operations including storage, handling and transport of agricultural products	1.09	0.327	0.039	4.6%	73.6%
1A4ai	Commercial/institutional: Stationary	0.44	0.005	0.036	4.2%	77.9%
2A5a	Quarrying and mining of minerals other than coal	1.32	0.0	0.035	4.1%	81.9%

Table 1.8 Key categories for TSP emissions for the year 2020

Level Assessment				
NFR Category Code	NFR Category	Latest Year (2020) Estimate [Gg] E _{x,t}	Level Assessment L _{x,t}	Cumulative Total of L _{x,t}
1A4bi	Residential: Stationary	7.638	38.0%	38.0%

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2A6	Other mineral products (please specify in the IIR)	3.362	16.7%	54.7%
2A5a	Quarrying and mining of minerals other than coal	1.856	9.2%	64.0%
2A2	Lime production	1.210	6.0%	70.0%
3B4gii	Manure management - Broilers	1.148	5.7%	75.7%
3B1a	Manure management - Dairy cattle	0.622	3.1%	78.8%
2D3b	Road paving with asphalt	0.614	3.1%	81.9%

Trend Assessment						
NFR Category Code	NFR Category	Base Year (1990) Estimate [Gg] E _{x,0}	Latest Year (2020) Estimate [Gg] E _{x,t}	Trend Assessment L _{x,t}	% Contribution to the trend	Cumulative Total of L _{x,t}
2A6	Other mineral products (please specify in the IIR)	1.94	3.362	0.171	28.1%	28.1%
1A1a	Public electricity and heat production	3.01	0.004	0.149	24.6%	52.8%
2I	Wood processing	1.32	0.184	0.051	8.4%	61.2%
2A2	Lime production	1.09	1.210	0.042	6.9%	68.1%
3B4gii	Manure management - Broilers	2.50	1.148	0.033	5.5%	73.6%
3Dc	Farm-level agricultural operations including storage, handling and transport of agricultural products	1.09	1.0	0.028	4.7%	78.3%
3B3	Manure management - Swine	0.78	0.4	0.028	4.6%	82.9%

Table 1.9 Key categories for BC emissions for the year 2020

Level Assessment				
NFR Category Code	NFR Category	Latest Year (2020) Estimate [Gg] E _{x,t}	Level Assessment L _{x,t}	Cumulative Total of L _{x,t}
1A4bi	Residential: Stationary	0.705	67.9%	67.9%
1A3biii	Road transport: Heavy duty vehicles and buses	0.172	16.5%	84.4%

Trend Assessment						
NFR Category Code	NFR Category	Base Year (1990) Estimate [Gg] E _{x,0}	Latest Year (2020) 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	0.705	0.196	24.9%	24.9%
1A1a	Public electricity and heat production	0.16	0.000	0.156	19.8%	44.6%
1A4ai	Commercial/institutional: Stationary	0.15	0.000	0.143	18.1%	62.8%
1A3biii	Road transport: Heavy duty vehicles and buses	0.19	0.172	0.113	14.3%	77.1%
1A3bii	Road transport: Light duty vehicles	0.10	0.086	0.057	7.2%	84.3%

Table 1.10 Key categories for CO emissions for the year 2020

Level Assessment

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NFR Category Code	NFR Category	Latest Year (2020) Estimate [Gg] E _{x,t}	Level Assessment L _{x,t}	Cumulative Total of L _{x,t}		
1A3bi	Road transport: Passenger cars	54.063	52.1%	52.1%		
1A4bi	Residential: Stationary	39.014	37.6%	89.7%		
Trend Assessment						
NFR Category Code	NFR Category	Base Year (1990) Estimate [Gg] E _{x,0}	Latest Year (2020) Estimate [Gg] E _{x,t}	Trend Assessment L _{x,t}	% Contribution to the trend	Cumulative Total of L _{x,t}
1A3bi	Road transport: Passenger cars	53.59	54.063	0.185	44.1%	44.1%
1A4bi	Residential: Stationary	61.16	39.014	0.083	19.9%	64.1%
1A4cii	Agriculture/Forestry/Fishing: Off-road vehicles and other machinery	4.75	0.447	0.040	9.6%	73.6%
1A2a	Stationary combustion in manufacturing industries and construction: Iron and steel	8.01	3.552	0.031	7.4%	81.1%

Table 1.11 Key categories for Pb emissions for the year 2020

Level Assessment						
NFR Category Code	NFR Category	Latest Year (2020) Estimate [Gg] E _{x,t}	Level Assessment L _{x,t}	Cumulative Total of L _{x,t}		
2C1	Iron and steel production	1.415	56.1%	56.1%		
1A2a	Stationary combustion in manufacturing industries and construction: Iron and steel	0.508	20.1%	76.3%		
1A4bi	Residential: Stationary	0.256	10.2%	86.4%		
Trend Assessment						
NFR Category Code	NFR Category	Base Year (1990) Estimate [Gg] E _{x,0}	Latest Year (2020) 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	1.12	0.508	0.459	22.9%	22.9%
1A4cii	Agriculture/Forestry/Fishing: Off-road vehicles and other machinery	0.97	0.008	0.373	18.6%	41.5%
1A1a	Public electricity and heat production	0.79	0.000	0.313	15.6%	57.1%
1A4bi	Residential: Stationary	0.44	0.256	0.279	13.9%	71.1%
1A2f	Stationary combustion in manufacturing industries and construction: Non-metallic minerals	0.09	0.151	0.234	11.7%	82.7%

Table 1.12 Key categories for Cd emissions for the year 2020

Level Assessment				
NFR Category Code	NFR Category	Latest Year (2020) Estimate [Gg] E _{x,t}	Level Assessment L _{x,t}	Cumulative Total of L _{x,t}

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1A4bi	Residential: Stationary	0.123	72.6%	72.6%		
1A2f	Stationary combustion in manufacturing industries and construction: Non-metallic minerals	0.012	7.3%	79.8%		
2A3	Glass production	0.007	4.1%	83.9%		
Trend Assessment						
NFR Category Code	NFR Category	Base Year (1990) Estimate [Gg] E _{x,0}	Latest Year (2020) Estimate [Gg] E _{x,t}	Trend Assessment L _{x,t}	% Contribution to the trend	Cumulative Total of L _{x,t}
1A1a	Public electricity and heat production	0.20	0.000	1.166	41.0%	41.0%
1A4bi	Residential: Stationary	0.19	0.123	1.080	38.0%	79.0%
1A2f	Stationary combustion in manufacturing industries and construction: Non-metallic minerals	0.01	0.012	0.176	6.2%	85.2%

Table 1.13 Key categories for Hg emissions for the year 2020

Level Assessment						
NFR Category Code	NFR Category	Latest Year (2020) 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	0.076	38.1%	38.1%		
2K	Consumption of POPs and heavy metals (e.g. electrical and scientific equipment)	0.037	18.7%	56.9%		
2C1	Iron and steel production	0.031	15.5%	72.4%		
1A2a	Stationary combustion in manufacturing industries and construction: Iron and steel	0.030	15.3%	87.7%		
Trend Assessment						
NFR Category Code	NFR Category	Base Year (1990) Estimate [Gg] E _{x,0}	Latest Year (2020) 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	0.076	0.634	37.7%	37.7%
2C1	Iron and steel production	0.15	0.031	0.392	23.3%	61.0%
1A1a	Public electricity and heat production	0.08	0.002	0.369	21.9%	83.0%

Table 1.14 Key categories for As emissions for the year 2020

Level Assessment				
NFR Category Code	NFR Category	Latest Year (2020) Estimate [Gg] E _{x,t}	Level Assessment L _{x,t}	Cumulative Total of L _{x,t}
2C1	Iron and steel production	0.123	61.2%	61.2%
1A2f	Stationary combustion in manufacturing industries and construction: Non-metallic minerals	0.041	20.3%	81.6%

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Trend Assessment						
NFR Category Code	NFR Category	Base Year (1990) Estimate [Gg] E _{x,0}	Latest Year (2020) Estimate [Gg] E _{x,t}	Trend Assessment L _{x,t}	% Contribution to the trend	Cumulative Total of L _{x,t}
1A1a	Public electricity and heat production	0.71	0.003	3.423	48.8%	48.8%
2C1	Iron and steel production	0.59	0.123	1.456	20.7%	69.5%
1A2f	Stationary combustion in manufacturing industries and construction: Non-metallic minerals	0.02	0.041	1.336	19.0%	88.5%

Table 1.15 Key categories for Cr emissions for the year 2020

Level Assessment				
NFR Category Code	NFR Category	Latest Year (2020) Estimate [Gg] E _{x,t}	Level Assessment L _{x,t}	Cumulative Total of L _{x,t}
2C1	Iron and steel production	1.385	78.8%	78.8%
1A4bi	Residential: Stationary	0.218	12.4%	91.3%

Trend Assessment						
NFR Category Code	NFR Category	Base Year (1990) Estimate [Gg] E _{x,0}	Latest Year (2020) Estimate [Gg] E _{x,t}	Trend Assessment L _{x,t}	% Contribution to the trend	Cumulative Total of L _{x,t}
1A4bi	Residential: Stationary	0.34	0.218	0.369	31.6%	31.6%
1A1a	Public electricity and heat production	0.44	0.000	0.253	21.7%	53.2%
2C1	Iron and steel production	6.60	1.385	0.206	17.6%	70.8%
1A2f	Stationary combustion in manufacturing industries and construction: Non-metallic minerals	0.04	0.063	0.142	12.1%	83.0%

Table 1.16 Key categories for Cu emissions for the year 2020

Level Assessment				
NFR Category Code	NFR Category	Latest Year (2020) 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	0.100	34.2%	34.2%
1A2a	Stationary combustion in manufacturing industries and construction: Iron and steel	0.066	22.7%	57.0%
1A4bi	Residential: Stationary	0.057	19.6%	76.5%
1A3bi	Road transport: Passenger cars	0.026	9.0%	85.5%

Trend Assessment						
NFR Category Code	NFR Category	Base Year (1990) Estimate [Gg] E _{x,0}	Latest Year (2020) Estimate [Gg] E _{x,t}	Trend Assessment L _{x,t}	% Contribution to the trend	Cumulative Total of L _{x,t}
1A1a	Public electricity and heat production	0.91	0.000	3.123	44.5%	44.5%

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1A2f	Stationary combustion in manufacturing industries and construction: Non-metallic minerals	0.06	0.100	1.599	22.8%	67.2%
1A4bi	Residential: Stationary	0.10	0.057	0.694	9.9%	77.1%
1A2a	Stationary combustion in manufacturing industries and construction: Iron and steel	0.15	0.066	0.693	9.9%	87.0%

Table 1.17 Key categories for Ni emissions for the year 2020

Level Assessment						
NFR Category Code	NFR Category	Latest Year (2020) 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	0.076		32.3%	32.3%	
1A2a	Stationary combustion in manufacturing industries and construction: Iron and steel	0.049		21.1%	53.4%	
2C1	Iron and steel production	0.043		18.4%	71.9%	
2A3	Glass production	0.026		11.2%	83.1%	

Trend Assessment						
NFR Category Code	NFR Category	Base Year (1990) Estimate [Gg] E _{x,0}	Latest Year (2020) Estimate [Gg] E _{x,t}	Trend Assessment L _{x,t}	% Contribution to the trend	Cumulative Total of L _{x,t}
1A1a	Public electricity and heat production	39.90	0.000	170.667	47.0%	47.0%
1A2f	Stationary combustion in manufacturing industries and construction: Non-metallic minerals	0.04	0.076	59.438	16.4%	63.4%
1A2a	Stationary combustion in manufacturing industries and construction: Iron and steel	0.11	0.049	38.405	10.6%	74.0%
2C1	Iron and steel production	0.21	0.043	33.090	9.1%	83.1%

Table 1.18 Key categories for Se emissions for the year 2020

Level Assessment						
NFR Category Code	NFR Category	Latest Year (2020) Estimate [Gg] E _{x,t}		Level Assessment L _{x,t}	Cumulative Total of L _{x,t}	
2A3	Glass production	0.043		42.1%	42.1%	
1A2f	Stationary combustion in manufacturing industries and construction: Non-metallic minerals	0.039		38.5%	80.6%	

Trend Assessment						
NFR Category Code	NFR Category	Base Year (1990) Estimate [Gg] E _{x,0}	Latest Year (2020) Estimate [Gg] E _{x,t}	Trend Assessment L _{x,t}	% Contribution to the trend	Cumulative Total of L _{x,t}
1A1a	Public electricity and heat production	0.56	0.000	5.504	47.5%	47.5%

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1A2f	Stationary combustion in manufacturing industries and construction: Non-metallic minerals	0.02	0.039	3.112	26.8%	74.3%
2A3	Glass production	0.16	0.043	2.073	17.9%	92.1%

Table 1.19 Key categories for Zn emissions for the year 2020

Level Assessment						
NFR Category Code	NFR Category	Latest Year (2020) Estimate [Gg] E _{x,t}		Level Assessment L _{x,t}	Cumulative Total of L _{x,t}	
1A4bi	Residential: Stationary	4.857		50.0%	50.0%	
1A3bi	Road transport: Passenger cars	1.378		14.2%	64.2%	
2C1	Iron and steel production	1.231		12.7%	76.8%	
1A2a	Stationary combustion in manufacturing industries and construction: Iron and steel	0.759		7.8%	84.6%	
Trend Assessment						
NFR Category Code	NFR Category	Base Year (1990) Estimate [Gg] E _{x,0}	Latest Year (2020) Estimate [Gg] E _{x,t}	Trend Assessment L _{x,t}	% Contribution to the trend	Cumulative Total of L _{x,t}
1A1a	Public electricity and heat production	13.92	0.000	1.433	41.8%	41.8%
1A4bi	Residential: Stationary	7.44	4.857	0.925	27.0%	68.8%
1A3bi	Road transport: Passenger cars	1.37	1.378	0.339	9.9%	78.7%
1A2f	Stationary combustion in manufacturing industries and construction: Non-metallic minerals	0.38	0.654	0.189	5.5%	84.2%

Table 1.20 Key categories for PCDD/ PCDF emissions for the year 2020

Level Assessment						
NFR Category Code	NFR Category	Latest Year (2020) Estimate [Gg] E _{x,t}		Level Assessment L _{x,t}	Cumulative Total of L _{x,t}	
1A4bi	Residential: Stationary	7.652		80.2%	80.2%	
Trend Assessment						
NFR Category Code	NFR Category	Base Year (1990) Estimate [Gg] E _{x,0}	Latest Year (2020) 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	7.652	0.344	50.9%	50.9%
2C1	Iron and steel production	4.40	0.923	0.269	39.8%	90.7%

Table 1.21 Key categories for benzo(a)pyrene emissions for the year 2020

Level Assessment						
NFR Category Code	NFR Category	Latest Year (2020) Estimate [Gg] E _{x,t}		Level Assessment L _{x,t}	Cumulative Total of L _{x,t}	

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1A4bi	Residential: Stationary	1.148	86.2%	86.2%		
Trend Assessment						
NFR Category Code	NFR Category	Base Year (1990) Estimate [Gg] E _{x,0}	Latest Year (2020) 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	1.148	0.208	66.8%	66.8%
1A2a	Stationary combustion in manufacturing industries and construction: Iron and steel	0.38	0.173	0.047	15.1%	81.9%

Table 1.22 Key categories for benzo(b)fluoranthene emissions for the year 2020

Level Assessment						
NFR Category Code	NFR Category	Latest Year (2020) Estimate [Gg] E _{x,t}	Level Assessment L _{x,t}	Cumulative Total of L _{x,t}		
1A4bi	Residential: Stationary	1.054	80.9%	80.9%		
Trend Assessment						
NFR Category Code	NFR Category	Base Year (1990) Estimate [Gg] E _{x,0}	Latest Year (2020) 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	1.054	0.253	65.7%	65.7%
1A2a	Stationary combustion in manufacturing industries and construction: Iron and steel	0.51	0.226	0.049	12.7%	78.4%
1A4ai	Commercial/institutional: Stationary	0.05	0.000	0.036	9.4%	87.7%

Table 1.23 Key categories for benzo(k)fluoranthene emissions for the year 2020

Level Assessment						
NFR Category Code	NFR Category	Latest Year (2020) Estimate [Gg] E _{x,t}	Level Assessment L _{x,t}	Cumulative Total of L _{x,t}		
1A4bi	Residential: Stationary	0.399	78.7%	78.7%		
1A2a	Stationary combustion in manufacturing industries and construction: Iron and steel	0.091	17.9%	96.6%		
Trend Assessment						
NFR Category Code	NFR Category	Base Year (1990) Estimate [Gg] E _{x,0}	Latest Year (2020) 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	0.399	0.266	66.6%	66.6%
1A2a	Stationary combustion in manufacturing industries and construction: Iron and steel	0.20	0.091	0.037	9.3%	75.9%
1A4ai	Commercial/institutional: Stationary	0.02	0.000	0.034	8.6%	84.5%

Table 1.24 Key categories for Indeno(1,2,3-cd)pyrene emissions for the year 2020

Level Assessment

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NFR Category Code	NFR Category	Latest Year (2020) Estimate [Gg] E _{x,t}	Level Assessment L _{x,t}	Cumulative Total of L _{x,t}		
1A4bi	Residential: Stationary	0.674	89.1%	89.1%		
Trend Assessment						
NFR Category Code	NFR Category	Base Year (1990) Estimate [Gg] E _{x,0}	Latest Year (2020) 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	0.674	0.159	64.2%	64.2%
1A2a	Stationary combustion in manufacturing industries and construction: Iron and steel	0.16	0.071	0.041	16.8%	81.0%

Table 1.25 Key categories for HCB emissions for the year 2020

Level Assessment						
NFR Category Code	NFR Category	Latest Year (2020) Estimate [Gg] E _{x,t}	Level Assessment L _{x,t}	Cumulative Total of L _{x,t}		
2C3	Aluminum production	22.000	99.7%	99.7%		
Trend Assessment						
NFR Category Code	NFR Category	Base Year (1990) Estimate [Gg] E _{x,0}	Latest Year (2020) Estimate [Gg] E _{x,t}	Trend Assessment L _{x,t}	% Contribution to the trend	Cumulative Total of L _{x,t}
1A4bi	Residential: Stationary	0.07	0.047	0.003	53.8%	53.8%
2C1	Iron and steel production	0.04	0.009	0.002	33.0%	86.8%

Table 1.26 Key categories for PCB emissions for the year 2020

Level Assessment						
NFR Category Code	NFR Category	Latest Year (2020) 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)"	371.686	99.6%	99.6%		
Trend Assessment						
NFR Category Code	NFR Category	Base Year (1990) Estimate [Gg] E _{x,0}	Latest Year (2020) 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	371.686	0.008	47.8%	47.8%
2C1	Iron and steel production	3.67	0.769	0.007	38.9%	86.8%

Trend assessment

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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

$\sum_i E_{i,t} - \sum_i E_{i,0}$ = 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 T_x , 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 NO _x and SO _x	
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)	NO _x , NMVOC, SO _x , PMs CO	Emission occur, but have not been estimated due to lack of statistic data
1A3aii(i)	NO _x , NMVOC, SO _x , 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	POPs except for total PAHs	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	SO _x , PCDD/PCDF	
1B2av	SO _x , PCDD/PCDF	
1B2b	SO _x , PCDD/PCDF	
1B2c	NH ₃ , PMs, HMs, PCDD/F, PAHs	
2A1	All except for PMs and PCBs	
2A2	NO _x , NMVOC, SO _x , 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, SO _x , 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	NO _x , SO _x , CO, POPs except for PCBs	
2D3c	NO _x , 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)
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	NO _x , NMVOC, NH ₃ , PM _{2.5} , PM ₁₀ , TSP	Emission occur, but have not been estimated due to lack of statistic data

3Da1	PM _{2.5} , PM ₁₀ , 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	NMVOC, 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	PMs, 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	NO _x , SO _x	1A2a
3B4a	NO _x , NMVOC, NH ₃ , PM _{2.5} , PM ₁₀ , TSP	3B1b
3B4gi	NO _x , 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. Emission trends for main pollutants are presented in figure 2.1.

