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Ministry of Environment
and Energy

REPUBLIC OF CROATIA 2020 INFORMATIVE INVENTORY REPORT (1990 – 2018)

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REPUBLIC OF CROATIA 2020 INFORMATIVE INVENTORY REPORT (1990 – 2018)
Submission under the Convention on Long-range Transboundary Air Pollution (CLRTAP)
And National Emission Ceilings Directive (NECD 2016/2284/EU)

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REPUBLIC OF CROATIA 2020 INFORMATIVE INVENTORY REPORT (1990 – 2018)

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Content

Executive summary

ES1 Annual report and responsible executor

This report is Croatia´s annual Informative Inventory Report 2020 (for period 1990 – 2018) (hereinafter referred to as IIR2020) under the Convention on Long-range Transboundary Air Pollution of the United Nations Economic Commission for Europe (CLRTAP) and Directive (EU) 2016/2284 of the European Parliament and of the Council of 14 December 2016 on the reduction of national emissions of certain atmospheric pollutants, amending Directive 2003/35/EC and repealing Directive 2001/81/EC (OJ L 344, 17/12/2016 (hereinafter new NEC Directive).

The air pollutants reported are main pollutants (SO_2, NOx, CO, NMVOC and NH_3), particles (TSP, PM_{10} and $PM_{2.5}$), black carbon (BC), heavy metals (Cd, Pb, Hg, As, Cr, Cu, Ni, Se and Zn) and persistent organic compounds (PCDD/PCDF, PAHs (benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene and indeno(1,2,3-cd)pyrene), HCB and PCBs).

The Croatian air pollution inventory is reported in Nomenclature for Reporting format[1] revised 25.9.2019 (hereinafter referred to as NFR 2019-1). The Republic of Croatia reports emission inventories for all years since 1990 and submits them in digital form.

The Croatian Air Pollution Inventory has been prepared in accordance with standard methods and procedures in accordance with the EMEP / EEA Air Pollution Inventory 2019 (hereinafter GB2019) and other available technical guidance.

The issues addressed in this report are trends in emissions, key emission sources, emission of large point sources, description of each NFR category, uncertainty estimates, recalculations, planned and made improvements and procedures for quality assurance and control. IIR2020 follows recommended structure for the IIR[2] and covers all years in period from 1990 to 2018.

Information contained in this report is available to the public on the Ministry of Environment and Energy (MEE) website, at the links: https://mzoe.gov.hr/o-ministarstvu-1065/djelokrug-4925/okolis/zrak/emisije-u-zrak/1312 and http://www.haop.hr/hr/emisije-oneciscujucih-tvari-u-zrak-na-podrucju-republike-hrvatske/emisije-oneciscujucih-tvari-u.

This report and the NFR tables are available on the Centre on Emission Inventories and Projections (CEIP) website, at the links: https://www.ceip.at/ms/ceip_home1/ceip_home/status_reporting/ and on the Eionet central data repository on links: http://cdr.eionet.europa.eu/hr/un/clrtap/ and http://cdr.eionet.europa.eu/hr/eu/nec_revised/.

EKONERG - Energy Research and Environmental Protection Institute Ltd. from Zagreb is under the Public Procurement Contract for the service delivery "Reporting Service in accordance with the requirements of the LRTAP Convention and the NEC Directive" for the MEE[3], the responsible executor for the preparation of IIR2020 and NFR reporting formats and for maintaining the CollectER and COPERT databases. EKONERG participates in the meetings under the UNECE Task Force on Emission Inventories and Projections and related expert panels, where parties to the LRTAP Convention prepare guidelines and methodologies on inventories.

[1] Annex I of 2014 Reporting guidelines (ECE/EB.AIR.125)

[2] Annex II of 2014 Reporting guidelines (ECE/EB.AIR.125)

[3] Contracting authority in the procurement process, responsible for the annual preparation and submission of the annual IIR and NFR tables to the UNECE-LRTAP Convention and the European Commission.

ES2 Emission trends 1990–2018 and projections for 2020, 2025 and 2030

Emissions of almost all relevant air pollutants show a general downward trend in the period from 1990 to 2018. The NOx emissions were reduced by 53.3%, SO_2 by 93.9%, NH_3 by 33.7%, NMVOC by 57.8%, CO by 57.6%, $PM_{2.5}$ by 25.8%, PM_{10} by 37.8%%, TSP by 13.7%%, BC by 28.2%, heavy metals: Pb by 98.4%, Cd by 24.9%, Hg by 64.4%, As by 93.6%, Cr by 61.8%, Ni by 79.6%, Se by 17.8% and Zn by 13.2% while emission of Cu was increased by 25.9%. The PCDD/PCDF emission was reduced by 42.7%, PCBs by 14.7%, HCB by 92% and PAHs by 35.8% (Table 1.1-5). The HCB emission increased by 3.4% since 1990 (see details in Chapter IV).

The emissions of the three main pollutants SO_2, NOx and NMVOC in 2018 were below and the NH_3 emission was above the emission quotas established for 2010 and the years thereafter, according to the Gothenburg Protocol (Table 1.1-2). It is expected that this status will be maintained until 2020, when new reduction commitments that include also reduction commitments for particulate matter $PM_{2.5}$ come into force. Details on the projections are presented in Chapter 6.

Following Figure ES2-1 shows trends of relative emissions of main pollutants, their projections in the with measures scenario (WM) and in the with additional measure (WAM) scenario, their emission quotas and the reduction commitments from 2020 to 2029 and for the period after 2030 that are prescribed in the revised Gothenburg Protocol and the new NEC Directives and which have also been transposed into Croatian legislation by the Regulation on the national obligations to reduce emissions of certain pollutants into air in the Republic of Croatia (OG 78/2018).

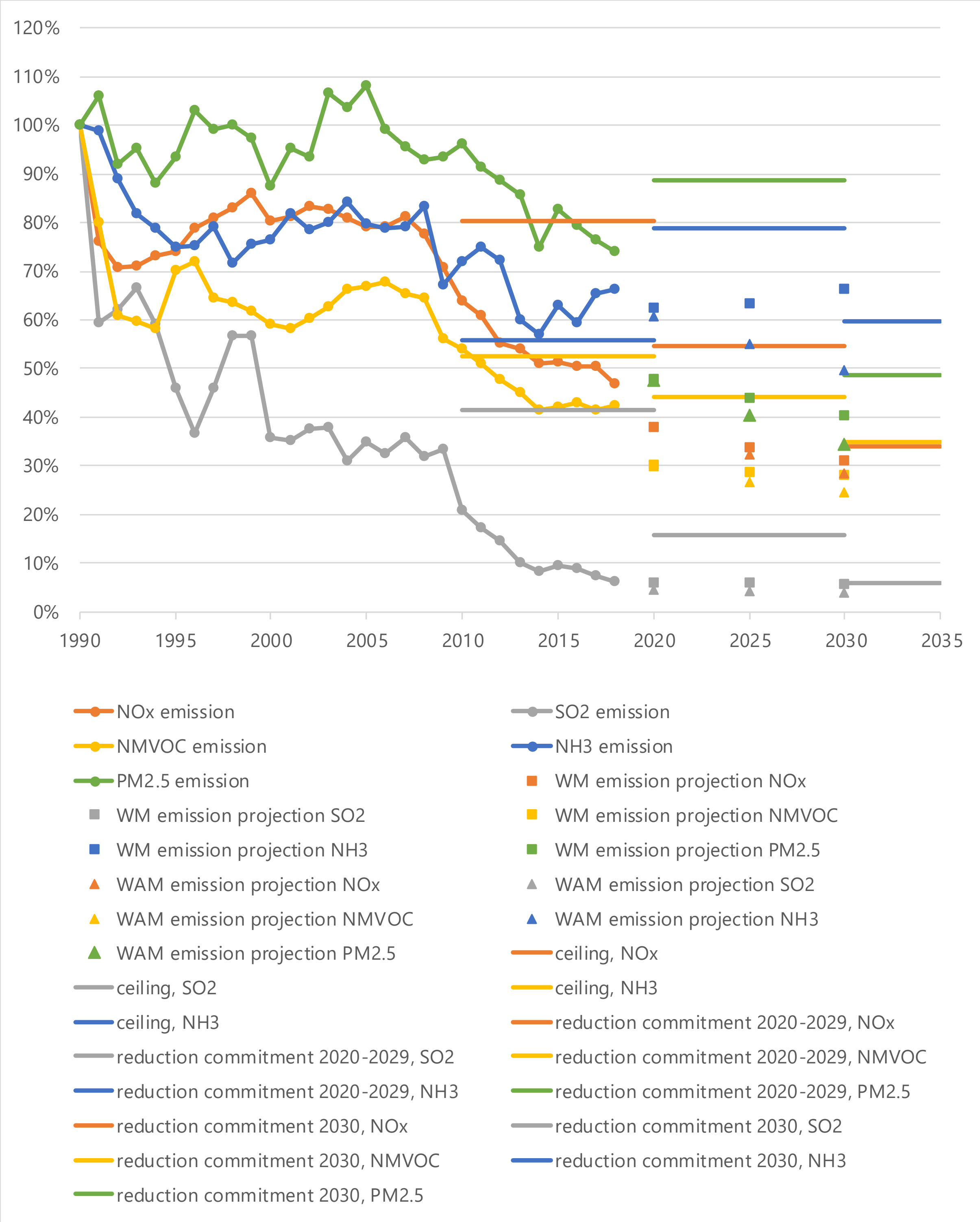

Figure ES2-1 Relative total emission for main pollutants in the Republic of Croatia for 1990 - 2018 and projections for 2020, 2025 and 2030 for with measure scenario (WM) and for with additional measure scenario (WAM), prescribed quotas and the reduction commitment from 2020 to 2029 and for the period of 2030

ES3 Sectoral emissions in 2018

Energy (fuel combustion and fugitive emissions) is the main source of air pollution in Croatia. The energy sector contributes the most to the following substances: to the total SO_2 emission with 98.7%, NOx with 84.7%, NMVOC with 44.4%, NH_3 with 9%, TSP with 42.5%, $PM_{2,5}$ with 92.6%, PM_{10} with 74.3%, BC with 95.3%, CO with 99.6%, Pb with 74.9%, Cd with 84.3%, Hg with 85.3%, As with 89.3%, Cr with 94.8%, Cu with 91.6%, Ni with 97.6%, Se with 44.9%, Zn with 99.6%, PCDD / PCDF with 93.5%, PAU with 99.5% and HCB with 52.6%.

Industrial processes and product use is the main sources for emissions of PCBs, NMVOC, Pb, Cd, Hg, TSP, PM_{10}, Se, As, Cu and Ni. To the total PCBs emissions it contributes with 99.4%, to NMVOC emission with 41.5%, TSP with 41.5%, PM_{10} with 14.4%, Pb with 25.1%, Cd with 15.6%, Hg with 12.1%, Se with 55%, As with 10.4%, Ni with 10.4%, Cu with 8.4% and NH_3 with 7.9%.

Agriculture is the main source for emissions of NH_3 (81.5%), HCB (47.3%), NOx (13.5%), TSP (12.9%), NMVOC (12.5%), and PM_{10} (11%).

Waste is the main source only for emission of PCDD/PCDF (5%).

Natural emissions: the emissions are reported from forest fires and they are not included in national total emissions. They are therefore observing under memo items.

Tables from ES3-1 to ES3-4 present total national emissions by source of discharges, and total (specific) emissions expressed in dependence of population, area and gross domestic product of Croatia in 2018. The share of each SNAP sector in total national emissions of certain pollutants is also representing in tables. Table ES3-1 shows an overview of national emissions of pollutants that cause acidification, eutrophication and photochemical pollution (SO_2, NOx, NMVOC, CO and NH_3). Table ES3-2 shows particulate matter emissions (TSP, PM_{10}, $PM_{2.5}$ and BC), Table ES3-3 shows heavy metal emissions (Pb, Cd, Hg, As, Cr, Cu, Ni, Se and Zn). Table ES3-4 shows emission of persistent organic pollutants (PAHs, PCDD / PCDF, PCBs and HCB) for Croatia in 2018.

Table ES3-1 Emissions of the substances that cause acidification, eutrophication and photochemical pollution in the Republic of Croatia, 2018.

Emissions 2018, t/yr	SO_2	NOx	NMVOC	CO	NH_3
Combustion in energy transformation industry	2,670.6	4,280.5	409.7	1,346.7	8.0
Non-industrial combustion plants	872.4	5,817.2	20,090.0	164,163.9	2,621.3
Combustion in manufacturing industry	2,179.8	4,094.5	1,012.1	5,506.0	52.6
Production processes	4,184.9	1,027.4	4,591.3	22,398.3	2,850.2
Extraction and distribution of fossil fuels and geothermal energy	0	0	2,550.8	0	0
Solvent and other product use	5	22	26,493.0	675.2	50
Road transport	31.2	21,768.9	5,616.4	28,113.5	418.9
Other mobile source and machinery	19.2	6,672.1	1,229.9	12,414.1	2.8
Waste treatment and disposal	332.0	50.4	1,160.8	204.9	605.2
Agriculture	0	6,815.4	9,018	48	29,053.2
TOTAL	10,295.4	50,548.5	72,171.9	234,870.8	35,662.1
Other source and sinks (not included in national total)	263.4	3,709.8	442.5	3,429.9	20.8
Emissions in relation to population, kg/citizen	2.5	12.1	17.3	56.3	8.5
Emissions in relation to area, kg/km^2	0.2	0.9	1.3	4.2	0.6
Emissions in relation to GDP, g/EUR	0.2	1.1	1.6	5.1	0.8
Share, %	**SO2**	**NOx**	**NMVOC**	**CO**	**NH3**
Combustion in energy transformation industry	25.9	8.5	0.6	0.6	2.3E-02
Non-industrial combustion plants	8.5	11.5	27.8	69.9	7.4
Combustion in manufacturing industry	21.2	8.1	1.4	2.3	0.1
Production processes	40.6	2.0	6.4	9.5	8.0
Extraction and distribution of fossil fuels and geothermal energy	0	0	3.5	0	0
Solvent and other product use	0	4.4E-02	36.7	2.9E-01	0
Road transport	0.3	43.1	7.8	12.0	1.2
Other mobile source and machinery	0.2	13.2	1.7	5.3	7.8E-03
Waste treatment and disposal	3.2E+00	1.0E-01	1.6	8.72E-02	1.7
Agriculture	0	13.5	12	0	81.5
TOTAL	100.0	100.0	100.0	100.0	100.0
Other source and sinks (not included in national total)	2.558	7.339	0.613	1.460	0.058

Table ES3-2 Particulate matter emissions in the Republic of Croatia, 2018

Emissions 2018, t/yr	TSP	$PM_{2.5}$	PM_{10}	BC
Combustion in energy transformation industry	1,398.4	1,042.0	1,228.1	39.8
Non-industrial combustion plants	24,988.9	23,208.1	23,801.7	2,780.2
Combustion in manufacturing industry	465.6	371.1	409.4	69.4
Production processes	16,409.9	1,266.5	5,305.3	35.2
Extraction and distribution of fossil fuels and geothermal energy	0	0	0	0
Solvent and other product use	577.7	449.9	548.1	146.3
Road transport	2,245.4	1,349.9	1,771.3	696.2
Other mobile source and machinery	415.3	413.0	414.1	113.4
Waste treatment and disposal	177.7	177.0	177.3	9.2
Agriculture	4,889.1	450.7	4,156.7	0.4
TOTAL	51,568.0	28,728.1	37,812.0	3,890.1
Other source and sinks (not included in national total)	83.4	79.1	83.4	15.0
Emissions in relation to population, kg/citizen	12.4	6.9	9.1	0.9
Emissions in relation to area, kg/km^2	0.9	0.5	0.7	0.1
Emissions in relation to GDP, g/EUR	1.1	0.6	0.8	0.1
Share, %	**TSP**	**$PM_{2.5}$**	**PM_{10}**	**BC**
Combustion in energy transformation industry	2.7	3.6	3.2	1.0
Non-industrial combustion plants	48.5	80.8	62.9	71.5
Combustion in manufacturing industry	0.9	1.3	1.1	1.8
Production processes	31.8	4.4	14.0	0.9
Extraction and distribution of fossil fuels and geothermal energy	0	0	0	0
Solvent and other product use	1.1	1.6	1.4	3.8
Road transport	4.4	4.7	4.7	17.9
Other mobile source and machinery	0.8	1.4	1.1	2.9
Waste treatment and disposal	0.345	0.616	0.469	0.238
Agriculture	9.5	1.6	11.0	0.0
TOTAL	100.0	100.0	100.0	100.0
Other source and sinks (not included in national total)	0.162	0.275	0.221	0.387

Table ES3-3 Heavy metals emissions in the Republic of Croatia, 2018

Emissions 2018, t/yr	Pb	Hg	Cd	As	Cr	Cu	Ni	Se	Zn
Combustion in energy transformation industry	294.8	108.9	26.6	116.2	128.1	246.3	2,101.8	25.7	2,000.3
Non-industrial combustion plants	1,267.7	42.4	597.0	13.6	1,077.9	284.0	354.7	24.1	23,557.3
Combustion in manufacturing industry	367.8	133.2	40.3	73.7	152.9	189.2	141.7	65.0	2,068.2
Production processes	1,020.0	51.2	99.6	344.6	265.7	86.0	652.2	237.5	667.0
Extraction and distribution of fossil fuels and geothermal	0	0	0	0	0	0	0	0	0
Solvent and other product use	1277.14	41.0	67.4	2.2	25.4	788.3	81.4	0	456.1
Road transport	3,999.5	11.8	5.5	0.3	343.6	7,320.6	61.8	8.1	2,750.5
Other mobile source and machinery	183.7	1.6	3.4	2.0	17.5	548.4	65.3	7.6	390.8
Waste treatment and disposal	2.0	10.8	3.0	1.7	6.9	5.7	6.8	1.4	22.9
Agriculture	0	0	1	0	0	0	0	0	0
TOTAL	8,412.6	401.0	843.5	554.3	2,018.2	9,468.6	3,465.8	369.4	31,913.5
Other source and sinks (not included in national total)	3.46	1.40	0.29	3.92	5.42	21.39	160.26	3.32	223.58
Emissions in relation to population, kg/citizen	2.0	0.1	0.2	0.1	0.5	2.3	0.8	0.1	7.6
Emissions in relation to area, kg/km^2	0.1	0.0	0.0	0.0	0.0	0.2	0.1	0.0	0.6
Emissions in relation to GDP, g/EUR	0.2	0.0	0.0	0.0	0.0	0.2	0.1	0.0	0.7
Share, %	**Pb**	**Hg**	**Cd**	**As**	**Cr**	**Cu**	**Ni**	**Se**	**Zn**
Combustion in energy transformation industry	3.5	27.2	3.2	21.0	6.3	2.6	60.6	6.9	6.3
Non-industrial combustion plants	15.1	10.6	70.8	2.5	53.4	3.0	10.2	6.5	73.8
Combustion in manufacturing industry	4.4	33.2	4.8	13.3	7.6	2.0	4.1	17.6	6.5
Production processes	12.1	12.8	11.8	62.2	13.2	0.9	18.8	64.3	2.1
Extraction and distribution of fossil fuels and geothermal	0	0	0	0	0	0	0	0	0
Solvent and other product use	15.1813	10.2	8.0	0.3909	1.25917	8.3	2.3	0	1.4
Road transport	47.5	2.94328	0.7	0.0525	17.0	77.3	1.8	2.2	8.6
Other mobile source and machinery	2.2	0.4	0.4	0.3523	0.9	5.8	1.9	2.0	1.2
Waste treatment and disposal	0.0	2.7	0.4	0.31	0.34	0.06	0.20	0.39	0.07
Agriculture	0.00095	0.02523	0.0754	0.0008	0.00286	0.00056	0.00108	0.00391	0.001268
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Other source and sinks (not included in national total)	0.041	0.348	0.035	0.707	0.269	0.226	4.624	0.899	0.701

Table ES3-4 Persistent organic pollutants emissions in the Republic of Croatia, 2018

Emissions 2018, kg/yr for PAH, HCB, PCB; g I-TEQ/yr for PCDD/PCDF	PAH	PCDD/ PCDF	HCB	PCB
Combustion in energy transformation industry	8.8	0.5	4.3E-02	2.1
Non-industrial combustion plants	13326.5	23.7	0.23	0.0
Combustion in manufacturing industry	375.3	0.5	1.9E-02	0.5
Production processes	67.07285	0.4	0	0.3
Extraction and distribution of fossil fuels and geothermal energy	0	0	0	0
Solvent and other product use	4.5	0.001	0	408.8
Road transport	157.6	0.9	NA	NE
Other mobile source and machinery	49.8	0.4	0.004	0.003
Waste treatment and disposal	0.0028	1.4	0.000966	0.003
Agriculture	1.657938	0.361364	0.266752	0
TOTAL	13991.1	28.2	0.56	411.8
Other source and sinks (not included in national total)	139.4	0.0138	0.001923	0.0031803
Emissions in relation to population, kg/citizen	3.4	0.007	0.000135	0.1
Emissions in relation to area, kg/km^2	0.2	0.0005	9.96E-06	0.007
Emissions in relation to GDP, g/EUR	0.3	0.001	1.22E-05	0.009
Share, %	**PAH**	**PCDD/ PCDF**	**HCB**	**PCB**
Combustion in energy transformation industry	6.3E-02	1.8	7.6	0.5
Non-industrial combustion plants	95.2	84.1	40.8	0.0
Combustion in manufacturing industry	2.7	1.8	3.4	0.1
Production processes	0.5	1.5	0.0	0.1
Extraction and distribution of fossil fuels and geothermal energy	0	0	0	0
Solvent and other product use	0.0	0.004	0	99.3
Road transport	1.1	3.4	-	-
Other mobile source and machinery	0.4	1.4	0.7	0.001
Waste treatment and disposal	0	4.9	0	0.001
Agriculture	0	1	47	0
TOTAL	100.0	100.0	100.0	100.0
Other source and sinks (not included in national total)	0.996	0.049	0.341	0.001

ES4 Recalculations and other changes

The recalculations had to be carried out due to the availability of new information, improvements in sectors, implementation of higher tier (e.g. Tier 2), changing methodology, due to identification of time series inconsistency, increase the accuracy of the estimates and reduce the uncertainty.

The emissions of almost all pollutants were recalculated for the full time series 1990–2017, for the present submission. In Appendix 8. the influence of emission recalculations made 1990 - 2017 in respect to each of pollutant and by SNAP97 sector are presented. In addition, the overview of changes between total pollutants emissions for 2017 submitted in 2019 and in this year submission with explanations for existing differences, and comparison with national total pollutants emissions in 2018 are presented in Table ES4-1.

Table ES4-1 Recalculations and explanations for changes between submitted total pollutants emissions for year 2017 in IIR 2019 and in IIR 2020

Pollutant	2019 submission IIR 2019	2020 submission IIR 2020		Unit	Explanations for changes between the 2019 and 2020 submissions
	2017	2017	2018		
NOx	56.2	54.7	50.5	kt	Changes stems from methodology improvement and recalculations made in: 1.A.2. for the period 1990-2000 and for 2013 emissions are calculated for each subsector separately 1.A.2.g.vii Recalculation was performed for the period 1990 – 1995 due to correction of data on gasoline consumption. 1.A.3.b Road transport: emissions calculated with COPERT 5 model 1.A.3.d.i(i) Recalculation was performed for the period 1994 – 2017 due to correction of data on fuel consumption. 1.A.4.b.i Residential: 1990-2017 due to new model for biomass by technology type according to GB2019. 1.B.2.c Updated EF (Tier 2) from GB2019 for flares in refineries. 2.C.1.1 Corrected AD. 3.B Recalculation of NH3 emissions were performed for the entire period 1990-2017 (for fattening pigs, breeding pigs and poultry) due to an estimate improvement and change of methodology from Tier 1 to Tier 2 and for cattle categories due to the correction of activity data used. 3.D.1.a Emissions estimates for NH3 and NOx were recalculated for the 2000-2017. The whole observed period was recalculated due to update of AD. 3.D.a.3 Recalculations of NH3 and NOx emissions were performed for the entire period 1990-2017 due to the correction of AD for cattle.
NMVOC	63.2	70.8	72.2	kt	Changes stems from methodology improvement and recalculations made in: 1.A.2. for the period 1990-2000 and for 2013 emissions are calculated for each subsector separately

Pollutant	2019 submission IIR 2019	2020 submission IIR 2020		Unit	Explanations for changes between the 2019 and 2020 submissions
	2017	2017	2018		
					1.A.2.g.vii Recalculation was performed for the period 1990 – 1995 due to correction of data on gasoline consumption. 1.A.3.b Road transport: emissions calculated with COPERT 5 model 1.A.3.d.i(i) Recalculation was performed for the period 1994 – 2017 due to correction of data on fuel consumption. 1.A.4.b.i Residential: 1990-2017 due to new model for biomass by technology type according to GB2019. 1.B.2.b.2 Included new AD and EF correction. 2.C.1.1 Corrected AD. 2.D.3.a Corrected AD for Car care products. 2.D.3.g New AD for Pharmaceutical products manufacturing and updated EFs for all activities according to GB2019. 3.D.e Emissions were recalculated for 1990-2017 due the improvement from Tier 1 to Tier 2 methodology. 3.F This is the first time emissions from 3.F source were estimated in the inventory. 5.A Biological treatment of waste - solid waste disposal on land: correction of EF for entire time series 1990. - 2017. Country Specific (CS) EF were calculated using a methodology for estimating EF based on CH4 emissions estimated in the framework of the UNFCCC GHG emissions report (NIR). The recalculation was made for the period 1990 - 2017. 5.D.2 Industrial wastewater handling: due to the allocation of wastewater from residential/commercial sectors from category 5.D.1 to category 5.D.2, as well correction of AD for residential/commercial wastewater for 2017, recalculation was made for the period 1990 - 2017.
SO_2	12.6	12.7	10.3	kt	Changes stems from methodology improvement and recalculations made in: 1.A.2 for the period 1990-2000 and for 2013 emissions are calculated for each subsector separately 1.A.2.g.vii Recalculation was performed for the period 1990 – 1995 due to correction of data on gasoline consumption. 1.A.3.b Road transport: emissions calculated with COPERT 5 model 1.A.3.d.i(i) Recalculation was performed for the period 1994 – 2017 due to correction of data on fuel consumption. 2.C.1.1 Corrected AD. 3.F This is the first time emissions from 3.F source were estimated in the inventory.
NH_3	37.6	35.2	35.7	kt	Changes stems from methodology improvement and recalculations made in: 1.A.2. for the period 1990-2000 and for 2013 emissions are calculated for each subsector separately 1.A.3.b Road transport: emissions calculated with COPERT 5 model. 1.A.4.b.i Residential: 1990-2017 due to new model for biomass by technology type according to GB2019.

Pollutant	2019 submission IIR 2019	2020 submission IIR 2020		Unit	Explanations for changes between the 2019 and 2020 submissions
	2017	2017	2018		
					3.B Recalculation of NH3 emissions were performed for the entire period 1990-2017 (for fattening pigs, breeding pigs and poultry) due to an estimate improvement and change of methodology from Tier 1 to Tier 2 and for cattle categories due to the correction of activity data used. 3.D.1.a Emissions estimates for NH3 and NOx were recalculated for the 2000-2017. The whole observed period was recalculated due to update of AD. 3.D.a.2.a Recalculations of NH3 emissions were performed for the entire period 1990-2017 (for fattening pigs, breeding pigs and poultry) due to the improvement of 3B methodology from Tier 2 to Tier 3. 3.D.a.3 Recalculations of NH3 and NOx emissions were performed for the entire period 1990-2017 due to the correction of AD for cattle. 3.F This is the first time emissions from 3.F source were estimated in the inventory. 5.B.1 Biological treatment of waste – composting: data on different types of waste on a wet weight basis (that used in the NIR report) have been included in the inventory in relation to previous inventory that used data on different types of waste based on dry matter. The recalculation was made for the period 2007 - 2017. 5.D.1 Domestic wastewater handling: due to the allocation of wastewater from latrines from category 5.D.3 to category 5.D.1, recalculation was made for the period 1990 - 2017.
$PM_{2.5}$	16.7	29.6	28.7	kt	Changes stems from methodology improvement and recalculations made in: 1.A.1.c EFs from GB2019 were used. 1.A.2. for the period 1990-2000 and for 2013 emissions are calculated for each subsector separately 1.A.2.g.vii Recalculation was performed for the period 1990 – 1995 due to correction of data on gasoline consumption. 1.A.3.b Road transport: emissions calculated with COPERT 5 model 1.A.3.d.i(i) Recalculation was performed for the period 1994 – 2017 due to correction of data on fuel consumption. 1.A.4.a emission factors from GB2019 were used. 1.A.4.b.i Residential: 1990-2017 due to new model for biomass by technology type according to GB2019 and new emission factors from GB2019 were used. 2.C.1.1 Corrected AD. 3.F This is the first time emissions from 3.F source were estimated in the inventory.
PM_{10}	25.4	38.6	37.8	kt	Changes stems from methodology improvement and recalculations made in: 1.A.1.c EFs from GB2019 were used. 1.A.2. for the period 1990-2000 and for 2013 emissions are calculated for each subsector separately 1.A.2.g.vii Recalculation was performed for the period 1990 – 1995 due to correction of data on gasoline consumption.