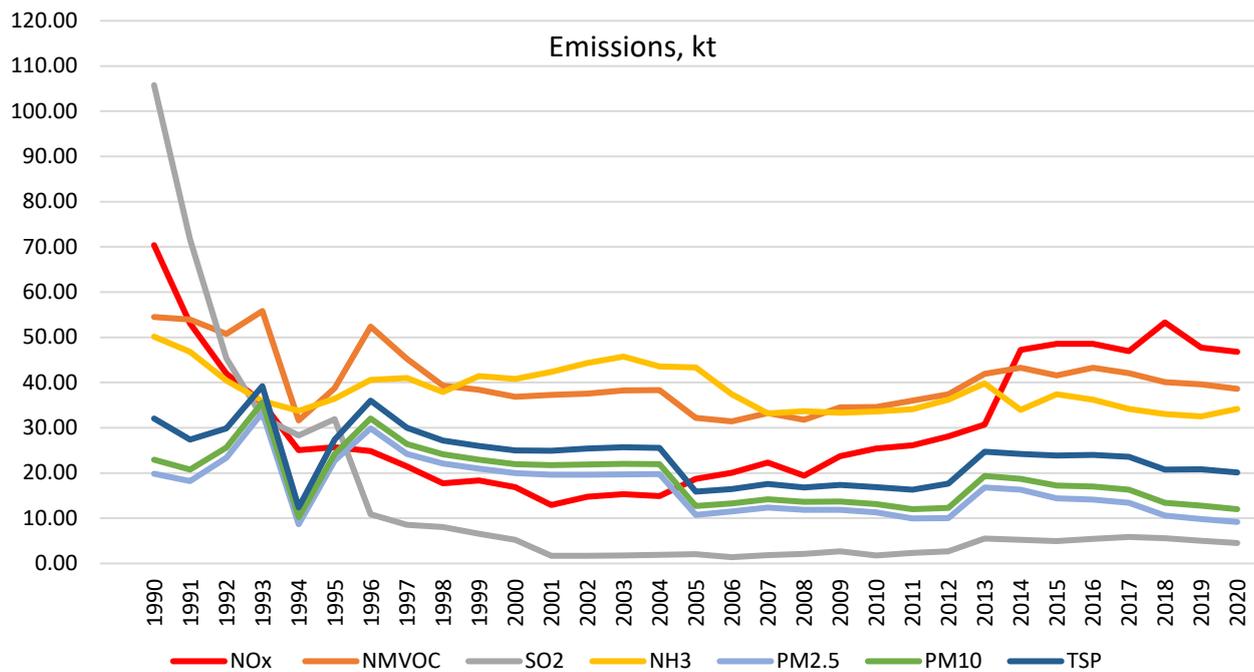


Figure 2.1 Main pollutants, trends over time, 1990-2020.

- 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 NO_x from millennium 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.
- Rise in emissions of NMVOC in 2009 was related to application of paint (coating), for which activity data before 2009 is not available.
- Dramatic rise of SO_x emissions in 2013 was caused by increased consumption of coal for iron and steel production.
- 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 residential stationary combustion compare to the data of the International Energy Agency, which was used for all previous years. While the reduction trend since 2016 is caused by decreased consumption of firewood in households.

Nitrogen Oxides

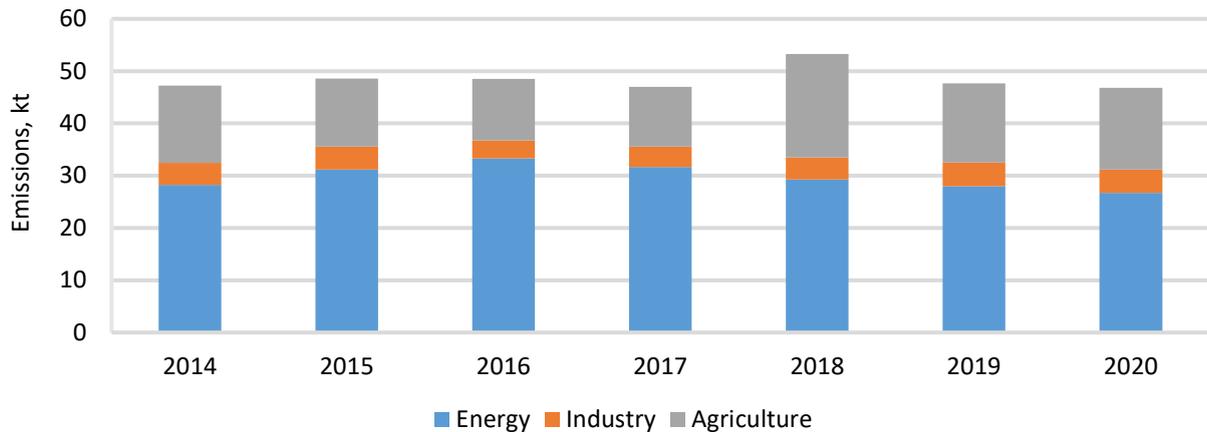


Figure 2.2 Trend of NOx emissions 2014-2020

Energy sector has the biggest share in total NOx emissions (about 57%).

Approximately 41% of total NOx emissions and 72% of energy sector emissions comes from transport. Emissions of NOx from transport have steady decreasing trend since 2016, which is caused by increasing share of new and clean transport types in import of vehicles and in the car fleet as well. The process was supported by increased taxes for the importation of fuel (petrol and diesel) and old cars and by reduction of excise duties for import of cleaner vehicles (electric/hybrid) in 2016-2017.

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 slightly (by 2%) in 2020 compared to previous year mainly due to Covid19 pandemic and its accompanied restrictions that resulted in less emissions from transport sector.

Non-methane volatile compounds

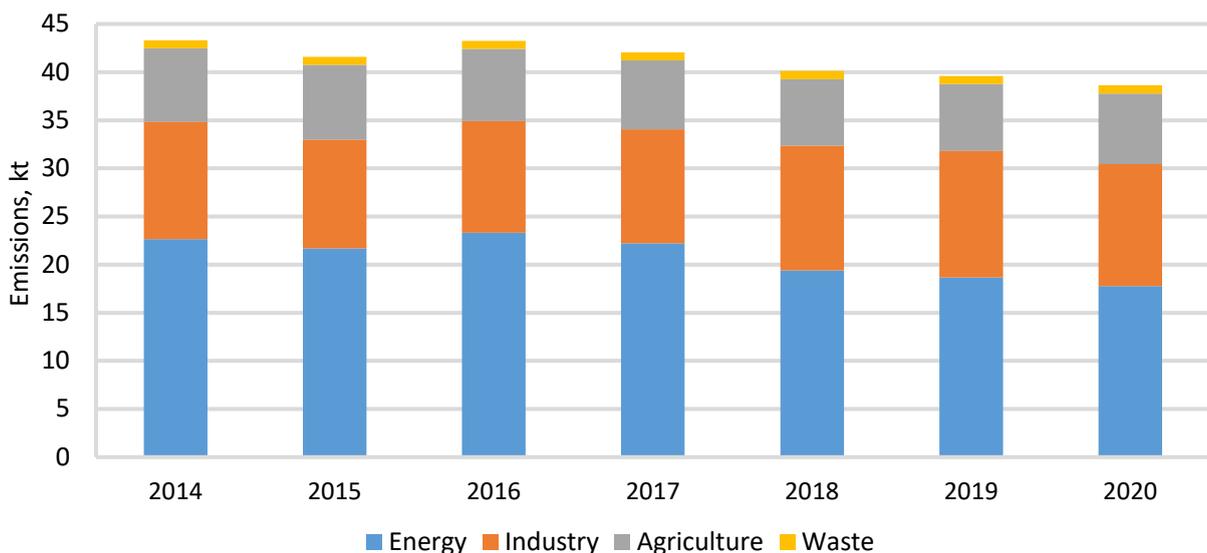


Figure 2.3 Trend of NMVOC emissions 2014-2020

Increased consumption of petrol by passenger cars caused rise in emissions of NMVOC in 2016. Since then emissions have decreased stably by 12% due to reduced emissions in energy sector, in particular reduced consumption of biomass by households. Energy sector is the main source of pollution with NMVOC (about 46%), while road transport within energy sector accounts for 26% of total emissions.

Sulphur Dioxide

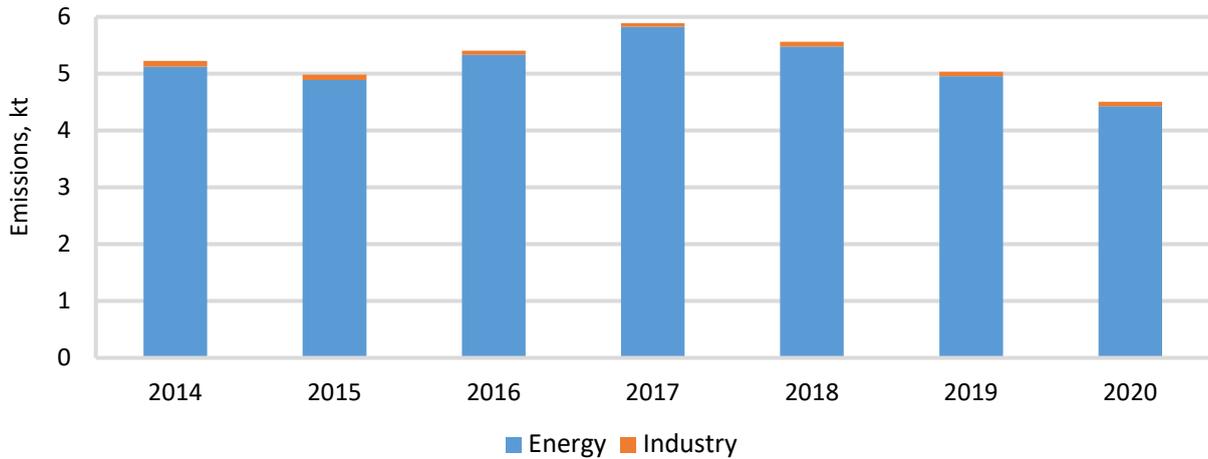


Figure 2.4 Trend of SO₂ emissions 2014-2020

Stationary combustion in manufacturing industries and construction accounted for nearly 93% of SO_x emissions in 2020.

Significant decrease after 2017 (by 32% compare to 2020) was caused by diminished and zero consumption of coal for public electricity and heat production (2018-2020), iron and steel (2020), and food production (2020).

Ammonia

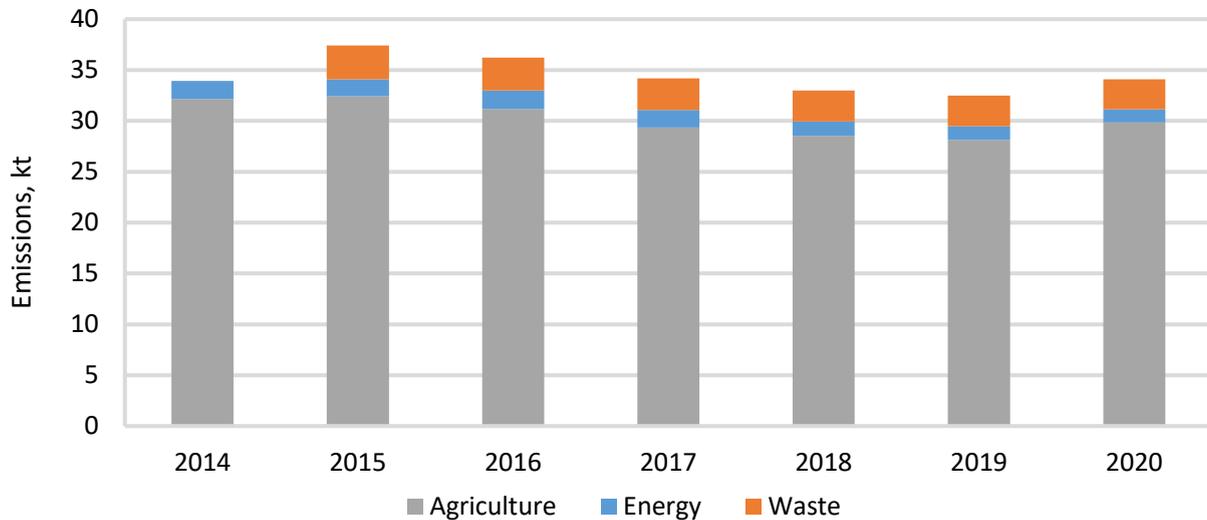


Figure 2.5 Trend of NH₃ emissions 2014-2020

Substantial increase of emissions in 2015 was caused by calculation of NH₃ emissions from domestic wastewater handling which previously was not able due to absence of relevant activity data for past years. Since 2015 NH₃ emissions started decreasing from all sectors and have decreased by 15% in 4-year term. However, emissions from agricultural sector, which accounts for 87% of total NH₃ emissions, increased in 2020 by 6% due to enlarged livestock population size in the sector that resulted in growth of total emissions by 5%.

Particulates

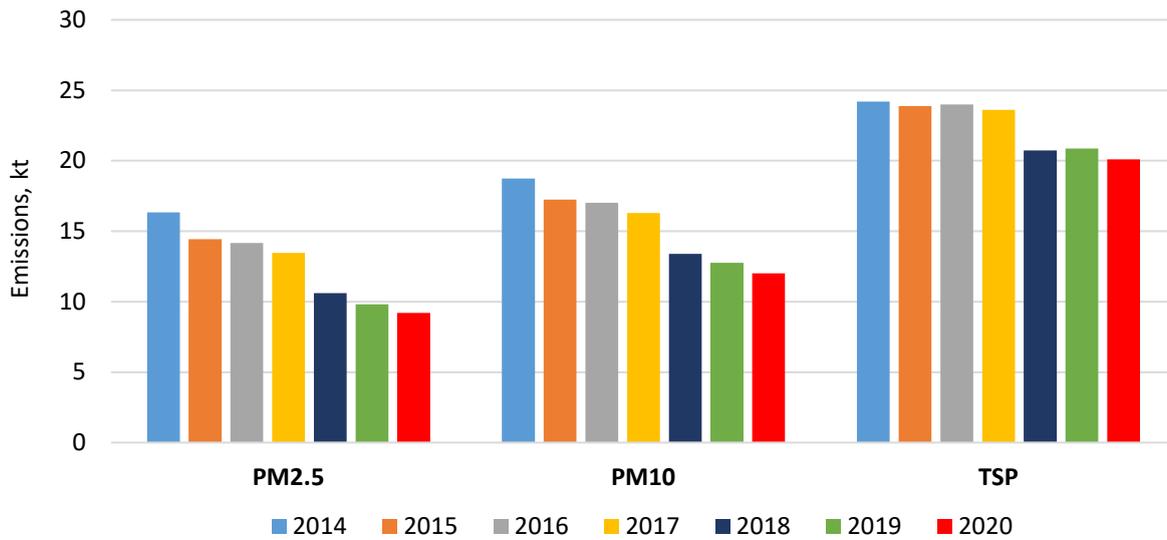


Figure 2.6 Trend of PM2.5, PM10 and TSP emissions 2014-2020

Total emissions of PM2.5 decreased by 44% from 2014 to 2020, PM10 – by 36% and TSP – by 17%. The sharp reduction of particulate matter’s emissions since 2014 was mostly achieved by decreasing biomass consumption in households.

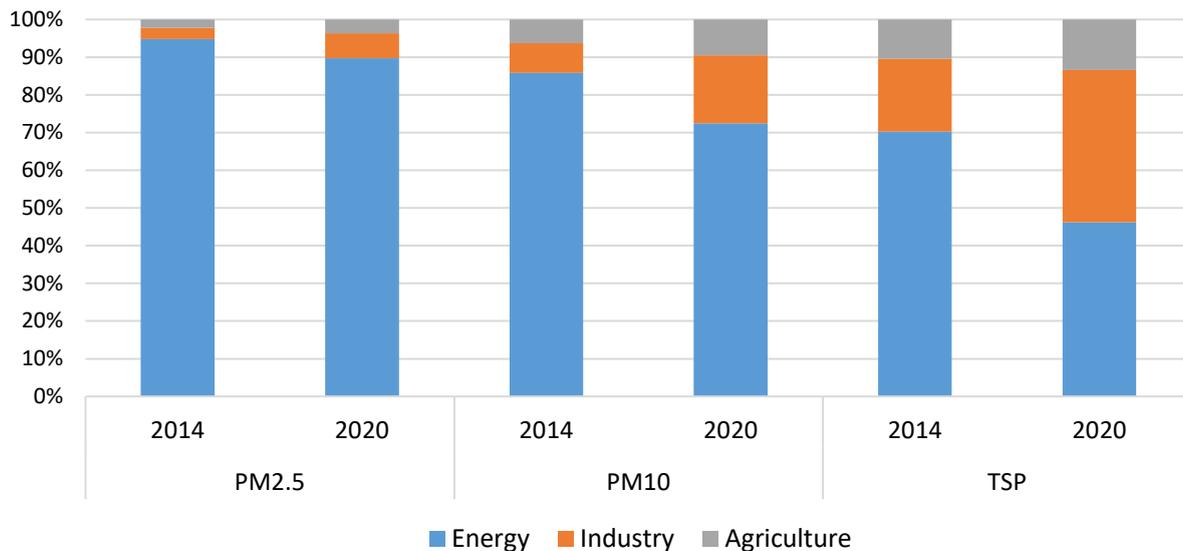


Figure 2.7 Sources of PM2.5, PM10 and TSP emissions in 2014 and 2020

In contrast, PM emissions from industry have rising trend. TSP emissions increased by 74% in 2014-2020 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, 72% of PM10 emissions and 46% of TSP emissions came from energy sector in 2020. Industry is second biggest polluter responsible for about 7% of PM2.5 emissions, 18% of PM10 emissions and 40% of TSP emissions as of 2020. 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

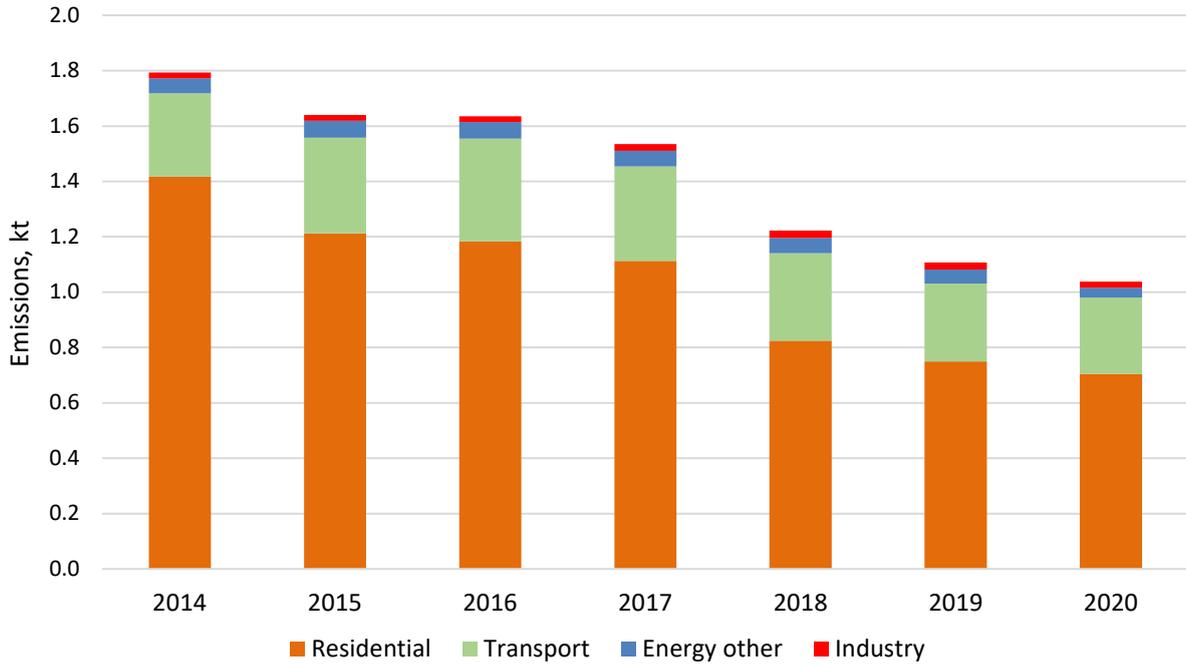


Figure 2.8 Trend of BC emissions 2014-2020

Emissions of BC have decreased since 2014 by 42% 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

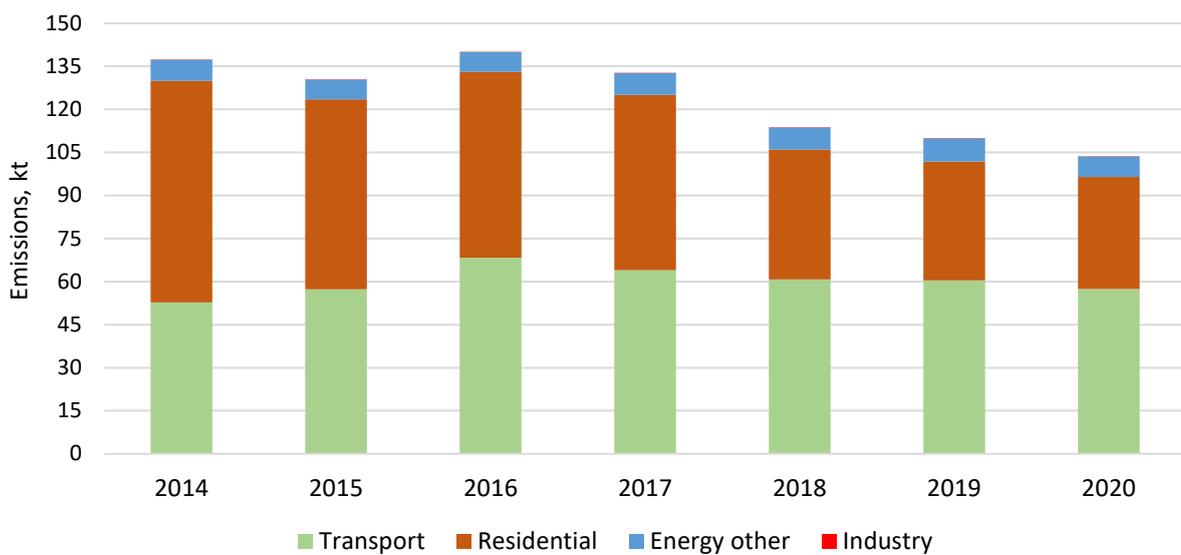


Figure 2.9 Trend of CO emissions 2014-2020

CO emissions were reduced by 25% in 2020 compared to 2014. The reduction of CO emissions was a result of its decreased release from residential sector as emissions from residential combustion have decreased by 49% in 2014-2020. CO emissions from 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 transport and residential combustion sources were 38% and 56%, since that emissions from transport outnumbered emissions from residential sources and by 2020 the shares are following: 55% to 38%.

Priority Heavy Metals

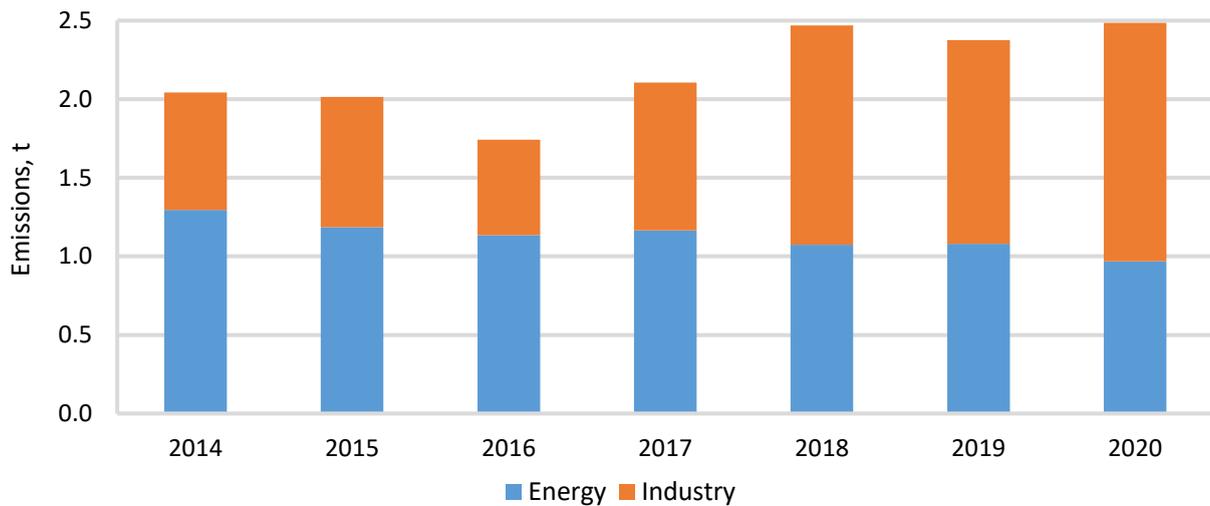


Figure 2.10 Trend of Pb emissions 2014-2020

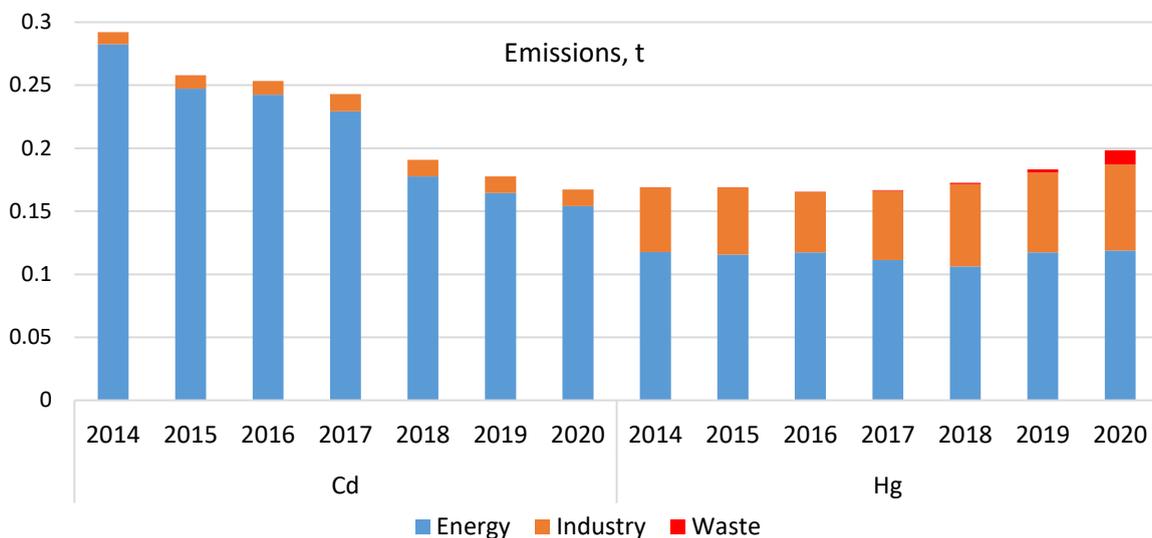


Figure 2.11 Trend of Cd and Hg emissions 2014-2020

There are different trends among priority heavy metals emissions over 7 year period. Pb emissions increased by 23%, Hg emissions increased by 17%, while Cd emissions were reduced by 39%. The main reason for growth of Pb emissions is increased iron and steel production since 2017. Increased Hg emissions in 2017-2019 was caused by rising production of iron and steel in Georgia, while sharp rise in emission in 2020 was further triggered by increased amount of medical waste incinerated. In case of

Cd emissions, reduction was caused by decreased wood consumption in households that triggered shrank of emissions by 50% in 2014-2020.

The main source of Pb emissions is iron and steel production (both combustion and industry sectors) that accounted for 76% of total emissions in 2020. Emissions from energy sector decreased by 25%, while emissions from industry increased by 103% in 2020 compared to 2014.

73% of Cd emissions came from residential stationary combustion in 2020, though the share was even more in 2014 – 85%. Energy sector, mainly combustion in cement and iron and steel production, is a source for 60% of Hg emissions.

Additional Heavy Metals

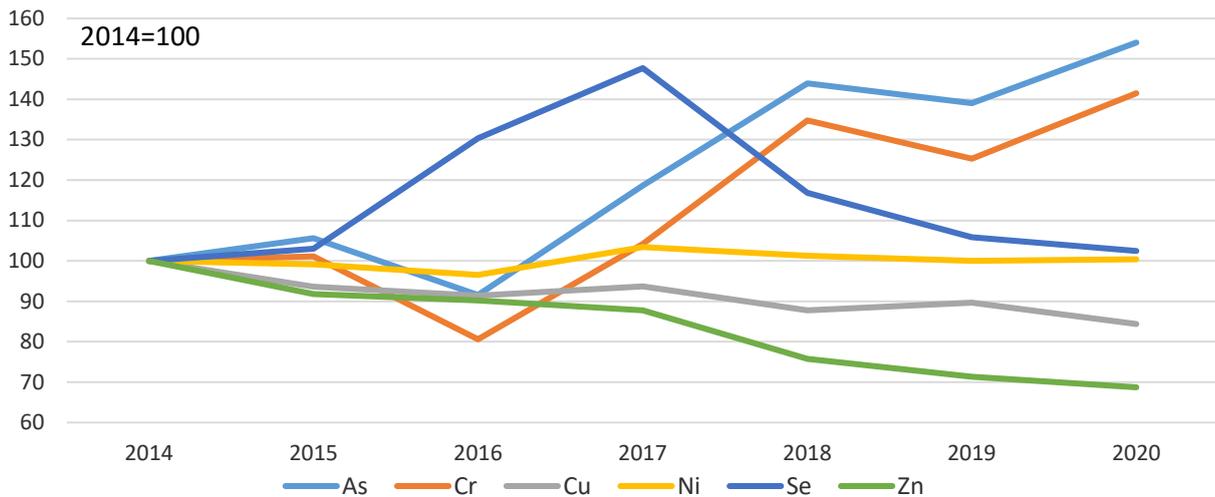


Figure 2.12 Trend of additional heavy metals emissions 2014-2020

In 2020 compared to 2014 emissions of As and Cr increased by 54% and 41% respectively, while emissions of Zn and Cu decreased by 31% and 16%. Emissions of Se have variable trend as it rises in 2015-2017 and reduces in 2018-2020. Ni emissions are stable.

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 consuming coal for public electricity and heat production in 2016-2018.

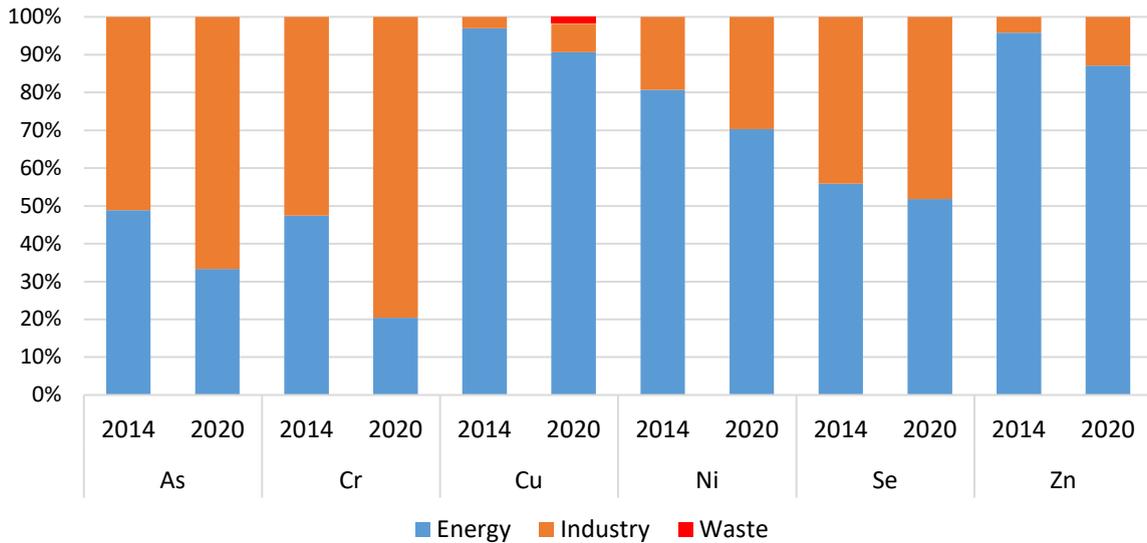


Figure 2.13 Sources of additional heavy metals emissions in 2014 and 2020

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

Dioxins/ Furans

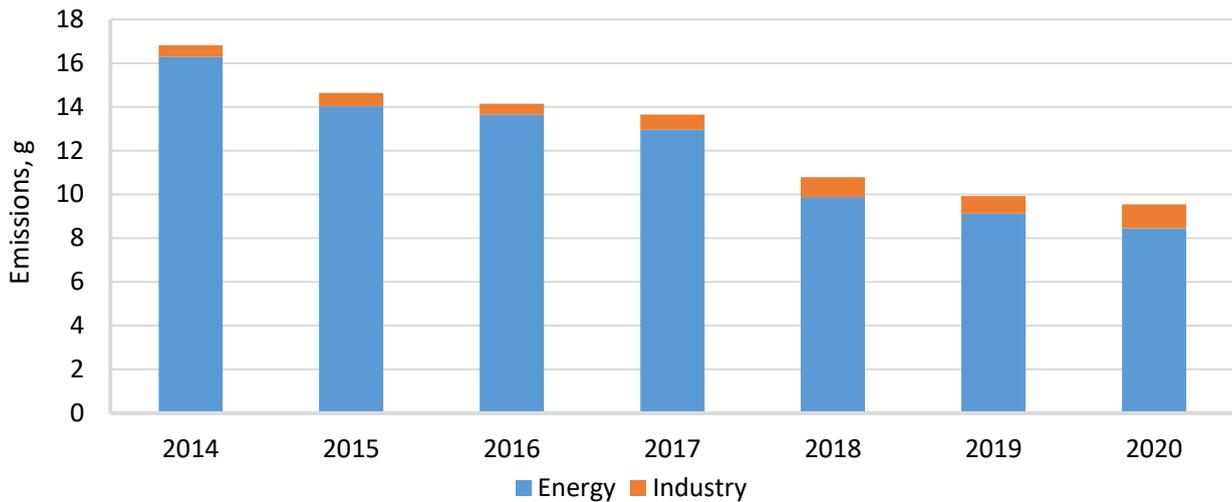


Figure 2.14 Trend of PCDD/ PCDF emissions 2014-2020

PCDD/ PCDF emissions were reduced by 43% in 2020 compared to 2014. The reduction of PCDD/ PCDF emissions was a result of its decreased discharge from residential sector as emissions from residential combustion, which comprise 80% of total emissions as of 2020, have reduced by 50% in 2014-2020. Unlike energy sector, emissions of PCDD/ PCDF from industry have increasing trend as it increased by 108% 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