Pollutant	2019 submission IIR 2019	2020 submission IIR 2020		Unit	Explanations for changes between the 2019 and 2020 submissions
	2017	2017	2018		
					1.A.3.b Road transport: emissions calculated with COPERT 5 model 1.A.3.d.i(i) Recalculation was performed for the period 1994 – 2017 due to correction of data on fuel consumption. 1.A.4.a emission factors from GB2019 were used. 1.A.4.b.i Residential: 1990-2017 due to new model for biomass by technology type according to GB2019 and new emission factors from GB2019 were used. 2.C.1.1 Corrected AD. 3.F This is the first time emissions from 3.F source were estimated in the inventory.
TSP	37.9	52.1	51.6	kt	Changes stems from methodology improvement and recalculations made in: 1.A.1.c EFs from GB2019 were used. 1.A.2. for the period 1990-2000 and for 2013 emissions are calculated for each subsector separately 1.A.2.g.vii Recalculation was performed for the period 1990 – 1995 due to correction of data on gasoline consumption. 1.A.3.b Road transport: emissions calculated with COPERT 5 model 1.A.3.d.i(i) Recalculation was performed for the period 1994 – 2017 due to correction of data on fuel consumption. 1.A.4.a emission factors from GB2019 were used. 1.A.4.b.i Residential: 1990-2017 due to new model for biomass by technology type according to GB2019 and new emission factors from GB2019 were used. 2.C.1.1 Corrected AD. 3.F This is the first time emissions from 3.F source were estimated in the inventory.
BC	2.8	4.1	3.9	kt	Changes stems from methodology improvement and recalculations made in: 1.A.2. for the period 1990-2000 and for 2013 emissions are calculated for each subsector separately 1.A.3.b Road transport: emissions calculated with COPERT 5 model. 1.A.4.a emission factors from GB2019 were used. 1.A.4.b.i Residential: 1990-2017 due to new model for biomass by technology type according to GB2019 and new emission factors from GB2019 were used. 2.C.1.1 Corrected AD.
CO	196.6	252.5	234.8	kt	Changes stems from methodology improvement and recalculations made in: 1.A.2. for the period 1990-2000 and for 2013 emissions are calculated for each subsector separately 1.A.3.b Road transport: emissions calculated with COPERT 5 model. 1.A.4.b.i Residential: 1990-2017 due to new model for biomass by technology type according to GB2019. 1.B.2.c Updated EF (Tier 2) from GB2019 for flares in refineries. 2.C.1.1 Corrected AD.
Pb	8.0	8.1	8.4	t	Changes stems from methodology improvement and recalculations made in:

Pollutant	2019 submission IIR 2019	2020 submission IIR 2020		Unit	Explanations for changes between the 2019 and 2020 submissions
	2017	2017	2018		
					1.A.2. for the period 1990-2000 and for 2013 emissions are calculated for each subsector separately. 1.B.2.c Updated EF (Tier 2) from GB2019 for flares in refineries. 2.C.1.1 Corrected AD.
Cd	0.8	0.8	0.8	t	Changes stems from methodology improvement and recalculations made in: 1.A.3.b Road transport: emissions calculated with COPERT 5 model. 1.B.2.c Updated EF (Tier 2) from GB2019 for flares in refineries. 2.C.1.1 Corrected AD.
Hg	0.4	0.4	0.4	t	Changes stems from methodology improvement and recalculations made in: 1.A.2. for the period 1990-2000 and for 2013 emissions are calculated for each subsector separately. 1.B.2.c Updated EF (Tier 2) from GB2019 for flares in refineries. 2.C.1.1 Corrected AD.
As	0.5	0.5	0.6	t	Changes stems from methodology improvement and recalculations made in: 1.A.3.b Road transport: emissions calculated with COPERT 5 model. 1.B.2.c Updated EF (Tier 2) from GB2019 for flares in refineries. 2.C.1.1 Corrected AD.
Cr	2.1	2.1	2.0	t	Changes stems from methodology improvement and recalculations made in: 1.A.2. for the period 1990-2000 and for 2013 emissions are calculated for each subsector separately. 1.B.2.c Updated EF (Tier 2) from GB2019 for flares in refineries. 2.C.1.1 Corrected AD.
Cu	8.9	9.6	9.5	t	Changes stems from methodology improvement and recalculations made in: 1.A.2. for the period 1990-2000 and for 2013 emissions are calculated for each subsector separately 1.A.3.b Road transport: emissions calculated with COPERT 5 model 1.B.2.c Updated EF (Tier 2) from GB2019 for flares in refineries. 2.C.1.1 Corrected AD.
Ni	4.3	4.3	3.5	t	Changes stems from methodology improvement and recalculations made in: 1.A.2. for the period 1990-2000 and for 2013 emissions are calculated for each subsector separately 1.A.3.b Road transport: emissions calculated with COPERT 5 model 1.B.2.c Updated EF (Tier 2) from GB2019 for flares in refineries. 2.C.1.1 Corrected AD.
Se	0.4	0.4	0.4	t	Changes stems from methodology improvement and recalculations made in: 1.B.2.c Updated EF (Tier 2) from GB2019 for flares in refineries.

Pollutant	2019 submission IIR 2019	2020 submission IIR 2020		Unit	Explanations for changes between the 2019 and 2020 submissions
	2017	2017	2018		
Zn	34.7	31.2	31.9	t	Changes stems from methodology improvement and recalculations made in: 1.A.2. for the period 1990-2000 and for 2013 emissions are calculated for each subsector separately 1.A.3.b Road transport: emissions calculated with COPERT 5 model 1.B.2.c Updated EF (Tier 2) from GB2019 for flares in refineries. 2.C.1.1 Corrected AD.
PCDD / PCDF	16.2	28.7	27.7	g I-Teq	Changes stems from methodology improvement and recalculations made in: 1.A.2. for the period 1990-2000 and for 2013 emissions are calculated for each subsector separately. 1.A.4.b.i Residential: 1990-2017 due to new model for biomass by technology type according to GB2019. 2.C.1.1 Corrected AD.
Total 4 PAHs	5.9	14.5	14.0	t	Changes stems from methodology improvement and recalculations made in: 1.A.3.b Road transport: emissions calculated with COPERT 5 model. 1.A.4.b.i Residential: 1990-2017 due to new model for biomass by technology type according to GB2019. 2.C.1.1 Corrected AD.
benzo (a) pyrene	1.9	5.0	4.8	t	Changes stems from methodology improvement and recalculations made in: 1.A.2. for the period 1990-2000 and for 2013 emissions are calculated for each subsector separately. 1.A.4.b.i Residential: 1990-2017 due to new model for biomass by technology type according to GB2019.
benzo (b) fluoranthene	2.1	4.7	4.6	t	Changes stems from methodology improvement and recalculations made in: 1.A.3.b Road transport: emissions calculated with COPERT 5 model. 1.A.4.b.i Residential: 1990-2017 due to new model for biomass by technology type according to GB2019.
benzo (k) fluoranthene	0.8	1.8	1.7	t	Changes stems from methodology improvement and recalculations made in: 1.A.2. for the period 1990-2000 and for 2013 emissions are calculated for each subsector separately. 1.A.4.b.i Residential: 1990-2017 due to new model for biomass by technology type according to GB2019.
indeno (1,2,3-cd) pyrene	1.1	2.9	2.8	t	Changes stems from methodology improvement and recalculations made in: 1.A.3.b Road transport: emissions calculated with COPERT 5 model. 1.A.4.b.i Residential: 1990-2017 due to new model for biomass by technology type according to GB2019.
HCB	0.28	0.46	0.56	kg	Changes stems from methodology improvement and recalculations made in: 1.A.2. for the period 1990-2000 and for 2013 emissions are calculated for each subsector separately Change due to inclusion of 3.D.f source in the inventory. 1.A.4.b.i Residential: 1990-2017 due to new model for biomass by technology type according to GB2019.

Pollutant	2019 submission IIR 2019	2020 submission IIR 2020		Unit	Explanations for changes between the 2019 and 2020 submissions
	2017	2017	2018		
PCBs	415.4	415.3	411.8	kg	Changes stems from methodology improvement and recalculations made in: 1.A.2. for the period 1990-2000 and for 2013 emissions are calculated for each subsector separately 1.A.3.b Road transport: emissions calculated with COPERT 5 model. 2.C.1.1 Corrected AD.

ES5 Improvements and other activity

The Croatian IIR 2020 includes improvements and other activity that will lead to future improvements of inventory are present in Table ES5-1.

Table ES5-1 Improvements and other activity made in IIR 2020

NFR sector, Name	NFR sub-sector, Name	Description of improvements and other activity made
1.A Energy – fuel combustion	1.A.2. Energy Industries	For the period 1990-2000 and for 2013 emissions are calculated for each subsector separately
1.A Energy – fuel combustion	1.A.2.g.vii Non-road mobile sources and machinery: Industry	Recalculation was performed for the period from 1990 to 1995 due to correction of activity data for gasoline consumption.
1.A Energy – fuel combustion	1.A.3.b Road transport	Emissions calculated with COPERT 5 model
1.A Energy – fuel combustion	1.A.3.d Navigation (shipping)	Recalculation was performed for the period 1994 – 2017 due to the correction of activity data for International bunkers of ships
1.A Energy – fuel combustion	1.A.4.a Commercial /Institutional	Update of EF according to GB2019.
1.A Energy – fuel combustion	1.A.4.b.i Residential	New model for biomass based on which activity data is distributed i.e. the amount of biomass by types of combustion technologies. Update of EF according to GB2019 for TSP, PM and BC for wood combustion in pellet stoves and boilers.
1.B Fugitive emissions from fuels	B.2.b.2 Natural gas – transport	An Emission Calculation Improvement Project has been implemented, led by the MEE, during which new data were collected. Accordingly, NMVOC emission for the whole time series was recalculated for this source category.
	1.B.2.c Venting and flaring	Emissions recalculation was done for the whole time series due to updated emission factors (Tier 2) from the new GB 2019 for flares in refineries.
2 Industrial processes and product use	2.A.1 Cement production	Recalculation was performed for the period 1990-1994, due to transition to Tier 1 approach for one factory.
2 Industrial processes and product use	2.B.1 Ammonia production	NH_3 emission recalculation was performed for the year 1999, due to corrected EF.
2 Industrial processes and product use	2.C.1 Iron and steel production	Recalculation of all emissions from steel production in EAFs was performed due to harmonization of AD with the NIR. Changes refer to years 2005-2008 and 2011-2017.
2 Industrial processes and product use	2.C.3 Aluminium production	Recalculation was performed for 1990 and 1991 due to updated EFs for SOx, TSP, PM, BC, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene and indeno[1,2,3-cd]pyrene, with exclusion of PCDD/F emission from the calculation.
2 Industrial processes and product use	2.D.3.a Domestic solvent use including fungicides	An error in activity data entry for 2017 was corrected for the Car care products activity, which led to a change in NMVOC emission. In addition, according to the new GB2019, Hg emission from fluorescent tubes is no longer included in this category.
2 Industrial processes and product use	2.D.3.g Chemical products	NMVOC emission factors and activity data were updated according to GB2019 for all activities except polystyrene foam processing and adhesive, magnetic tapes, films and photographs manufacturing. In addition, asphalt blowing activity was included in the emissions calculation.

NFR sector, Name	NFR sub-sector, Name	Description of improvements and other activity made
3 Agriculture	3.B Manure management	Recalculation of NH3 emissions were performed for the entire period 1990-2017 (for fattening pigs, breeding pigs and poultry) due to an estimate improvement and change of methodology from Tier 1 to Tier 2.
3 Agriculture	3.D.1.a. Inorganic N fertilizers (including urea)	Emissions estimates for NH3 and NOx were recalculated for the 2000-2017. The observed period was recalculated due to update of AD.
3 Agriculture	3.D.e Cultivated crops	The emission estimate for NMVOC was recalculated due the improvement from Tier 1 to Tier 2 methodology.
3 Agriculture	3.D.f.	Emissions from 3.D.f source estimated in the inventory (Tier1).
3 Agriculture	3.F Field burning of agricultural residues	This is the first time emissions from 3.F source were estimated in the inventory (Tier1).
5 Waste	5.A Biological treatment of waste - solid waste disposal on land	According to the recommendation by Technical expert review team (TERT) during review in 2019, a technical correction were performed for NMVOC emissions from 5.A. In order to improve the accuracy of the estimate, a CS methodology was developed to estimate a NMVOC EF for all years in reporting period, based on the CH_4 emissions estimated in the framework of the NIR report. CH_4 emission ratio per ton of disposed waste was used, converted into a volume of CH_4 per tonne of disposed waste (using the molecular volume of CH_4) and then into a volume of biogas per tonne of disposed waste (applying the fraction of CH_4 in biogas F = 50%) and then the fraction of NMVOC in biogas (5.65 g/m^3 of landfill gas), presented in the note at the bottom of Table 3-1, Chapter 5.A of the EMEP/EEA GB2019, was applied.
5 Waste	5.B.1 Biological treatment of waste - composting	Data on different types of waste on a wet weight basis (that used in the NIR report) have been included in the inventory, in order to harmonize AD used in both reports (IIR and NIR).
5 Waste	5.D Wastewater handling	According to the recommendation by Technical expert review team (TERT) during review in 2019, allocation of wastewater from residential/commercial sectors from category 5.D.1 to category 5.D.2 as well wastewater from latrines from category 5.D.3 to category 5.D.1 has been performed, as defined in the EMEP/EEA GB2019. In addition, correction of AD for residential/commercial wastewater for 2017 has been performed.

ES6 Planned improvements

Planned improvements for the next or one of the next inventories are present in Table ES6-1.

Table ES6-1 Improvements planned for the next or one of the next inventory

NFR sector, Name	NFR sub-sector, Name	Improvements planned
1.A Energy – fuel combustion	1.A.2 Stationary combustion in manufacturing industries and construction	For NOx emission calculation, Croatia uses methodology disaggregated by fuel types (gas oil, fuel oil, natural gas, etc.) but not disaggregated by technology. As long-term goal, Croatia will estimate NOx emission by technology type.
1.A Energy – fuel combustion	1.A.3.a Aviation (civil)	For the harmonization of the calculation methodology with the GB2019 for the aviation, it is necessary to estimate the representative aircraft. For that, it is necessary to collect data that are more detailed on aircrafts and their movements in all airports in Croatia.
2 Industrial processes and product use	2.A.3 Glass production	Currently, both glass which is nationally produced and glass, which is imported and then processed in Croatia, is being included in calculations as nationally produced glass products, due to unavailability of disaggregated statistical data. Revision of applied method for emission calculation in line with specific national circumstances should be made to avoid overestimation of emissions for this category. At the moment, this matter is categorised as a long term plan for improvement, provided the required financial resources are made available.
2 Industrial processes and product use	2.A.5.b Construction and demolition	The plan is to recalculate emissions according to Tier 1 EMEP/EEA GB2019 methodology. Based on data that have been collected so far, it will most likely be necessary to carry out significant estimates of missing data and/or to adapt the emission calculation methodology. Given that for this year's inventory the emissions calculation improvements were focused on several other categories, recalculation of emissions from this activity is currently planned for one of the next submissions.
2 Industrial processes and product use	2.D.3.d Coating applications	The plan is to recalculate the trend (entire reporting period) for this category after further investigation of available data, which would enable a transition to Tier 2 GB2019 methodology. Since trend analysis should be carried out, the recalculations will be included in one of the next submissions, provided the required financial resources are made available.
2 Industrial processes and product use	2.D.3.g Chemical products	For pharmaceutical products manufacturing, data on the quantities of solvents used are currently available only from four manufacturers, for the period 2004-2018. Further investigation of this activity is ongoing and any information that may be collected will be included in the inventory in one of the next submissions.
2 Industrial processes and product use	2.D.3.h Printing	The plan is to recalculate the trend (entire reporting period) for this category after further investigation of available data, which would enable transition to Tier 2 GB2019 methodology. Since trend analysis should be carried out, the recalculations will be included in one of the next submissions, provided the required financial resources are made available.
3 Agriculture	3.B Manure management	The plan is also to improve emission calculation of NH_3 (Nex and other parameters used in the emission estimates are taken from the „Improvement of NH_3, CH4 i N2O emission calculation from manure management and development of national factors“, developed by the experts from the Faculty of

NFR sector, Name	NFR sub-sector, Name	Improvements planned
		Agriculture, 2015). Factors and parameters in question will undergo a revision during a new project that is planned due to issues raised by the ERT in the NIR In-country review in. As a part of this revised project, updated national emission factors and parameters are expected, as well as incorporation of existing abatement measures for cattle farms. In addition, planned improvement is upgrading methodology to EMEP/EEA GB 2019. The above-mentioned improvement will be carried out in one of the following submissions.
3 Agriculture	3.D.a.2.c Other organic fertilizers applied to soils (including composts)	It is necessary to check on availability of AD on other organic fertilizers. This improvement will be made in one of the upcoming reports.
3 Agriculture	3.F. Field burning of agricultural residues	This is the first time emissions from 3.F source were estimated in the inventory. As the current emission estimate is probably overestimated due to, using p_b value of 0.5, long-term planned improvement is getting a better national estimate for the value.
5 Waste	5.B.1 Biological treatment of waste - composting	Activity data on types of composted waste (wet weight) have been used for NH_3 emission calculation for the period 2007 – 2018. Activity data for the previous period are not available, so notation key 'NE' is used, which should be investigated. Future improvements are related primarily to aggregation of accurate data for NH_3 emission calculations for the entire reporting period, which is included in the Annual Data Collection Plan. This primarily refers for the pre-2007 years, for which activity data need to be investigated. When the competent authority provides all necessary information and data, it will be included in the inventory.
5 Waste	5.B.2 Biological treatment of waste - anaerobic digestion at biogas facilities	Potential NH_3 emissions from pre- and post-storage as well as possible leakage during solid-liquid separation are not included in the inventory. This issue should be investigated for the entire activity period and included in the inventory.
5 Waste	5.C.2 Open burning of waste	Although law in Croatia prohibits this activity, the Annual Data Collection Plan includes activity data need to be investigated for the entire reporting period.

1. Introduction

The Ministry of Environment and Energy[4] (hereinafter MEE) is, in accordance with the Air Protection Act (OG 127/2019) and the Regulation on National Emission Ceiling of Certain Pollutants in Air in the Republic of Croatia (OG 76/18)[5] (hereinafter Regulation on NEC), the competent authority for ensuring the preparation of national inventories, annual emission inventories, emission projections, spatially disaggregated inventories, large point sources inventories, if appropriate adjusted emission inventories, and informative inventory reports, carried out by authorized company in accordance with the law governing environmental protection.

EKONERG - Energy Research and Environmental Protection Institute Ltd. from Zagreb is under the Public Procurement Contract for the service delivery "Reporting Service in accordance with the requirements of the LRTAP Convention and the NEC Directive", record number: 800/02-19/36JN, for the MEE[6], authorized company and responsible executor for the preparation of IIR2020 and NFR reporting formats (1990-2018) and for maintaining the CollectER and COPERT 5 databases.

This report is Croatia´s annual Informative Inventory Report 2020 (for period 1990 – 2018) (hereinafter referred to as IIR2020) under the UNECE - Convention on Long-range Transboundary Air Pollution of the United Nations Economic Commission for Europe (hereinafter referred to as the LRTAP Convention) and Directive (EU) 2016/2284 of the European Parliament and of the Council of 14 December 2016 on the reduction of national emissions of certain atmospheric pollutants, amending Directive 2003/35/EC and repealing Directive 2001/81/EC (OJ L 344, 17/12/2016 (hereinafter referred to as new NEC Directive). The report contains information on Croatia´s air pollution emission inventories for all years from 1990 to 2018.

The air pollutants reported are main pollutants (SO_2, NOx, CO, NMVOC and NH_3), particles (TSP, PM_{10} and $PM_{2.5}$), black carbon (BC), heavy metals (Cd, Pb, Hg, As, Cr, Cu, Ni, Se and Zn) and persistent organic compounds (PCDD/PCDF, PAHs (benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene and indeno(1,2,3-cd)pyrene), HCB and PCBs).

The Croatian air pollution inventory is reported in Nomenclature for Reporting format[7] revised 25.9.2019 (hereinafter referred to as NFR 2019-1). Previously, the annual emission inventory for Croatia was reported in the Nomenclature for Reporting (NFR) 2014 format. Croatia submits IIR and reporting formats in digital form.

The Croatian Air Pollution Inventory has been prepared in accordance with standard methods and procedures in accordance with the EMEP / EEA Air Pollutant Emission Inventory Guidebook 2019 (hereinafter referred to as GB2019) and other available technical guidance.

The issues addressed in this report are trends in emissions, key emission sources, emission of large point sources, description of each NFR category, uncertainty estimates, and

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[4] Ministry of the Environment and Energy, pursuant to Article 73, paragraph 3 of the Law on Amendments to the Environmental Protection Act (OG 118/18 of December 27, 2018) and deletion of the Croatian Agency for Environment and Nature (CAEN) from the court register (January 17, 2019) assumed the Agency's employees, jobs, rights and obligations, as well as assets, equipment, records and other documentation.

[5] Replaces the earlier regulation: Regulation on emission quotas for certain non-detergents in the Republic of Croatia (OG 108/13, 19/17)

[6] Contracting authority in the procurement process, responsible for the annual preparation and submission of the annual IIR and NFR tables to the UNECE-LRTAP Convention and the European Commission.

[7] Annex I of 2014 Reporting guidelines (ECE/EB.AIR.125)

recalculations, planned and made improvements, procedures for quality assurance and control and emission projections. IIR2020 follows recommended structure for the IIR[8].

Information contained in this report is available to the public on the Ministry of Environment and Energy (MEE) website, at the links: https://mzoe.gov.hr/o-ministarstvu-1065/djelokrug-4925/okolis/zrak/emisije-u-zrak/1312 and http://www.haop.hr/hr/emisije-oneciscujucih-tvari-u-zrak-na-podrucju-republike-hrvatske/emisije-oneciscujucih-tvari-u.

This report and the NFR tables are available on the Centre on Emission Inventories and Projections (CEIP) website, at the links: https://www.ceip.at/ms/ceip_home1/ceip_home/status_reporting/ and on the Eionet central data repository on links: http://cdr.eionet.europa.eu/hr/un/clrtap/ and http://cdr.eionet.europa.eu/hr/eu/nec_revised/.

1.1. National Inventory Background

According to the Regulation on NEC (Article 16), the informative inventory reports are prepared in accordance with the latest adopted guidelines for reporting emissions and projections data under the LRTAP Convention. The 2014 reporting guidelines (ECE/EB.AIR.125), prepared by the Task Force on Emission Inventories and Projections and approved by the Executive Body, are adopted for application in 2015 and subsequent years.

The Regulation on NEC fully transposes the Republic of Croatia's obligations under the UNECE LRTAP Convention as well as the obligations laid down in the Gothenburg Protocol (see Chapter 1.1.).

The LRTAP Convention (and the NEC Directives) based on 2014 Reporting guidelines prescribes use the methodologies in the latest version of the EMEP/EEA Guidebook, as approved by the Executive Body to estimate emissions and projections for each source category. Parties can use, as an alternative to the EMEP/EEA Guidebook, national or international methodologies that they consider better able to reflect their national situation, provided that the methodologies produce more accurate estimates than the default methods, are scientifically based, are compatible with the EMEP/EEA Guidebook and are documented in their IIRs.

The Republic of Croatia (i.e. MEE) is in accordance with Article 12 of the Regulation on NEC and as a party to the LRTAP Convention, the Protocol on Long-term Financing of the Cooperative Programme for Monitoring and evaluation of the Long-range Transmission of Air Pollutants in Europe (EMEP Protocol) and the remaining seven protocols and as a full member of the EU, is required to submit to the relevant body of the LRTAP Convention and to the European Environment Agency (EEA/EIONET) emission inventory and projections, spatially disaggregated emission inventories, large point source inventory and the informative inventory report by deadlines and for certain pollutants as required by Annex I of the Regulation on NEC and other deadlines for reporting purposes under the obligations of the LRTAP Convention.

One of the obligations of the Parties to the LRTAP Convention is also the annual verification of submitted reports (estimates / inventories) and emission projections by the Parties to the LRTAP Convention in parallel with the verification of the report in accordance with the new NEC Directive. The annual review of the emissions in accordance with the LRTAP Convention is carried out by appointed experts of the parties (the so-called ROSTER list of all appointed experts who can participate in the review). The review team is established by the EMEP Centre

[8] Annex II of 2014 Reporting guidelines (ECE/EB.AIR.125)

for Inventory Inventories and Projections for Every Annual Review (ERT). The annual review by the European Commission is carried out by a Technical Expert Review Team (TERT) pursuant to the new NEC Directive.

The LRTAP Convention is the framework agreement and was the first international legal binding instrument to deal with air pollution on regional bases. The aim of the LRTAP Convention is that Parties shall endeavour to limit and, as far as possible, gradually reduce and prevent air pollution including long-range transboundary air pollution by developing policies and strategies to combat the discharge of air pollutants through exchanges of information, consultation, research and monitoring. The LRTAP Convention entered into force in 1983 and currently has a 51 Party. The LRTAP Convention has been extended by eight protocols (1985 – 1999) that are the key assets/legal instruments for reducing air pollution. Protocols identify specific measures to be taken by Parties to cut their emissions of air pollutants - sulphur dioxide (SO_2), nitrogen oxides (NOx), volatile organic compounds (VOC), heavy metals (HMs) and persistent organic pollutants (POPs).

The Republic of Croatia is a party to the UNECE LRTAP Convention and its seven related protocols (Table 1.1-1). Pursuant to the above, the Republic of Croatia is internationally obliged to observe the obligations stipulated by the LRTAP Convention and its protocols.

Table 1.1-1 Status of ratification of international treaties under the CLRTAP

Treaty	Signed by the Parties	In force since	Number of Parties	Ratified[9] by Croatia	Official gazette, No.
Convention on Long-range Transboundary Air Pollution	1979	1983	51	1992	OG-IT 12/93
Protocol on Long-term Financing of the Cooperative Programme for Monitoring and evaluation of the Long-range Transmission of Air Pollutants in Europe (EMEP)	1984	1988	45	1992	OG-IT 12/93
Helsinki Protocol on the Reduction of Sulphur Emissions or their Transboundary Fluxes by at least 30 per cent	1985	1987	25	-	OG-IT 17/98
Oslo Protocol on Further Reduction of Sulphur Emissions	1994	1998	28	1998	OG-IT 3/99
Protocol concerning the Control of Emissions of Nitrogen Oxides or their Transboundary Fluxes	1988	1991	35	2007	OG-IT 10/07
Protocol concerning the Control of Emissions of Volatile Organic Compounds or their Transboundary Fluxes	1991	1997	24	2007	OG-IT 10/07
Aarhus Protocol on Persistent Organic Pollutants/revised in 2009	1998	2003	33	2007	OG-IT 05/07
Protocol on Heavy Metals/revised in 2012	1998	2003	33	2007	OG-IT 05/07
Gothenburg Protocol to Abate Acidification, Eutrophication and Ground-level Ozone	1999	2005	28	2008	OG-IT 07/08
Gothenburg Protocol to Abate Acidification, Eutrophication and Ground-level Ozone, as amended on 4 May 2012	2012	2019	23	2019	-

The Protocol to abate acidification, eutrophication and ground-level ozone in the context of the LRTAP Convention (hereinafter: GP) promotes an approach that takes into account the multiple

[9] Ratification, Acceptance (A), Approval (AA), Accession (a)

effects of certain pollutants in order to prevent or to minimize exceedances of critical loads of acidification, nitrogen loads and critical levels of ozone for human health and vegetation. For this purpose, national emission quotas must be set, which each Party shall keep below the defined value until 2010 and in the following years, for the following pollutants: SO_2, NOx, NH_3 and VOC. For the Republic of Croatia, the prescribed quotas are shown in Table 1.1-2.

In the legislation of the European Union (EU) and then in the national legislation, the Gothenburg Protocol was largely transposed by Directive 2001/80/EC of the European Parliament and of the Council of 23 October 2001 on large combustion plants and Directive 2001/81 / EC of the European Parliament and Council of 23 October 2001 on the national emission ceilings for certain pollutants (old NEC Directive).

The GP was amended in 2012 by Executive Body decisions 2012/1 and 2012/2 to include national emission reduction commitments to be achieved by 2020 and beyond. This amended version entered into force on 7 October 2019. With Amendments to the Gothenburg Protocol, new emission reduction commitments have been adopted, including, and in addition to the above-mentioned pollutants, fine particles ($PM_{2.5}$) which are listed for the Republic of Croatia in the Tables 1.1-2 and 1.1-3.

At the EU level, an existing policy on air protection has been improved with a view to achieve an air quality level that does not lead to significant adverse effects and risks to human health and the environment and was adopted by Directive 2016/2284/EU of the European Parliament and of the Council of 14 December 2016 on the reduction on national emission of certain atmospheric pollutants, amending Directive 2003/35/EC and repealing Directive 2001/81/EC (OJ L 433, 17.12.2016) (hereinafter: the new NEC Directive).

The new NEC Directive foresees new obligations for the reduction of certain pollutants in the air for NMVOC, NH_3, SO_2, $PM_{2.5}$ and NOx for the period 2020 to 2029 and after 2030 at a certain percentage (%) reduction compared with 2005[10] (Tables 1.1-2 and 1.1-3). The new NEC Directive also assumes the commitments proposed in the revised GP, which were defined for achievement in 2010 and in the following years. The new NEC Directive came into force on 31 December 2016.

Table 1.1-2 Emission quotas for certain pollutants for Croatia and deadlines achieving them

Emission quotas *	Deadline	SO_2	NOx	NH_3	NMVOC
Gothenburg Protocol	by 2010	70 kt	87 kt	30 kt	90 kt
Revised Gothenburg Protocol	after 2010 up to 2020				
NEC Directive (2001/81/EC)	1. July 2013				

Table 1.1-3 Emission reduction commitments for SO_2, NOx, NH_3, NMVOC and $PM_{2.5}$ in accordance to NEC Directive for Croatia

Pollutant	Reduction commitments for Croatia compared to 2005	
	For any year from 2020 to 2029	For any year from 2030
SO_2	55 %	83 %
NOx	31 %	57 %
NH_3	1 %	25 %
NMVOC	34 %	48 %
$PM_{2.5}$	18 %	55 %

[10] 2005 is a base year in respect of which the compliance with Gothenburg Protocols and the new NEC Directive is checked

The Republic of Croatia is obliged to fulfil the prescribed obligations both for SO_2, NOx, NMVOC, NH_3, $PM_{2.5}$, in accordance with the Gothenburg Protocol and the new NEC Directive, and for persistent organic pollutants: PAU, HCB, PCB and PCDD / PCDF in accordance with the Protocol on Persistent Organic Pollutants (hereinafter referred to as the POPs Protocol).

The POPs Protocol entered into force for the Republic of Croatia on 6 December 2008. In accordance with paragraph 5 (a) of Article 3 (Principal Obligations) "[Beach Party Shall] i.e. each Party shall reduce its total emissions of each of the substances listed in Annex III to the POPs Protocol to the emission level in the reference year determined in accordance with the same Annex, by taking effective measures, appropriate for each of the above mentioned substances." The reference year for the Republic of Croatia for all POPs is 1990. Accordingly, in Table 1.1-4 there is an overview of emission levels for individual POPs, which need to reduce emissions if they are currently exceeding that level.

Table 1.1-4 Emission levels for certain POPs according to Protocol on POPs

Pollutant	Emission level in 1990*
Polycyclic aromatic hydrocarbons (PAHs)**	21.8 t
Dioxins and furans (PCDD/PCDF)	48.5 g I-TEQ
Hexachlorobenzene (HCB)	7.1 kg
Polychlorinated biphenyls (PCBs)	482.8 kg

*according to Annex III, Protocol on POPs

*"For the purposes of emission inventories, the following four indicator compounds shall be used: Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene i Indeno(1,2,3-cd)pyrene

In accordance with CLRTAP Executive Body's Decision 2002/10[11], on emission data reporting under the LRTAP Convention and the Protocols in force, Croatia is obliged to report on air emissions in line with Emission Reporting Guidelines[12] and methodology described in EMEP/EEA Emission Inventory Guidebook 2019. Specifically, the application of annual emissions under the CLRTAP consists of the preparation of NFR formats (emission inventor) and Informative Inventory Report (IIR). Croatia, as a Party to the UNECE LRTAP Convention and its Protocols, in 1998, submitted its first national emission calculation and IIR for emissions in 1996.