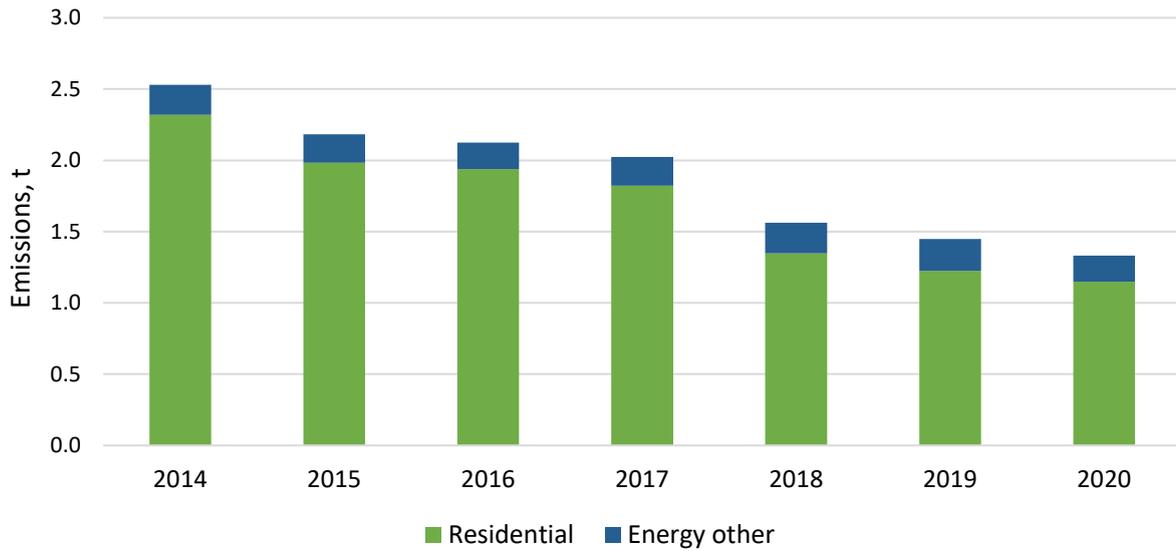


Figure 2.15 Trend of BaP emissions 2014-2020

Benzo(a)pyrene (BaP) emissions were reduced by 47% in 2020 compared to 2014. The reduction of BaP emissions was a result of its decreased discharge from residential sector. Emissions from residential combustion, which comprise 86% of total emissions as of 2020, have decreased by 47% in 2014-2020 due to diminished firewood consumption in households. BaP is basically emitted from energy sector.

HCB and PCBs

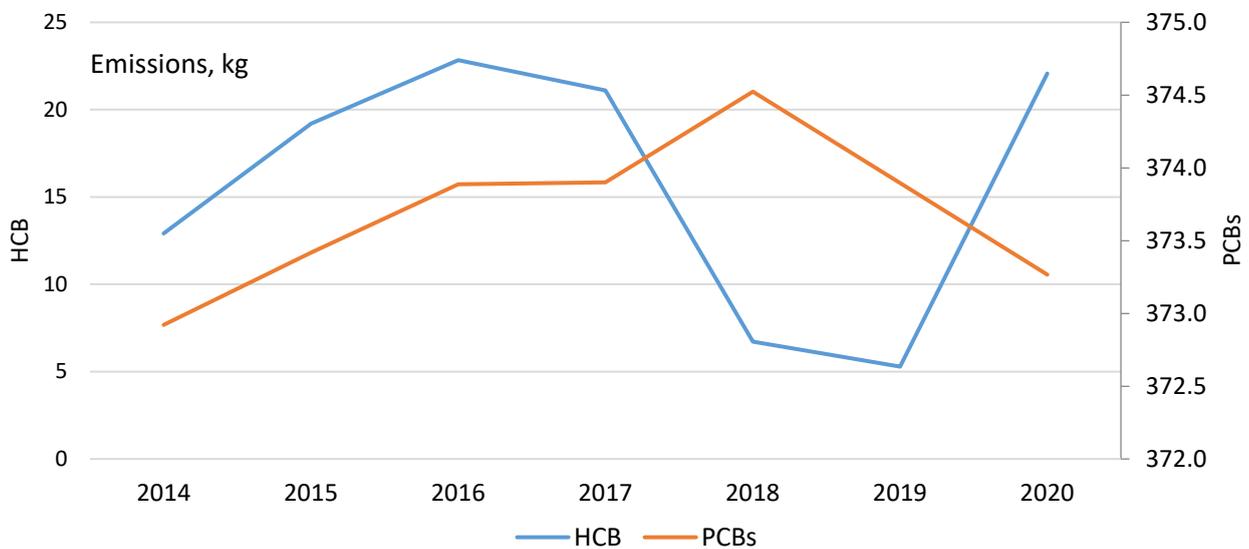


Figure 2.15 Trend of HCB and PCBs emissions 2014-2020

PCBs emissions slightly increased in 2014-2020 due to rising demand by population for POPs and heavy metals. Variability of HCB emissions trend is caused by changeable amount of aluminum production in the mentioned period, which is responsible for more than 99% of emissions.

3. Energy (NFR sector 1)

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 1990-2020⁹. The missing emission data in energy sector before 2007 and additional categories for 2007-2012 was managed to calculate in the framework of Swedish International Development Cooperation Agency (SIDA) funded project "Enhancing air quality management capacities in Georgia" in 2020. In addition, since 2013 GEOSTAT prepares yearly National Energy Balance, which gives more precise activity data for this sector.

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 NO_x, SO₂, NMVOC, CO and PMs emissions in Georgia. In 2020, this sector contributed 57.1% of total NO_x emissions, 98.2% of total SO₂ emissions, 46% of total NMVOC emissions, 46.2% of total TSP emissions and 99.9% of total CO emissions.

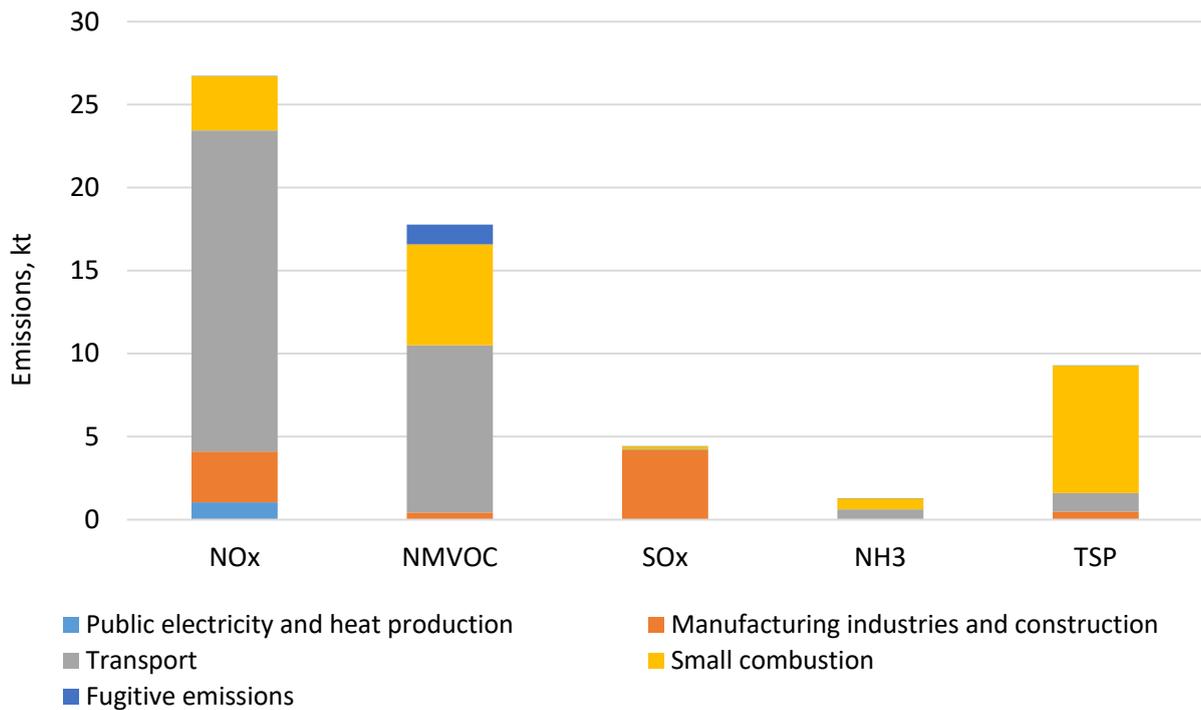


Figure 3.1 Emissions from energy sector in 2020

Transport is the major contributor of NO_x (72.4%) and NMVOC (56.6%) emissions in the energy sector. Share of industrial combustion in total SO₂ emissions in energy sector is 94.4%. Small combustion is responsible for the 82.67% of TSP and 51.8% of NH₃ emissions in this sector.

⁹ However, some activities did not occur in some years of the reporting period including 1B1b, which did not occur in 2020.

Energy industries (1A1)

Source category description

Emissions in this category mostly come from natural gas consumption.

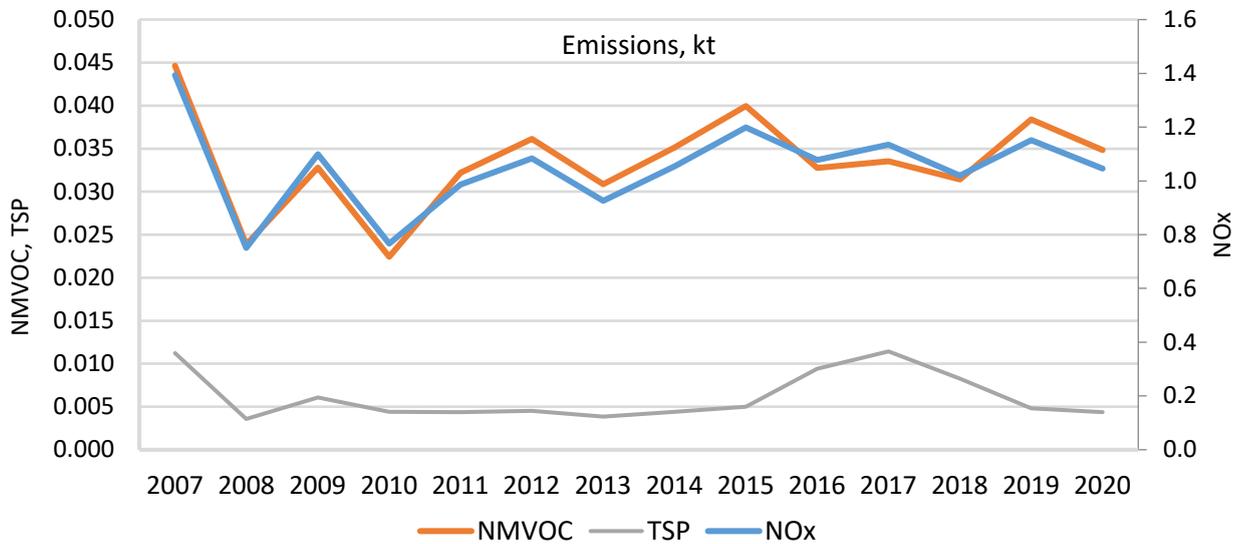


Figure 3.2 Emissions from public electricity and heat production 2007-2020

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 1990-2020 using EMEP/EEA Guidebook – 2019, Tier 1/2 approach based on data from International Energy Agency (1990-2018) and National Energy Balance (2019-2020).

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.

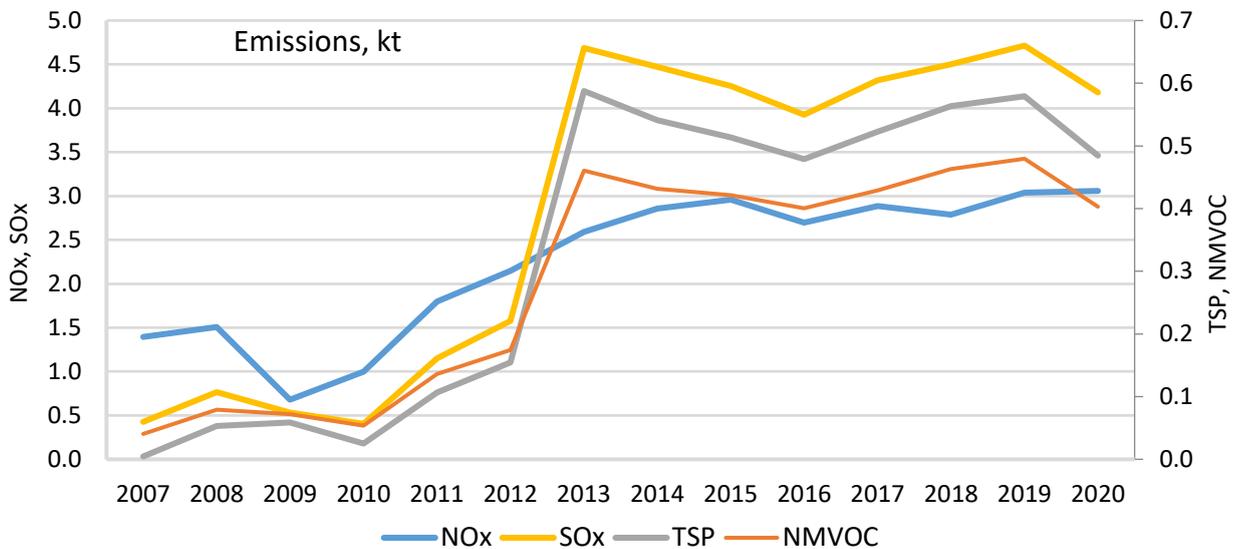


Figure 3.3 Emissions from combustion in manufacturing industries 2007-2020

Increasing trend of SO₂ emissions from 2011 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 NO_x emissions is caused mainly by expansion in cement production that more than tripled in 2010-2020, and partially by increased coal consumption in iron and steel production. Decreasing emissions of SO₂ 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. However, coal consumption again increased from 2017 that resulted in rising emissions of SO_x.

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 SO₂, 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 1990-2020 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 – 2019-2020), national inventory of stationary emission sources (1A2b, 1A2f – 2013-2020¹⁰), 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, motorcycles¹¹) 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.

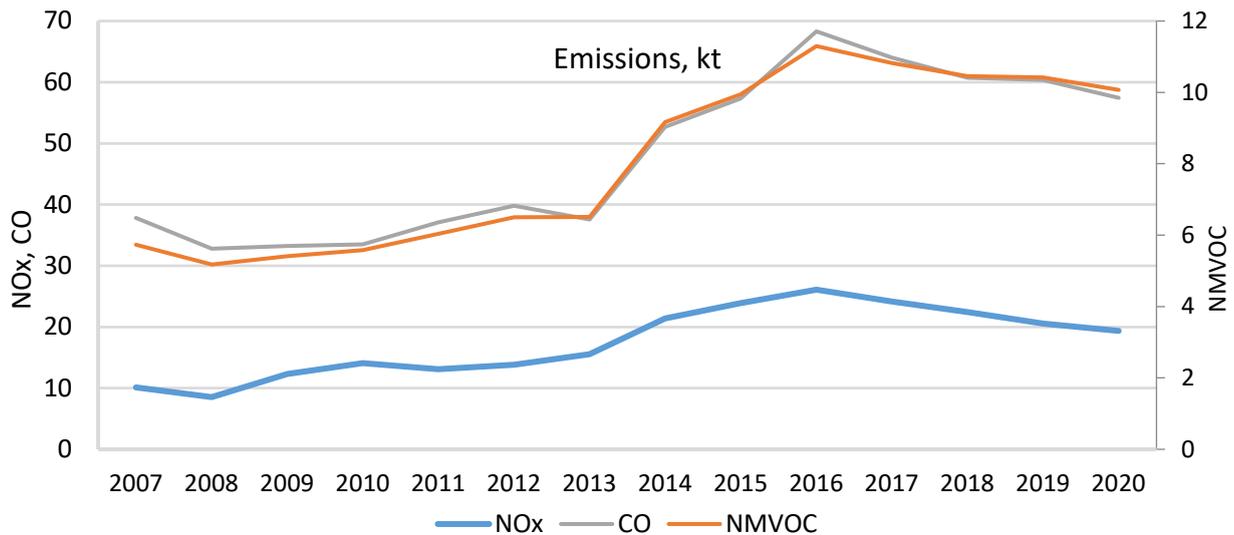


Figure 3.4 Emissions of NO_x and NMVOC from transport 2007-2020

¹⁰ In 2020, emissions from lime production under 1A2f was calculated based on production data provided by GEOSTAT.

¹¹ 1Abiv is not estimated.

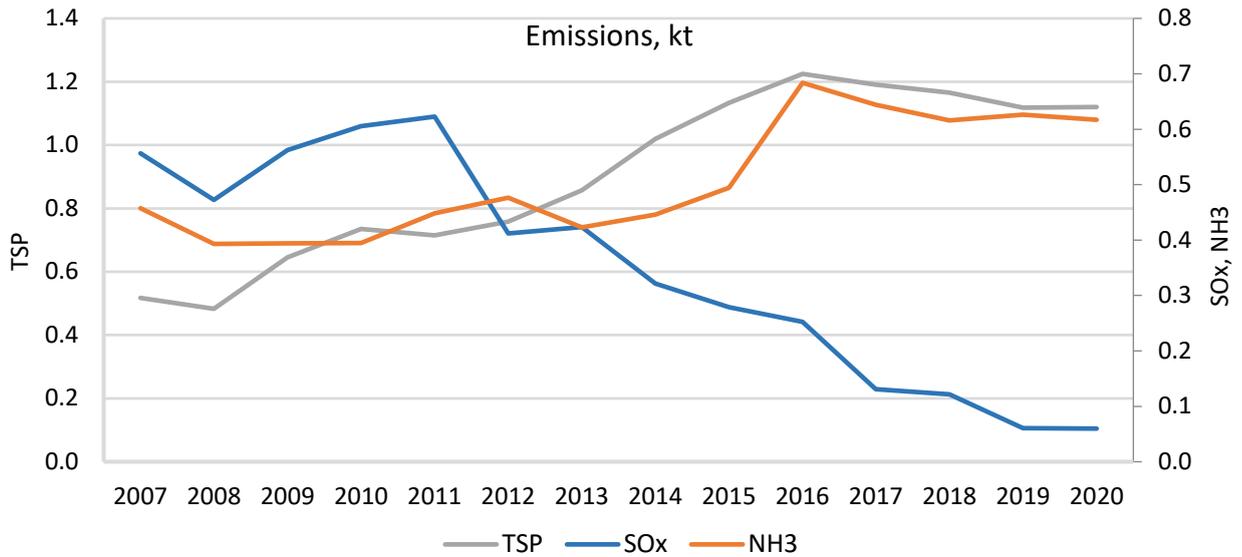


Figure 3.5 Emissions of TSP, SOx and NH3 from transport 2007-2020

Emission trends of NOx, CO, TSP, NMVOC and NH₃ from this sector is gradually increasing (peaked in 2016) alongside growing number of vehicle in the country. From 2007 to 2020, emissions of NOx were increased by 91.5%, TSP by 116.5%, NMVOC by 75.6%, CO by 52% and emissions of NH₃ by 34.8%.

Reducing trends in 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.

Reduction of CO and low-level increase in NMVOC emissions in 2013 compared to 2012 were caused by reduction of petrol consumption due to switching of passenger cars from petrol fuel to compressed natural gas (CNG). Increasing emissions since 2014 are related to growing petrol consumption in these years caused by increasing car fleet.

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). In 2020, these are 9 times less compared to 2007.

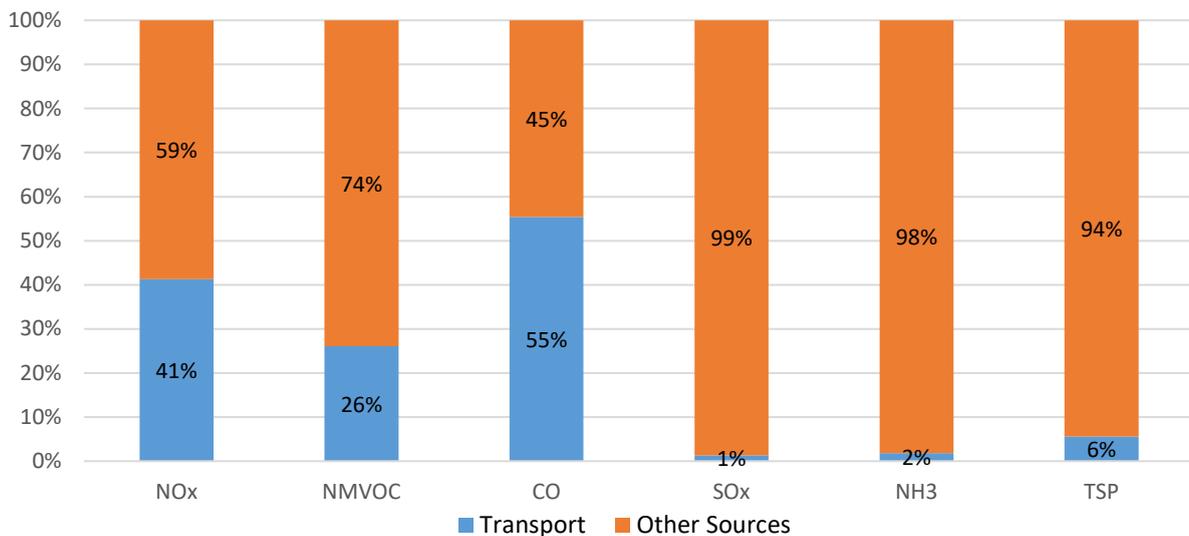


Figure 3.6 Share of emissions from transport in total emissions in 2020

Transport was a source of 41% of NO_x emissions, 26% of NMVOC emissions and 55% of CO emissions in 2020.

Methodology

Road transport emissions are calculated by Tier 1 method of the EMEP/EEA Guidebook – 2019. Emissions from railways and national navigation (shipping) are estimated using EMEP/EEA Guidebook – 2019, Tier 1 approaches based on data from International Energy Agency (1990-2012) and from National Energy Balance (2013-2020).

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.

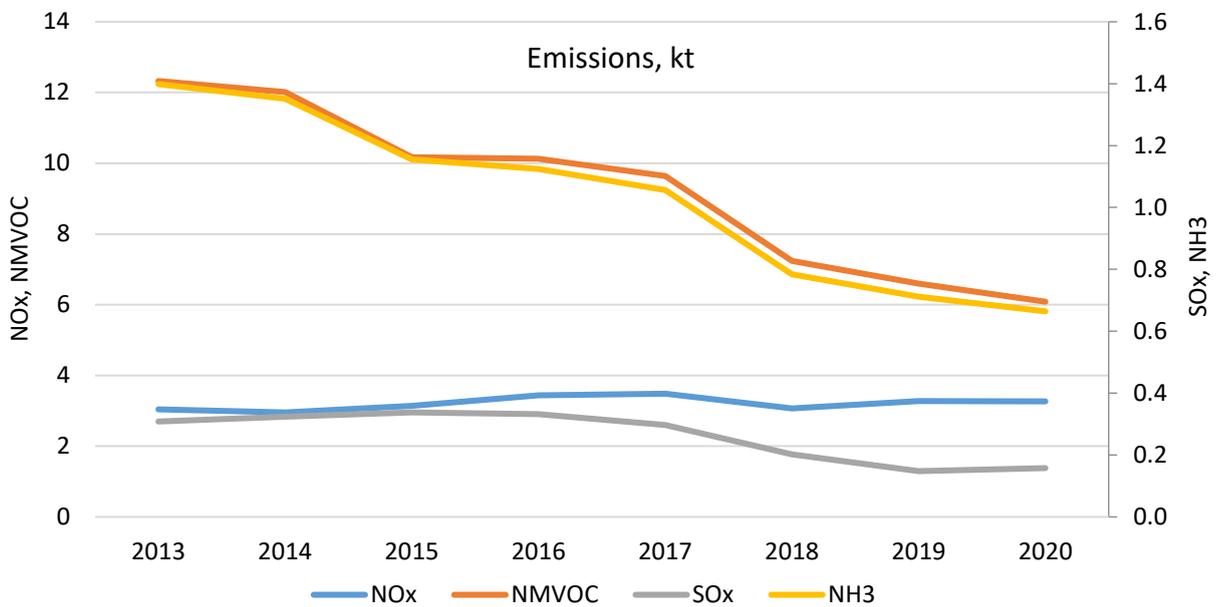


Figure 3.7 Emissions of main pollutants from small combustion in 2013-2020

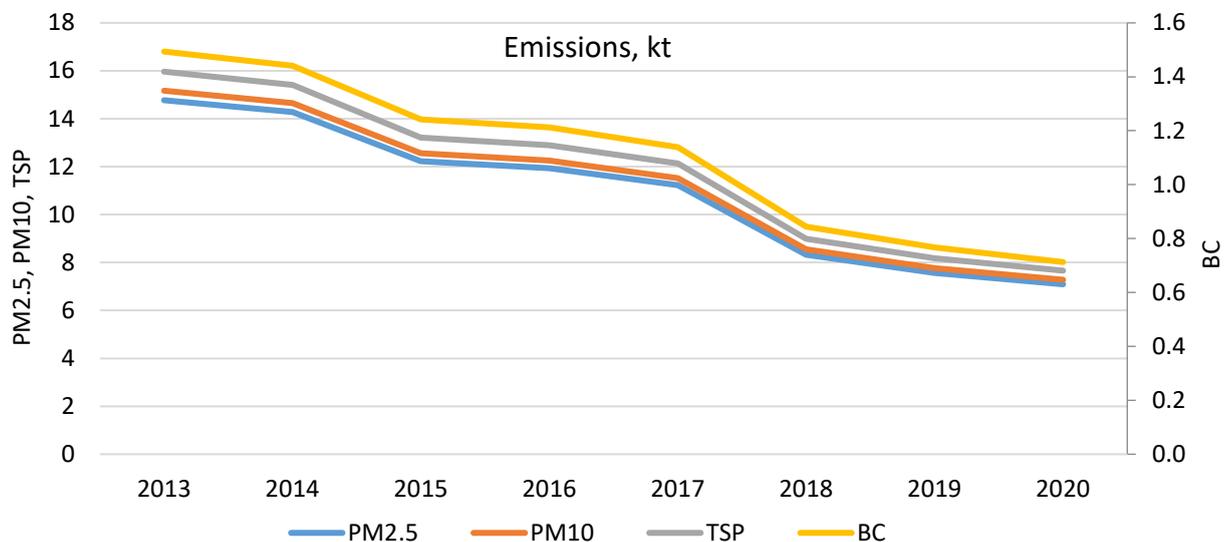


Figure 3.8 Emissions of particulate matters from small combustion in 2013-2020

Due to reduction in biomass and coal consumption in residential sector, emissions of NMVOC, SO_x, NH₃, PMs and CO have decreased, however emissions of NO_x kept stability since increased consumption of alternative fuels (mainly gas) still constitutes source for significant amount of NO_x.

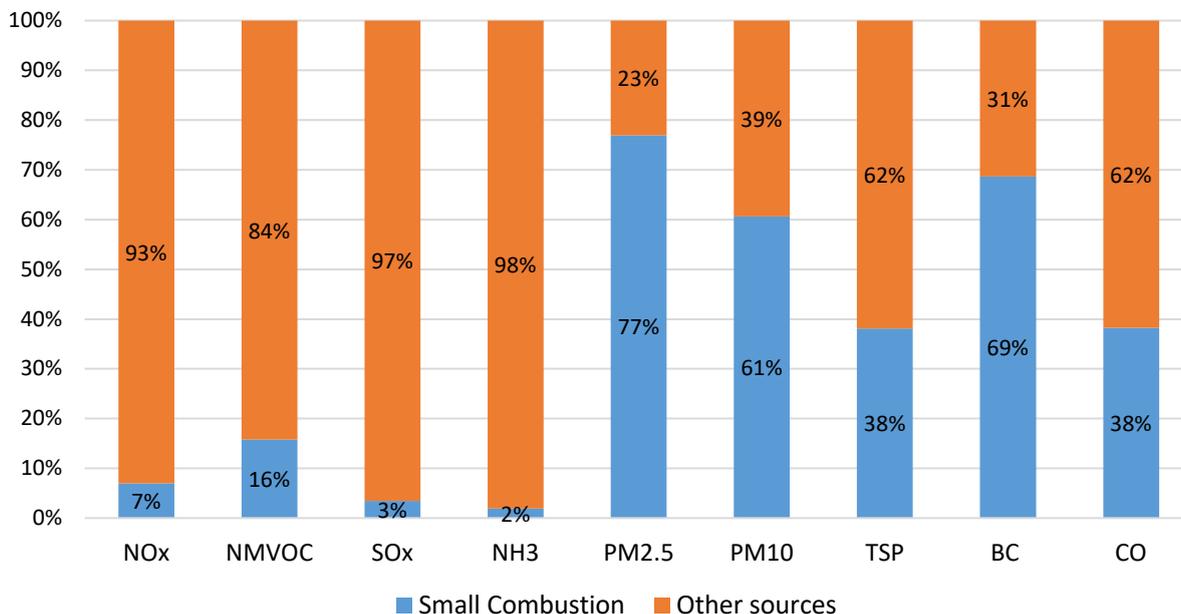


Figure 3.9 Share of emissions from small combustion in total emissions in 2020

PMs are mainly emitted from small combustion sector. In addition, the sector is responsible for 38% of CO, 16% of NMVOC and 7% of NO_x emissions.

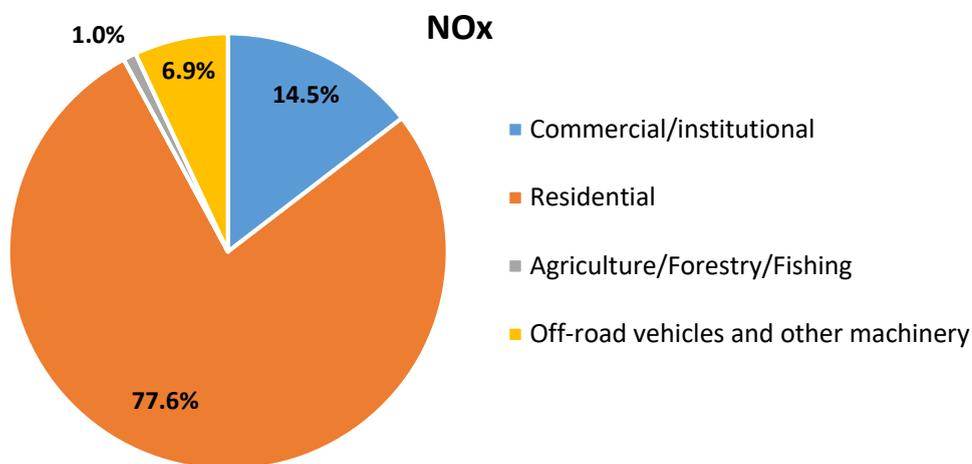


Figure 3.10 NO_x emissions by sources of pollution in 2020

NMVOC

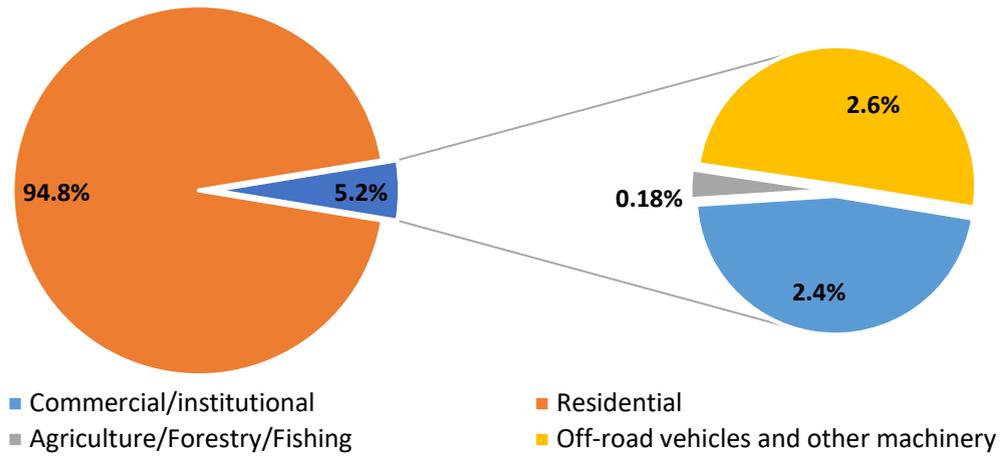


Figure 3.11 NMVOC emissions by sources of pollution in 2020

TSP

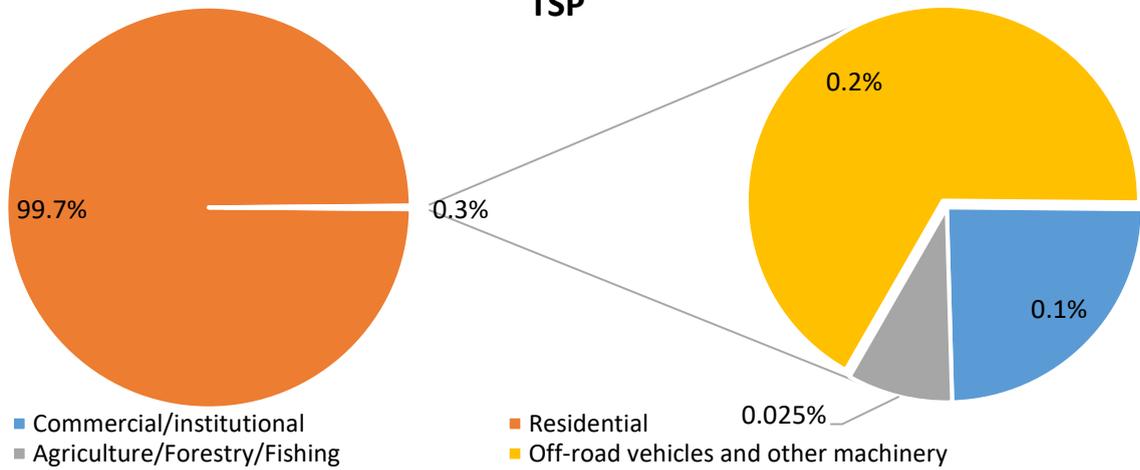


Figure 3.12 TSP emissions by sources of pollution in 2020

CO

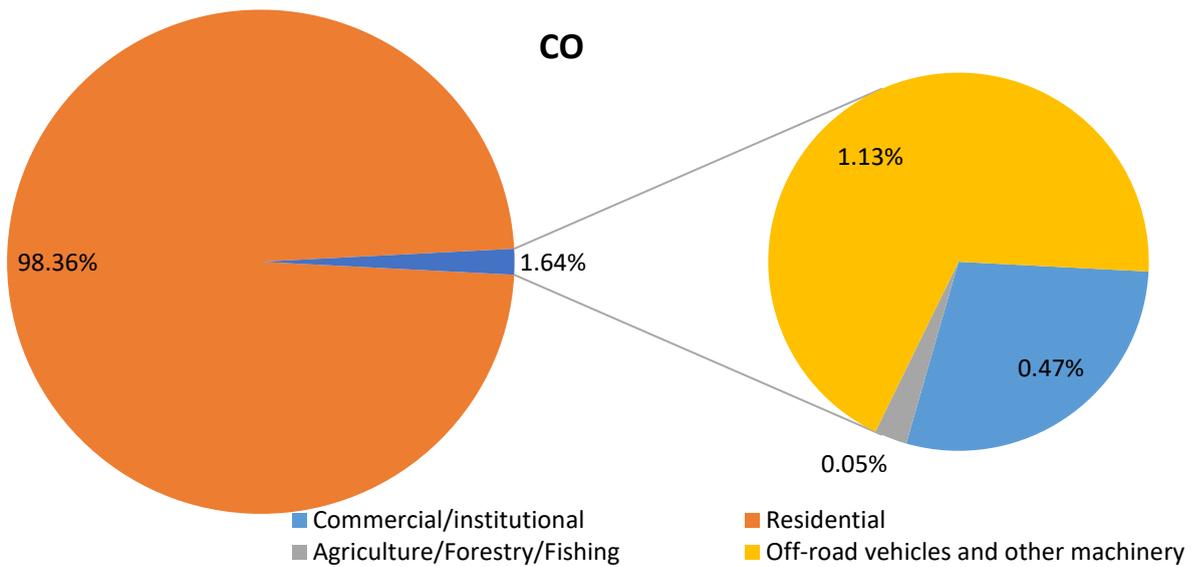


Figure 3.13 CO emissions by sources of pollution in 2020

Residential stationary combustion is a main emission source NOx, NMVOC, CO and TSP. Also, 73% of Cd, 20% of Cu, 50% of Zn, 80% of dioxins/furans and 81% of PAHs are emitted from this category.