The NFR nomenclature (CLRTAP) is fully consistent with the CRF nomenclature under the UN Framework Convention on Climate Change (UNFCCC), with the overall aim of harmonization reporting formats.

Taking into account the above mentioned, this IIR follows the proposed content; the introductory chapter describes the national inventory background, the institutional and organizational arrangements, and the inventory preparation process, and methodologies and data sources used. It also gives an overview of the key categories, QA/QC procedures, the uncertainty evaluation and the general assessment of completeness. The Chapter 2 provides explanation of key trends by pollutants following NFR nomenclature. The Chapter 3 provides emission trends by pollutant. Chapters 4 to 8 present on source category descriptions, methodologies used for emission estimation, activity statistics, emission factors, main recalculations and planned improvements. The Chapter 9 gives a summary of recalculations (by sector, year and pollutant) and planned improvements. In Chapter 10 an overview of Croatia projections for the following pollutants are presented NOx, SO_2, NMVOC, NH_3 and $PM_{2.5}$.

[11] Decision 2002/10 on emission data reporting under the Convention and the Protocols in force, ECE.EB.AIR/77/Add.1, 2002

[12] Emission Reporting Guidelines, ECE/EB.AIR/80, 2003

The national inventory is updated annually in order to reflect the availability of new information, sectoral improvements, implementation of higher Tier (e.g. Tier 2), change in methodology used, identification of time series inconsistency, the accuracy of the estimates, inclusion of technical corrections by teams for revision under the LRTAP Convention and the NEC Directive and the reduction of the uncertainty.

Recalculations are applied retrospectively to earlier years, which accounts for any difference in previously published data. Conducted recalculations are described in detail in Chapters from 4 to 8, and in the Chapter 9 with a summary of them.

The total emissions by pollutant on territory of the Republic of Croatia for years 1990, 1995, 2000, 2005, 2010, 2015, 2016, 2017 and 2018 are presented in the Table 1.1-5, along with the share of change in period since 1990 and in relation to the earlier historical year.

Table 1.1-5 Time series of total emissions in the Republic of Croatia by pollutant

Pollutant	Unit	1990	1995	2000	2005	2010	2015	2016	2017	2018	Share of change from 1990-2018	Share of change fron 2017-2018	Emission ceiling in 2010 and up to 2020
NOx	kt	108.2	80.2	87.0	85.7	69.3	55.5	54.6	54.7	50.5	-53.3%	-7.6%	87
NMVOC	kt	170.8	120.1	101.2	114.3	92.5	71.8	73.5	70.8	72.2	-57.8%	2.0%	90
SO2	kt	168.5	77.4	60.5	58.6	35.2	15.8	14.8	12.7	10.3	-93.9%	-18.7%	70
NH3	kt	53.8	40.4	41.1	42.9	38.7	33.9	32.0	35.2	35.7	-33.7%	1.4%	30
PM2.5	kt	38.7	36.2	33.9	41.8	37.3	32.1	30.7	29.6	28.7	-25.8%	-3.0%	-
PM10	kt	50.8	45.3	41.9	52.9	46.8	41.0	39.5	38.6	37.8	-25.6%	-2.2%	-
TSP	kt	59.8	53.5	52.1	72.3	62.3	54.3	52.3	52.1	51.6	-13.7%	-1.1%	-
BC	kt	5.4	5.0	4.8	5.8	5.2	4.3	4.2	4.1	3.9	-28.2%	-4.1%	-
CO	kt	554.1	444.3	453.5	416.5	328.0	267.5	258.3	252.5	234.8	-57.6%	-7.0%	-
Pb	t	523.4	263.6	145.3	13.7	8.1	7.9	8.0	8.1	8.4	-98.4%	4.3%	-
Cd	t	1.1	0.8	0.9	1.0	0.9	0.9	0.8	0.8	0.8	-24.9%	4.1%	-
Hg	t	1.1	0.3	0.5	0.6	0.5	0.5	0.5	0.4	0.4	-64.4%	-3.7%	-
As	t	8.6	1.2	1.1	1.1	0.8	0.5	0.4	0.5	0.6	-93.6%	6.9%	-
Cr	t	5.3	3.7	3.2	3.7	2.6	2.2	2.0	2.1	2.0	-61.8%	-5.2%	-
Cu	t	7.5	6.3	7.7	9.7	8.4	8.6	8.8	9.6	9.5	25.9%	-1.3%	-
Ni	t	17.0	13.8	12.6	13.7	7.7	4.5	4.2	4.3	3.5	-79.6%	-18.7%	-
Se	t	0.4	0.3	0.3	0.4	0.4	0.3	0.4	0.4	0.4	-17.8%	-0.4%	-
Zn	t	36.7	30.4	28.6	34.9	33.8	32.3	31.2	31.2	31.9	-13.2%	2.3%	-
PCDD/ PCDF	g I-Teq	48.5	43.1	41.6	49.4	40.0	34.1	32.3	28.7	27.8	-42.7%	-3.0%	-
PAHs	t	21.8	16.6	14.9	18.4	17.4	15.7	15.0	14.5	14.0	-35.8%	-3.2%	-
HCB	kg	7.09	6.43	1.99	0.45	0.85	0.43	0.47	0.46	0.56	-92.0%	21.5%	-
PCBs	kg	482.8	468.2	441.4	435.7	433.7	424.9	422.1	415.3	411.8	-14.7%	-0.8%	-

1.2. Institutional and organizational arrangements for inventory preparation

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

In terms of organizational arrangements, a decentralized model was applied in Croatia in which particular tasks of inventory preparation is delegated to domestic public and professional institutions.

The MEE[13] is in accordance with the Air Protection Act (OG 127/2019) and the Regulation on NEC the competent authority competent authority for ensuring the preparation of national inventories, annual emission inventories, emission projections, spatially disaggregated inventories, large point sources inventories, if appropriate adjusted emission inventories, and informative inventory reports, carried out by authorized company in accordance with the law governing environmental protection.

EKONERG - Energy Research and Environmental Protection Institute Ltd. from Zagreb is under the Public Procurement Contract for the service delivery "Reporting Service in accordance with the requirements of the LRTAP Convention and the NEC Directive", record number: 800/02-19/36JN, for the MEE[14], authorized company and responsible executor for the preparation of IIR2020 and NFR reporting formats (1990-2018) and for maintaining the CollectER and COPERT 5 databases.

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

- The Ministry of Environment and Energy[15] with assistance of Energy Institute Hrvoje Požar that prepares the national annual energy balance and is competent for the Environmental Pollution Register (EPR) [16];
- The Central Bureau of Statistics (Business Statistics Sector) that, on the basis of the statistic survey programme, collects data on the amounts of raw materials and products relating to activities defined by the National Classification of Business Activities;
- The Ministry of Interior keeps data on number of registered road vehicles and off-road vehicles.
- The Ministry of Agriculture[17]
- The EUROCONTROL data
- The EUROSTAT data.

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

The Figure 1.2-1 shows structure and components of Croatia emission inventory system.

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[13] Ministry of the Environment and Energy, pursuant to Article 73, paragraph 3 of the Law on Amendments to the Environmental Protection Act (OG 118/18 of December 27, 2018) and deletion of the Croatian Agency for Environment and Nature (CAEN) from the court register (January 17, 2019) assumed the Agency's employees, jobs, rights and obligations, as well as assets, equipment, records and other documentation.

[14] Contracting authority in the procurement process, responsible for the annual preparation and submission of the annual IIR and NFR tables to the UNECE-LRTAP Convention and the European Commission.

[15] Since December 2011 Ministry of Economy, since 19 October 2016 Ministry of Environment and Energy

[16] EPR – Environmental Pollution Register: a: a set of data of sources, type, amount, manner and place of discharge, transfer and disposal of pollutants and waste into the environment based on the *Ordinance on the Environmental Pollution Register (OG 87/15)*

[17] Ministry of Regional Development, Forestry and Water Management - since December 2011 Ministry of Agriculture

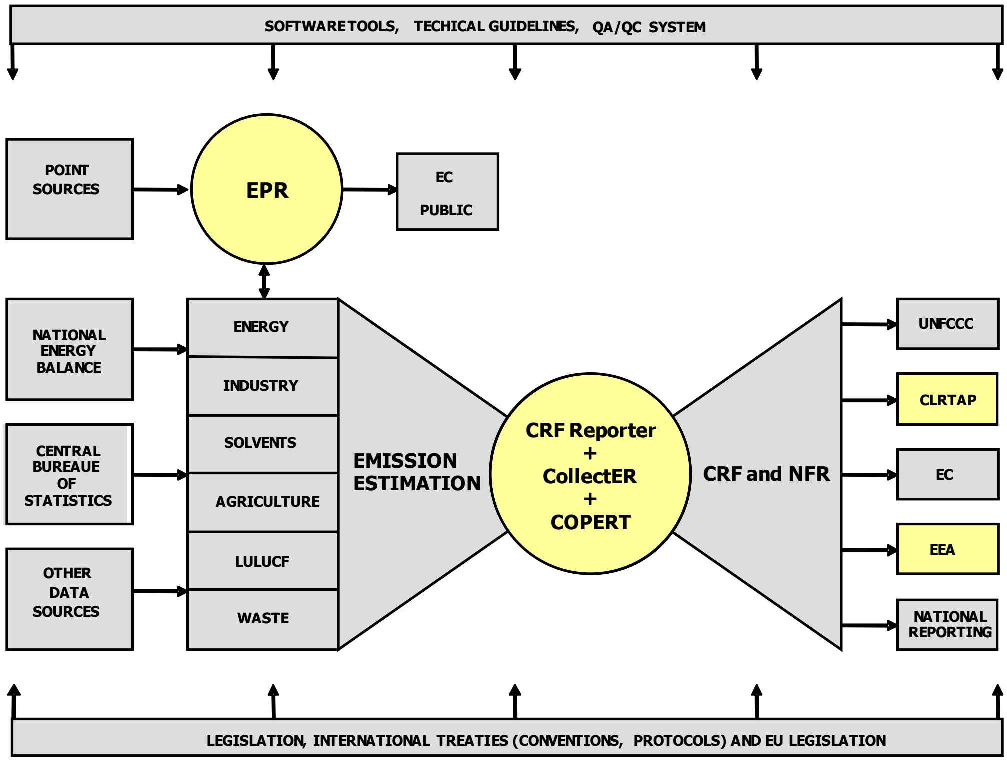

Figure 1.2-1 National emission inventory system

1.3. The process of inventory preparation

The process of inventory preparation has three main phases:

1. planning,
2. preparation and
3. reporting and archiving.

Planning

Planning phase includes activities related to organizational, technical and financial aspects of inventory preparation such as:

- planning the funds for the activities required for the following reporting year,
- planning the funds for the activities required for the improvement of the inventory for the following reporting year,
- preparation of tender documentation (inclusion of timetable according to EMEP/EEA reporting programme),
- selection of executive institution(s) for inventory preparation and inventory improvement,
- preparation a schedule of activities for data quality control and quality assurance (see Appendix 1),

- review of existing/updated reporting guidelines and guidebooks,
- analysis of recommendations for inventory improvement from previous submissions or gave by expert review teams if such exists,
- updating of emission factors, and activity data.

Inventory preparation

Inventory preparation phase is a central phase in the process, which includes identification and updating of emission sources according to Nomenclature for Reporting (NFR) format, collection and processing of activity data, updating of emission factors (if necessary), emission calculation and recalculations if necessary according to EMEP/EEA methodology, filling the databases (CollectER and COPERT) and preparation of report and formats requiring for the following annual reporting requirements.

Reporting and archiving

The inventory preparation phase is followed by the reporting and archiving phase. Submission of IIR and requested formats is carried out in accordance with the Guidelines for Reporting Emissions and Projections Data under the LRTAP Convention [18] within the following deadlines and scope:

- *Reporting deadlines*: The deadline for submitting annual emission inventory reports is 15 February. The deadline for submitting four-yearly projection reports is 15 March. The deadline for submitting the IIR is 15 March. Parties are, however, encouraged to submit their IIRs at the same time they submit their emission reports. The deadline for submitting gridded data and LPS data is 1 May. The EU may deliver its emission and projections reports by 30 April, its IIR by 30 May and its gridded data and LPS data by 15 June;
- *Four-yearly reporting*: Parties to the Gothenburg Protocol within the geographical scope of EMEP shall regularly update their projections and report every four years from 2015 onward their updated projections, for the years 2020, 2025 and 2030 and, where available, also for 2040 and 2050.
- *Four-yearly reporting*: Every four years from 2017 onward, Parties shall report for the year x-2 updated aggregated sectoral (GNFR) gridded emissions and LPS emissions. Gridded emissions in a grid of 0.1 x 0.1 degrees shall be reported for all substances referred to in paragraph 7 of these Guidelines. As an alternative, a Party may report gridded emissions in a grid of approximately 50 x 50 km^2 until it is technically and economically feasible to switch to a grid of 0.1 x 0.1 degrees.

Detailed and updated information related to deadlines and scope of reporting are available on official EMEP[19] /CEIP[20] web page – www.ceip.at/.

The Republic of Croatia electronically submits its data to the EMEP Centre for Emission Inventories and Projections (CEIP) (emep.emissions@,umweltbundesamt.at)) or alternatively to the EIONET Central Data Repository, maintained by EEA. Inform the UNECE secretariat

[18] ECE/EB.AIR/125, Guidelines for Reporting Emissions and Projections Data under the Convention on Long-range Transboundary Air Pollution, TFEIP, March 2014.

[19] EMEP European Monitoring and Evaluation Programmeis a scientifically based and policy driven programme under the CLRTAP for international co-operation to solve transboundary air pollution problems.

[20] CEIP: The EMEP Centre on Emission Inventories and Projections

of LRTAP Convention (krzysztof.olendrzynski@,iu'i.org) of the contents of its data submission by means of the enclosed notification form (but without sending the data files to the secretariat).

Reporting under the new NEC Directive should be fully consistent with reporting under the LRTAP Convention.

Activity data and emission factors are archived and stored in the CollectER and COPERT databases and are owned by MEE. QA/QC procedures and activities are documented in the IIR.

IIR and reporting formats are made available to the interested public on the websites of the MEE and CEIP.

1.4. Description of methodologies and data sources used

1.4.1. Official data sources

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

The Table 1.4-2 gives the overview of the official and other activity data sources in relation to the NFR sectors.

Table 1.4-2 Official and other activity data sources for NFR sectors

NFR Sector	Activity data	Source
1 Energy 1 A 1 Energy Industries	Fuel sold, fuel consumption and fuel characteristic data for thermal power plants Fuel characteristic in power plants	Energy balance - The Ministry of Environment and Energy with assistance of Energy Institute Hrvoje Požar (1990 – 2018)
		Environmental Pollution Register - The Ministry of Environment and Energy
		National electricity producer
	Sulphur content in fuel	Major national fuel producer
1 A 2 Manufacturing Industries and Construction	Fuel sold Fuel consumption	Energy balance - The Ministry of Environment and Energy with assistance of Energy Institute Hrvoje Požar (1990 – 2018) Industry analysis balance - Energy Institute Hrvoje Požar (2000 – 2018)
		Environmental Pollution Register - The Ministry of Environment and Energy
		Major national industry companies
	Sulphur content in fuel	Major national fuel producer
1 A 3 Transport	Fuel sold	Energy balance - The Ministry of Environment and Energy with assistance of Energy Institute Hrvoje Požar (1990 – 2018)
	Number of vehicles	Vehicle data base – the Ministry of Interior
	Annual mileage	Statistical yearbook – the Central Bureau of Statistics Odyssee database
	Min. and max temperature for big towns	Statistical yearbook – the Central Bureau of Statistics
	Sulphur content in fuel	Major national fuel producer

NFR Sector	Activity data	Source
	Number of flights and fuel amount by cycle and routes	EUROCONTROL data (2005 – 2017)
	Annual take-off and landing number by aircraft type and at airports	Croatian Civil Aviation Agency
	Average flight time by type of aircraft for domestic aviation and international air traffic. In respect of international air traffic by category of flights shorter than 1,000 nm and for flights longer than 1,000 nm (km or nm of airline)	Croatian Civil Aviation Agency
1 A 4 Residential – public – commercial sector – agriculture / forestry / fishing	Fuel sold	Energy balance - The Ministry of Environment and Energy with assistance of Energy Institute Hrvoje Požar (1990 – 2017)
	Sulphur content in fuel	Major national fuel producer
1 B Fugitive Emissions from fuel	Amount of fuel treated, stored, distributed	Energy balance - Ministry of Environment and Energy with assistance of Energy Institute Hrvoje Požar (1990 – 2018), Plinacro Ltd.
	Data on production and used inputs	Ministry of Environment and Energy (survey request: oil refineries)
	Emission data	Environmental Pollution Register (EPR) - CAEN
2 Industrial Processes and Product Use	Production/consumption data	Annual Report on Industrial Production – PRODCOM - the Central Bureau of Statistics
		Environmental Pollution Register (EPR)
		Ministry of Environment and Energy (survey requests to manufacturers)
		Database on Volatile Organic Compound emissions (VOC database)
	Import and export data	EUROSTAT database (2001 – 2018)
	Fuel sold for non-energy consumption	Energy balance - Ministry of Environment and Energy with assistance of Energy Institute Hrvoje Požar (1990 – 2018)
	Population data	Statistical yearbooks – Central Bureau of Statistics
3 Agriculture	Number of animals	Statistical yearbook - the Central Bureau of Statistics Croatian Agricultural Agency
	Amount of N-fertilizers sold	Report on fertilizer production - the International Fertilizer Association - IFA data bank The Ministry of Environment and Energy (survey requests: fertilizers producers)
	Nitrogen from a sewage sludge when used in agriculture	The Ministry of Environment and Energy
5 Waste	Amount of waste	Environmental Pollution Register, Waste Management Information System - Ministry of Environment and Energy
	Statistical data related to living conditions in households	Censuses for 1981, 1991, 2001, 2011 - Croatian Bureau of Statistics
	The amount of treated wastewater	Statistical Reports and Releases - Croatian Bureau of Statistics
	Number of car and house fires	Ministry of Interior
11 Natural sources (11B Forest fires)	Area of land burned and amount of wood burned	Statistical yearbook - the Central Bureau of Statistics
		Ministry of Agriculture

1.4.2. Methodology

After activity data are collected, they are distributed to NFR and SNAP sectors, sub-sectors and source categories database with corresponding update emission factors entered into central database CollectER. Croatia is using CollectER III (Version 3 of October 2010) for annual inventory preparation. The CollectER III was conducted in accordance with the recommendations TFEIP/EIONET and ETC/ACC European Environment Agency (EEA). Emissions from road transport are calculated by means of program application COPERT 5 (v3) that contains activity data on vehicle fleet and procedures for emissions calculation from road transport. For the calculation of emissions from non-road transport (1.A.2.gvii and 1.A.4.ii), agriculture (3.B and 3.D), use of pesticides (3.D.f), field burning of agricultural residues (3.F), small combustion - residential (NFR 1.A.4.b.i), Waste and the IPPU sectors, engineering-mathematical models are used.

Pollutant emissions are reporting in defined NFR19 format (Excel spreadsheet), which discusses the sources of emissions of the following sectors: Energy (NFR 1); Industrial Processes and product use (NFR 2); Agriculture (NFR 3); Waste (NFR 5); and Natural sources (NFR 11). The NFR format under the CLRTAP is in full compliance with the CRF format under the UNFCCC. In Appendix 2, the distribution of sectors according to SNAP nomenclature with explanations is presented.

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

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

Due to evident advantages and shortcomings of both approaches inventory agency in practice, utilize both of them with emphasis on achieving a balance between resources available and quality of estimations. For Large point sources emissions calculation, "bottom up" approach is used, and emissions from all other sources by "top down". That combination is reasonable because data for LPS are considered more reliable than other smaller sources.

Emissions are calculated on the base of the standard methods and procedures of:

- EMEP/EEA[21] Air Pollutant Emission Inventory Guidebook “Technical Guidance to Prepare National Emission Inventories” (2013, 2016, 2019),
- EMEP/CORINAIR Atmospheric Emission Inventory Guidebook 2007 (EMEP 2007),
- EMEP/CORINAIR Good Practice Guidance. Good practice for CLRTAP emission inventories (Tinus Pulles, John van Aardenne, 24 June 2004),
- EMEP/CORINAIR Atmospheric emission inventory guidebook, Second edition (September, 1999),
- Emission factor manual PARCOM-ATMOS, Emission factor for air pollution (1992),

[21] Cooperative Programme for Monitoring and Evaluation of the Long-range Transmission of Air Pollutants in Europe (EMEP) of the Convention on Long-range Transboundary Air Pollution provides scientific support to theConvention

- Bundesamt für Umwelt, Wald und Landschaft (BUWAL): Emissionsfaktoren für stationäre Quallen – HANDBUCH (1995),
- US EPA Compilation of Air Pollutant Emission Factors, Vol. 1: Stationary Point and Area Sources (1995),
- Corinair; Technical annexes, Volume 2, Default emission factors handbook (CORINE, 1992).

Emission factors not recommended in GB2019 are mainly taken from the sectoral guidelines for determining the emission of pollutants produced in the framework of the project *Reconstruction of the National Inventory System and enforcement of its implementation* (LIFE/TCY/CRO/00086).

The methodology used for calculation of emissions includes product of activity data (e.g. fuel consumption, the production statistics, number of animals, waste treated, etc.) and corresponding emission factor.

Emission factors used are default, plant specific emission factors (calculated from direct emissions observed plants reported in Croatian EPR base) and country specific emission factors. Croatia uses country specific emission factor for SO_2 emission calculation. Details on methodology and emission factors used are described in sectoral chapters from 4 to 8.

Information on inclusion/exclusion of the condensable component from PM_{10} and $PM_{2.5}$ emission factors by NFR source category are provide in Appendix 9 of this Report.

A detailed description of the methodology used is shown in sector-specific chapters of IIR in chapters from 4 to 8 and their abstract follows below.

The methods used for the NFR sectors are as follows:

1 ENERGY

- 1.A.1.a (Electricity production and Combined heat and power generation), 1.A.1.b, 1.A.2.f.i, 1.B.2.b.i: Tier 2 method. Emission factors: plant specific (DE – direct emissions from EPR) and emission factors from GB2019.
- 1.A.1.a (Heat plants), 1.A.1.c, 1.A.2.a, 1.A.2, 1.A.3.b.vii, 1.A.4.a, 1.A.4.c.i: Tier 1 EMEP/EEA methodology, along with the recommended Tier 1 emission factors from GB2019.
- 1.A.3.a (Aviation (civil)), 1.A.3.a.i (i), 1A.3.a.ii (i), 1.A.3.a.i (ii), 1.A.3.a.ii (ii): Tier 1 EMEP/EEA methodology, along with the recommended Tier 1 emission factors from GB2013.
- 1.A.3.b (Road transport), 1.A.3.b.i 1.A.3.b.ii, 1.A.3.b.iii, 1.A.3.b.iv, 1.A.3.b.v, 1.A.3.b.vi, 1.A.3.b.vii: COPERT 5 (v 3) model
- 1.A.3.b.vii Road transport: Road abrasion: Tier 1 EMEP/EEA methodology, along with the recommended Tier 1 emission factors from GB2019.
- 1.A.3.c: Tier 1 EMEP/EEA methodology, along with the recommended Tier 1 emission factors from GB2019
- 1.A.3.d.ii, 1.A.3.d.i(i): Tier 1 EMEP/EEA methodology, along with the recommended Tier 1 emission factors from GB2019
- 1.A.4.b.i, 1.A.2.g.vii, 1.A.4.b.ii, 1.A.4.c.ii: Tier 2 EMEP/EEA methodology, along with the recommended Tier 2 emission factors from GB2019

- 1.B.1.a, 1.B.1.b, 1.B.2.c.i - SOx and NMVOC, 1.B.2.c.ii: Tier 1 EMEP/EEA, along with the recommended Tier 1 emission factors from GB2019.
- 1.B.2.a.i, 1.B.2.a.iv, 1.B.2.a.v, 1.B.2.b, 1.B.2.c.i (not including SOx and NMVOC): Tier 2 EMEP/EEA, along with the recommended Tier 1 emission factors from GB2019.

2 INDUSTRIAL PROCESSES AND PRODUCT USE

- 2.A.1 (not including one factory, for which Tier 1 is used), 2.A.2: Tier 2 EMEP/EEA, along with the abated Tier 2 emission factors from GB2019.
- 2.A.3 (glass production only): Tier 1 EMEP/EEA, along with the recommended Tier 1 emission factors from GB2019; for rock wool production: Tier 3.
- 2.A.5.a, 2.A.5.b: Tier 1 EMEP/EEA, along with the recommended Tier 1 emission factors from GB2019 (except 2.A.5.b - emission factors from GB2013).
- 2.B.1, 2.B.2, 2.B.10.a (sulphuric acid, NPK fertilizers and urea): Tier 2. Emission factors: plant specific (DE – direct emissions from EPR) and/or EMEP/EEA emission factors from GB2019.
- 2.C.1: Tier 2 EMEP/EEA, along with Tier 2 emission factors from GB2019.
- 2.C.2: Tier 1 EMEP/EEA, along with Tier 1 emission factors from GB2019.
- 2.C.3: Tier 2 EMEP/EEA, along with Tier 2 emission factors from GB2019.
- 2.D.3.a: Tier 2 EMEP/EEA, along with Tier 2 emission factors from GB2019.
- 2.D.3.b, 2.D.3.c, 2.D.3.d: Tier 1 EMEP/EEA, along with Tier 1 emission factors from GB2019.
- 2.D.3.e: Tier 2 EMEP/EEA, along with Tier 2 emission factors from GB2019.
- 2.D.3.f: other (methodology suggested by the TERT; see Chapter 5.4).
- 2.D.3.g (not including polyester and PVC processing, for which Tier 1 approach and EFs from GB2019 are used): Tier 2 EMEP/EEA, along with Tier 2 emission factors from GB2019.
- 2.D.3.h: Tier 1 EMEP/EEA, along with Tier 1 emission factors from GB2019.
- 2.D.3.i (not including application of glues), 2.G: Tier 2 EMEP/EEA, along with Tier 2 emission factors from GB2019.
- 2.D.3.i (application of glues): other (IIASA GAINS model; see Chapter 5.4).
- 2.H: Tier 2 EMEP/EEA, along with Tier 2 emission factors from GB2019.
- 2.K, 2.I: Tier 1 EMEP/EEA, along with Tier 1 emission factors from GB2019.

3 AGRICULTURE

- 3.B: Tier 2 EMEP/EEA methodology and Tier 2 emission factors from GB2016 with national specifics for all animals except swine, broilers and laying hens, which were calculated using Tier 3 EMEP/EEA methodology with emission factors from GB2016 with national specifics and abatement measures.
- 3.D.1.a: Tier 1 EMEP/EEA methodology and Tier 1 emission factors from GB2019 for NOx, NMVOC, and PMs emission calculation, and Tier 2 EMEP/EEA methodology, along with Tier 2 emission factors from GB2019 for NH_3 emission calculation.

- 3.D.a.2.a: Tier 2 EMEP/EEA methodology and Tier 2 emission factors from GB2019 with national specifics.
- 3.D.a.2.b: Tier 1 EMEP/EEA methodology and Tier 1 emission factors from GB2019
- 3.D.a.3: Tier 2 EMEP/EEA methodology and Tier 2 emission factors from GB2019
- 3.D.c: Tier 1 EMEP/EEA methodology and Tier 1 emission factors from GB2019
- 3.D.e: Tier 2 EMEP/EEA methodology from GB2019
- 3.D.f: Tier 1 EMEP/EEA methodology and Tier 1 emission factors from GB2019
- 3.F: Tier 1 EMEP/EEA methodology and emission factors from GB2019

5 WASTE

- 5.A: CS methodology was developed to estimate a NMVOC EF based on the CH_4 emissions estimated in the framework of the NIR report; $PM_{2,5}$, PM_{10} and TSP Tier 1 EMEP/EEA methodology, along with Tier 1 emission factors from GB2019.
- 5.B.1: Tier 2 EMEP/EEA methodology for NH_3 from GB2019.
- 5.C.1.b.i: Tier 1 EMEP/EEA methodology, along with Tier 1 emission factors from GB2019 and GB2009 (for emission factors not estimated in GB2019).
- 5.C.1.b.iii, 5.C.1.b.v: Tier 1 EMEP/EEA methodology, along with Tier 1 emission factors from GB2019.
- 5.D.1, 5.D.2: Tier 2 EMEP/EEA methodology, along with Tier 2 emission factors from GB2019.
- 5.E: Tier 2 EMEP/EEA methodology, along with Tier 2 emission factors from GB2019.

11 NATURAL SOURCES

- 11.B Forest fires: MEP/EEA methodology, along with Tier 1 emission factors from GB2019.