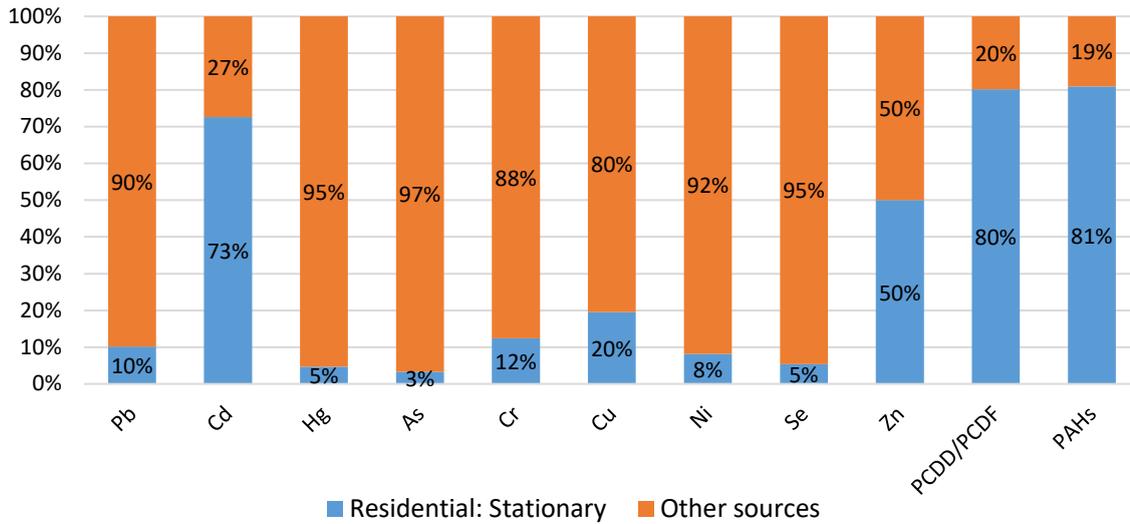


Figure 3.14 Share of HMs and POPs emissions from residential combustion in total emissions in 2020

Methodology

Emissions are estimated according to EMEP/EEA Guidebook – 2019, Tier 1 approach based on the activity data from International Energy Agency (1990-2012) and National Energy Balance (2013-2020)¹².

Fugitive emissions from fuels (1B)

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

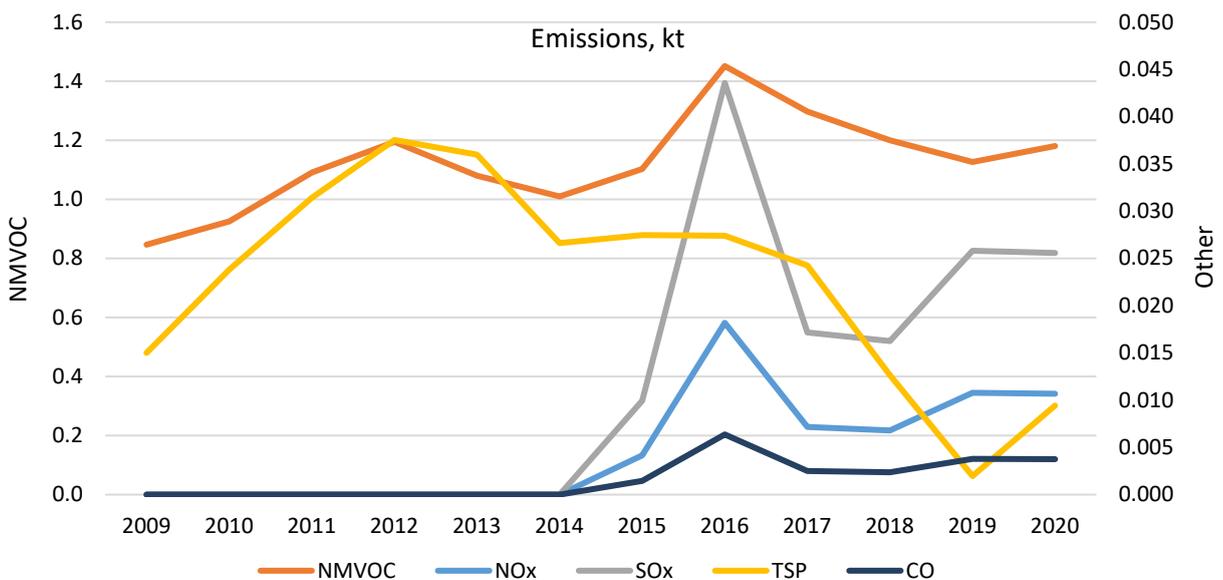


Figure 3.15 Fugitive emissions of NMVOC, NOx, SOx, TSP and CO in 2009-2020

¹² In case of 1A4bi liquid fuel data was taken from International Energy Agency for the years of 2013-2018.

1B emits meaningful amount of NMVOC only, which peaked in 2016 because of increased oil consumption and coal mining. Since then due to reduction of coal production emissions have decreased by 19%, but still stayed high compared to 2009. Emissions of NO_x, SO_x and CO 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 (1B2av in 1990-2012), National Energy Balance (1B2aiv, 1B2av and 1B2c in 2013-2020) and from GEOSTAT (1B1a, 1B1b, 1B2ai, 1B2aiv in 1990-2012, 1B2b, 1B2c in 1990-2012).

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.

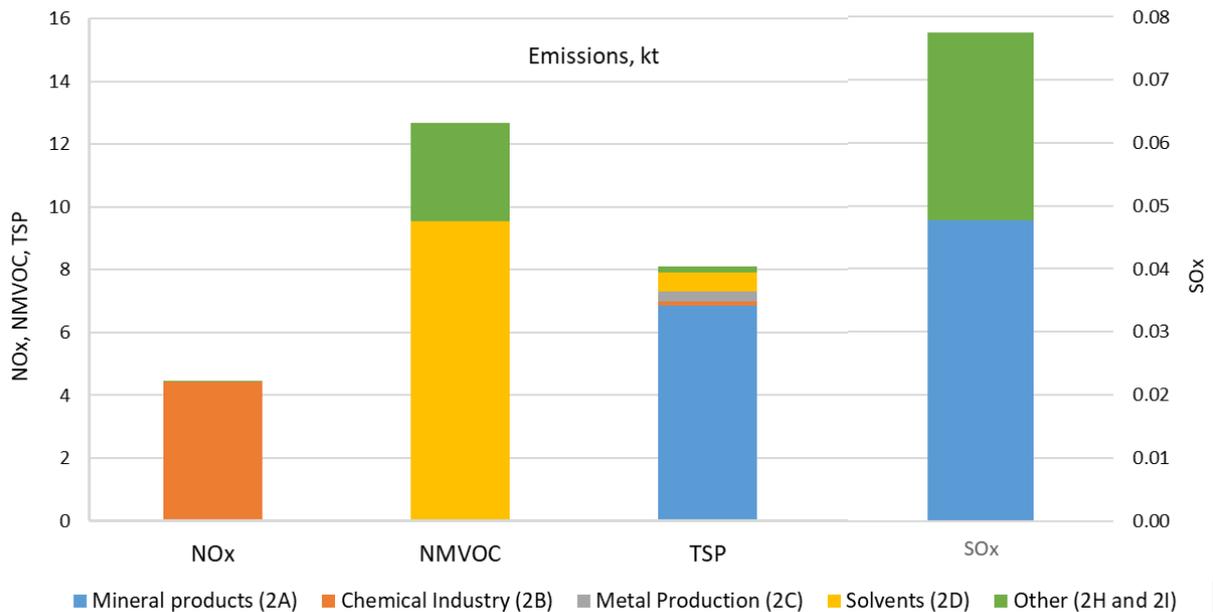


Figure 4.1 Emissions from industry sector in 2020

Share of chemical industry in total NO_x emissions in industry sector is 99.4%. Solvent subsector is responsible for 74.8% of NMVOC emissions. Manufacturing of mineral products is the major contributor of SO_x (61.6%) and TSP (84.4%) emissions from this sector.

Mineral Products (2A)

Source category description

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

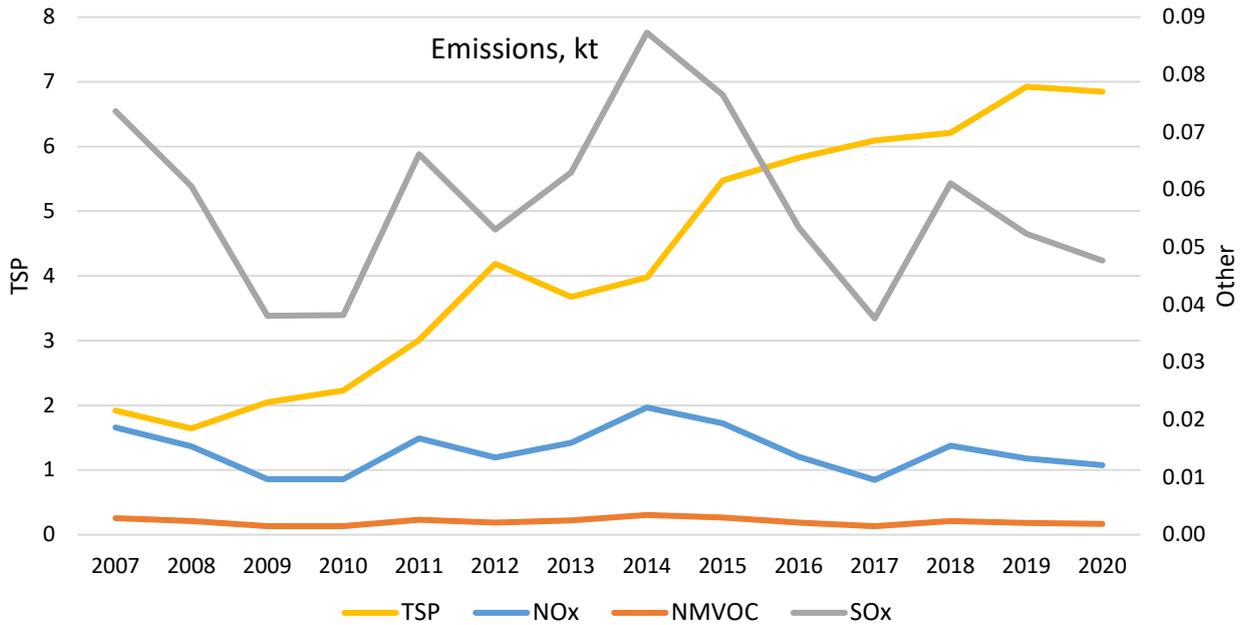


Figure 4.2 Emissions from mineral products 2007-2020

The most important pollutant emitted from this category is particulate matters. TSP emissions from 2A increased by 4-times and accounted for 34.1% of total TSP emissions in 2020. 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.

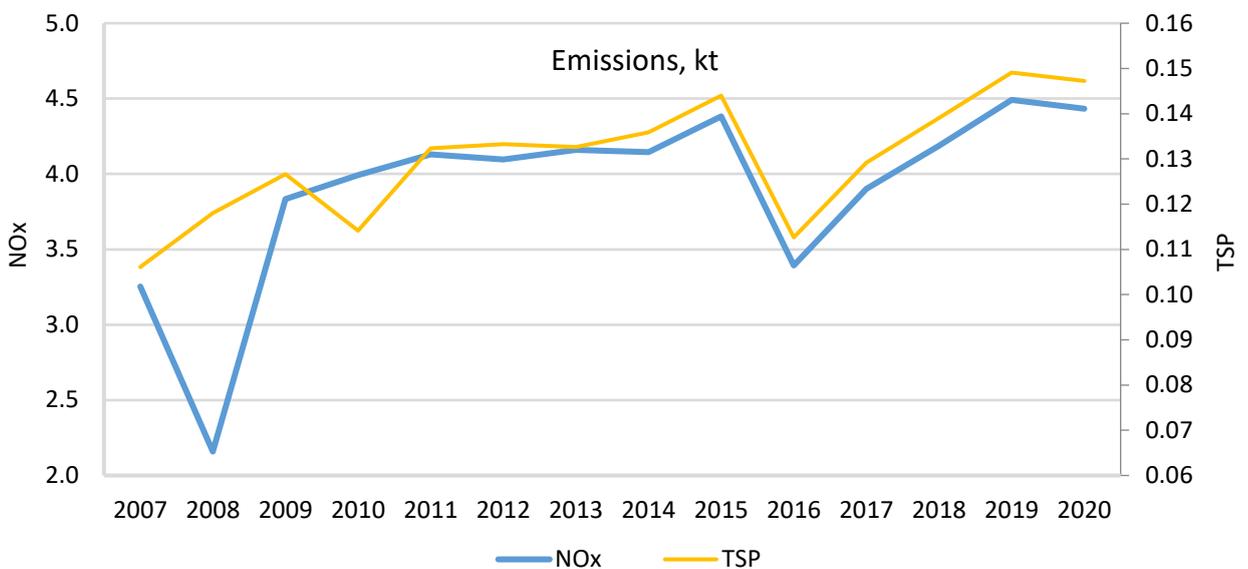


Figure 4.3 Emissions from chemical industry 2007-2020

Chemical industry emitted 9.5% of total NOx emissions in 2020. The main source from the category in this regard is nitric acid production (2B2). Significant decrease of emissions in 2016 was caused by switching to production data that is retrieved from state reporting system for stationary sources.

Methodology

Emissions are estimated based on EMEP/EEA Guidebook – 2019, Tier 1/2 approach. Activity data came from GEOSTAT (1990-2005), state reporting system for stationary sources (2016-2020), GHG emissions reports (2006-2013) and through extrapolation (2014-2015).

Metal Production (2C)

Source category description

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

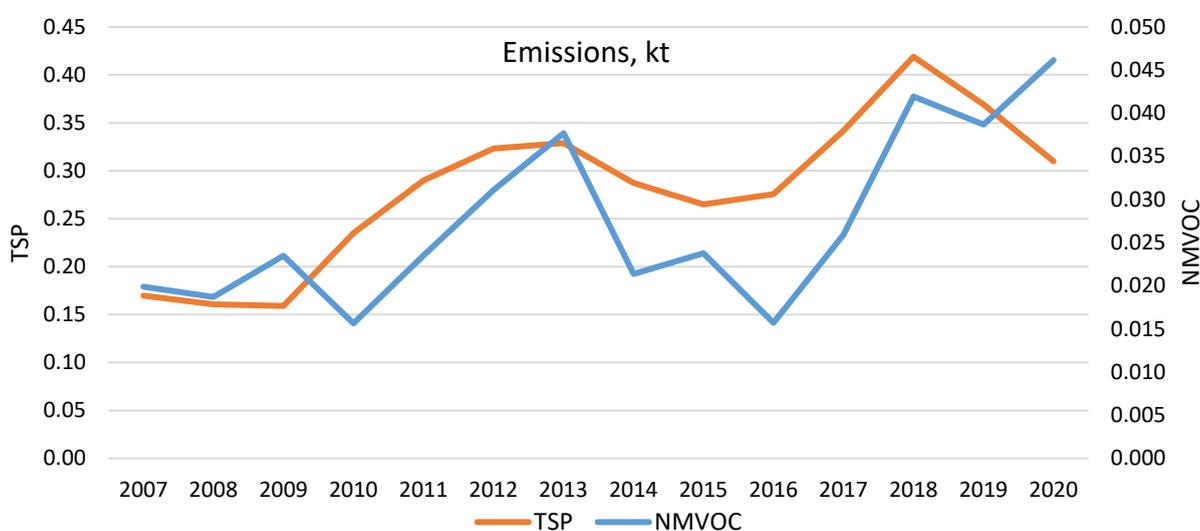


Figure 4.4 Emissions from metal production 2007-2020

Ferroalloys production (2C2) 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.

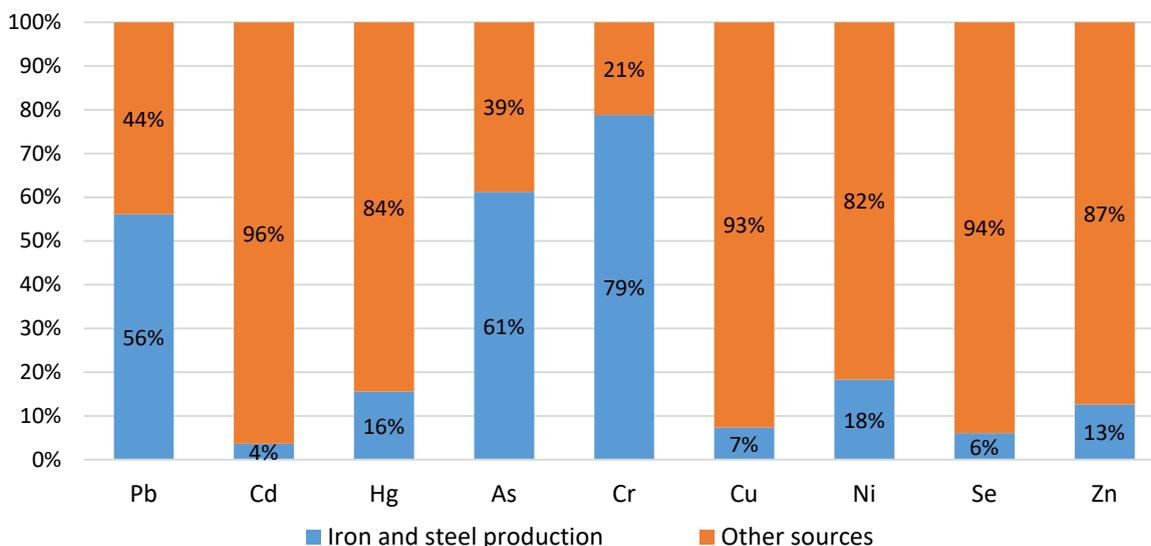


Figure 4.5 Share of heavy metals emissions from iron and steel production in total emissions in 2020

Iron and steel production (2C1) is a key source of heavy metals emissions especially Pb (56.1%), As (61.2%) and Cr (78.8%). Aluminum production (2C3) is responsible for 99.7% 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 three activities - road paving with asphalt, coating application and domestic solvent use including fungicides.

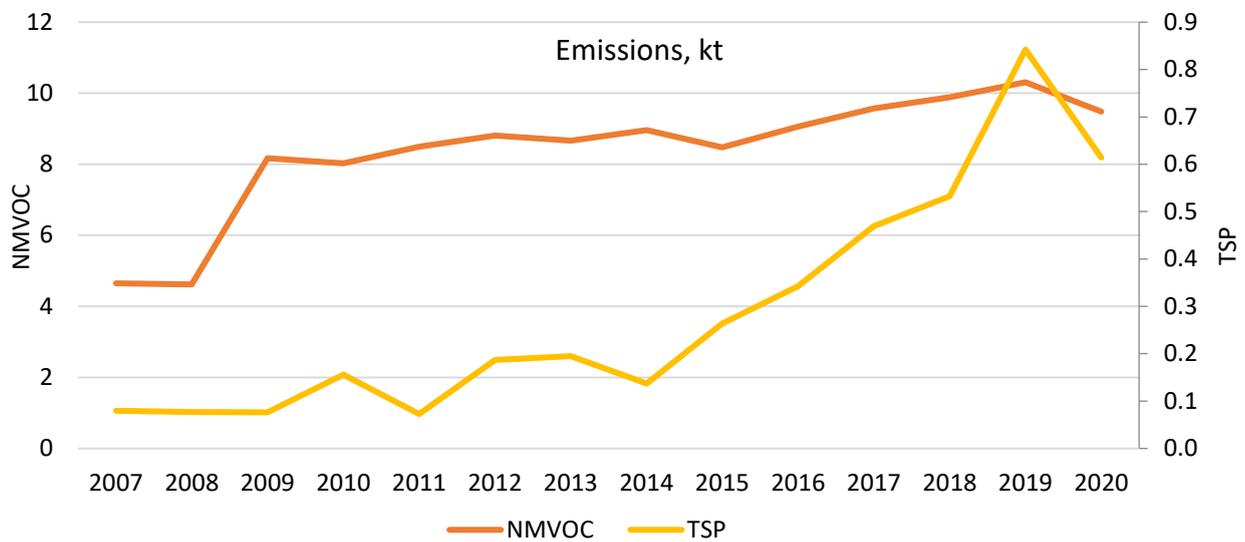


Figure 4.6 Emissions from solvents 2007-2020

NMVOC is the most important pollutant from this category as 24.6% of total emissions comes from 2D as of 2020. It increases due to rising quantity of applied paints year-by-year. Sharp increase in 2009 was caused by obtaining data on paints application that was unavailable before 2009.

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.

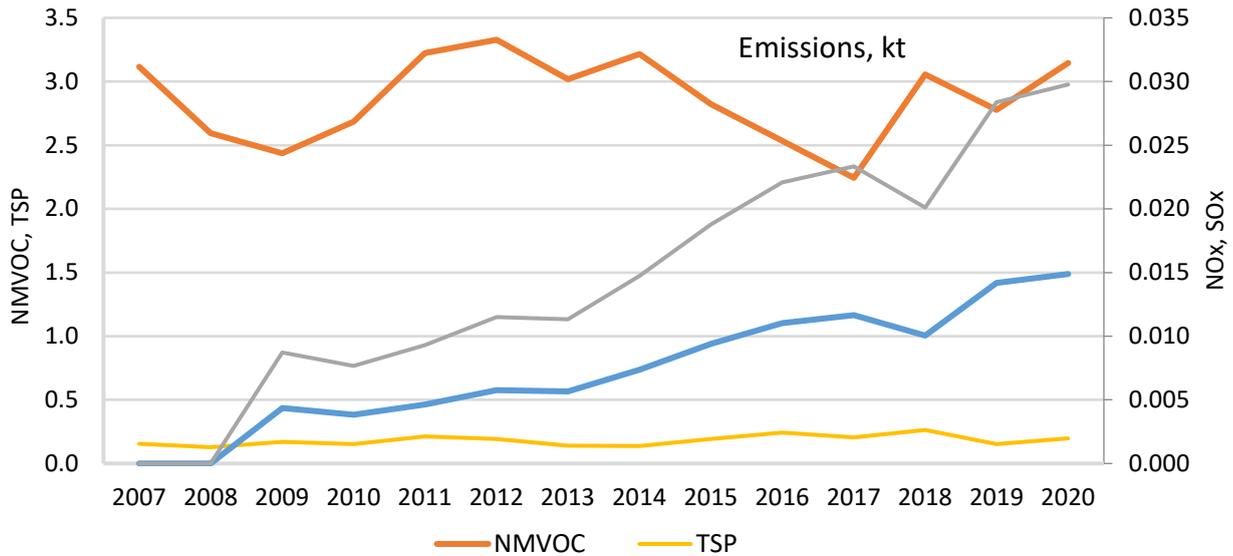


Figure 4.7 Emissions from other industrial processes 2007-2020

Reductions of NMVOC and TSP 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.

Food and beverages industry is a responsible for 8.1% of NMVOC emissions as of 2020. 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.

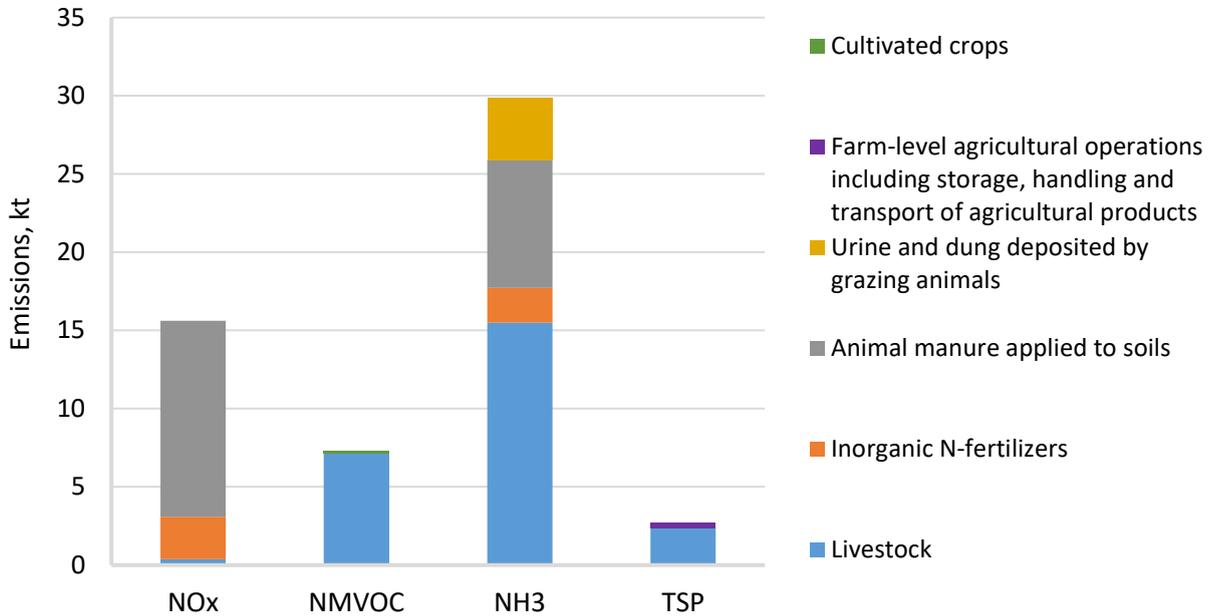


Figure 5.1 Emissions from agriculture sector in 2020

Agriculture sector is the main emitter of ammonia in the country. It also accounts for 33% of total NOx emissions and 19% of total NMVOC emissions as of 2020.

Manure Management (3B)

Source category description

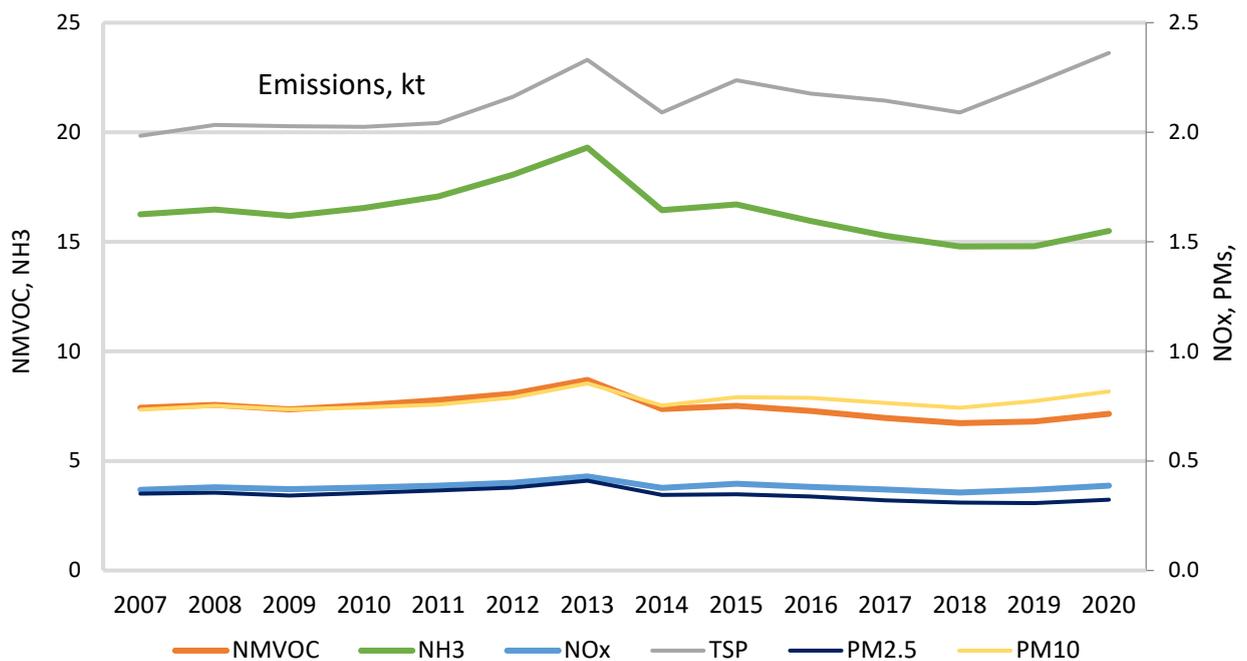


Figure 5.2 Emissions from livestock manure management 2007-2020

Manure management is the most significant source of ammonia emissions as it accounts for 45% of total NH₃ emissions. It is also responsible for 98% of NMVOC and 88% of TSP emissions from agriculture.

Drop of trend in 2014 is related to 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, NO_x and NH₃ 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.