1.5. Key sources categories

Table 1.5-1 Key source categories in 2018 for the Croatian Emission Inventory

Pollutant	Key categories (Sorted from high to low from left to right)											Total (%)
SOx	1B2aiv	1A1b	1A2f	1A4bi								80.6
	(39.4%)	(21.0%)	(12.5%)	(7.6%)								
NOx	1A3bi	1A3biii	1A4bi	1A2f	3Da1	1A1a	1A4cii	3Da3	3Da2a	1A3dii		80.2
	(21.5%)	(17.7%)	(8.7%)	(5.8%)	(5.1%)	(4.8%)	(4.7%)	(4.5%)	(3.7%)	(3.6%)		
NH3	3Da1	3Da2a	3B3	2B10a	1A4bi	3B1b						81.9
	(33.6%)	(16.1%)	(11.8%)	(7.4%)	(7.3%)	(5.7%)						
NMVOC	1A4bi	2D3d	2D3i	2D3a	2H2	3B1b	3B1a	2D3g	2D3h	1B2av	1A3bi	80.5
	(27.3%)	(16.6%)	(6.1%)	(6.1%)	(4.7%)	(3.8%)	(3.5%)	(3.2%)	(3.2%)	(3.2%)	(2.8%)	
CO	1A4bi	1B2aiv	1A3bi									88.0
	(69.6%)	(9.4%)	(8.9%)									
TSP	1A4bi	2D3b	2A5a	3Dc								80.7
	(48.2%)	(23.2%)	(4.8%)	(4.5%)								
PM10	1A4bi	2D3b	3Dc	2A5a	1A1a							81.7
	(62.7%)	(6.8%)	(6.1%)	(3.2%)	(2.9%)							
PM2.5	1A4bi											80.4
	(80.4%)											
Pb	1A3bi	2G	1A4bi	1A3bvi	2A3							81.7
	(31.6%)	(15.2%)	(14.7%)	(10.3%)	(5.7%)							
Hg	1A2f	1A1a	1B2aiv	1A4bi	2K							88.6
	(30.9%)	(26.4%)	(10.9%)	(10.2%)	(10.2%)							
Cd	1A4bi	2G	2A3									82.4
	(70.1%)	(8.0%)	(4.3%)									
PCDD/ PCDF	1A4bi											83.9
	(83.9%)											
PAH	1A4bi											95.1
	(95.1%)											
HCB	3Df											87.5
	(47.3%)											

Data source: RepDab Report, http://www.ceip.at/repdab-check-your-inventory/

Table 1.5-1 (cont.) Key source categories in 2018 for the Croatian Emission Inventory

Pollutant	Key categories (Sorted from high to low from left to right)											Total (%)
As	1B2aiv	1A1a	1A2f									81.2
	52.1%	16.8%	12.3%									
Cr	1A4bi	1A3bvi	1B2aiv	1A2f								83.7
	51.9%	16.0%	9.3%	6.6%								
Cu	1A3bvi	2G										83.0
	74.7%	8.3%										
Ni	1A1b	1B2aiv	1A1a	1A4ai	2A3							82.5
	53.1%	12.1%	7.5%	5.8%	4.0%							
Se	2A3	1A2f	1A4bi									84.2
	61.1%	16.8%	6.3%									
Zn	1A4bi	1A3bvi										81.0
	73.0%	8.1%										
benzo(a) pyrene	1A4bi											96.7
	96.7%											
benzo(b) fluoranthen	1A4bi											94.4
	94.4%											
benzo(k) fluoranthen	1A4bi											93.7
	93.7%											
Indeno (1,2,3-cd)	1A4bi											96.8
	96.8%											
PCBs	2K											99.3
	99.3%											
BC	1A4bi	1A3bi										81.1
	70.5%	10.6%										

Data source: EKONERG Ltd

1.6. QA/QC and verification methods

Quality assurance and quality control procedures for inventory compilation and reporting are part of defined QA/QC plan. In 2009, EKONERG Ltd. for the MEE has prepared an internal document (the QA/QC plan) to organise and implement activities across all of the emissions inventory activities including involved stakeholders (e.g. suppliers of data, recipients, inventory compiling institution), data collection, data manipulation, inventory compilation, consolidating the inventory estimates (e.g. into a single national database) and reporting. QA/QC activities performed for this inventory compilation is presented in Appendix 1 and these include checks in: data collection activities, activity data entry into databases, emission calculation, databases items, filling of emission reporting templates - NFR tables for 1990 - 2018 (for 2018 in Appendix I), preparation of IIR.

Before submitting reporting tables, the RepDab tool is run. If needed, data is revised. When all tables passed all RepDab tests, then tables are submitted.

Following sub-chapters give a clarification of the terms "quality control" and "quality assurance" used for the purpose of the inventory management.

1.6.1. Quality Control (QC)

Quality Control (QC) is a system of routine technical activities to measure and control the quality of the inventory as it is being developed. The QC system is designed to:

- Provide routine and consistent checks to ensure data integrity, correctness, and completeness;
- Identify and address errors and omissions;
- Document and archive inventory material and record all QC activities.

QC activities include general methods such as accuracy checks on data acquisition and calculations and the use of approved standardized procedures for emission calculations, measurements, estimating uncertainties, archiving information and reporting. Higher tier of QC activities include technical reviews of source categories, activity and emission factor data and methods. For example, control of bottom-up data for industry and energy sector from the Croatia Environmental Pollution Register (EPR) is performed. The EPR is based on the Ordinance on the Environmental Pollution Register (OG 80/13, 87/15). According to that Ordinance the competent authorities, which are 21 counties, with in cooperation with the competent inspectorate, are responsible to assess the completeness, consistency and credibility of the data submitted by the operators, and they verified forms. Data from EPR (direct pollutants emissions, fuel consumptions and productivity) by each individual plant are checking on consistency, transparency and completeness in the process of inventory preparation. If, by comparing previously reported data, there are significant decreases (dips) or significant increases (peak) in the reported emissions and/or fuel consumption and/or realized productivity, then it is checked whether the plant has introduced a new emission reduction technology (also part of the ROO system), new fuel or incorrect entry of certain data in the database occurred (the most common error is entering the data in another metering unit). In the next step, the inventory compiler informs the person in MEE responsible for air pollutant emission inventory work, who then informs the person responsible for EPR database. Further, person responsible for EPR database notifies the competent authority in the county, who then informs the responsible person at operator about data inconsistency. The responsible person at operator then corrects or explains the inconsistency. For the energy sector particularly for the sector of electricity and heat production, the total amount of fuel reported in the ROO database is compared with fuel sold amount by fuel type from the National Energy Balance. Last notation is also the part of yearly process of data collection.

1.6.2. Quality Assurance (QA) and Verification

Quality Assurance (QA) activities include a planned system of review procedures conducted by personnel not directly involved in the inventory compilation/development process. Reviews, preferably by independent third parties, should be performed upon a finalized inventory following the implementation of QC procedures. Reviews verify that data quality objectives were met, ensure that the inventory represents the best possible estimates of emissions and sinks given the current state of scientific knowledge and data available, and support the effectiveness of the QC programme.

The MEE[22] is in accordance with the Air Protection Act (OG 127/2019) and the Regulation on NEC the competent authority competent authority for ensuring the preparation of national inventories, annual emission inventories, emission projections, spatially disaggregated inventories, large point sources inventories, if appropriate adjusted emission inventories, and informative inventory reports, carried out by authorized company in accordance with the law governing environmental protection.

EKONERG - Energy Research and Environmental Protection Institute Ltd. from Zagreb is under the Public Procurement Contract for the service delivery "Reporting Service in accordance with the requirements of the LRTAP Convention and the NEC Directive", record number: 800/02-19/36JN, for the MEE[23], authorized company and responsible executor for the preparation of IIR2020 and NFR reporting formats (1990-2018) and for maintaining the CollectER and COPERT 5 databases.

In the view of the aforementioned, it follows that MEE and EKONERG Ltd. are responsible for carry out quality assurance and quality control of activity data, calculated emissions and the prepared annual report before electronic submission to EMEP / CEIP or alternatively to EIONET.

In accordance with the NEC Regulation, data providers are responsible for the information they submit to the MEE.

In the inventory preparation process, general quality control procedures have been applied (see Appendix 1). In addition, some specific quality control procedures related to check of activity data and emission factors were applied in previous submissions with new or updated emission factors and activity data from other sources (Environmental Pollution Register, direct communication with operators). Application of quality control procedures have resulted in recalculations of emissions which is presented in Chapter 10. For now, the system of quality assurance at the national level has not been established yet i.e. the institutions that will examine the inventory have not yet been determined.

In the framework of the UNECE LRTAP Convention and EU National Emissions Ceilings Directive by the year, 2008 began with a review and check in detail the inventories of each Party (so-called Stage 3 in depth reviews) in accordance with the model established under the

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[22] Ministry of the Environment and Energy, pursuant to Article 73, paragraph 3 of the Law on Amendments to the Environmental Protection Act (OG 118/18 of December 27, 2018) and deletion of the Croatian Agency for Environment and Nature (CAEN) from the court register (January 17, 2019) assumed the Agency's employees, jobs, rights and obligations, as well as assets, equipment, records and other documentation.

[23] Contracting authority in the procurement process, responsible for the annual preparation and submission of the annual IIR and NFR tables to the UNECE-LRTAP Convention and the European Commission.

UN Framework Convention on Climate Change (UNFCCC). The Republic of Croatia was reviewed in 2011 and in 2014 (Table 1.6-1). The annual review is concentrated on SO_2, NOx, NMVOC, NH_3, plus PM_{10} and $PM_{2.5}$ for the time series which are reflecting current priorities from EMEP Steering Body and the Task Force on Emission Inventories and Projections (TFEIP). HMs and POPs have reviewed to the extent possible.

Approved plan of Stage 3 (in depth) review in the 2018 -2020 period - of Emission inventories under CLRTAP by Parties to be reviewed is presented in Table 1.6-1.

Table 1.6-1 Approved plan of Stage 3 (in depth) reviews of Emission inventories under CLRTAP (2018 -2020)

2018	Armenia, Azerbaijan, Belarus, Finland, Moldova and Ukraine
2019	Albania, Bosnia and Herzegovina, Georgia, Montenegro, Norway, Russian Federation, Serbia and Turkey
2020	European Union, FRY of Macedonia, Island, Kazakhstan, Kyrgyzstan, Liechtenstein, Monaco and Switzerland

Data source: http://www.ceip.at/review-of-inventories/in-depth-review-of-ae-inventories

The first comprehensive technical review of National Emission Inventories for EU member states, pursuant to the Directive on the Reduction of National Emissions of Certain Atmospheric Pollutants (Directive (EU) 2016/2284), was first implemented in June 2017. A technical review is conducted on the basis of officially submitted emissions in NFR tables for the period 1990 - 2015 (submission on 15. February 2017) and the Informative Inventory Report (IIR) (submission on 15. March 2017). Comprehensive technical review of inventories under NEC Directive was carried out for 2005, 2010 and 2015 and for the following pollutants: NOx, NMVOC, SO_2, NH_3 and $PM_{2.5}$.

The Comprehensive Technical Review of Member State Inventories aims to ensure accurate, reliable and verified emission inventories, in particular for 2005 and 2015, to ensure that the Commission has accurate, reliable and verified information on annual NECD emissions to determine compliance with the NECD targets. A secondary objective of the review was to strengthen Member States' capacity in managing NECD inventories efficiently and in delivering high quality inventory data and Informative Inventory Reports (IIRs) to the European Commission in due time. The review also sought to harmonise approaches used in monitoring inventories reported under the NECD with reviews undertaken by other organisations that have similar interests such as the reviews under the LRTAP Convention and the EU Greenhouse Gas Monitoring Mechanism (MMR)/United Nations Framework Convention on Climate Change (UNFCCC).

1.7. General uncertainty evaluation

Emissions uncertainty analysis are calculated on the basis of the standard methods and procedures of:

- UNECE: Guidelines for Estimating and Reporting Emission Data under the Convention on Long Range Transboundary Air Pollution, Edition 2009 (UNECE 2009)
- EMEP/EEA air pollutant emission inventory guidebook (EMEP/EEA Guidebook).

The uncertainty estimations of total national emissions reporting to the CLRTAP for Croatia are developed to be in accordance with the Tier 1 methodology described in the EMEP/EEA Guidebook. The uncertainty estimates are based on emission data for the base year 1990 and 2018, and on uncertainties for activity rates and emission factors for NFR sectors. Estimated emissions for 1990 and 2018, the uncertainty introduced into the trend 1990-2018, and the uncertainty in total national emissions 2018 for all pollutants are shown in the Table 1.7-1. The uncertainty estimates include all NFR sectors on aggregated level Detail calculation sheets and results of Croatia uncertainty analyses are provided in Appendix 7.

1.7.1. Overview of the uncertainty evaluation method

The uncertainty in an emission can be propagated from uncertainties in the activity data and the emission factor through the error propagation equation (Mandel 1984, Bevington and Robinson 1992)[24]. This method is present in the EMEP/EEA Guidebook, where the conditions imposed for use of the method are:

- Input parameters (emission factor, activity data) have Gaussian (normal) distributions. Uncertainty is symmetric with respect to the mean value. The length of the range from mean to upper larger value (97.5% percentile) is equal to the length of the range from mean to lower, smaller value (2.5% percentile).
- The correlation between the input data in model does not exist. That is the main reason why is appropriate aggregation of data needed for the uncertainty analysis.
- Calculation of trend uncertainty using Tier 1 method is based on the essential assumption that the input uncertainty of emission factors and activity data for 1990 and 2018 are equal.

Under these conditions, the uncertainty calculated for the emission rate is appropriate.

The Guidebook recommends that inputs (direct emissions[25], activity data and emission factors) are as far as possible statistically independent, e.g. that emission factors used in several source categories yield one uncertainty estimate on an aggregated level rather than using the same Figure for each source category.

Appropriate aggregation of data for the uncertainty analysis is important to avoid over- or underestimation of uncertainty due to correlations.

Assumptions used in NFR sectors aggregation are following:

- Emission factors are considered independent across the different sectors, technologies and fuel.
- Emission estimates of different pollutants are considered to be independent.
- Activity data are considered to be independent.

Assumptions used in uncertainty calculation are following:

- Emission factor uncertainties were in lower end of default range for all sources and pollutants (EMEP/EEA Guidebook, Part A - general guidance chapters, 5-Uncertainties, Table 3-2 and 3-3).
- Emission factor uncertainties have Type A sensitivities and activity data uncertainties have Type B sensitivities, as suggested in EMEP/EEA Guidebook.

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[24] http://cxdd.broceliande.kerbabel.fr/?q=node/398/200

[25] In this context direct emissions means emission data based on measurements or expert judgements reported e.g. by plants in EPRT.

1.7.2. Documentation of uncertainties

The uncertainty estimates for emission factors derive from expert judgments based on information on 95% confidence intervals in the EMEP/EEA Guidebook. The default uncertainties for emission factors are given in letter codes (Table 3-2, General guidance chapter 5 - Uncertainties EMEP/EEA Guidebook) representing an uncertainty range (Table 3-3, General guidance chapter 5 - Uncertainties EMEP/EEA Guidebook). In uncertainty analysis, the lower value of the default uncertainty range for emission factors was used for all sources and pollutants. For some pollutants and source categories, no information on default uncertainty ranges is available in the EMEP/EEA Guidebook and thus the uncertainty ranges from Switzerland´s IIR 2011 are applied when appropriate.

The uncertainty estimates for activity data derive from Croatia's greenhouse gas inventory (Croatian NIR), from expert judgment based on comparisons with available datasets of other countries and from EMEP/EEA Guidebook (Table 3-1, General guidance chapter 5 – Uncertainties) where appropriate (Table 1.7.2-1). For source categories where activity data uncertainty was taken from Croatian NIR, default uncertainty from IPCC guidance was used and average value from range of given uncertainty was set. For source categories, where activity data uncertainty was taken from other countries with available activity data uncertainty sheets, available data was compared and expert judgment was made to choose the most acceptable activity data uncertainty.

Sources of data used:

- uncertainty analysis of Croatia's greenhouse gas inventory – NIR (activity data),
- uncertainties from France's, Finland's, Switzerland's and Danish's Informative Inventory Reports (emission factors and activity data),
- default values of EMEP/EEA Guidebook (activity data and emission factors).

Uncertainty ranges for activity data

Uncertainty rates for activity data in NFR sectors and used aggregation level are listed in Table 1.7.2-1.

Table 1.7.2-1 Applied uncertainty levels for activity data and data sources by NFR sector aggregation

NFR SECTOR AGGREGATION	%	DATA SOURCE
1A1, 1A2, 1A3b	3	National data in combination with comparisons with other datasets and other countries
1A3a Aviation	3	National data in combination with EUROCONTROL datasets
1A3c i 1A3d	5	National data in combination with comparisons with other datasets and other countries
1A4a	5	expert judgment in combination with comparisons with other datasets and other countries
1A4b, 1A4c	3	National data in combination with Tier 2 methodology from EMEP/EEA 2019 guidebook
1B1, 1B2ai	10	expert judgment in combination with comparisons with other datasets and other countries
1B2aiv, 1B2av, 1B2b,1B2c	3	Facilities data in combination with Tier 2 methodology from EMEP/EEA 2019 guidebook
2A1, 2A2, 2A3	3	Facilities data in comparison with national statistical data
2A5a, 2A5b	5	National data and comparison with other datasets and other countries
2B1, 2B2	3	Facilities data in comparison with national statistical data

NFR SECTOR AGGREGATION	%	DATA SOURCE
2B10a, 2H, 2I	5	National data and comparisons with other datasets and other countries
2C	7.5	Facilities data in comparison with national statistical data
2D3b, 2D3c, 2D3d, 2D3g, 2D3h	30	National statistical data and comparisons with other datasets and other countries
2K	50	National population statistical data and comparisons with other datasets and other countries
2D3a, 2D3i, 2G, 2D3d, 2D3e, 2D3f	10	National statistical data in combination with Tier 2 methodology from EMEP/EEA 2019 guidebook
3B1, 3B2, 3B4d, 3B4e, 3B4f	10	National statistical data in comparisons to National Central Register of Livestock under Croatian Agricultural Agency
3B3, 3B4g	50	National statistical data in comparisons to National Central Register of Livestock under Croatian Agricultural Agency
3D	5	Facilities data in combination with Tier 2 methodology from EMEP/EEA 2019 guidebook
3Df	3	National statistical sale data
3F	50	The default values are combined with national statistics
5A, 5B1, 5C	5	National data from the Environmental Pollution Register and Waste Management Information System under Ministry of Environment and Energy
5D1, 5D2	30	National statistical data from Statistical Reports and Releases and from Census 1981, Census 1991, Census 2001 and Census 2011 (in combination with extrapolation method) under Croatian Bureau of Statistics
5A, 5B1, 5C	5	National data from the Environmental Pollution Register and Waste Management Information System under Ministry of Environment and Energy

Uncertainty ranges for emission factors

The applied uncertainties are for most emission factors, default values referring to EMEP/EEA Guidebook. Guidebook doesn´t propose uncertainty for pollutants TSP, PM_{10}, $PM_{2.5}$, BC and NH_3 (regard some sectors) so in comparison with datasets of other countries, expert judgment is applied for TSP, PM_{10}, $PM_{2.5}$ and BC, or in the case of NH_3 the emission factors uncertainty from Danish IIR was applied (Table 1.7.2-3). Furthermore, for 1.A.4 subsectors the TSP, PM_{10} and $PM_{2.5}$ emission factors uncertainty from Switzerland´s IIR 2011 was applied (Table 1.7.2-4). The applied uncertainties for emission factors are listed in Tables from 1.7.2-2 to 1.7.2-4.

Table 1.7.2-2 Applied uncertainty levels for SO_2, NO_2, NMVOC, CO, TSP, PM_{10}, $PM_{2.5}$, PAH, HCB, PCDD/PCDF emission factors by NFR sectors

NFR SECTORS	EMISSION FACTORS UNCERTAINTY RATES, %										
	SO_2	NO_2	NMVOC	CO	TSP	PM_{10}	$PM_{2.5}$	BC	PAH	HCB	PCDD/ PCDF
1.A.1, 1.A.2	10	20	50	20	50	50	50	50	100	100	100
1.A.3.b	20	20	20	20	100	100	100	100	400	400	400
1.A.3.a, c, d	20	100	100	100	500	500	500	500	400	400	400
1.A.4	20	50	50	50	x	x	x	x	400	400	400
1.B	50	50	50	50	50	50	50	50	400	400	400
2	20	50	50	50	50	50	50	50	400	400	400
2.A	20	50	20	50	50	50	50	50	400	400	400
2.D.3.i	20	31	50	50	50	50	50	50	400	400	400
3.B	-	100	-	-	100	100	100	x	400	400	400
3.D	-	100	100	-	50	50	50	x	400	400	400
3.D.f	-	-	-	-	-	-	-	-	-	30	-
3.F	50	50	50	17	25	25	25	25	100	100	50

NFR SECTORS	EMISSION FACTORS UNCERTAINTY RATES, %										
	SO_2	NO_2	NMVOC	CO	TSP	PM_{10}	$PM_{2.5}$	BC	PAH	HCB	PCDD/ PCDF
5.A, 5.D	20	-	50	-	100	100	100	100	400	400	400
5.C	20	20	50	50	50	50	50	50	100	100	100

Data source: EMEP/EEA guidebook, Part A - general guidance chapters, 5-uncertainties, Table 3-2 and 3-3, with exception for TSP, PM_{10}, $PM_{2.5}$ – expert judgment

Table 1.7.2-3 Applied uncertainty levels for heavy metals, HCH and PCBs emission factors by NFR sectors

NFR SECTORS	EMISSION FACTORS UNCERTAINTY RATES, %										
	As	Cd	Cr	Cu	Hg	Ni	Pb	Se	Zn	NH_3	PCBs
1.A.1, 1.A.2	100	100	100	100	100	100	100	100	100	1000	100
1.A.3.b	400	400	400	400	400	400	400	400	400	400	400
1.A.3.a, c, d	400	400	400	400	400	400	400	400	400	1000	400
1.A.4	400	400	400	400	400	400	400	400	400	1000	400
1.B	400	400	400	400	400	400	400	400	400	1000	400
2 A, 2 B, 2 C, 2 D, 2 F	400	400	400	400	400	400	400	400	400	400	400
3.B	400	400	400	400	400	400	400	400	400	100	400
3.D	400	400	400	400	400	400	400	400	400	100	400
3.D.f	-	-	-	-	-	-	-	-	-	-	-
3.F	100	100	100	100	100	100	100	100	100	100	-
5.D.1	400	400	400	400	400	400	400	400	400	400	400

Data source: EMEP/EEA guidebook, Part A - general guidance chapters, 5-uncertaintie, Table 3-2 and 3-3

Table 1.7.2-4 Applied uncertainty levels for $PM_{2.5}$, PM_{10} and TSP emission factors for NFR 1.A.4

NFR SECTORS	EMISSION FACTORS UNCERTAINTY RATES, %			
	$PM_{2.5}$	BC	PM_{10}	TSP
1.A.4.a	78.0	78.0	78.0	78.0
1.A.4.b.i	76.0	76.0	76.0	76.0
1.A.4.b.ii	50.0*	50.0*	50.0*	50.0
1.A.4.c.i	39.0	39.0	39.0	39.0
1.A.4.c.ii	80.0*	80.0*	80.0*	80.0

Data source: Switzerland´s IIR 2011 with exception for (*) PM_{10}, $PM_{2.5}$, BC– expert judgment

1.7.3. Results of Tier 1 uncertainty evaluation

Table 1.7.3-1 shows a summary of the uncertainty evaluation of Croatia total emissions 2018 and the trend uncertainties 1990-201 by pollutant. Detail calculation sheets and results of Croatia uncertainty analyses are provided in Appendix 7.

Table 1.7.3-1 The summary of the uncertainty evaluation for Croatia and total emissions by pollutant in 2018

Pollutant	Total emission in 2018	Unit	Emission uncertainty	Trend	Trend uncertainty
			%	%	%
SO_2	10.30	kt	20.19	-93.89	1.20
NOx	50.55	kt	18.58	-53.27	2.90
NMVOC	72.17	kt	19.30	-57.76	4.77
CO	234.87	kt	36.80	-57.62	8.40
TSP	51.57	kt	40.13	-13.71	13.24
PM_{10}	37.81	kt	48.89	-25.62	5.40
$PM_{2.5}$	28.73	kt	61.95	-25.84	4.16
BC	3.89	kt	57.89	-28.21	7.39
PAH	13.99	kt	381.04	-35.83	30.83

Pollutant	Total emission in 2018	Unit	Emission uncertainty	Trend	Trend uncertainty
			%	%	%
HCB	0.56	kg	162.07	-92.04	11.94
PCDD/PCDF	28.17	g I-TEQ	335.96	-42.57	36.40
NH_3	35.66	kt	99.06	-33.67	15.82
As	0.55	kt	210.44	-93.55	26.23
Cd	0.84	kt	284.46	-24.94	81.89
Cr	2.02	kt	217.05	-61.77	60.40
Cu	9.47	kt	160.25	25.88	52.58
Hg	0.40	kt	84.81	-64.36	90.61
Ni	3.47	kt	86.30	-79.60	12.86
Pb	8.41	kt	129.73	-98.39	1.91
Se	0.37	kt	247.10	-17.79	41.29
Zn	31.91	kt	295.19	-13.16	44.97
PCBs	411.79	kg	400.17	-14.71	59.88

The results of uncertainty analysis are interpreted in the manner provided below. For example, in Table 1.7.3-1 row with evaluated NO_2 emission uncertainty tells us that with certainty of 95% total NO_2 emission for the year 2018 varies between [50.55*(1-p/100), 50.55*(1+p/100)], where “p” is emission uncertainty (18,58%). With the same approach the 95% probability range for trend is between [-53.27%-t, -53.27%+t], where “t” is trend uncertainty (2.90%).

High emission uncertainty for pollutants: PAH, PCDD/PCDF, Cu, Pb, Se, PCBs, Zn, Hg is expected. The main reason is high default uncertainty of emission factors (400%) that is given in Table 3.2 from EMEP/EEA guidebook. These are categories that have been classified at level E, which is an estimate of uncertainty based on assumptions and has unlimited range of uncertainty. For pollutants: PM_{10}, $PM_{2.5}$, BC and TSP uncertainty ranges in Table 3.3 from EMEP/EEA guidebook are not defined. For pollutant, NH_3 range of uncertainty is classified in category D or E, where estimate of the uncertainty is based on assumption, so the range is not specified. As the total uncertainty would not be overestimated, for PM_{10}, $PM_{2.5}$, BC and TSP, the source category NFR 1.A.4 is divided into lower subcategories.

1.8. General assessment of completeness

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

Notation keys are used in NFR emission tables for sub-sectors, from which emissions has not been quantitatively estimated. In Table 1.8-1 definition for each notation key used in NFR format is presented.

Table 1.8-1 Definition of Notation keys

Notation key	Meaning	Purpose
NO	Not occurring	For activities or processes which do not exist in Republic of Croatia / for emissions by sources of compounds that do not occur for a particular compound or source category;
NE	Not estimated	Where emission occur, but have not been estimated or reported

Notation key	Meaning	Purpose
NA	Not applicable	When activity or process exist, but it is assumed that they do not result with emission / Is used for activities which are believed to result in emission which are insignificant to national totals;
IE	Included elsewhere	Where emissions for mentioned activity or process are calculated and included in inventory, but did not separately presented for this source category / For emissions of pollutants which are calculated, but included elsewhere from expected source category in the inventory;
C	Confidential	For emissions by sources of compounds which could lead to the disclosure of confidential information
NR	Not relevant	According to paragraph 9 in the Emission Guidelines, Emission inventory reporting should cover all years from 1980, Onwards, if data are available, Where emissions are not strictly required by the different Protocols, e.g. for some parties emissions of NMVOC prior to 1988

1.8.1. Sources reported as "NE"

Table 1.8.1-1 Explanation to the Notation key NE

NFR14 code	Substance(s)	Reason for not estimation
1.A.1.b	NH_3, PCB, HCB	FEs are not available in EMEP/EEA GB
1.A.1.c	PCB, HCB	FEs are not available in EMEP/EEA GB
1.A.2.g.vii	PCB, HCB, benzo(k)fluoranthene, indeno(1,2,3-cd)pyrene, PCDD/F, Hg, As	FEs are not available in EMEP/EEA GB
1.A.3.b.v	Zn, PCDD/F, PAHs, PCB	FEs are not available in EMEP/EEA GB, neither in COPERT 5 model
1.A.3.b.vi	Hg, As, PCDD/F, PAHs, PCBs	FEs are not available in EMEP/EEA GB, neither in COPERT 5 model
1.A.3.b.vii	BC, PCDD/F, PAHs, PCBs	FEs are not available in EMEP/EEA GB, neither in COPERT 5 model
1.A.3.d.ii	benzo(k)fluoranthene, indeno(1,2,3-cd)pyrene	FEs are not available in EMEP/EEA GB
1.A.4.b.ii, 1.A.4.c.ii	Hg, As, PCDD/PCDF, benzo(k)fluoranthene, indeno(1,2,3-cd)pyrene, HCB, PCBs	FEs are not available in EMEP/EEA GB
1.A.4.c.i	HCB, PCBs	FEs are not available in EMEP/EEA GB
1.B.2.a.i	SO_2, PCDD/F	FEs are not available in EMEP/EEA GB
1.B.2.c	NH3, PCDD/PCDF	FEs are not available in EMEP/EEA GB
2.B.1	SO_2, $PM_{2.5}$	FEs are not available in EMEP/EEA GB
2.B.2	NH_3, $PM_{2.5}$	FEs are not available in EMEP/EEA GB
2.C.3	HCB	FEs are not available in EMEP/EEA GB
3.D.a.2.b	NH_3, NOx (1990 – 2004)	AD are not available
3.D.a.2.c	NH_3, NOx	AD are not available
3.D.a.4	NH_3, NOx	FEs are not available in EMEP/EEA GB
3.D.b	All relevant	There is no methodology.
3.D.d	All relevant	There is no methodology.
3.F	HCB, PCB	FEs are not available in EMEP/EEA GB
5.A	NH_3, CO, Hg	FEs are not available in EMEP/EEA GB
5.B.1	NH_3 (1990 - 2006)	AD are not available
	NOx, CO, NMVOC, SO_2, TSP, PM_{10}, $PM_{2.5}$, BC	FEs are not available in EMEP/EEA GB
5.C.1.b.i	NH_3, Se	FEs are not available in EMEP/EEA GB
5.C.1.b.iii	NH_3, PM_{10}, $PM_{2.5}$, Se, Zn	FEs are not available in EMEP/EEA GB
5.C.1.b.v	BC	FEs are not available in EMEP/EEA GB
5.D.1	NH_3, TSP, PM_{10}, $PM_{2.5}$, BC, Pb, Cd, Hg, As, Cr, Cu, Ni, Se, Zn	FEs are not available in EMEP/EEA GB
5.D.2	NH_3, TSP, PM_{10}, $PM_{2.5}$, BC, Pb, Cd, Hg, As, Cr, Cu, Ni, Se, Zn	FEs are not available in EMEP/EEA GB

NFR14 code	Substance(s)	Reason for not estimation
5.D.3	NMVOC, TSP, PM_{10}, $PM_{2.5}$, BC, Pb, Cd, Hg, As, Cr, Cu, Ni, Se, Zn	FEs are not available in EMEP/EEA GB
5.E	NOx, CO, NMVOC, SO_2, NH_3, BC, Pb, Cd, Hg, As, Cr, Cu, Ni, Se, Zn, PAHs, HCB, PCBs	FEs are not available in EMEP/EEA GB

1.8.2. Explanation of the notation key “IE“

Table 1.8.2-1 Explanation to the Notation key “IE”