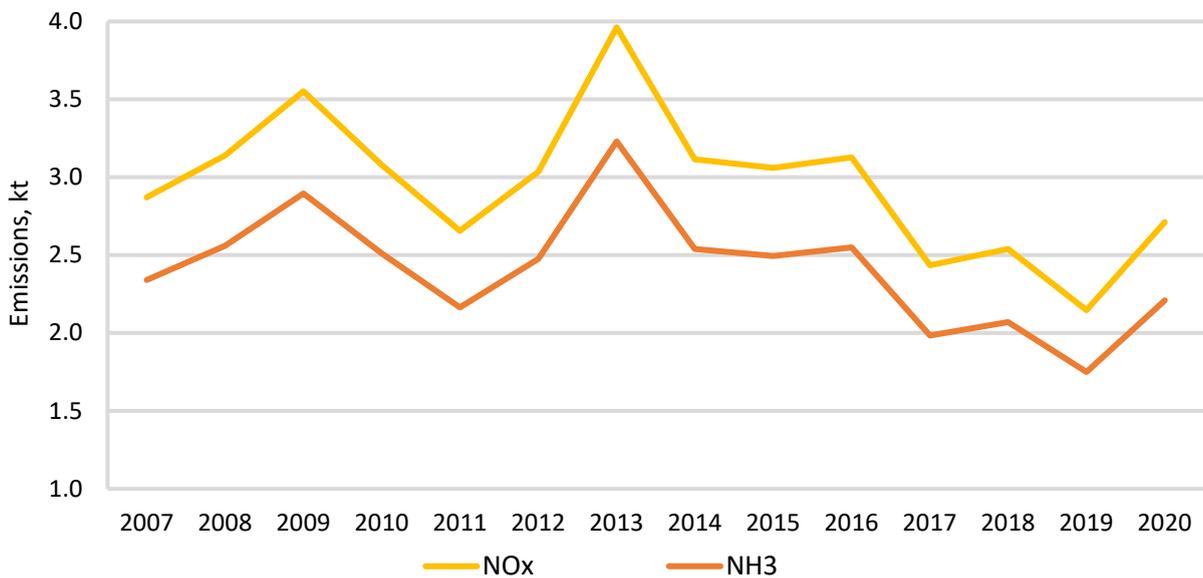


Figure 5.3 Emissions from use of inorganic N-fertilizers 2007-2020

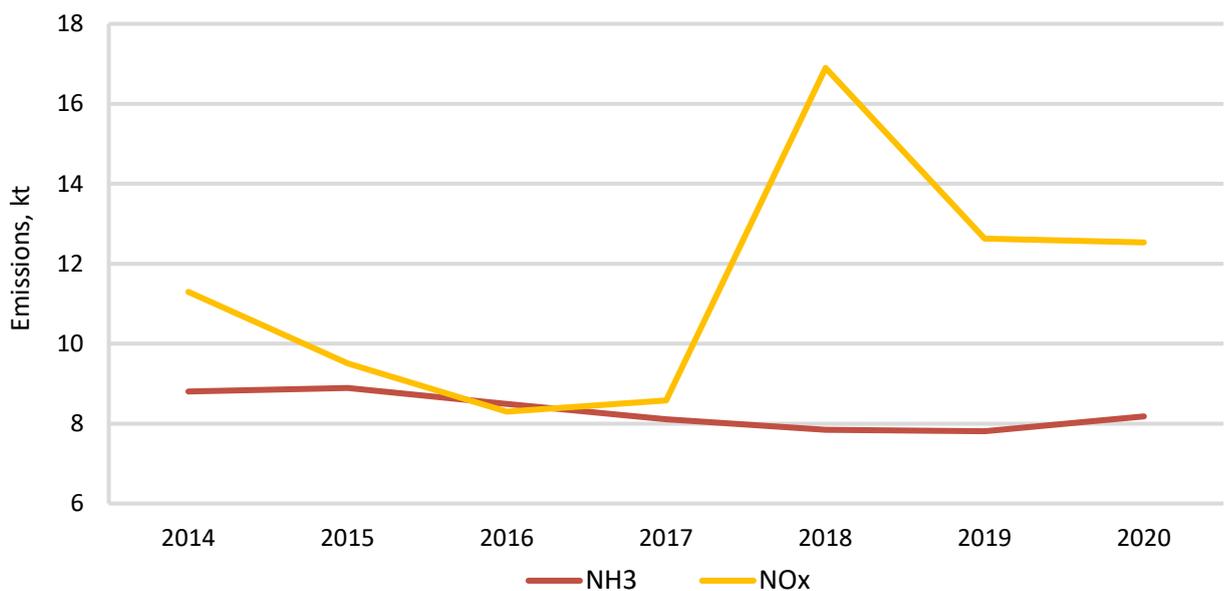


Figure 5.4 Emissions from application of animal manure to soils 2014-2020

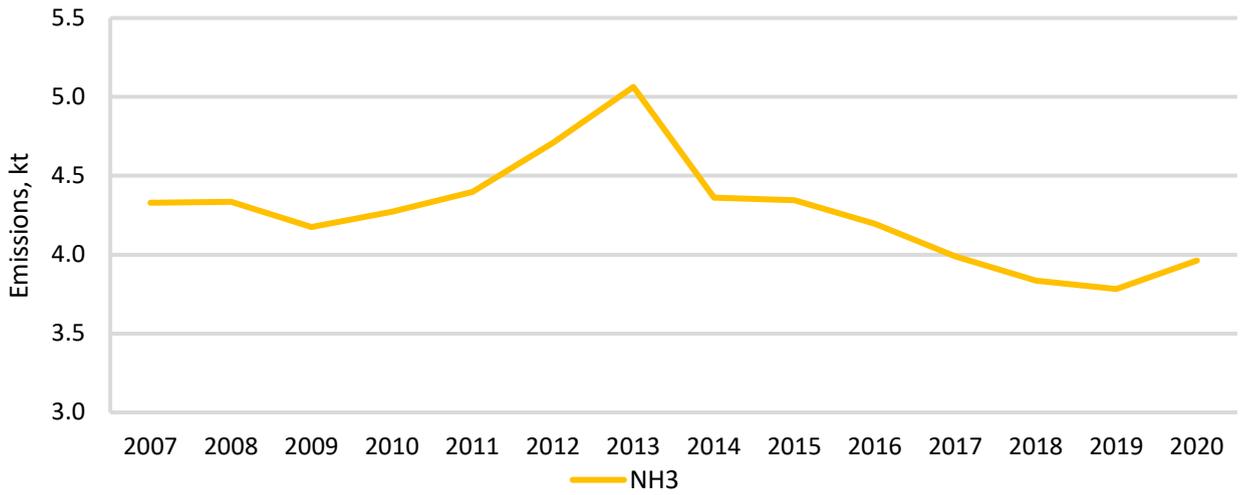


Figure 5.5 Emissions from urine and dung deposited by grazing animals 2007-2020

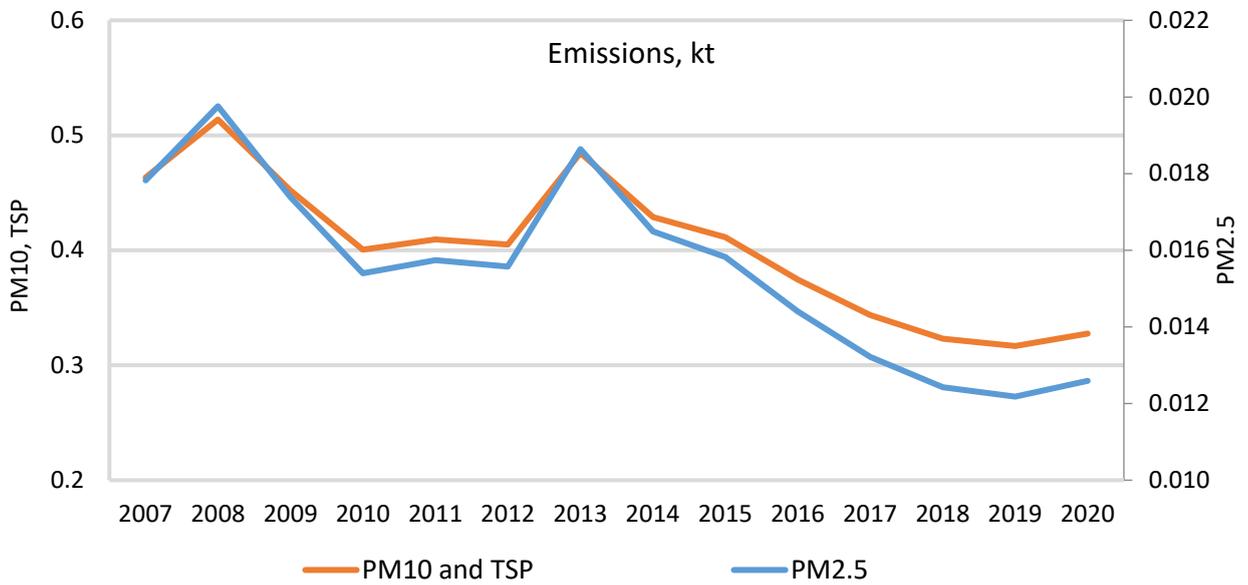


Figure 5.6 Emissions from farm-level agricultural operations including storage, handling and transport of agricultural products 2007-2020

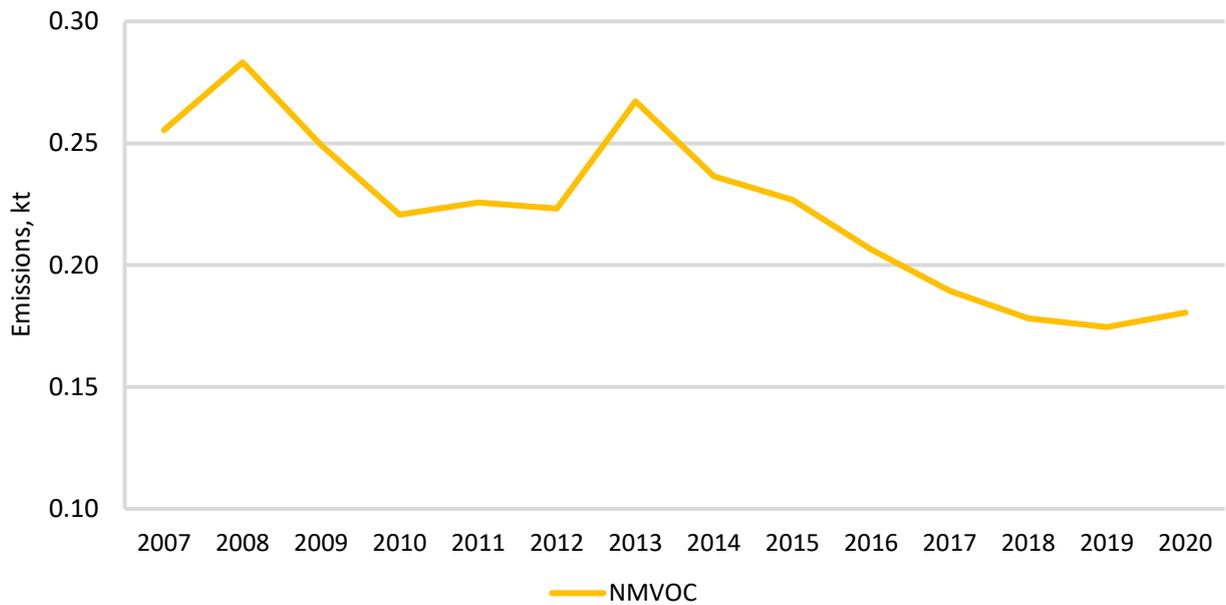


Figure 5.7 Emissions from cultivated crops 2007-2020

Crop production and agricultural soils is a source for 42% of total ammonia emissions. Almost all (98%) NOx emissions from agriculture comes from this subsector, which accounts for 33% of total NOx emissions as of 2020. Subcategory - manure application to soils (3Da2a) - is only responsible for 27% of total NOx and 24% of total NH₃ emissions. In addition, 80% of NOx emissions from agriculture comes from 3Da2a.

Drop of emissions in 2014 is related to recalculations of activity data in agriculture sector by GEOSTAT. Further decrease of NOx emissions from use of inorganic N-fertilizers in 2017 (figure 5.3) are resulted by sharp reduction of use of fertilizers, while rise in NOx emissions from application of animal manure to soils in 2018 was caused by doubling quantity of manure applied to soils that year.

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.

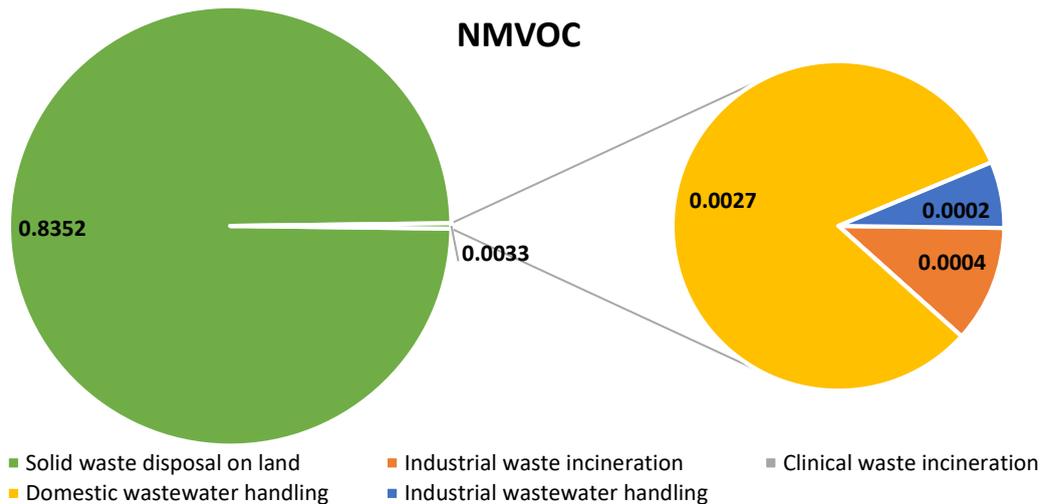


Figure 6.1 Emissions of NMVOC from waste sector in 2020 (kt)

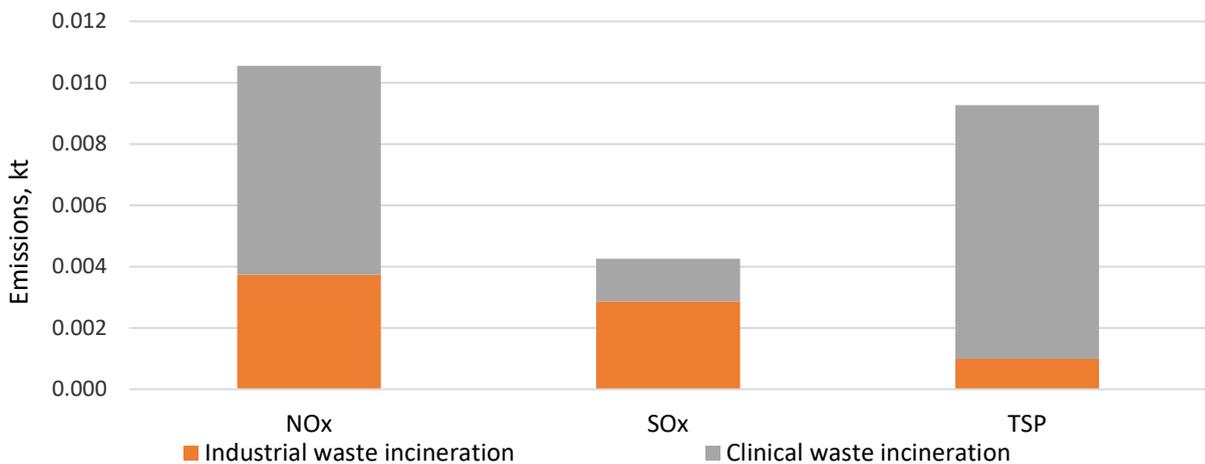


Figure 6.2 Emissions of NOx, SOx and TSP from waste sector in 2020

Solid waste disposal on land (5A)

Source category description

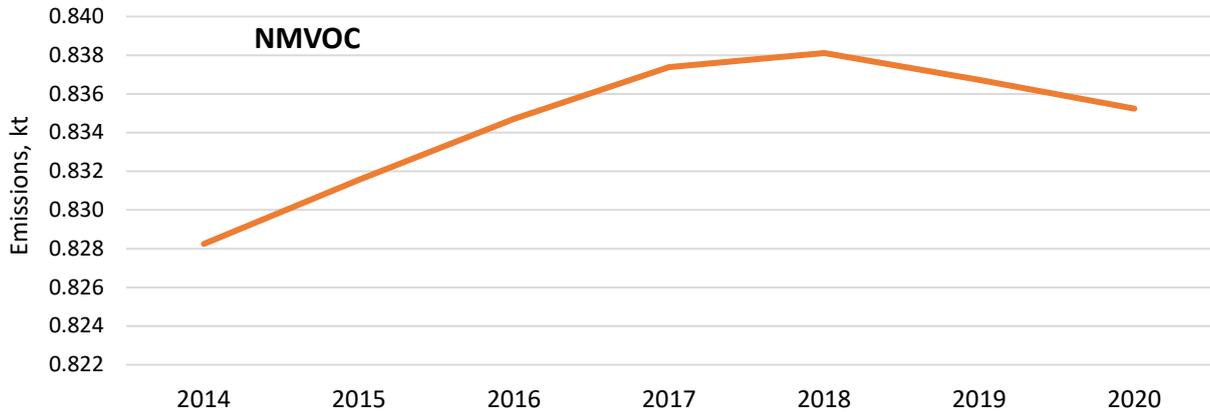


Figure 6.3 Emissions from solid waste disposal on land 2014-2020

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 CH₄ emissions from solid waste disposal on land were obtained from Georgia’s Biennial Update Reports (BUR) to the UNFCCC. Emissions for 2018-2020 were extrapolated, since data on CH₄ 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.

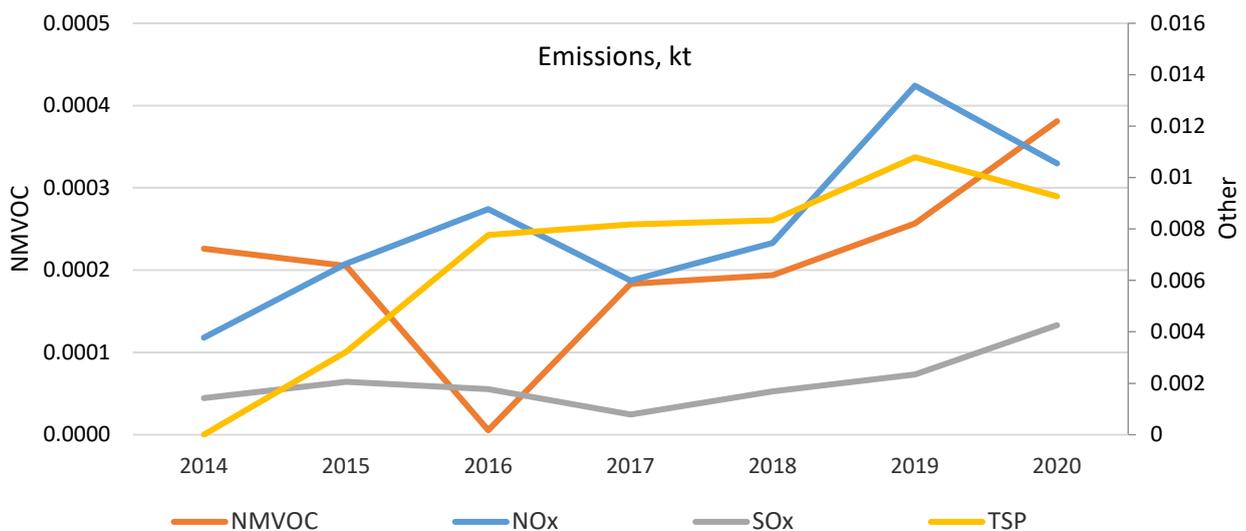


Figure 6.4 Emissions from waste incineration 2014-2020

Increased emissions in this category is related to 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.

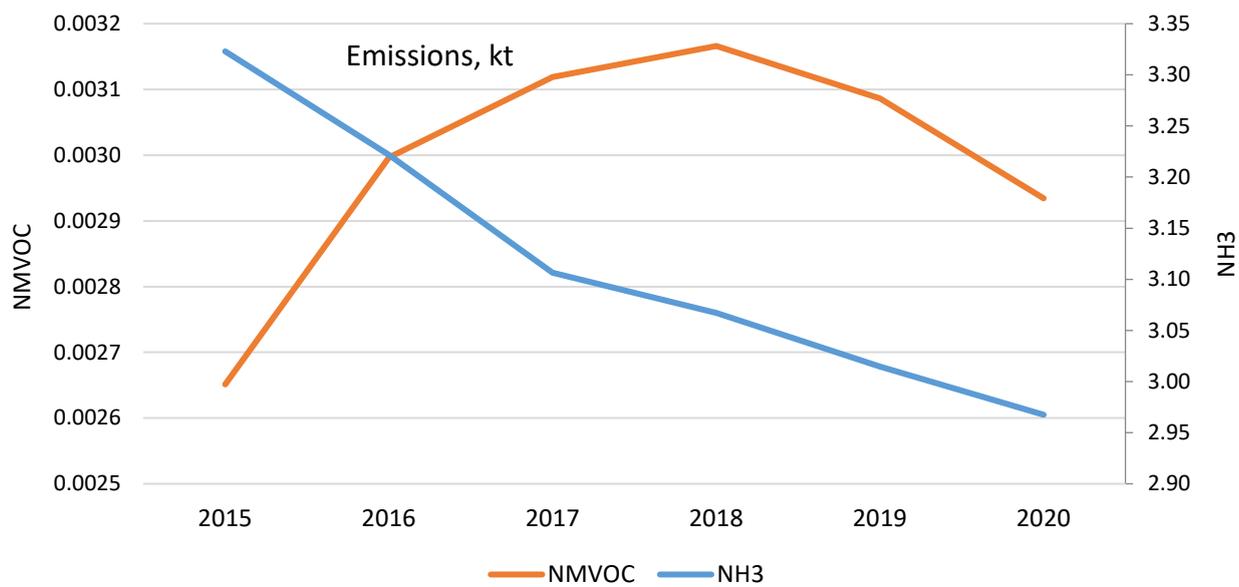


Figure 6.5 Emissions from wastewater handling 2015-2020

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 started increasing and doubled in 2011-2020.

Due to lack of activity data on a number of population not connected to centralized wastewater collection system NH₃ emissions from this category were estimated only from 2015.

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

Activity data on liquid fuel for 1A3bi were changed for 2013-2016 and 2018-2019 to correct inconsistencies arising from different data in PDF and Excel versions of National Energy Balance. 1A3bi were recalculated for 2013-2019 due to estimation of emissions from LPG consuming vehicles. Relevant activity data were added to the gaseous fuels in these years.

Se emission from 1A4ai were corrected in 2016 as it was wrongly estimated before. Ni emissions from the same category were recalculated for all years due to selection of Tier 2 emission factors separately for fuel oil and gasoil, which better complies with national specificities.

Emissions from 1A4bi in 2019 were recalculated once LPG consumption was wrongly reported as a liquid fuel. It was added to the gaseous fuels and liquid fuel consumption was nullified for 2019.

Activity data of 1B1a were indicated for all years reported, as relevant production data is no longer confidential.

Emissions from and activity data of 1B2av were corrected in 2017 as activity data was wrongly estimated before.

Activity data for 2B1 and 2B2 is confidential and it was indicated for all years reported.

All emissions except for HCB from 2C3 in 2019 were corrected as they were wrongly indicated in previous submission.

Due to obtaining information of paints consumption from 2009 onward emissions from 2D3b were estimated for 2009-2019.

Emissions from 5D1 in 2018-2019 were recalculated because relevant activity data were recalculated by GEOSTAT.

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.

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