NFR14 code	Substance(s)	Included in NFR code	
1A.2.a	All relevant	1.A.2.f	1990 - 2000
1.A.2.b	All relevant	1.A.2.f	1990 - 2000
1.A.2.c	All relevant	1.A.2.f	1990 - 2000
1.A.2.d	All relevant	1.A.2.f	1990 - 2000
1.A.2.e	All relevant	1.A.2.f	1990 - 2000
1A2gviii	All relevant	1.A.2.f	1990 - 2018
1.A.3.d.i.(ii)	All relevant	1.A.3.d.i(i)	1990 - 2018
1.A.4.a.ii	All relevant	1.A.4.b.ii and 1.A.4.c.ii	1990 - 2018
1.A.4.c.iii	All relevant	1.A.3.d.ii (based on total amount of exhausted fuel for national navigation, maritime and river traffic)	1990 - 2018
1.A.5.a	All relevant	1.A.4.a.i	1990 - 2018
1.A.5.b	All relevant	1.A.3.a, 1.A.3.b (i-iv), 1.A.3.d	1990 - 2018
2.A.1	All relevant for fuel combustion except for PMs	1.A.2.f	1990 - 2018
2.A.2	All relevant for fuel combustion except for PMs	1.A.2.f	1990 - 2018
2.A.3	All relevant for fuel combustion except for PMs	1.A.2.f	1990 - 2018
2.A.5.c	TSP, PM_{10}, $PM_{2.5}$	2.A.1, 2.A.2, 2.A.3, 2.A.5.a, 2.A.5.b	1990 - 2018
2.B.10.b	TSP, PM_{10}, $PM_{2.5}$	2.B.10.a	1990 - 2018
2.C.1	NH_3	1.A.2.f	1990 - 2000
		1.A.2.a	2001 - 2018
2.C.2	All relevant for fuel combustion	1.A.2.b	1990 - 2003
2.C.3	All relevant for fuel combustion	1.A.2.b	1990 - 1991
2.G	All relevant	2.D.3.a	1990 - 2018
3.D.a	NOx, NH_3, and other relevant	3.B source categories	1990 – 2018
3.D.b	PMs	3.D.a.1	1990 – 2018
3.D.c	PMs	3.B source categories, 3.D.a.1	1990 – 2018
3.D.e	PMs	3.D.a.1	1990 – 2018
5.C.1.b.i	All relevant for fuel combustion	1.A.2.f	2009 – 2018
5.C.1.b.ii	All relevant	5.C.1.b.i	1997 – 2002

1.8.3. An account of sub-sources included in reporting codes “OTHER”

Table 1.8.3-1 Sub-sources accounted for in reporting codes “Other”

NFR14 code	Substance(s) reported	Sub-source description	
1.A.2.f	All relevant	Stationary combustion in manufacturing industries and construction: Iron and steel (1 A 2 a), Non-ferrous metals (1 A 2 b), Chemicals (1 A 2 c), Pulp, Paper and Print (1 A 2 d), Food processing, beverages and tobacco (1 A 2 e)	1990 - 2000
1.A.5.a	All relevant	(C) - military, (IE) Combustion in commercial and institutional plants (NFR 1 A 4 a and SNAP 020100)	1990 - 2018

NFR14 code	Substance(s) reported	Sub-source description	
1.A.5.b	All relevant	(C) - military, (IE) - Combustion in vehicles (sub-sectors 1 A 3 b (i-iv)), other mobile combustion in NFR code 1 A 4 a i	1990 - 2018
1.B.1.c	NO	-	1990 - 2018
1.B.3	NO	-	1990 - 2018
2.B.10.a	NOx, CO, NMVOC, SO_2, NH_3, PM_{10}, TSP, $PM_{2.5}$	Processes in inorganic chemical industry - production of: sulphuric acid (SNAP 040401), NPK fertilizers (SNAP 040407), urea (SNAP 040408), Ammonium phosphate SNAP 040406), carbon black (SNAP 040409), and processes in organic chemical industry - production of: Ethylene (SNAP 040501), Propylene (SNAP 040502), Vinyl chloride (SNAP 040504), Polyethylene LD (SNAP 040506), Polyvinylchloride (SNAP 040508), Styrene (SNAP 040510), Polystyrene (SNAP 040511) and Ethyl benzene (SNAP 040518)	1990
		Processes in inorganic chemical industry - production of: sulphuric acid (SNAP 040401), NPK fertilizers (SNAP 040407), urea (SNAP 040408), Ammonium phosphate SNAP 040406), carbon black (SNAP 040409), and processes in organic chemical industry - production of: Ethylene (SNAP 040501), Propylene (SNAP 040502), Vinyl chloride (SNAP 040504), Polyethylene LD (SNAP 040506), Polyvinylchloride (SNAP 040508), Polystyrene (SNAP 040511) and Ethyl benzene (SNAP 040518)	1991
		Processes in inorganic chemical industry - production of: sulphuric acid (SNAP 040401), NPK fertilizers (SNAP 040407), urea (SNAP 040408), Ammonium phosphate SNAP 040406), carbon black (SNAP 040409), and processes in organic chemical industry - production of: Ethylene (SNAP 040501), Propylene (SNAP 040502), Vinyl chloride (SNAP 040504), Polyethylene LD (SNAP 040506), Polyvinylchloride (SNAP 040508), Polystyrene (SNAP 040511)	1992 and 1993
		Processes in inorganic chemical industry - production of: sulphuric acid (SNAP 040401), NPK fertilizers (SNAP 040407), urea (SNAP 040408), Ammonium phosphate SNAP 040406), carbon black (SNAP 040409), and processes in organic chemical industry - production of: Ethylene (SNAP 040501), Propylene (SNAP 040502), Vinyl chloride (SNAP 040504), Polyethylene LD (SNAP 040506), Polyvinylchloride (SNAP 040508), Polystyrene (SNAP 040511), Formaldehyde (SNAP 040517) and Ethyl benzene (SNAP 040518)	1995 and 1996
		Processes in inorganic chemical industry - production of: sulphuric acid (SNAP 040401), NPK fertilizers (SNAP 040407), urea (SNAP 040408), Ammonium phosphate SNAP 040406), carbon black (SNAP 040409), and processes in organic chemical industry - production of: Ethylene (SNAP 040501), Propylene (SNAP 040502), Vinyl chloride (SNAP 040504), Polyethylene LD (SNAP 040506), Polyvinylchloride (SNAP 040508), Polystyrene (SNAP 040511) and Formaldehyde (SNAP 040517)	1994 and 1997 - 2000
		Processes in inorganic chemical industry - production of: sulphuric acid (SNAP 040401), NPK fertilizers (SNAP 040407), urea (SNAP 040408), Ammonium	2001 and 2002

NFR14 code	Substance(s) reported	Sub-source description	
		phosphate SNAP 040406), carbon black (SNAP 040409), and processes in organic chemical industry - production of: Ethylene (SNAP 040501), Propylene (SNAP 040502), Vinyl chloride (SNAP 040504), Polyethylene LD (SNAP 040506), Polystyrene (SNAP 040511) and Formaldehyde (SNAP 040517)	
		Processes in inorganic chemical industry - production of: sulphuric acid (SNAP 040401), NPK fertilizers (SNAP 040407), urea (SNAP 040408), Ammonium phosphate SNAP 040406), carbon black (SNAP 040409), and processes in organic chemical industry - production of: Ethylene (SNAP 040501), Propylene (SNAP 040502), Polyethylene LD (SNAP 040506), Polystyrene (SNAP 040511) and Formaldehyde (SNAP 040517)	2003 - 2009
		Processes in inorganic chemical industry - production of: NPK fertilizers (SNAP 040407), urea (SNAP 040408), and processes in organic chemical industry - production of: Ethylene (SNAP 040501), Propylene (SNAP 040502), Polyethylene LD (SNAP 040506), Polystyrene (SNAP 040511) and Formaldehyde (SNAP 040517)	2010 - 2011
		Processes in inorganic chemical industry - production of: sulphuric acid (SNAP 040401), NPK fertilizers (SNAP 040407), urea (SNAP 040408), and processes in organic chemical industry - production of: Formaldehyde (SNAP 040517)	2012 – 2018
2.C.7.c	NO	-	1990 - 2018
2.D.3.i	VOC, NOx, CO, SO_2, NH_3, $PM_{2.5}$, PM_{10}, TSP, As, Cd, Cr, Cu, Hg, Pb, PCDD/PCDF, Total 4 PAH, benzo(a), benzo(b), benzo(k), Indeno	Fat, edible and non-edible oil extraction (SNAP 060404), Tobacco combustion (SNAP 060602), Preservation of wood with creosote preservative type / organic solvent borne preservative (SNAP 060406), Application of glues and adhesives (SNAP 060405) and conservation of vehicles (SNAP 060407)	1990 - 2018
2.H.3	NO	-	1990 - 2018
2.G	NMVOC	Use of pesticide, including fungicide	1990 – 2018
3.D.a.2.c	NO	-	1990 - 2018
5.E	All relevant	Detached house fire (SNAP 091010), undetached house fire (SNAP 091011), apartment building fire (SNAP 091012), industrial building fire (SNAP 091013) and car fire (SNAP 091009)	1990 - 2018

2. Analysis of key trends by pollutant

This chapter gives an overview of the methodology for the key source analysis by observed pollutants, the results of key sources analysis with an overview of the change in share from 1990 to 2018, then overview of direct emissions of large point sources in Croatia (from EPR base) and in the end overview and analysis of pollutants time series.

2.1. The methodology for key source analysis

The methodology used to identify key source categories of individual pollutant follows the quantitative Approach 1 described in the *IPCC Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories*. Sensitivity analysis - a simplified approach, suggested in the assessment of key sources, if uncertainties are not known. In Approach 1, key categories are identified using a predetermined cumulative emissions threshold. Key categories are those which, when summed together in descending order of magnitude, cumulatively add up to 80 % of the total level[26]

2.2. Key source analysis

The analysis of key sources in Republic of Croatia includes all pollutants under CLRTAP and associated protocols: pollutants which causes acidification, eutrophication and ground-level ozone (SO_2, NO_X, CO, NMVOC and NH_3), particles (TSP, PM_{10} and $PM_{2.5}$), black carbon (BC), heavy metals (Pb, Cd and Hg), other heavy metals (As, Cr, Cu, Ni, Se and Zn) and persistent organic pollutants: total 4 PAHs (benzo(a)-pyrene, benzo(b)-fluoranthene, benzo(k)-fluoranthene, Indeno(1,2,3-cd)-pyrene), PCDD/PCDF, HCB and PCBs). National emissions have been disaggregated into the categories according to required reporting format (NFR). A summary of all key and main sources and their contributions to overall pollutant emissions and percentage of emission change (“-“decrease and “+“increase) from 1990 to 2018 is provided in Table 2.2-1 below. As a note, each of pollutant totals in Table 2.2-1 represents pollutant total only for emission of key sources, not a national total.

Table 2.2-1 Summary of key and main sources and their contributions to overall pollutants emission and percentage of emission change (“-“ decrease and “+“ increase) from 1990 to 2018

Pollutant	NFR Code	Key source during 2018	Emission in 2018	% of total emission in 2018	% change from 1990 to 2018
		NFR name			
NO_x	1A3biii	Road transport: Heavy duty vehicles and buses	8.97	17.74%	-12.40%
	1A3bi	Road transport: Passenger cars	10.86	21.49%	-54.33%
	1A1a	Public electricity and heat production	2.42	4.78%	-78.99%

[26] *Guidebook 2009 (Key category analysis and methodological choice)*: The predetermined threshold is based on an evaluation of several inventories and is aimed at establishing a general level where a significant percentage of inventory uncertainty will be covered by key categories. The final category that should be defined as key is that category for which the cumulative total is exactly equal to, or exceeds the 80 % threshold. This approach is consistent with that recommended by IPCC for the determination of key sources.

Pollutant	NFR Code	Key source during 2018 NFR name	Emission in 2018	% of total emission in 2018	% change from 1990 to 2018
	1A2f	Stationary combustion in manufacturing industries and construction: Non-metallic minerals	2.94	5.82%	-68.61%
	1A4cii	Agriculture/Forestry/Fishing: Off-road vehicles and other machinery	2.40	4.74%	-69.18%
	3Da3	Urine and dung deposited by grazing animals	2.27	4.50%	-47.68%
	3Da1	Inorganic N-fertilizers (includes also urea application)	2.58	5.11%	-7.44%
	1A3dii	Road transport: Light duty vehicles	1.81	3.59%	9.61%
	1A4bi	Residential: Stationary	4.39	8.69%	1.95%
	3Da2a	Animal manure applied to soils	1.87	3.71%	-29.33%
		Total for key sources	40.53	80.2%	
NMVOC	1A4bi	Residential: Stationary	19.69	27.28%	-16.72%
	2H2	Food and beverages industry	3.40	4.72%	-84.77%
	2D3i	Other solvent use	4.41	6.12%	-61.70%
	2D3g	Chemical products	2.33	3.23%	12.56%
	1A3bi	Road transport: Passenger cars	1.99	2.76%	-91.67%
	2D3d	Coating applications	12.00	16.63%	-44.48%
	1B2av	Distribution of oil products	2.32	3.21%	-35.74%
	3B1a	Manure management - Dairy cattle	2.52	3.49%	-41.97%
	3B1b	Manure management - Non-dairy cattle	2.74	3.80%	61.75%
	2D3a	Domestic solvent use including fungicides	4.39	6.08%	-60.40%
	2D3h	Printing	2.32	3.22%	-28.82%
		Total for key sources	48.67	80.5%	
SO_2	1B2aiv	Fugitive emissions oil: Refining / storage	4.06	39.4%	125.5%
	1A1b	Petroleum refining	2.16	21.0%	-90.4%
	1A4bi	Residential: Stationary	0.79	7.6%	-94.7%
	1A2f	Stationary combustion in manufacturing industries and construction: Non-metallic minerals	1.29	12.5%	-88.1%
		Total for key sources	8.29	80.6%	
NH_3	3B3	Manure management - Swine	4.20	11.77%	-39.39%
	3Da1	Inorganic N-fertilizers (includes also urea application)	11.99	33.63%	16.85%
	1A4bi	Residential: Stationary	2.60	7.30%	-13.87%
	3B1b	Manure management - Non-dairy cattle	2.04	5.72%	-19.65%
	2B10a	Chemical industry: Other	2.63	7.38%	-24.49%
	3Da2a	Animal manure applied to soils	5.76	16.14%	-55.50%
		Total for key sources	29.22	81.9%	
$PM_{2.5}$	1A4bi	Residential: Stationary	23.10	80.42%	-21.04%
		Total for key sources	23.10	80.4%	
PM_{10}	1A4bi	Residential: Stationary	23.69	62.65%	-21.07%
	2D3b	Road paving with asphalt	2.57	6.79%	326.94%
	2A5a	Quarrying and mining of minerals other than coal	1.21	3.20%	-10.40%

Pollutant	NFR Code	Key source during 2018 NFR name	Emission in 2018	% of total emission in 2018	% change from 1990 to 2018
	3Dc	Farm-level agricultural operations including storage, handling and transport of agricultural products	2.32	6.13%	-51.45%
	1A1a	Public electricity and heat production	1.10	2.91%	-7.02%
		Total for key sources	30.88	81.7%	
TSP	1A4bi	Residential: Stationary	24.87	48.23%	-21.32%
	2D3b	Road paving with asphalt	11.98	23.23%	326.94%
	3Dc	Farm-level agricultural operations including storage, handling and transport of agricultural products	2.32	4.49%	-51.45%
	2A5a	Quarrying and mining of minerals other than coal	2.47	4.79%	-10.40%
		Total for key sources	41.64	80.7%	
CO	1A4bi	Residential: Stationary	163.44	69.6%	-14.6%
	1A3bi	Road transport: Passenger cars	21.01	8.9%	-90.0%
	1B2aiv	Fugitive emissions oil: Refining / storage	22.16	9.4%	-55.7%
		Total for key sources	206.61	88.0%	
Pb	1A3bi	Road transport: Passenger cars	2.66	31.6%	-99.3%
	1A4bi	Residential: Stationary	1.24	14.7%	-30.6%
	1A3bvi	Road transport: Automobile tyre and brake wear	0.87	10.3%	66.4%
	2A3	Glass production	0.48	5.7%	2.4%
	2C1	Iron and steel production	0.35	4.2%	-99.5%
		Total for key sources	5.60	66.5%	
Cd	1A4bi	Residential: Stationary	0.59	70.1%	5.8%
	2G	Other product use	0.07	8.0%	1.7%
	2A3	Glass production	0.04	4.3%	2.4%
		Total for key sources	0.70	0.82	
Hg	1A1a	Public electricity and heat production	0.11	26.4%	93.0%
	1A2f	Stationary combustion in manufacturing industries and construction: Non-metallic minerals	0.12	30.9%	21.4%
	2K	Consumption of POPs and heavy metals (e.g. electrical and scientific equipment)	0.04	10.2%	-14.4%
	1B2aiv	Fugitive emissions oil: Refining / storage	0.04	10.9%	-51.4%
	1A4bi	Residential: Stationary	0.04	10.2%	-29.2%
		Total for key sources	0.36	88.6%	
PCDD/ PCDF	1A4bi	Residential: Stationary	23.6	83.9%	-30.0%
		Total for key sources	23.6	83.9%	
PAH	1A4bi	Residential: Stationary	13.31	95.1%	-27.0%
		Total for key sources	13.31	95.1%	
As	1B2aiv	Fugitive emissions oil: Refining / storage	0.29	52.1%	1510.8%
	1A1a	Public electricity and heat production	0.09	16.8%	-86.8%
	1A2f	Stationary combustion in manufacturing industries and construction: Non-metallic minerals	0.07	12.3%	16.5%
		Total for key sources	0.45	81.2%	
Cr	1A4bi	Residential: Stationary	1.05	51.89%	1.99%

Pollutant	NFR Code	Key source during 2018 NFR name	Emission in 2018	% of total emission in 2018	% change from 1990 to 2018
	1A3bvi	Road transport: Automobile tyre and brake wear	0.32	15.99%	66.24%
	1B2aiv	Fugitive emissions oil: Refining / storage	0.19	9.28%	-55.72%
	1A2f	Stationary combustion in manufacturing industries and construction: Non-metallic minerals	0.13	6.60%	-26.60%
		Total for key sources	1.69	83.7%	
Cu	1A3bvi	Road transport: Automobile tyre and brake wear	7.07	74.7%	66.2%
	2G	Other product use	0.79	8.3%	107.4%
		Total for key sources	7.86	83.0%	
Ni	1A1b	Petroleum refining	1.84	53.1%	-65.5%
	1B2aiv	Fugitive emissions oil: Refining / storage	0.42	12.1%	-46.4%
	1A1a	Public electricity and heat production	0.26	7.5%	-95.7%
	1A4ai	Commercial/institutional: Stationary	0.20	5.8%	-77.0%
		Total for key sources	2.72	0.78	
Se	2A3	Glass production	0.23	61.1%	2.4%
	1A2f	Stationary combustion in manufacturing industries and construction: Non-metallic minerals	0.06	16.8%	15.4%
	1A4bi	Residential: Stationary	0.02	6.3%	-23.1%
		Total for key sources	0.31	84.2%	
Zn	1A4bi	Residential: Stationary	23.30	73.0%	2.7%
	1A3bvi	Road transport: Automobile tyre and brake wear	2.57	8.1%	70.4%
		Total for key sources	25.87	81.0%	
benzo(a) pyrene	1A4bi	Residential: Stationary	4.64	96.7%	-25.9%
		Total for key sources	4.64	96.7%	
benzo(b) fluoranthene	1A4bi	Residential: Stationary	4.32	94.4%	-29.8%
		Total for key sources	4.32	94.4%	
benzo(k) fluoranthene	1A4bi	Residential: Stationary	1.64	93.7%	7.6%
		Total for key sources	1.64	93.7%	
Indeno (1,2,3-cd) pyrene	1A4bi	Residential: Stationary	2.71	96.8%	-22.0%
		Total for key sources	2.71	96.8%	
PCBs	2K	Consumption of POPs and heavy metals (e.g. electrical and scientific equipment)	408.78	99.3%	-14.4%
		Total for key sources	408.78	99.3%	
HCB	1A4bi	Residential: Stationary	0.23	40.3%	6.4%
	3Df	Use of pesticides	0.27	47.3%	-96.1%
		Total for key sources	0.23	40.3%	
BC	1A4bi	Residential: Stationary	2.74	70.49%	-13.64%
	1A3bi	Road transport: Passenger cars	0.41	10.63%	407.45%
		Total for key sources	3.16	81.12%	

2.3. Emissions of large point sources (LPS) in 2018

Overview of the total emissions of large point sources (LPSs) is shown in Table 2.3-1. Emissions of LPSs reported in the EPR were used. All other pollutant emissions required under the LRTAP Convention were calculated according to EMEP/EEA methodology.

The Table also shows total emissions of LCPs, total national emissions and the share of LCPs in total national emissions in 2018.

Table 2.3-1 Pollutant emissions from large point source (LPS) and LPS share in the Republic of Croatia national total emissions, 2018

Pollutant	NOx (as NO_2)	NMVOC	SOx (as SO_2)	NH_3	$PM_{2.5}$	PM_{10}	TSP	CO	Pb	Cd	Hg	PCDD/ PCDF (dioxins/ furans)	PAHs	HCB	PCBs
LCP	kt	kt	kt	kt	kt	kt	kt	kt	t	t	t	g I-Teq	t	kg	kg
HEP, TPP PLOMIN 2	0.53678	0.0372549	0.36955	0.003845	0.000075	0.000075	0.0003	0	0.1122	0.002756	0.09842	0.1240444	2.599E-05	0.00768924	2.10833882
HEP, TPP SISAK	0.17335	0.0205334	0.00414	0.00077	0.000585	0.00117	0.00234	0.03613	0	0	0.00074	0.0025667	1.54E-05	0	0
HEP, CHP ZAGREB (EL-TO)	0.444443	0.012433	0.001187	0.000466	0.000759	0.001517	0.003034	0.020594	0	0	0.000541	0.0015541	9.325E-06	0	0
HEP, CHP ZAGREB (TE-TO)	0.21578	0.0397122	0.00794	0.001489	0.001369	0.002738	0.005476	0.04444	0	0	0.001427	0.004964	2.978E-05	0	0
PETROKEMIJA	1.062622	0.0645077	0.11614	2.730229	0.325028	0.199034	0.648397	0.07752	0	0	0.0025102	0.0001235	0	0	0
INA D.D. OIL REFINERY	1.730976	1.1549508	6.549287	0.090787	0.276014	0.536769	0.760664	22.62189	0.225044	0.049055	0.0466206	0.0251566	0.0023066	0	0
NAŠICECEMENT	0.457681	0.0890871	0.294003	0	0.056061	0.111	0.013081	0.846458	0.070435	0.00575	0.0352177	0.0029468	0.0003342	0.00330615	0.07402898
CEMEX HRVATSKA (DALMACIJACEMENT)	1.037987	0.0192603	0.090356	0	0.083461	0.165254	0.019474	1.479193	0.104862	0.00856	0.0524309	0.0043871	0.0004976	0.00492208	0.11021185
HOLCIM HRVATSKA Ltd	0.340133	0.0221056	0.031835	0	0.031754	0.062873	0.007409	0.541892	0.039896	0.003257	0.0199479	0.0016691	0.0001893	0.00187266	0.0419314
ISTRACEMENT, CALUCEM Group	0.403213	0.00234	0.278456	0	0.01014	0.020077	0.002366	0.254278	0.01274	0.00104	0.0063699	0.000533	6.045E-05	0.00059799	0.01338979
ROCKWOOL ADRIATIC	0.005289	0.024152	0.204155	0.10943	0.023867	0.027078	0.030765	0.00137	0.068054	0.00098	0.0040372	0.1033226	0.0748232	0.00031475	0.08630348
BELIŠĆE	0.157185	0	0	0	0	0.000705	0	0.015543	0	0	0	0	0	0	0
Vetropack Straža d.d.	0.372215	0	0.214357	0	0	0.001833	0	0.00456	0	0	0	0	0	0	0
SUGAR FACTORY OSIJEK	0.081451	0	0.572241	0	0	0.020602	0	0.012239	0	0	0	0	0	0	0
LCP TOTAL	**7.02**	**1.49**	**8.73**	**2.94**	**0.81**	**1.15**	**1.49**	**25.96**	**0.63**	**0.07**	**0.27**	**0.27**	**0.08**	**0.02**	**2.43**
NATIONAL TOTAL	**50.55**	**72.17**	**10.30**	**35.66**	**28.72**	**37.81**	**51.56**	**234.82**	**8.41**	**0.84**	**0.40**	**27.81**	**13.99**	**0.56**	**411.79**
SHARE LCP IN NATIONAL TOTAL	**13.89%**	**2.06%**	**84.83%**	**8.24%**	**2.82%**	**3.04%**	**2.90%**	**11.05%**	**7.53%**	**8.47%**	**66.92%**	**0.98%**	**0.56%**	**3.31%**	**0.59%**

3. Emission trends by pollutant

This chapter gives a description and graphical overview of pollutant emissions, as well, the overview of emissions by SNAP nomenclature, for the period 1990 - 2018. In addition, the acidification index was considered.

Methodology improvement (move to higher tier), harmonization of so far used EFs with new propose ones in EMEP/EEA guidebook, activity data harmonization with NIR and other activities led to differences in national emission total of pollutants submitted in previous year and those submitted this year, and are aggregated in Tables in Appendix 8 and in detail described in chapters from 4 to 9 in the part *Recalculations and other changes* and in the Chapter 10.

Significant changes in emission trends in this year's inventory are the result of the realization of the Contract for the service Improvement of emission inventory of the LRTAP for sectors: Energy, Agriculture and Production Processes 800 / 02-19 / 39JN, Executor EKONERG d.o.o. for the Client MZOE listed here:

- for NFR 1.A.4.b.i Small combustion - Residential a new model for residential biomass combustion was developed (for details see sub-chapter 4.5), which has led to significant changes in the emissions of those pollutants whose emissions depend on combustion technology (NOx, NMHOS, NH_3, CO, particles, dioxins / furans, PAUs and PCBs). This resulted in a reduction of NOx emissions and an increase in the emissions of the other mentioned pollutants. The new model did not affect the emissions of heavy metals, SO_2 and HCB. Additional, EFs for TSP, PM and BC for wood combustion in pellet stoves and boilers were updated according to GB2019, which led to increase of these emissions in the period since 2005;
- for NFR 3.B Manure management a technique for reducing ammonia emission from manure management used on Croatian farms in estimation along with information and data on the ammonia emission calculation in accordance with Annex III, Part 2 of the NEC Directive (2001/81 / EC 2016/2284 / EU) for the following NFR animal categories: 3.B.3 Swine (sows + fattening pigs), 3.B.4.gi Laying hens, NFR 3.B.4.g.ii Broilers and 3.B.4 .g.iii Turkeys (see sub- chapter 6.1 and 6.2 for details). The inclusion of techniques has led to a decrease in NH_3 emissions depending on the year of application of the technique in individual animal species;
- for NFR 3.D.f Use of pesticides HCB emissions are estimated for the period 1990-2018, resulting from the activity of pesticide use in agriculture and forestry (see sub-section 6.2 for details). This improvement had a significant impact on the increase in HCB emissions between 1990 and 2002 and less in the period after 2002;
- for NFR 2.D.3.g Chemical products the emission factors and activity data were harmonized according to GB2019 for the whole historical period, which mainly led to a decrease in NMVOC emissions for the period 1990 - 2003. Also, the emissions from the activity of Asphalt blowing were calculated and included in the inventory, which led to an increase in NMVOC, TSP, Cd, As, Cr, Ni, Se and PAHs emissions in the period 2004-2014 (see sub- chapter 5.4 for details);

Minor changes in emissions trends result from the following improvements:

- for NFR 1.A.2 Industry and Construction Sector: emissions for the period from1990-2000 are calculated and reported by each industry type (iron and steel, non-ferrous metals, chemical, paper, food, building materials, petrochemical and construction industries) with usage of GB2019

- for NFR 1.A.3.b Road transport: switching from COPERT 4 to COPERT 5 model and inclusion of national Raid Vapour Pressure values for gasoline in a way that they comply with the laws of the Republic of Croatia instead of using the values recommended by the COPERT model (for details see sub-chapter 4.5). The impact of this improvement on emissions trends can be seen in 12.8. Annex 8, column SNAP sector 07 for each pollutant;
- for NFR 1.B.2.b Fugitive emissions from natural gas (exploration, production, processing, transmission, storage, distribution, etc.) for the period 1990-2009: use of newly acquired activity data (see sub-section 4.8). This improvement had a slight effect on the reduction of NMVOC emissions for the period;
- NFR 2.C.1 Manufacture of iron and steel: activity data was updated of for the period 2005-2008 and 2011-2017 for the purpose of aligning the data with the NIR after the in-country audit (see sub-section 5.3 for details);
- for NFR 3.F Field burning of agricultural residues: a model has been developed and all relevant emission were calculated with Tier 1 method according to GB2019 (see sub-section 6.3 for details).

3.1. Sulphur dioxide (SO_2)

The total sulphur dioxide (SO_2) emission in 2018 was amounted to 10.3 kt that is 18.7 % lower than in 2017 (Table 3.1-1). Moreover, the SO_2 emission in 2018 was decrease by 93,9 % compared with 1990 (Figure 3.1-1).

Of the total SO_2 emission in 2018, 98.7% is generated from Energy sector; 25.9 % from the public electricity and heat production, 21.2% from fuel combustion in manufacturing industry and construction, 42.7% from fugitive emissions - activities in the Refining/storage sector and 8.5 % from small combustion (stationary and mobile).

Since 1990, emissions from the public electricity and heat production sector have declined by 97.3 %, from the manufacturing industry and construction by 93.8 %, from transport sector by 99.2 %, from small combustion by 95.7 %. Sulphur emissions from industrial processes and product use sector, have also decreased, by 88.6 % compared to 1990, due to a stopping of the aluminium production, pulp and paper production (Kraft process) and carbon black production and also due to great reduction in production of sulphuric acid. Increasing trend in SO_2 emissions (by 68.3 % since 1990) has sector Refining/storage (NFR 1.B.2.a.iv) due to the installation of sulphur recovery plants, the first one in 1997 and second in 2008 within the refineries.

The great reduction is mainly occurs due to a transfer from fuels with high sulphur content to low-sulphur fuels, for both road transport and stationary combustion. In addition, the war for Croatian independence in the period 1991 – 1995 was the reason for the decline in fuel consumption and overall production in almost all sectors and as consequence the decline in emissions. Great decline in SO_2 emission trend can be observed in 2000 due to second coal thermal power plant (TPP) entering into operation in Croatia. Second TPP has a technique for reducing SO_2 emission (SO_2 scrubbing process) with efficiency higher than 95%. The second TPP on coal has approximately double capacity in comparison to first one. Since 2000, first TPP with no technique for the SO_2 emission reduction is in operation only when the electricity needs are higher (mainly in the summer).

It can be seen that the SO_2 emissions in 2018 was lower than the commitment quota of 70 kt.

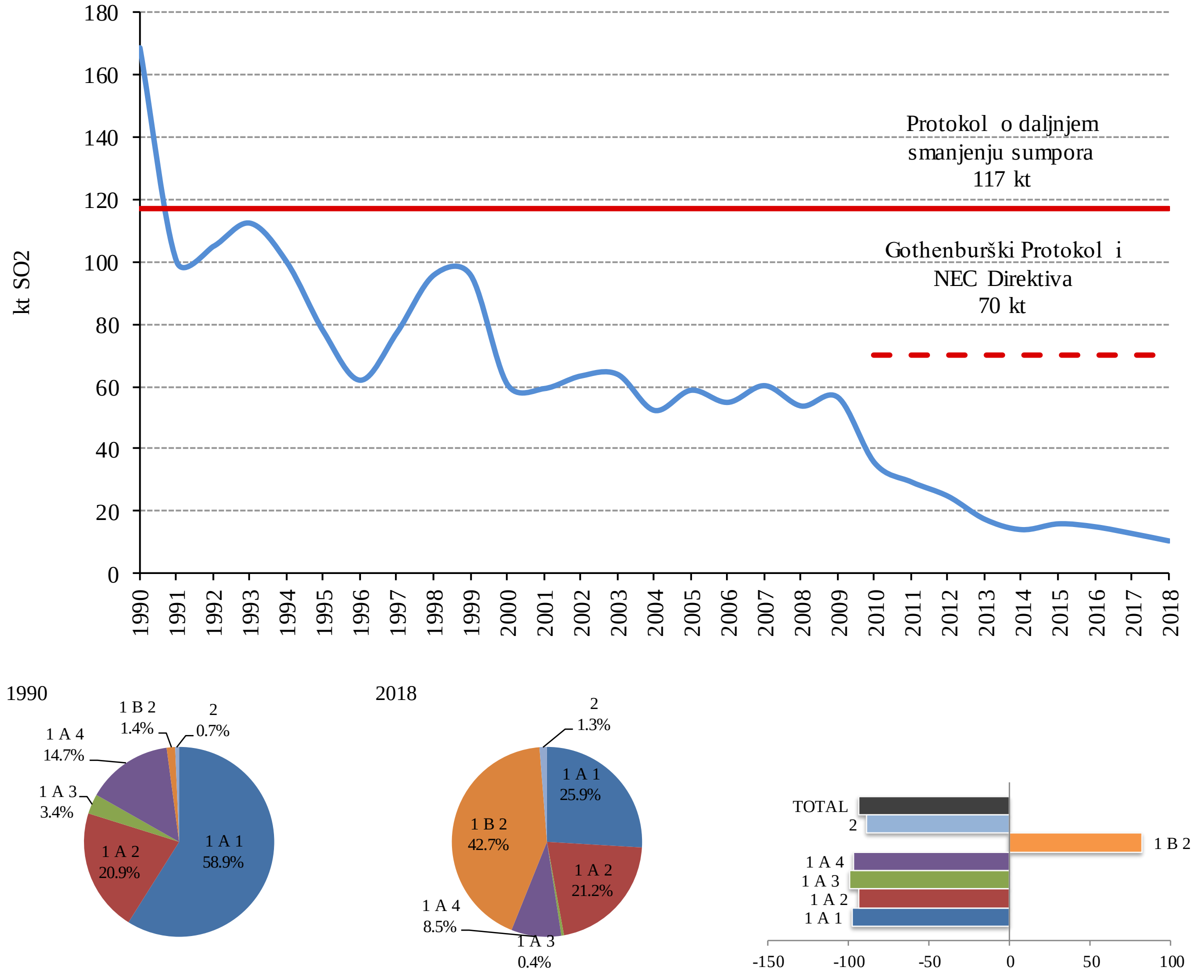


Figure 3.1-1 The SO_2 emissions (kt/yr.) and percentage share by sector and variation in SO_2 emissions

Table 3.1-1 The SO_2 emissions by SNAP nomenclature in the period 1990-2018

SO_2											
SNAP	1	2	3	4	5	6	7	8	9	10	Total
Unit	kt	kt	kt	kt	kt	kt	kt	kt	kt	kt	kt
1990	99.3	22.7	33.9	2.9	NA	NA	4.4	4.7	0.61	5.45E-04	168.5
1991	59.9	13.3	18.2	2.0	NA	NA	3.0	3.1	0.40	5.29E-04	99.9
1992	73.3	7.7	15.2	1.6	NA	NA	4.5	2.1	0.35	2.64E-04	104.8
1993	75.1	10.1	17.5	1.8	NA	NA	4.8	2.5	0.44	3.38E-04	112.3
1994	66.4	7.4	18.1	1.8	NA	NA	3.6	2.0	0.45	3.01E-04	99.7
1995	53.2	4.6	12.7	1.9	NA	NA	2.9	1.6	0.48	3.31E-04	77.4
1996	39.2	4.3	8.6	1.6	NA	NA	5.1	2.6	0.46	2.97E-04	61.9
1997	52.9	6.1	10.1	1.9	NA	NA	4.1	1.8	0.46	3.33E-04	77.3
1998	69.2	4.9	12.4	2.5	NA	NA	4.2	2.0	0.45	4.00E-04	95.6
1999	69.5	6.5	9.6	2.8	NA	NA	4.6	2.0	0.49	3.02E-04	95.6
2000	32.9	6.2	9.2	3.9	NA	NA	5.2	2.7	0.46	3.13E-04	60.5
2001	33.6	5.2	10.5	3.4	NA	NA	3.9	2.2	0.43	3.23E-04	59.2
2002	33.5	7.0	11.7	3.6	NA	NA	4.4	2.7	0.43	3.47E-04	63.2
2003	35.3	6.5	9.5	3.4	NA	NA	5.7	2.9	0.44	2.25E-04	63.7
2004	25.3	5.9	9.0	3.8	NA	NA	5.2	2.6	0.46	3.34E-04	52.2
2005	32.5	5.7	9.5	3.8	NA	NA	4.3	2.5	0.44	2.74E-04	58.6
2006	29.3	4.9	9.8	3.4	NA	NA	4.2	2.7	0.42	3.58E-04	54.8
2007	38.3	3.7	8.5	4.0	NA	NA	3.1	2.0	0.46	3.21E-04	60.1
2008	32.0	3.4	8.1	3.6	NA	NA	2.9	3.3	0.39	3.60E-04	53.6

SO_2											
SNAP	1	2	3	4	5	6	7	8	9	10	Total
Unit	kt	kt	kt	kt	kt	kt	kt	kt	kt	kt	kt
2009	36.7	3.8	6.5	3.5	NA	NA	2.4	3.0	0.43	3.70E-04	56.3
2010	19.7	3.6	5.6	2.3	NA	NA	1.9	1.7	0.38	2.97E-04	35.2
2011	17.2	3.1	3.8	3.5	NA	NA	0.5	0.8	0.31	3.29E-04	29.2
2012	13.9	2.9	3.4	3.7	NA	NA	0.0	0.4	0.26	3.74E-04	24.6
2013	8.9	1.5	3.0	3.3	NA	NA	0.0	0.2	0.27	3.67E-04	17.2
2014	6.1	1.1	2.8	3.6	NA	NA	0.0	0.1	0.22	2.84E-04	13.9
2015	7.8	1.1	3.0	3.5	NA	NA	0.0	0.1	0.27	3.42E-04	15.8
2016	6.2	1.1	3.0	4.2	NA	NA	0.0	0.1	0.29	4.34E-04	14.8
2017	4.3	1.0	2.3	4.6	NA	NA	0.0	0.0	0.32	3.42E-04	12.7
2018	2.7	0.9	2.2	4.2	NA	NA	0.0	0.0	0.33	3.61E-04	10.3
2018 vs 1990	-97.3%	-96.1%	-93.6%	42.9%	NA	NA	-99.3%	-99.6%	-46.0%	-33.6%	-93.9%
2018 vs 2017	-38.2%	-16.5%	-6.0%	-9.1%	NA	NA	-9.5%	-16.5%	3.8%	5.7%	-18.7%

3.2. Nitrogen oxides (NO_X)

The nitrogen oxides (NO_x) emission encompasses nitrogen monoxide and nitrogen dioxide emissions. The emissions are expressed as equivalents of NO_2. The NO_x is a pollutant that causes acidification and eutrophication. Together with volatile organic compounds and other reactive gases in atmosphere, and in presence of solar radiation, the NO_x takes part in ground ozone formation. Nitrogen oxides are formed in all combustion in the energy and transport sectors, and the largest emission sources are road traffic, off-road vehicles and machinery, production of electricity and heating and manufacturing industry and construction.

The NOx emission in 2018 amounted to 50.5 kt, which is a decline by 53.3 % since 1990 and by 7.6 % compare to 2017 (Table 3.2-1). Emissions from the energy sector in 2018 were about 42.8 kt and account for about 84.7 % of the total NOx emission. Transport sector (NFR 1.A.3) was the main contributor in energy sector in 2018, with contribution of 48.8 % to the total of NOx emission, and with domination of road transport.

In relation to the 1990 the NOx emission in transport sector has declined by 38.9%, due to the introduction of catalytic converters in cars and the subsequent successively more strict emission standards. Energy stationary combustion sectors (including off-road mobile sources) also have recorded a great decrease since 1990, mostly due to lower fuel consumption. The industrial processes and product use sector also record a decline of historic emissions by 65.8 %, mostly due to stopping the production of aluminium, paper and pulp (Kraft process) and carbon black production and also due to decline in productions. The Agriculture Sector recorded a decrease of 31.2% in the 1990s, mainly due to the decrease in the use of N-fertilizers in crop production. In addition, the war for Croatian independence in the period 1991 – 1995 was the reason for the decline in fuel consumption and overall production in almost all sectors and as consequence the decline in emissions. Since 2007, the trend of NOx emission has recorded decline due to the economic crisis that still exists in Croatia (Figure 3.2-1).

The NOx emission in 2017 was lower than the commitment quota of 87 kt.

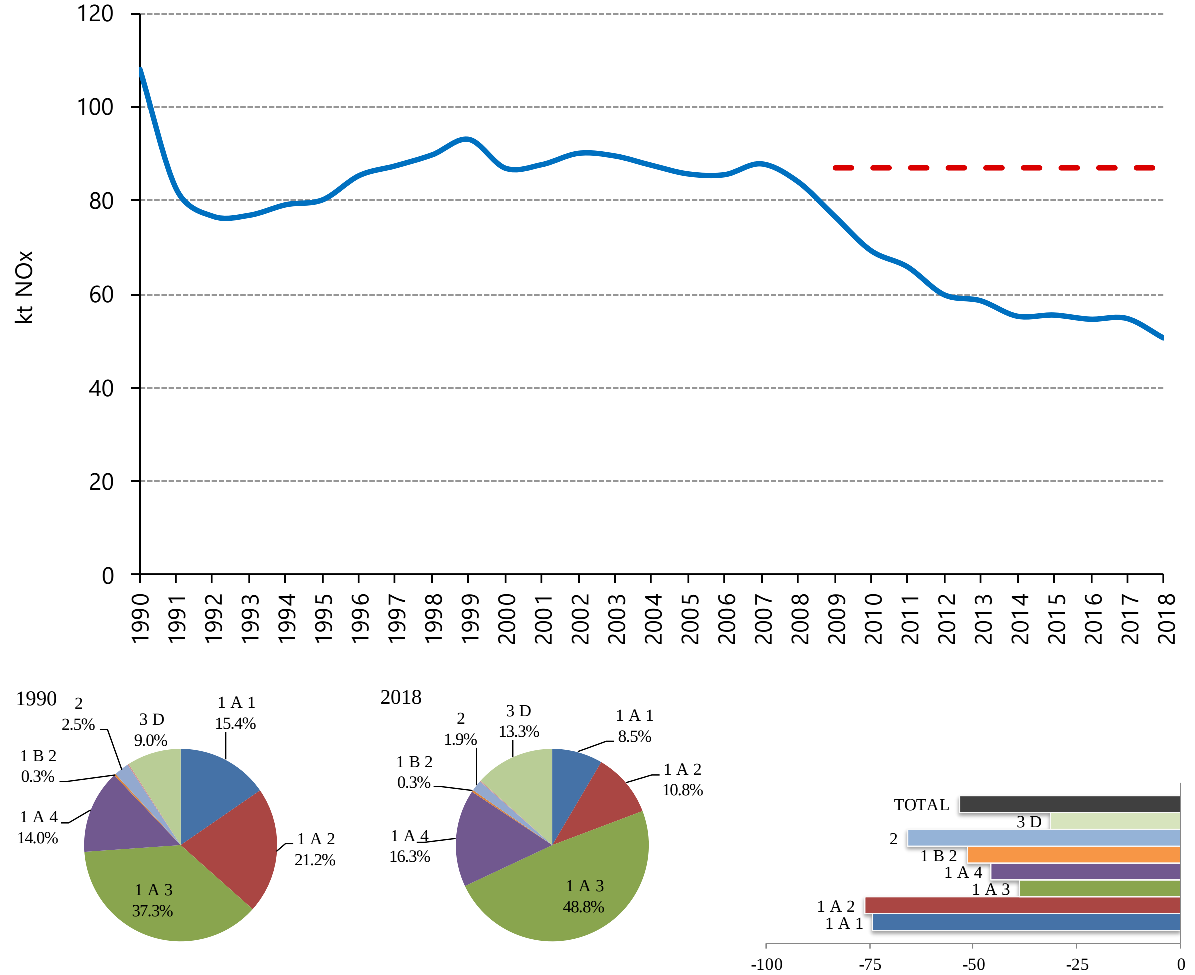


Figure 3.2-1 The NO_X emissions (kt/yr.) and percentage share by sector and variation in NO_X emissions

Table 3.2-1 The NO_X emissions by SNAP nomenclature in the period 1990-2018

NOx											
SNAP	1	2	3	4	5	6	7	8	9	10	Total
Unit	kt	kt	kt	kt	kt	kt	kt	kt	kt	kt	kt
1990	16.6	7.4	18.3	3.0	NA	2.19E-02	36.4	16.4	7.2E-02	10.0	108.2
1991	12.1	6.6	12.9	2.6	NA	2.04E-02	26.0	12.4	5.6E-02	9.7	82.4
1992	14.4	6.6	11.5	2.9	NA	2.26E-02	24.8	7.8	4.8E-02	8.6	76.6
1993	14.9	7.1	10.9	2.5	NA	2.05E-02	26.7	7.1	5.7E-02	7.7	76.9
1994	12.9	6.1	11.3	2.6	NA	8.93E-03	28.9	9.6	5.4E-02	7.6	79.1
1995	15.0	6.7	10.8	2.8	NA	2.16E-02	28.5	9.2	5.9E-02	7.2	80.2
1996	14.7	7.9	11.0	2.6	NA	2.09E-02	31.2	10.6	5.4E-02	7.1	85.4
1997	14.4	7.6	11.8	2.7	NA	2.06E-02	33.1	10.0	5.6E-02	7.7	87.5
1998	17.0	6.7	12.0	2.4	NA	2.18E-02	33.0	11.7	5.7E-02	6.9	89.9
1999	18.2	7.6	11.4	2.7	NA	2.52E-02	34.3	11.6	6.3E-02	7.4	93.2
2000	13.1	6.7	11.0	2.9	NA	2.45E-02	32.0	13.6	6.2E-02	7.6	87.0
2001	12.7	6.8	12.2	2.3	NA	3.22E-02	31.3	14.5	6.2E-02	7.9	87.7
2002	14.3	6.9	12.0	2.4	NA	3.52E-02	32.8	13.9	5.8E-02	7.8	90.2
2003	13.2	7.6	11.1	2.6	NA	3.73E-02	32.9	14.3	5.9E-02	7.8	89.6
2004	10.8	7.3	12.5	3.0	NA	2.73E-02	32.3	13.2	5.7E-02	8.3	87.6
2005	11.4	7.4	12.5	2.6	NA	2.71E-02	30.1	13.6	5.7E-02	8.1	85.7
2006	10.5	6.8	13.1	2.5	NA	2.65E-02	30.5	13.8	6.0E-02	8.3	85.6
2007	12.6	6.2	14.1	2.7	NA	2.67E-02	30.4	13.6	6.6E-02	8.2	87.9
2008	10.8	6.4	13.0	2.6	NA	2.80E-02	27.6	14.8	6.1E-02	8.9	84.1

NOx											
SNAP	1	2	3	4	5	6	7	8	9	10	Total
Unit	kt	kt	kt	kt	kt	kt	kt	kt	kt	kt	kt
2009	10.5	6.5	11.8	1.6	NA	2.05E-02	26.6	12.6	6.2E-02	6.9	76.7
2010	8.5	6.8	8.1	1.8	NA	2.39E-02	25.4	11.2	3.5E-02	7.4	69.3
2011	9.0	6.5	6.8	1.3	NA	2.10E-02	24.0	10.5	4.3E-02	7.7	65.8
2012	7.9	6.1	6.9	1.2	NA	2.01E-02	21.1	9.3	4.3E-02	7.2	59.8
2013	7.9	5.9	5.8	1.1	NA	1.77E-02	22.6	8.8	4.1E-02	6.3	58.5
2014	7.3	5.2	5.6	1.2	NA	1.53E-02	21.5	8.2	4.7E-02	6.1	55.2
2015	7.2	5.9	5.2	1.2	NA	1.49E-02	21.8	7.5	5.1E-02	6.5	55.5
2016	7.2	5.9	5.2	1.1	NA	1.50E-02	21.8	7.1	5.7E-02	6.1	54.6
2017	5.5	5.9	4.5	1.3	NA	1.67E-02	23.6	6.8	3.9E-02	7.0	54.7
2018	4.3	5.8	4.1	1.0	NA	2.21E-02	21.8	6.7	5.0E-02	6.8	50.5
2018 vs 1990	-74.3%	-21.1%	-77.6%	-65.4%	NA	0.7%	-40.2%	-59.3%	-30.1%	-32.0%	-53.3%
2018 vs 2017	-22.2%	-1.8%	-8.3%	-23.3%	NA	32.1%	-7.9%	-2.4%	29.3%	-2.1%	-7.6%

3.3. Ammonia (NH_3)

Ammonia contributes to acid deposition and eutrophication. It also reacts rapidly with atmospherically formed sulphuric and nitric acids to contribute to ambient levels of fine particles. Agriculture represents the largest source of ammonia emissions. Ammonia is a common by-product of animal excreta due to often-inefficient conversion of feed nitrogen into animal product.

The NH_3 emission in 2018 amounted to 35.7 kt. Emission has decrease by 33.7 % since 1990 and has increase by 1.4 % since year before (Table 3.3-1). About 81.5 % of NH_3 emissions in Croatia in 2018 originate from the Agriculture sector, in which source category Manure management account for about 28.7 % and the Production of crops and agricultural soils with 52.8%. Sectors with a smaller share in NH_3 total emissions in 2018 were the Industrial processes sector (about 7.9 %) with emission domination from production of ammonia, nitric acid and mineral N-fertilizers; the Small combustion sector and mobile machinery (7.4 %) with dominance of emission from Residential; Waste sector with dominance of emissions from Latrines (1.7%) and Transport sector (1.2%) with dominance of emissions from passenger cars.

Since 1990, NH_3 emissions has decreased considerably and this is due to emission reductions in the sectors Agriculture, Industrial processes and product use, Small combustion and Waste. The decrease in the Agricultural sector is 76.5% as a result of the continuous decrease in the number of animals for most types and more recently the introduction of farm-based emission reduction technologies (see Tables 6.1-4 and 6.1-5). Decrease in the sector Industrial processes and product use is 20.9% and is the result of reduced production. The decline of NH_3 emissions by sectors in the period from 1991 to 1995 is the result of the war for Croatian independence, while the reason for decline in the years after 2008 is due to economic recession. The increase in NH_3 emissions by 7.4 times compared to 1990 was recorded in the Transport sector with road traffic domination and as a result of the introduction of catalysts into vehicles. The catalysts contain urea that is converted into NH_3.

The ammonia emission in 2018 (Figure 3.3-1) was above the quota value of 30 kt.

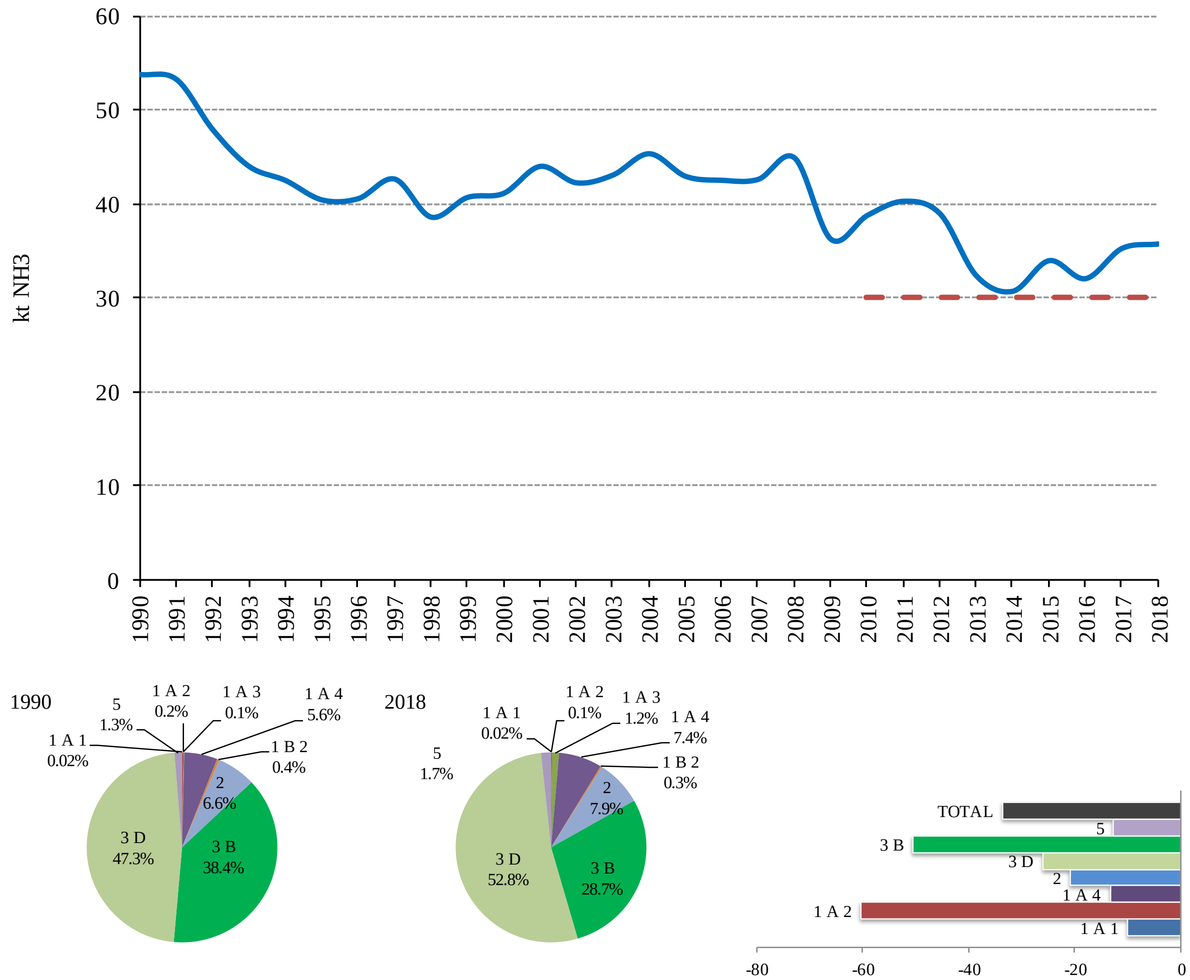


Figure 3.3-1 The NH_3 emissions (kt/yr.) and percentage share by sector and variation in NH_3 emissions

Table 3.3-1 The NH_3 emission by SNAP nomenclature in the period 1990-2018

NH_3											
SNAP	1	2	3	4	5	6	7	8	9	10	Total
Unit	kt	kt	kt	kt	kt	kt	kt	kt	kt	kt	kt
1990	8.9E-03	3.02	0.13	3.71	NA	5.0E-02	0.06	3.5E-03	0.69	46.1	53.8
1991	5.4E-03	3.59	0.13	3.63	NA	4.7E-02	0.04	2.5E-03	0.69	45.1	53.2
1992	6.3E-03	3.13	0.11	4.61	NA	5.2E-02	0.04	1.4E-03	0.69	39.2	47.9
1993	9.0E-03	3.30	0.11	3.26	NA	4.7E-02	0.04	1.7E-03	0.69	36.5	43.9
1994	5.5E-03	2.99	0.08	3.62	NA	2.0E-02	0.04	1.8E-03	0.68	35.0	42.4
1995	4.0E-03	3.16	0.09	3.68	NA	4.9E-02	0.07	1.7E-03	0.68	32.6	40.4
1996	4.8E-03	3.53	0.09	3.65	NA	4.7E-02	0.09	1.8E-03	0.67	32.4	40.5
1997	7.0E-03	3.24	0.12	3.71	NA	4.6E-02	0.16	1.7E-03	0.67	34.6	42.6
1998	6.6E-03	3.25	0.11	4.16	NA	5.0E-02	0.24	2.0E-03	0.66	30.0	38.5
1999	6.4E-03	3.19	0.08	3.05	NA	5.7E-02	0.31	2.4E-03	0.66	33.3	40.6
2000	1.0E-02	2.84	0.09	3.57	NA	5.6E-02	0.34	2.4E-03	0.66	33.5	41.1
2001	9.4E-03	3.13	0.07	2.77	NA	7.3E-02	0.31	2.6E-03	0.65	36.9	43.9
2002	1.2E-02	2.99	0.08	2.92	NA	7.6E-02	0.35	2.5E-03	0.65	35.1	42.2
2003	1.1E-02	3.44	0.09	3.61	NA	7.9E-02	0.37	3.0E-03	0.65	34.8	43.0
2004	1.1E-02	3.36	0.10	4.60	NA	5.9E-02	0.37	2.9E-03	0.64	36.2	45.3
2005	1.1E-02	3.55	0.08	3.79	NA	6.1E-02	0.40	3.1E-03	0.64	34.3	42.9
2006	1.0E-02	3.22	0.10	2.57	NA	6.0E-02	0.44	3.3E-03	0.64	35.4	42.5
2007	1.2E-02	3.06	0.09	2.74	NA	6.1E-02	0.59	3.4E-03	0.64	35.4	42.6
2008	1.2E-02	3.02	0.08	2.18	NA	6.4E-02	0.58	3.8E-03	0.63	38.3	44.8

NH_3											
SNAP	1	2	3	4	5	6	7	8	9	10	Total
Unit	kt	kt	kt	kt	kt	kt	kt	kt	kt	kt	kt
2009	9.5E-03	3.11	0.09	1.70	NA	4.7E-02	0.59	3.4E-03	0.63	30.0	36.2
2010	1.2E-02	3.29	0.09	2.63	NA	5.5E-02	0.55	3.1E-03	0.63	31.5	38.7
2011	1.3E-02	3.16	0.08	2.63	NA	4.8E-02	0.52	3.0E-03	0.62	33.1	40.2
2012	1.1E-02	3.10	0.09	2.82	NA	4.6E-02	0.52	2.8E-03	0.62	31.7	38.9
2013	1.1E-02	3.03	0.08	1.95	NA	4.0E-02	0.51	2.7E-03	0.62	26.0	32.3
2014	1.0E-02	2.63	0.06	1.58	NA	3.5E-02	0.47	2.7E-03	0.62	25.2	30.6
2015	1.0E-02	2.96	0.05	2.58	NA	3.4E-02	0.47	2.6E-03	0.62	27.2	33.9
2016	1.1E-02	2.83	0.03	2.27	NA	3.4E-02	0.47	2.6E-03	0.61	25.7	32.0
2017	9.1E-03	2.69	0.05	2.56	NA	3.8E-02	0.45	2.7E-03	0.61	28.8	35.2
2018	8.0E-03	2.62	0.05	2.85	NA	5.0E-02	0.42	2.8E-03	0.61	29.1	35.7
2018 vs 1990	-10.0%	-13.3%	-60.5%	-23.1%	NA	-0.4%	656.3%	-20.9%	-12.7%	-37.0%	-33.7%
2018 vs 2017	-11.5%	-2.7%	5.4%	11.3%	NA	32.4%	-6.0%	4.0%	-0.4%	1.0%	1.4%

At the time when the quota was allocated, the Republic of Croatia had a basic inventory, partly incomplete because of the (non) availability of emission data, due to the (non) availability of methodologies for the calculation of emissions from particular sectors. Specifically, it was a manure management sector in which the number of animals was incomplete and the FE NH_3 used were, for each animal category, lower than those in GB1999, which were valid at the time the emission quotas of the LRTAP Convention members were allocated. The methodology for the calculation of ammonia emissions from agriculture firstly was improved and applied for the year 2001 and reported in December 2004 under the LIFE project and it was recommended that the improved methodology should be applied to the historical trend until 1990, which was done two years later (in 2006). Improved methodology implied the use of recommended emission factors for ammonia for each of the animal categories, instead of the ones used by Croatia. In 2006, two reports were submitted to the LRTAP Convention, including the emissions inventory report for the period 1990-2003 and 1990-2004, as well as NFR tables for 2003 and 2004. That emission reports have indicated the need for implementation of measures for NH_3 emission reduction from agriculture to achieve a reduction in NH_3 emissions and to meet the requirements of the Gothenburg Protocol under the LRTAP Convention.

This year's inventory includes technical measures for the reduction of ammonia emissions that are being implemented on Croatian farms with regard to pigs (sows, fatteners) and poultry (broilers, turkeys, and laying hens). The plan is to continue research on dairy cattle and other cattle, as well as to implement activities based on the guidelines given for reducing NH_3 emissions from mineral fertilizers based on urea: incorporation of fertilizer into the soil, is a measure that, besides reducing emissions, is recommended to farmers and because of higher crop yields, and that farmers are likely to apply.

3.4. Acid equivalent (AEQ)

Acid equivalent is a parameter for assessing the overall amount of acidifying substances emitted into the atmosphere. At different spatial and time scales, these substances contribute to the acidification of soil, air and the aquatic environment. The acid equivalent is based on the potential fixation of H^+ ion. The calculation only takes into account SO_2, NOx and NH_3, because it is quite obvious that other acidifying substances such as HCl, only have a negligible effect, regarding their low emission level compared to the other three substances. The acid equivalent is calculated using weight coefficients: 0.0313 for SO_2, 0.0217 for NOx and 0.0588 for NH_3.

Due to the respective weight of each of three substances, the proportion of NH_3 and NO_x emissions have increased: for NOx from 21.8% in 1990 to 31.2% in 2018 and for NH_3 from 29.3% in 1990 to 59.6 % in 2018 (Table 3.4-1). In addition, their absolute emissions are slightly decreased during the observed period (Figure 3.4-1). This is mainly due to the significant decrease of SO_2 emission during the same period (from 48.9 % in 1990 to 9.2 % in 2018). It can be noticed that the acid equivalent has an overall decreasing trend, as a result of downward trends of all three substance emissions. This acid equivalent should follow a downward trend in coming years, as a result of the expected continuous decrease of SO_2, and with no significant change in NO_x and NH_3 emissions.

Table 3.4-1 Emission of acidifying substances that contribute to the acidification expressed in Aeq (*)

Year	SO_2 % Aeq	NO_x % Aeq	NH_3 % Aeq	Aeq(**) kt
1990	48.9	21.8	29.3	10.8
1991	38.9	22.2	38.9	8.0
1992	42.3	21.4	36.3	7.8
1993	45.2	21.5	33.3	7.8
1994	42.6	23.4	34.0	7.3
1995	37.1	26.6	36.3	6.5
1996	31.4	30.0	38.6	6.2
1997	35.5	27.8	36.7	6.8
1998	41.5	27.0	31.4	7.2
1999	40.4	27.3	32.3	7.4
2000	30.6	30.5	39.0	6.2
2001	29.2	30.0	40.8	6.3
2002	30.8	30.5	38.7	6.4
2003	30.8	30.1	39.1	6.5
2004	26.4	30.7	43.0	6.2
2005	29.5	29.9	40.6	6.2
2006	28.2	30.6	41.1	6.1
2007	29.9	30.3	39.8	6.3
2008	27.3	29.7	43.0	6.1
2009	31.7	30.0	38.3	5.6
2010	22.6	30.8	46.6	4.9
2011	19.4	30.3	50.2	4.7
2012	17.7	29.8	52.5	4.4
2013	14.5	34.3	51.2	3.7
2014	12.7	34.9	52.4	3.4
2015	13.4	32.6	54.0	3.7
2016	13.2	33.6	53.3	3.5
2017	10.9	32.5	56.6	3.7
2018	9.2	31.2	59.6	3.5

(*) Emissions concern only anthropogenic one (without nature)

(**) Acid equivalent: indicator of acid equivalent calculate on the base of potential fixation of H+ ion: 0.0313 for SO_2, 0.0217 for NOx and 0.0588 for NH_3

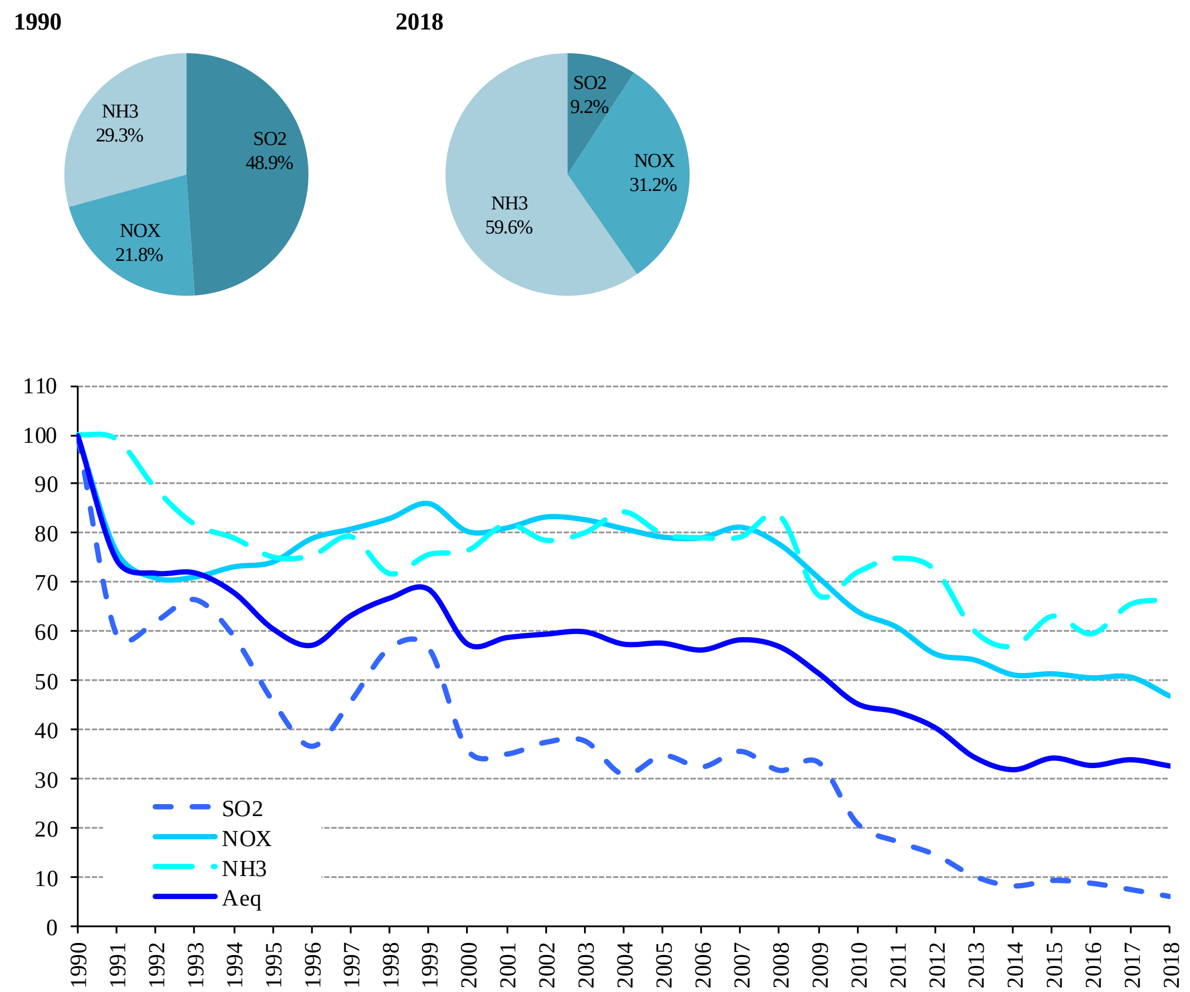


Figure 3.4-1 Relative emission of substances (without nature) that contribute to acidification and eutrophication for 1990-2017 (1990 = 100%)

3.5. Carbon monoxide emission (CO)

Main source in carbon monoxide emission is the incomplete fossil fuel combustion in energy sectors both, stationary and mobile.

The CO emission in 2018 amounted to 234.8 kt and decreased by 57.6% compared to 1990 and by 7 % compared with year before (Figure 3.5-1 and Table 3.5-1). The Energy Sector is 99.6% of the total CO emission in 2018, of which 73% comes from small combustion sources (with domination of residential), 12.9% from the Transport sector (with the dominance of road transport), 9.5% from the Refining / storage sector, and 3.7% from fuel combustion in industry and construction.

The war for Croatian independence in the period 1991 – 1995 was the reason for the decline in fuel consumption and overall production in almost all sectors and as consequence the decline in emissions. Road transport was a main reason for CO emission reduction since 1990 (by 87.3 %) due to the introduction of catalytic converters and renewing of the vehicle fleet. Other energy sectors also note the downward trend of CO emission since 1990 mainly due to changes in the structure of fossil fuel combustion by reducing the use of low quality coal and fuel wood and increasing use of natural gas. Other sectors also have a significant reduction trend since

1990. The Industrial processes and product use sector has recorded a great reduction (by 97.8 % since 1990), due to stopping the production of aluminium, paper and pulp (Kraft process) and carbon black production and also due to the overall decline of production. CO emissions from Refining /storage sector have also decrease by 55.6 % since 1990, mostly due to decline in catalytic cracking activity (partial burn without CO boiler). Since 2000, the trend of CO emissions has declining due to previously mentioned reasons and since 2007, the economic crisis has contributed to further reduction of CO emissions (Figure 3.2-1). In addition, reduction since 2008 is a partly result of gradual replacement of certain percentage of traditional domestic stoves and manual single house boilers with advanced/ecolabelled stoves and boilers and pellet stoves and boilers (see Table 4.5-1 and Figure 4.5-2). In addition, emission dips can be seen in the years 1994, 2000, 2002 and 2014 when, due to the warmer winter, the consumption of biomass for heating was lower (Figure 4.5-3).

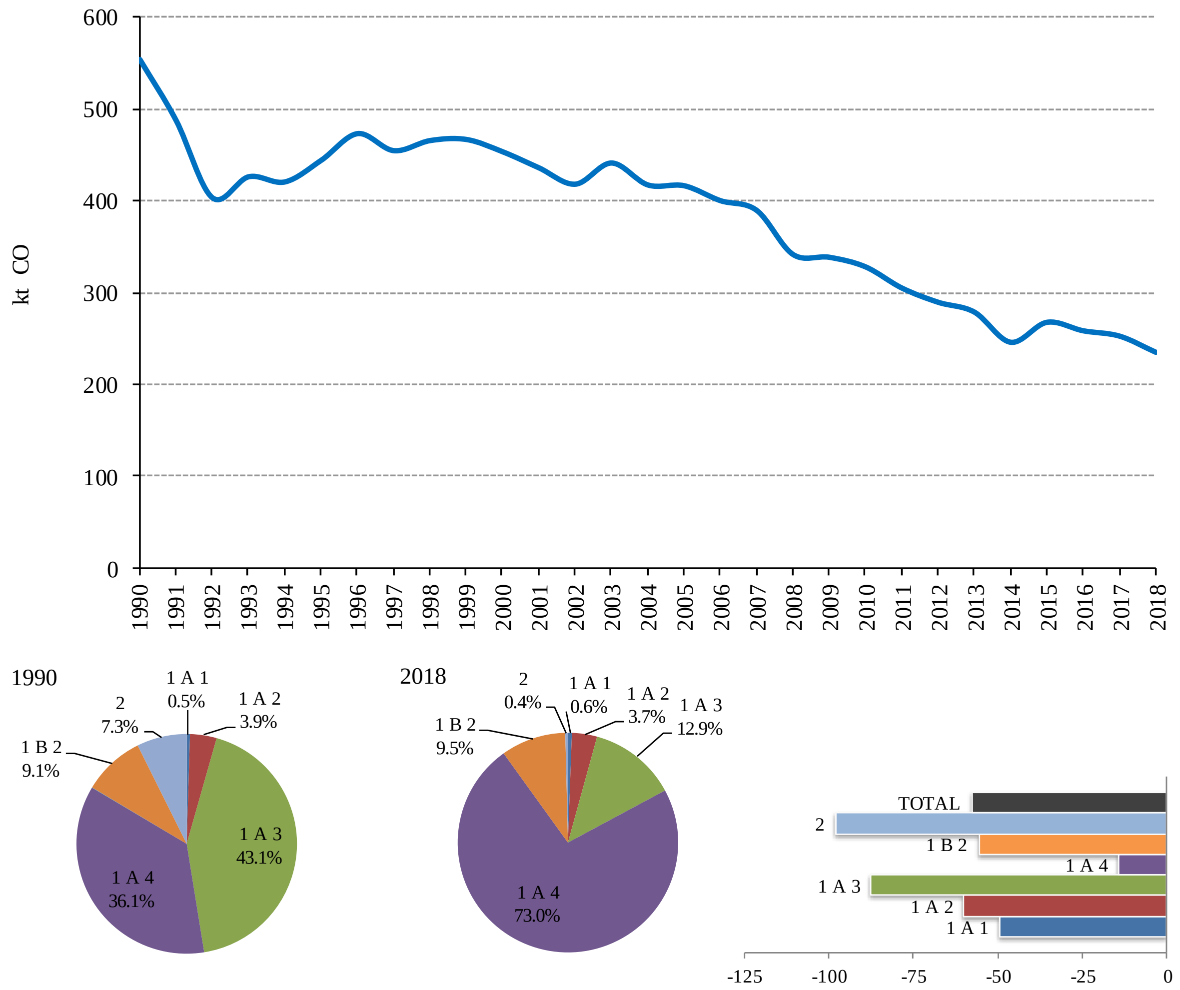


Figure 3.5-1 The CO emissions (kt/yr.) and percentage share by sector and variation in CO emissions

Table 3.5-1 The CO emissions by SNAP nomenclature in the period 1990-2018

CO											
SNAP	1	2	3	4	5	6	7	8	9	10	Total
Unit	kt	kt	kt	kt	kt	kt	kt	kt	kt	kt	kt
1990	2,67	193,1	18,9	90,2	NA	0,67	235,5	12,8	0,32	0,073	554,2
1991	2,09	213,4	13,4	60,3	NA	0,62	178,4	19,1	0,24	0,071	487,6
1992	2,30	180,1	10,6	41,1	NA	0,69	154,8	13,5	0,21	0,035	403,4
1993	2,57	189,6	9,5	54,4	NA	0,63	153,8	15,7	0,25	0,045	426,4
1994	2,62	170,6	9,6	54,6	NA	0,27	167,4	15,4	0,23	0,040	420,7

CO											
SNAP	1	2	3	4	5	6	7	8	9	10	Total
Unit	kt	kt	kt	kt	kt	kt	kt	kt	kt	kt	kt
1995	2,75	179,8	9,2	61,8	NA	0,66	173,4	16,3	0,26	0,044	444,3
1996	2,56	201,3	9,0	54,3	NA	0,64	187,0	18,4	0,23	0,040	473,3
1997	2,34	185,0	10,0	51,7	NA	0,63	187,9	17,0	0,24	0,044	454,8
1998	2,51	186,1	9,6	59,4	NA	0,67	190,8	16,5	0,24	0,053	465,8
1999	2,60	183,3	9,2	61,3	NA	0,77	188,6	20,9	0,26	0,040	467,0
2000	1,97	162,8	9,8	84,2	NA	0,75	174,1	19,5	0,26	0,042	453,5
2001	1,48	178,2	10,4	71,6	NA	0,99	154,2	18,8	0,25	0,043	436,0
2002	1,39	171,0	9,9	75,6	NA	1,07	142,5	16,5	0,24	0,046	418,2
2003	1,68	197,1	9,4	77,0	NA	1,13	135,8	18,9	0,25	0,030	441,3
2004	1,58	191,7	10,7	70,6	NA	0,83	123,2	18,5	0,24	0,045	417,4
2005	1,22	203,4	10,9	71,8	NA	0,83	111,2	16,9	0,24	0,036	416,5
2006	1,59	185,1	11,4	83,7	NA	0,81	99,9	17,5	0,26	0,048	400,3
2007	2,15	176,5	12,2	88,5	NA	0,81	91,5	17,7	0,28	0,043	389,6
2008	1,50	175,9	11,8	50,9	NA	0,86	81,6	18,7	0,26	0,048	341,6
2009	1,22	182,0	10,1	52,0	NA	0,63	74,9	17,4	0,27	0,049	338,5
2010	1,18	194,5	10,1	40,3	NA	0,73	66,2	14,8	0,14	0,040	328,0
2011	1,21	188,0	8,8	32,8	NA	0,64	58,9	14,4	0,18	0,044	305,0
2012	1,08	186,0	9,0	35,4	NA	0,61	43,9	13,2	0,18	0,050	289,4
2013	1,11	183,5	9,2	29,6	NA	0,54	41,6	12,9	0,17	0,049	278,7
2014	0,90	160,3	9,0	25,0	NA	0,47	36,6	13,3	0,20	0,038	245,8
2015	1,04	182,2	9,6	26,2	NA	0,46	35,1	12,8	0,21	0,046	267,6
2016	1,15	175,7	8,3	26,0	NA	0,46	33,7	12,8	0,24	0,058	258,3
2017	1,43	168,9	8,3	29,1	NA	0,51	31,6	12,6	0,16	0,046	252,5
2018	1,35	164,2	5,5	22,4	NA	0,68	28,1	12,4	0,20	0,048	234,9
2018 vs 1990	-49,5%	-15,0%	-70,8%	-75,2%	NA	0,6%	-88,1%	-2,9%	-35,8%	-33,6%	-57,6%
2017 vs 2018	-5,5%	-2,8%	-33,3%	-23,0%	NA	32,2%	-11,0%	-1,4%	30,6%	5,7%	-7,0%

3.6. Non-methane volatile organic compounds (NMVOC)

The VOCs play a significant role in the formation of ozone and fine particulates in the atmosphere. Under sunlight, VOCs react with NOx emitted mainly from vehicles, power plants and industrial activities to form ozone, which in turn helps the formation of fine particulates. The accumulation of ozone, fine particulates and other gaseous pollutants results in smog. Some of NMVOCs may have undesirable ecotoxicological properties, for example benzene and xylene.

In 2018, NMVOC emissions amounted to 72.2 kt, and compared to the previous year has reduced by 2% and in comparison with 1990 by 57.8% (Figure 3.6-1). Sectors Industrial processes and product use, Small combustion and mobile machinery, Agriculture, Transport and Refining are dominant in NMVOC emissions, and in 2017, these sectors contribute to NMVOC total emissions as follows: 39.5%, 24.6%, 14% and 5.7% respectively.

The NMVOC emission reduction in the historical trend since 1990 has been recorded in all sectors. In the Industrial processes and product use, 65.6 % decrease was recorded as a result of the introduction of environmental protection requirements for the reduction of NMVOC emissions from organic solvent containing products i.e. the implementation of best available techniques (BAT) and partly as a result of reduced production of solvent and solvent based products and stopping the production of certain chemicals. In the NMVOC emission, Transport sector has decreased by 82.7% since 1990, due to the increased use of energy-efficient vehicles and the introduction of new exhaust emission requirements. Fugitive emissions of NMVOC from petroleum products (gasoline) and natural gas have also decreased by 41.4% since 1990. In addition, the war for Croatian independence in the period 1991 – 1995 was the reason for the decline due to lower fuel consumption and overall reduction of production activities in almost all sectors. The economic crisis has contributed to further reduction of NMVOC emissions since 2007 (Figure 3.6-1). Also, reduction since 2005 is a partly result of gradual replacement of certain percentage of traditional domestic stoves and manual single house boilers with advanced/ecolabelled stoves and boilers, high efficiency stoves and boilers and pellet stoves and boilers (see Table 4.5-1 and Figure 4.5-2). The Waste sector and category 3.D is the only ones with an increasing trend in NMVOC emissions since 1990; waste for about 3 times due to increased activities related to the solid waste disposal on land and 3.D by 1.3%.

The NMVOC emission in 2018 (Figure 3.6-1) was below the quota value of 90 kt.

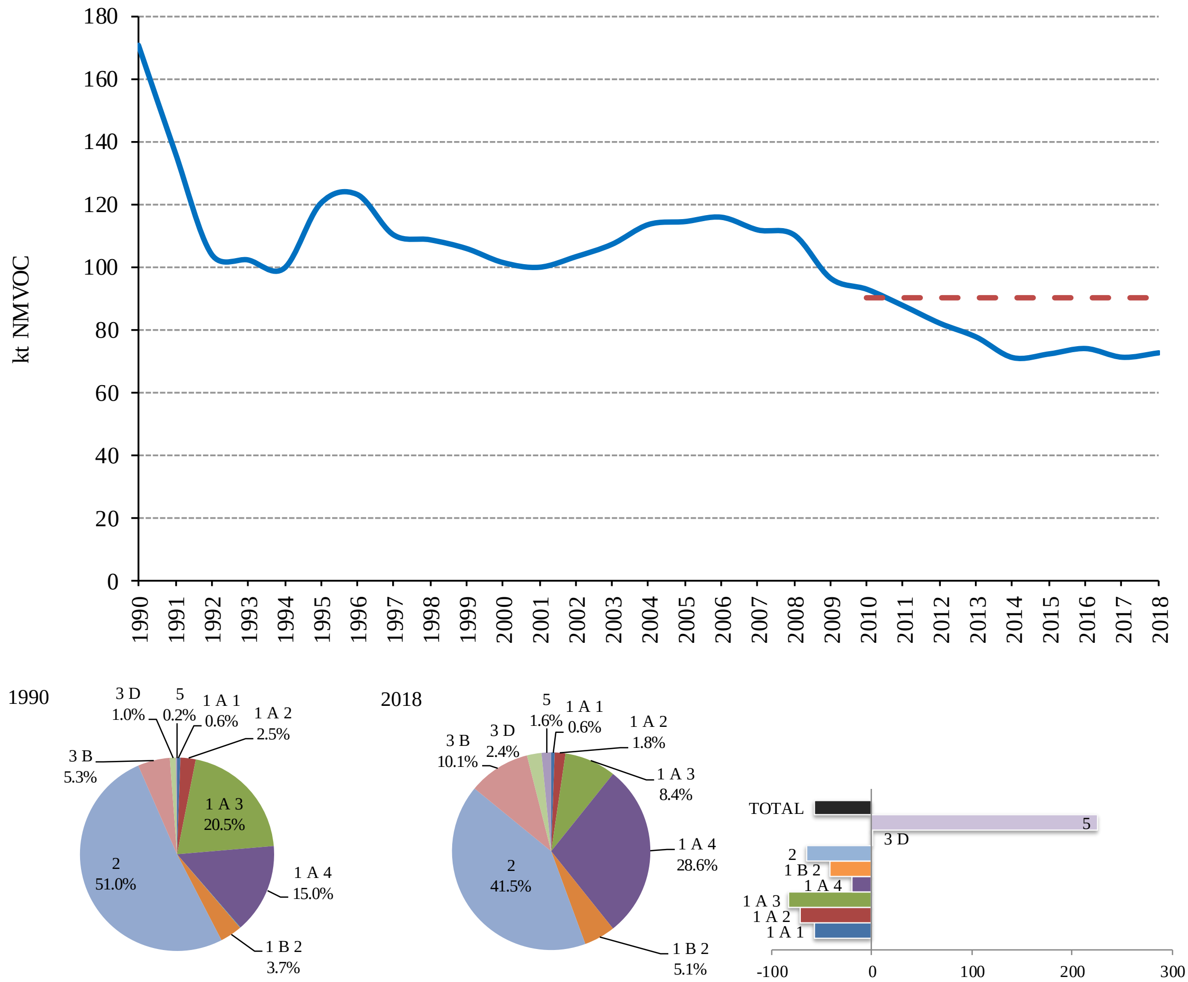


Figure 3.6-1 The NMVOCs emissions (kt/yr.) and percentage share by sector and variation in NMVOCs

Table 3.6-1 The NMVOC emissions by SNAP nomenclature in the period 1990-2018

NMVOC											
SNAP	1	2	3	4	5	6	7	8	9	10	Total
Unit	kt	kt	kt	kt	kt	kt	kt	kt	kt	kt	kt
1990	1.0	24.0	3.4	25.6	4.2	63.8	34.5	3.2	0.39	10.8	170.8
1991	0.7	27.2	2.7	21.8	2.3	40.5	26.9	3.4	0.40	10.8	136.7
1992	0.8	23.4	2.2	13.8	2.8	24.7	23.5	3.2	0.41	9.1	103.9
1993	0.9	24.7	2.1	13.0	2.8	23.9	22.7	2.1	0.43	9.3	102.0

NMVOC											
SNAP	1	2	3	4	5	6	7	8	9	10	Total
Unit	kt	kt	kt	kt	kt	kt	kt	kt	kt	kt	kt
1994	0.8	22.3	2.0	9.9	3.1	24.8	24.6	2.5	0.44	8.9	99.3
1995	0.8	23.6	1.9	10.4	3.4	42.8	25.5	2.5	0.45	8.7	120.1
1996	0.8	26.5	1.9	11.7	3.4	39.0	28.0	2.8	0.47	8.4	123.0
1997	0.8	24.5	2.2	10.1	3.5	28.0	29.4	2.6	0.50	8.5	110.0
1998	0.8	24.6	2.0	9.7	3.6	26.7	29.3	2.7	0.53	8.4	108.4
1999	0.8	24.3	1.7	9.8	3.9	23.3	29.5	3.0	0.56	8.8	105.7
2000	0.8	21.7	1.7	9.3	3.7	23.5	28.0	3.1	0.59	8.7	101.2
2001	0.5	23.9	1.7	8.6	3.7	24.1	24.7	3.1	0.62	8.9	99.6
2002	0.5	22.9	1.7	9.1	3.7	29.7	23.1	2.7	0.64	8.9	103.0
2003	0.5	26.5	1.7	8.8	3.7	30.9	22.1	2.9	0.66	9.3	107.0
2004	0.5	25.9	1.9	9.5	3.7	38.6	20.2	2.7	0.69	9.6	113.3
2005	0.5	27.5	1.8	10.4	3.5	39.6	18.2	2.6	0.70	9.5	114.3
2006	0.5	24.9	1.9	9.8	3.5	45.2	16.7	2.6	0.76	9.8	115.7
2007	0.5	23.6	2.0	8.0	3.8	45.1	15.6	2.6	0.81	9.7	111.6
2008	0.4	23.3	1.8	7.4	3.4	46.5	14.3	2.7	0.87	9.2	110.0
2009	0.5	23.9	1.7	6.9	3.6	33.4	13.1	2.3	0.93	9.6	96.1
2010	0.5	25.3	1.7	6.8	3.3	30.9	11.6	1.9	0.95	9.6	92.5
2011	0.5	24.3	1.5	7.1	3.0	28.3	10.6	1.7	0.98	9.4	87.2
2012	0.4	23.8	1.6	6.3	2.7	26.5	8.5	1.5	1.00	9.4	81.6
2013	0.4	23.3	1.4	6.1	2.6	24.2	7.7	1.4	1.00	9.1	77.2
2014	0.3	20.2	1.2	6.6	2.4	21.4	7.0	1.4	1.05	9.1	70.6
2015	0.4	22.7	1.0	5.5	2.5	21.3	6.6	1.3	1.08	9.4	71.8
2016	0.4	21.7	1.0	6.5	2.5	23.4	6.3	1.3	1.12	9.3	73.5
2017	0.4	20.7	1.0	6.7	2.4	21.9	5.9	1.2	1.15	9.4	70.8
2018	0.4	20.1	1.0	4.6	2.6	26.5	5.6	1.2	1.16	9.0	72.2
2018 vs 1990	-57.4%	-16.2%	-70.0%	-82.1%	-39.4%	-58.5%	-83.7%	-61.3%	197.1%	-16.7%	-57.8%
2018 vs 2017	-1.3%	-3.0%	0.1%	-31.0%	5.3%	20.9%	-4.7%	-1.4%	0.8%	-3.6%	2.0%

3.7. Particles (TSP, PM_{10} and $PM_{2.5}$) and black carbon (BC)

"Particulate matter" (PM), is an air pollutant consisting of a mixture of particles suspended in the air. These particles differ in their physical properties (such as size and shape) and chemical composition[27]. Calculation of particulate matter emissions and its fractions (PM_{10} and $PM_{2.5}$) is the obligation of the Parties to CLRTAP since 2002.

The TSP and BC is the substances for which emission reporting is encouraged in the LRTAP Convention by Executive Body. The BC emission calculation is introduced in the reporting Guidelines as a component of $PM_{2.5}$. The Republic of Croatia voluntarily reports the emissions of these two pollutants. Calculation of BC emission has been introduced in the Reporting Guidelines as a $PM_{2.5}$ component. BC emissions are calculated for all NFR emission sources with available FE in accordance with GB2019.

The TSP emission trend for the source category 2.A.1 Cement production is lower than PM_{10}, and $PM_{2.5}$ trends. The reason for that is abatement technologies installed in all four cement production facilities in Croatia. Abatement technologies are ESP on main stacks and smaller

[27] ece.eb.125, Advance version of Guidelines for Reporting Emissions and Projections Data under the Convention on Long-range Transboundary Air Pollution, TFEIP, March 2014

fabric filters for moderate control of fugitive sources with default efficiency of 93% for TSP emission reduction, 40% for PM_{10} emission reduction and 34% for $PM_{2.5}$ emission reduction.

3.7.1. Total suspended particles (TSP)

Emission of TSP is voluntary reported as an additional air pollutant.

In 2018, total TSP emissions were 51.6 kt, which is 1.1% lower than in the previous year and 13.7% lower compared to 1990 (Figure 3.7.1-1 and Table 3.7.1-1). In 2018, the key sectors of the TSP emissions were Energy with 58.5%, Industrial processes and product use with 31.8% and Agriculture with 9.5%.

Since 1990, the TSP emission has a downward trend, the largest contributing factor to the energy sector with the reduction of TSP emissions by 30% due to the reduction of the consumption of solid fuels and at the same time the increase in the consumption of gaseous and liquid fuels and the Agriculture sector, with a reduction of 50% due to decrease in number of animals and in crop production. Sectors that have a trend of increasing TSP emission since 1990 are: the Transport sector (increase by 22.6%) due to a larger number of vehicles and Industrial processes and product use sector (by two times) due to increase the use and productivity of some products.

The TSP emission trend has several dips and peaks in the historical trend. Great decline in the period from 1991 to 1994 was a result of the war for Croatian independence (1991 – 1995), due to lower fuel consumption and overall reduction of production activities in almost all sectors. In 1994 began the reconstruction of areas devastated by war so the emissions from the sectors of mineral products increased, and increasing trend lasted until 1999. Second increasing trend started in 2002 mostly due to increase in road paving with asphalt, and with small influence due to increasing of quarrying and mining, construction and demolition, cement production, and inorganic chemicals production (such as carbon black, ammonium phosphate, urea and NPK fertilizers). Road paving with asphalt has recorded great increase in 2002 mainly due to the longest highway in Croatia “A1” (Dalmatians) was started to build from Zagreb to Dubrovnik (total length 456 km). The economic crisis which most hit construction sector in Croatia has contributed to reduction of TSP emissions since 2008 (Figure 3.7.1-1). A significant reduction since 2005 is a result of gradual replacement of certain percentage of traditional domestic stoves and manual single house boilers with advanced/ecolabelled stoves, high efficiency stoves and boilers and boilers and pellet stoves and boilers (see Table 4.5-1 and Figure 4.5-2).

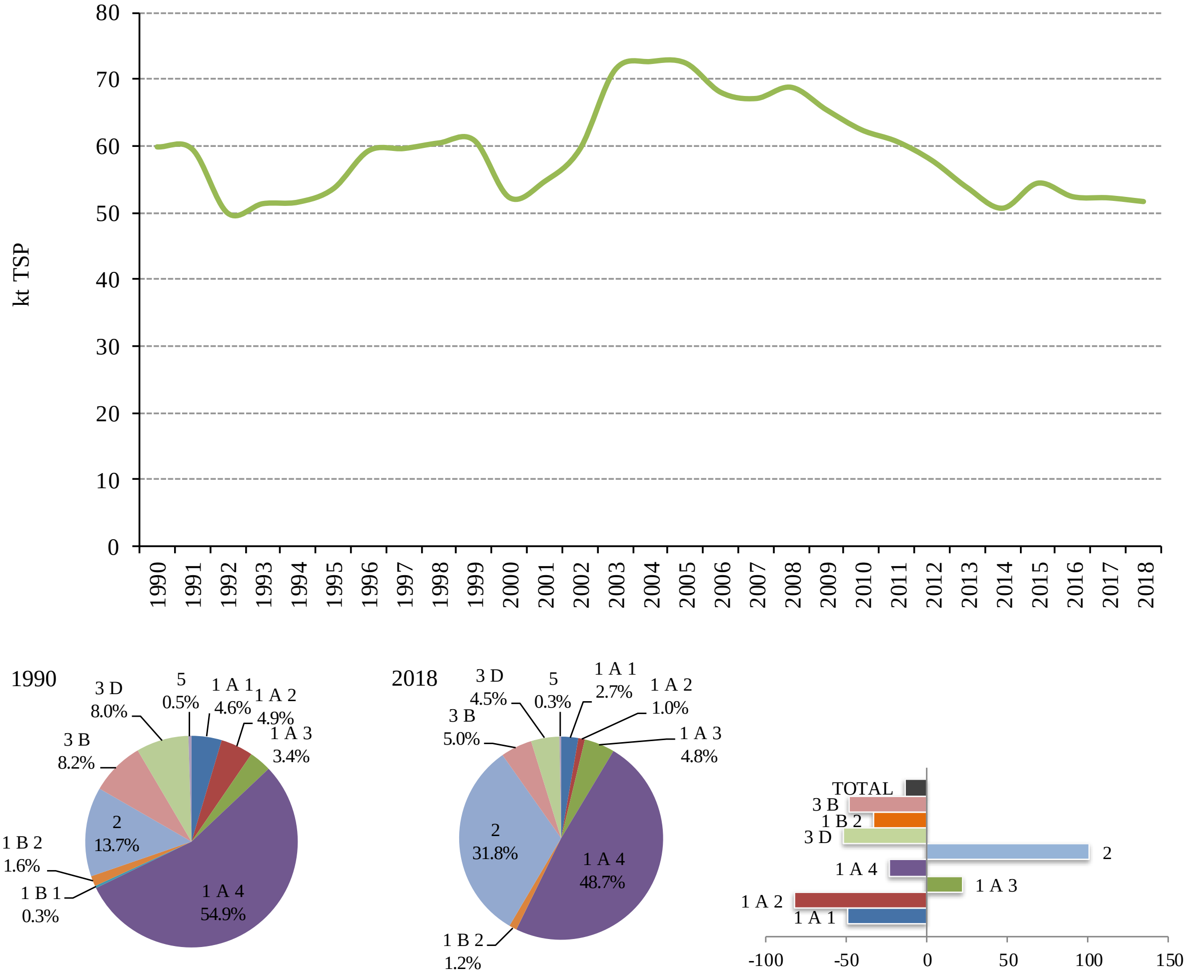


Figure 3.7.1-1: The TSP emissions (kt/yr.) and percentage share by sector and variation in TSP emissions

Table 3.7.1-1 The TSP emissions by SNAP nomenclature in the period 1990-2018

TSP											
SNAP	1	2	3	4	5	6	7	8	9	10	Total
Unit	kt	kt	kt	kt	kt	kt	kt	kt	kt	kt	kt
1990	1,9	36,6	1,7	6,4	1,4E-02	0,4	1,4	1,2	2,3E-01	9,5	59,4
1991	2,4	31,6	1,2	4,5	1,1E-02	0,5	1,4	0,8	3,7E-01	7,0	49,8
1992	2,7	33,4	1,1	4,1	1,0E-02	0,4	1,7	0,6	2,3E-01	7,0	51,2
1993	2,3	30,2	1,0	7,8	9,2E-03	0,3	1,8	0,8	2,7E-01	7,0	51,5
1994	2,1	32,0	1,0	8,0	7,3E-03	0,5	2,0	0,7	3,1E-01	6,7	53,5
1995	2,0	35,9	1,0	9,3	5,9E-03	0,6	2,1	0,8	3,1E-01	7,1	59,2
1996	2,9	33,1	1,1	11,1	4,3E-03	0,6	2,4	0,8	3,0E-01	7,3	59,5
1997	3,6	33,3	1,0	11,1	4,5E-03	0,6	2,4	0,9	3,1E-01	7,3	60,3
1998	3,3	32,9	0,7	12,0	1,4E-03	0,6	2,5	0,8	3,3E-01	7,6	60,7
1999	1,4	29,3	0,9	11,4	NA	0,5	2,5	0,9	3,2E-01	5,0	52,2
2000	1,8	32,3	0,8	10,2	NA	0,7	2,5	1,0	3,1E-01	5,1	54,6
2001	1,6	31,0	0,8	15,6	NA	1,6	2,6	0,9	2,9E-01	5,1	59,4
2002	1,7	35,8	0,7	21,9	NA	1,9	2,9	0,9	3,3E-01	5,1	71,3
2003	0,9	35,0	0,8	25,3	NA	1,2	3,0	0,8	2,8E-01	5,3	72,6
2004	1,2	37,2	0,7	23,2	NA	0,9	3,1	0,8	2,9E-01	5,0	72,3
2005	1,1	33,4	0,7	22,4	NA	0,8	3,1	0,8	3,0E-01	5,2	68,0
2006	1,9	31,6	0,8	22,8	NA	0,7	3,2	0,8	2,9E-01	5,1	67,0
2007	1,1	31,0	0,6	26,3	NA	0,7	3,0	0,9	2,8E-01	5,0	68,7
2008	1,6	31,7	0,7	21,9	NA	0,5	2,9	0,8	2,6E-01	5,1	65,4

TSP											
SNAP	1	2	3	4	5	6	7	8	9	10	Total
Unit	kt	kt	kt	kt	kt	kt	kt	kt	kt	kt	kt
2009	1,0	33,4	0,7	18,1	NA	0,5	2,7	0,6	2,3E-01	5,0	62,3
2010	0,9	31,8	0,6	18,6	NA	0,4	2,6	0,6	2,6E-01	4,7	60,6
2011	0,9	31,1	0,6	16,9	NA	0,3	2,4	0,5	2,4E-01	4,8	57,7
2012	0,6	30,2	0,6	13,9	NA	0,5	2,3	0,5	2,2E-01	4,9	53,7
2013	0,7	26,0	0,4	15,3	NA	0,4	2,2	0,5	1,7E-01	4,9	50,6
2014	1,0	29,1	0,5	15,5	NA	0,4	2,3	0,5	1,7E-01	5,0	54,3
2015	1,2	27,5	0,4	14,7	NA	0,4	2,3	0,4	1,8E-01	5,0	52,3
2016	1,2	26,0	0,5	16,0	NA	0,5	2,5	0,4	1,9E-01	4,9	52,1
2017	1,4	25,0	0,5	16,4	NA	0,6	2,2	0,4	1,8E-01	4,9	51,6
2018	-49,1%	-21,7%	-80,2%	88,4%	NA	7,5%	28,2%	-76,1%	-44,5%	-49,5%	-13,7%
2018 vs 1990	13,3%	-3,9%	-3,2%	2,8%	NA	25,1%	-8,4%	-0,6%	-4,8%	-0,6%	-1,1%
2018 vs 2017	1,9	36,6	1,7	6,4	NA	0,4	1,4	1,2	2,3E-01	9,5	59,4

3.7.2. Particulate matter (PM_{10})

The total PM_{10} emission in 2018 was 37.8 kt. The emission decreased by 25.6% compared to 1990 and by 2.2% compared to the previous year (Figure 3.7.2-1). Energy Sector is the largest source of PM_{10} emissions and contributes 74.3% of the total emissions in 2018 (Table 3.7.2-1). Small combustion dominated by biomass combustion in residential are the key sources of PM_{10} emissions and contribute to 63.2% of total emissions in 2018. Sector Industrial processes and product use are the second largest source of PM_{10} emissions (14.4% in 2018). The third key sector in the PM_{10} emission is Agriculture, which contributes to the overall emissions in 2018 with 11%.

Since 1990, PM_{10} emissions have a downward trend, which was the most contributed by the Energy sector with the reduction of the PM_{10} emissions by 29% due to the reduction of the consumption of solid fuels and at the same time increasing the consumption of gaseous and liquid fuels and the Agriculture sector with a reduction of 51% due to decreasing number of animals and crop production. Sectors that note the PM_{10} emission growth trend since 1990 is the Transport sector (14.3% increase) due to the greater number of vehicles and sectors Industrial processes and product use (by 39.7%) due to increase the use and productivity of some products.

The trend of PM_{10} emissions has several dips and peak between 1990 and 2018. Great decline in the period from 1991 to 1994 was a result of the war for Croatian independence (1991 – 1995), due to lower fuel consumption and overall reduction of production activities in almost all sectors. In 1994 began the reconstruction of areas devastated by war so the emissions from the sectors of mineral products increased, and increasing trend lasted until 1999. Second increasing trend started in 2002 mostly due to increase in road paving with asphalt, and with small influence due to increasing of quarrying and mining, construction and demolition, cement production, and inorganic chemicals production (such as carbon black, ammonium phosphate, urea and NPK fertilizers). Road paving with asphalt has recorded great increase in 2002 mainly due to the longest highway in Croatia “A1” (Dalmatians) was started to build from Zagreb to Dubrovnik (total length 456 km). The economic crisis which most hit construction sector in Croatia has contributed to reduction of PM_{10} emissions since 2008 (Table 3.7.2-1). A significant reduction since 2005 is a result of gradual replacement of certain percentage of traditional domestic stoves and manual single house boilers with advanced/ecolabelled stoves and boilers, high efficiency stoves and boilers and pellet stoves and boilers (see Table 4.5-1 and Figure 4.5-

2). In addition, emission dips can be seen in the years 1994, 2000, 2002 and 2014 when, due to the warmer winter, the consumption of biomass for heating was lower (Figure 4.5-3).

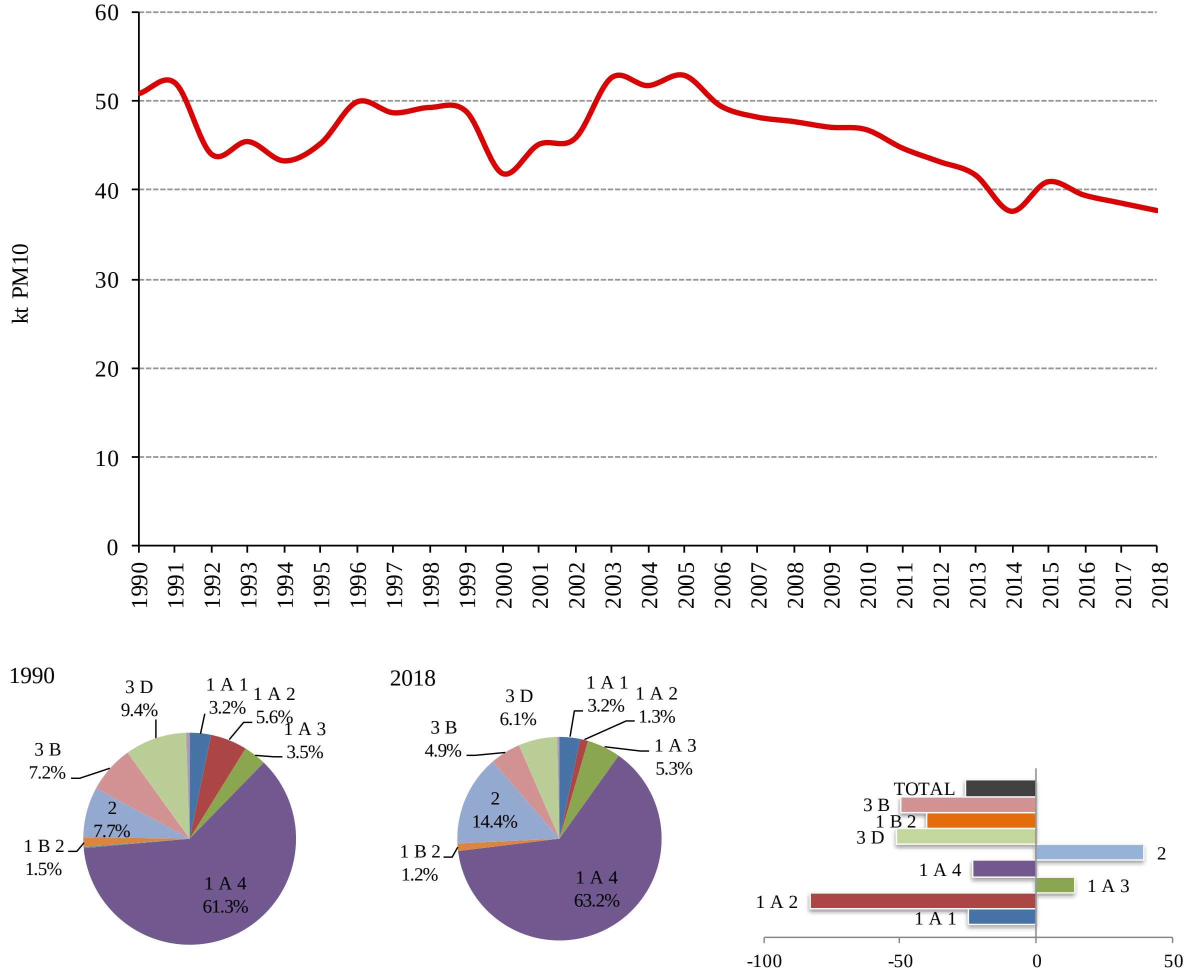


Figure 3.7.2-1 The PM_{10} emissions (kt/yr.) and percentage share by sector and variation in PM_{10} emissions

Table 3.7.2-1 The PM_{10} emissions by SNAP nomenclature in the period 1990-2018

PM10											
SNAP	1	2	3	4	5	6	7	8	9	10	Total
Unit	kt	kt	kt	kt	kt	kt	kt	kt	kt	kt	kt
1990	1.6	30.3	2.2	4.2	7.3E-03	0.5	1.5	1.7	0.32	8.4	50.8
1991	1.2	34.8	1.7	3.1	6.5E-03	0.4	1.2	1.2	0.23	8.3	52.0
1992	1.4	30.1	1.2	2.4	5.1E-03	0.5	1.2	0.8	0.37	6.0	44.1
1993	1.6	31.9	1.1	2.3	4.8E-03	0.4	1.5	0.6	0.22	6.0	45.5
1994	1.4	28.8	1.0	3.2	4.3E-03	0.3	1.5	0.8	0.27	6.0	43.3
1995	1.4	30.5	1.0	3.3	3.5E-03	0.5	1.7	0.7	0.31	5.8	45.3
1996	1.3	34.2	0.9	3.6	2.8E-03	0.5	1.9	0.8	0.31	6.3	49.9
1997	2.1	31.5	1.0	3.9	2.0E-03	0.6	2.1	0.8	0.30	6.4	48.7
1998	2.4	31.7	0.9	4.0	2.1E-03	0.6	2.1	0.9	0.31	6.4	49.3
1999	1.9	31.3	0.7	4.4	6.4E-04	0.6	2.2	0.8	0.32	6.6	48.9
2000	0.9	27.9	0.8	4.4	NA	0.5	2.2	0.9	0.32	4.1	41.9
2001	1.2	30.7	0.7	4.2	NA	0.7	2.2	1.0	0.30	4.2	45.2
2002	1.0	29.5	0.7	5.5	NA	1.5	2.3	0.9	0.29	4.2	45.8
2003	1.0	34.1	0.7	7.0	NA	1.8	2.5	0.9	0.33	4.2	52.6
2004	0.7	33.3	0.8	7.9	NA	1.1	2.6	0.8	0.28	4.3	51.7
2005	0.7	35.4	0.6	7.5	NA	0.8	2.7	0.8	0.29	4.1	52.9

PM10											
SNAP	1	2	3	4	5	6	7	8	9	10	Total
Unit	kt	kt	kt	kt	kt	kt	kt	kt	kt	kt	kt
2006	0.8	31.8	0.7	7.4	NA	0.7	2.7	0.8	0.29	4.2	49.5
2007	1.1	30.1	0.7	7.7	NA	0.6	2.8	0.8	0.29	4.2	48.2
2008	0.7	29.5	0.6	8.4	NA	0.6	2.5	0.9	0.28	4.2	47.7
2009	0.9	30.2	0.6	7.2	NA	0.4	2.4	0.8	0.26	4.2	47.1
2010	0.6	31.8	0.7	6.0	NA	0.5	2.3	0.6	0.23	4.1	46.8
2011	0.6	30.3	0.5	5.9	NA	0.4	2.2	0.6	0.26	3.9	44.8
2012	0.6	29.6	0.6	5.5	NA	0.3	2.0	0.5	0.24	4.0	43.3
2013	0.4	28.7	0.6	4.8	NA	0.4	1.9	0.5	0.22	4.2	41.8
2014	0.5	24.7	0.4	5.1	NA	0.4	1.8	0.5	0.16	4.2	37.7
2015	0.7	27.7	0.4	5.1	NA	0.4	1.9	0.4	0.17	4.2	41.0
2016	0.9	26.2	0.4	4.9	NA	0.4	1.9	0.4	0.18	4.2	39.5
2017	1.0	24.8	0.4	5.4	NA	0.4	2.0	0.4	0.19	4.1	38.7
2018	1.2	23.8	0.4	5.3	NA	0.5	1.8	0.4	0.18	4.2	37.8
2018 vs 1990	-24.9%	-21.4%	-81.8%	27.0%	NA	8.3%	19.2%	-76.1%	-44.2%	-50.7%	-25.6%
2018 vs 2017	27.7%	-3.9%	-3.2%	-0.8%	NA	25.7%	-9.7%	-0.5%	-4.8%	0.4%	-2.2%

3.7.3. Particulate matter ($PM_{2.5}$)

The $PM_{2.5}$ emission in the year 2018 was 28.7 kt. Emissions decreased by 25.8% compared to 1990 and by 3% compared to the previous year (Figure 3.7.3-1). Energy Sector is the largest source of $PM_{2.5}$ emissions and contributes with 92.6% of total emissions in 2018 (Table 3.7.3-1). Key sources of emissions in Energy sector are Small combustion and mobile machinery with the domination of residential biomass combustion that contributes to 81.2% of total emissions in 2018. Transport sector contributes to emission to a lesser extent (5.5% in 2018), as does the IPPU sector (5.4% in 2018).

Since 1990, $PM_{2.5}$ emissions have had a downward trend, driven most by the stationary energy sector, with a 28% reduction in $PM_{2.5}$ emissions due to a reduction in the consumption of solid fuels while increasing the consumption of gaseous and liquid fuels. The sector that has been trending with $PM_{2.5}$ emissions since 1990 is Transport (increase by 5.3%) due to the increase in the number of vehicles.

The trend of $PM_{2.5}$ emissions has several dips and peak between 1990 and 2018. Great decline in the period from 1991 to 1994 was a result of the war for Croatian independence (1991 – 1995), due to lower fuel consumption and overall reduction of production activities in almost all sectors. In 1994 began the reconstruction of areas devastated by war so the emissions from the sectors of mineral products increased, and increasing trend lasted until 1999. Second increasing trend started in 2002 mostly due to increase in road paving with asphalt, and with small influence due to increasing of quarrying and mining, construction and demolition, cement production, and inorganic chemicals production (such as carbon black, ammonium phosphate, urea and NPK fertilizers). Road paving with asphalt has recorded great increase in 2002 mainly due to the longest highway in Croatia "A1" (Dalmatians) was started to build from Zagreb to Dubrovnik (total length 456 km). The economic crisis, which most hit construction sector in Croatia, has contributed to reduction of $PM_{2.5}$ emissions since 2008 (Table 3.7.3-1). A significant reduction since 2005 is a result of gradual replacement of certain percentage of traditional domestic stoves and manual single house boilers with advanced/ecolabelled stoves and boilers, high efficiency stoves and boilers and pellet stoves and boilers (see Table 4.5-1 and

Figure 4.5-2). In addition, emission dips can be seen in the years 1994, 2000, 2002 and 2014 when, due to the warmer winter, the consumption of biomass for heating was lower (Figure 4.5-3).

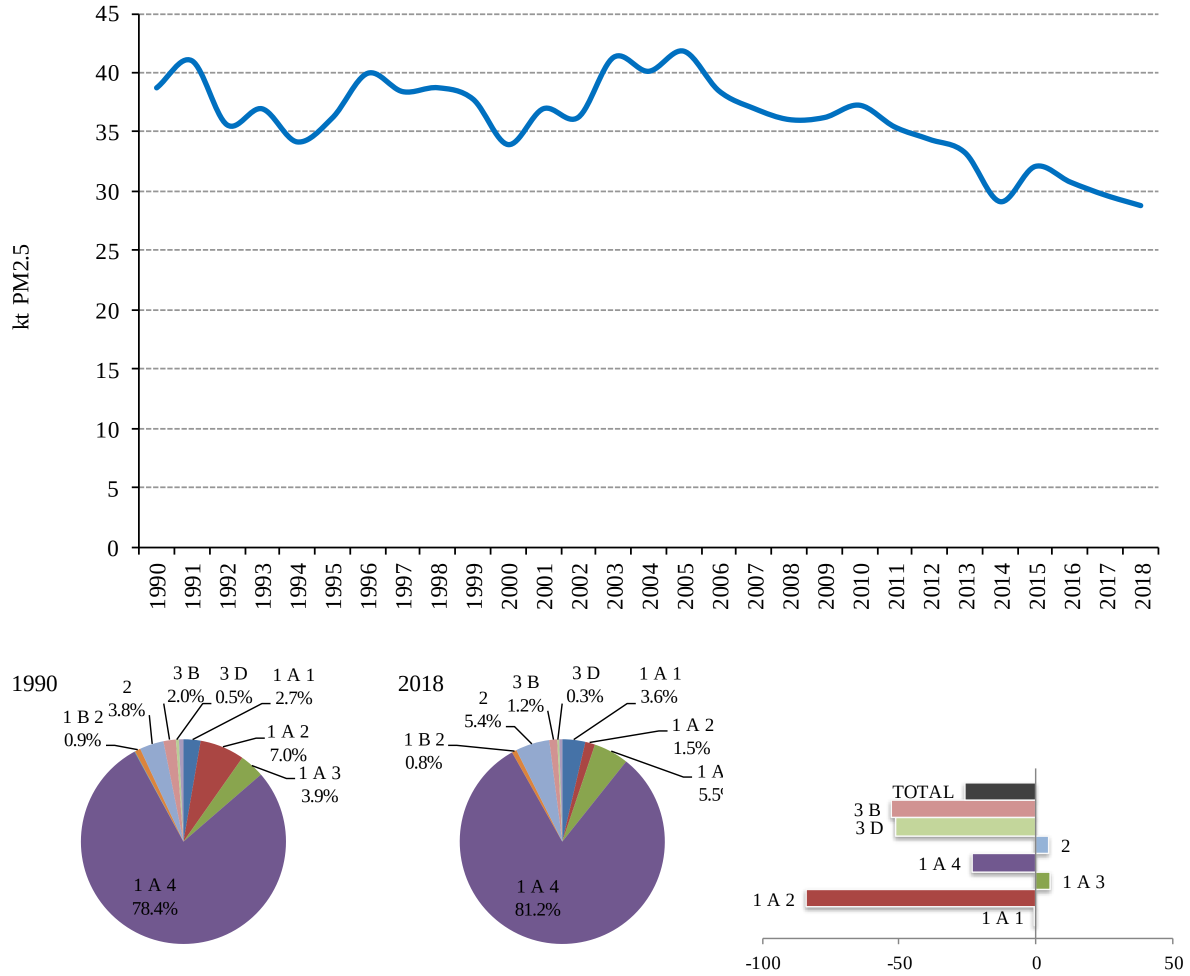


Figure 3.7.3-1 The $PM_{2.5}$ emissions (kt/yr.) and percentage share by sector and variation in $PM_{2.5}$ emissions

Table 3.7.3-1 The $PM_{2.5}$ emissions by SNAP nomenclature in the period 1990-2018

$PM_{2.5}$											
SNAP	1	2	3	4	5	6	7	8	9	10	Total
Unit	kt	kt	kt	kt	kt	kt	kt	kt	kt	kt	kt
1990	1.0	28.6	2.4	1.4	8.7E-04	0.4	1.3	1.7	0.32	1.0	38.2
1990	0.8	34.0	1.6	1.1	7.7E-04	0.4	1.0	1.2	0.23	0.9	41.0
1991	0.9	29.3	1.1	0.9	6.0E-04	0.4	1.1	0.8	0.37	0.7	35.6
1992	1.0	31.0	1.0	0.8	5.8E-04	0.4	1.3	0.6	0.22	0.7	37.0
1993	0.9	28.1	0.9	1.0	5.2E-04	0.2	1.3	0.8	0.27	0.7	34.1
1994	0.9	29.7	1.0	1.0	4.1E-04	0.4	1.5	0.7	0.31	0.6	36.2
1995	0.9	33.4	0.9	1.0	3.3E-04	0.4	1.6	0.8	0.31	0.6	40.0
1996	1.7	30.7	1.0	1.0	2.4E-04	0.5	1.8	0.8	0.30	0.6	38.4
1997	1.8	30.9	0.9	1.0	2.5E-04	0.5	1.8	0.9	0.31	0.6	38.7
1998	1.2	30.5	0.7	1.2	7.7E-05	0.5	1.9	0.8	0.32	0.7	37.8
1999	0.6	27.2	0.8	1.3	NA	0.4	1.9	0.9	0.32	0.5	33.9
2000	0.8	30.0	0.7	1.2	NA	0.6	1.9	1.0	0.30	0.6	37.0
2001	0.7	28.7	0.7	1.3	NA	1.0	2.0	0.9	0.29	0.5	36.2
2002	0.7	33.2	0.7	1.6	NA	1.2	2.2	0.9	0.33	0.6	41.3

$PM_{2.5}$											
SNAP	1	2	3	4	5	6	7	8	9	10	Total
Unit	kt	kt	kt	kt	kt	kt	kt	kt	kt	kt	kt
2003	0.5	32.5	0.8	1.8	NA	0.8	2.3	0.8	0.28	0.6	40.1
2004	0.5	34.5	0.6	1.7	NA	0.6	2.3	0.8	0.29	0.5	41.8
2005	0.5	31.0	0.7	1.7	NA	0.6	2.3	0.8	0.29	0.6	38.5
2006	0.7	29.3	0.7	1.8	NA	0.5	2.4	0.8	0.29	0.5	37.0
2007	0.5	28.8	0.6	1.8	NA	0.5	2.2	0.9	0.28	0.5	36.0
2008	0.5	29.4	0.6	1.6	NA	0.4	2.1	0.7	0.26	0.5	36.2
2009	0.4	31.0	0.7	1.5	NA	0.4	1.9	0.6	0.23	0.5	37.3
2010	0.4	29.6	0.5	1.4	NA	0.4	1.8	0.6	0.26	0.5	35.4
2011	0.4	28.8	0.6	1.4	NA	0.3	1.6	0.5	0.24	0.5	34.3
2012	0.3	28.0	0.5	1.3	NA	0.4	1.5	0.5	0.22	0.5	33.2
2013	0.3	24.1	0.4	1.3	NA	0.3	1.5	0.5	0.16	0.5	29.1
2014	0.5	27.0	0.4	1.3	NA	0.3	1.5	0.4	0.17	0.5	32.1
2015	0.7	25.6	0.3	1.2	NA	0.3	1.5	0.4	0.18	0.5	30.7
2016	0.8	24.2	0.4	1.4	NA	0.4	1.5	0.4	0.19	0.5	29.6
2017	1.0	23.2	0.4	1.3	NA	0.4	1.3	0.4	0.18	0.5	28.7
2018	-0.2%	-21.4%	-82.6%	-8.0%	NA	3.2%	8.7%	-76.1%	-44.2%	-52.4%	-25.8%
2018 vs 1990	37.2%	-3.9%	-3.1%	-7.5%	NA	27.5%	-11.5%	-0.5%	-4.8%	-2.5%	-3.0%

3.7.4. Black carbon (BC)

The Republic of Croatia voluntarily reports on the emissions of BC as an additional pollutant in the air.

In 2018, BC emission was 3.9 kt (Figure 3.7.4-1) and was down by 28.2% compared to 1990 and by 4.1% compared to the previous year. The Energy sector is the sector with the highest contribution to the total BC emission in 2018 with 95.3%. The remaining emissions in 2018 (4.7%) come from the IPPU sector. The key category in the energy sector is Small combustion and mobile machinery that contributes to the total BC emission in 2018 with 73% and Transport sector with a contribution of 18%.

Since 1990, the BC emission has a downward trend, and the largest contributing sector was the stationary Energy with the reduction of the BC emission by 59% due to the reduction of the consumption of solid fuels and at the same time increasing the consumption of gaseous and liquid fuels. The sector that recorded the increase of BC emissions since 1990 was the Transport (33.4% increase) due to the increase number of vehicles.

Trend of BC emissions follows the trend of $PM_{2.5}$ emissions so the reasons for present peaks and dips are the same. Great decline in the period from 1991 to 1994 was a result of the war for Croatian independence (1991 – 1995), due to lower fuel consumption and overall reduction of production activities in almost all sectors. In 1994 began the reconstruction of areas devastated by war so the emissions from the sectors of mineral products increased, and increasing trend lasted until 1999. Second increasing trend started in 2002 mostly due to increase in road paving with asphalt, and with small influence due to increasing of quarrying and mining, construction and demolition, cement production, and inorganic chemicals production (such as carbon black, ammonium phosphate, urea and NPK fertilizers). Road paving with asphalt has recorded great increase in 2002 mainly due to the longest highway in Croatia "A1" (Dalmatians) was started to build from Zagreb to Dubrovnik (total length 456 km). The economic crisis has contributed to reduction of BC emissions since 2007 (Figure 3.7.4-1). The economic crisis, which most hit construction sector in Croatia, has contributed to reduction of BC emissions since 2008. A significant reduction since 2005 is a result of gradual replacement of certain percentage of traditional domestic stoves and manual single house boilers with advanced/ecolabelled stoves and boilers and pellet stoves and boilers (see Table 4.5-1 and Figure 4.5-2). In addition, emission dips can be seen in the years 1994, 2000, 2002 and 2014 when, due to the warmer winter, the consumption of biomass for heating was lower.

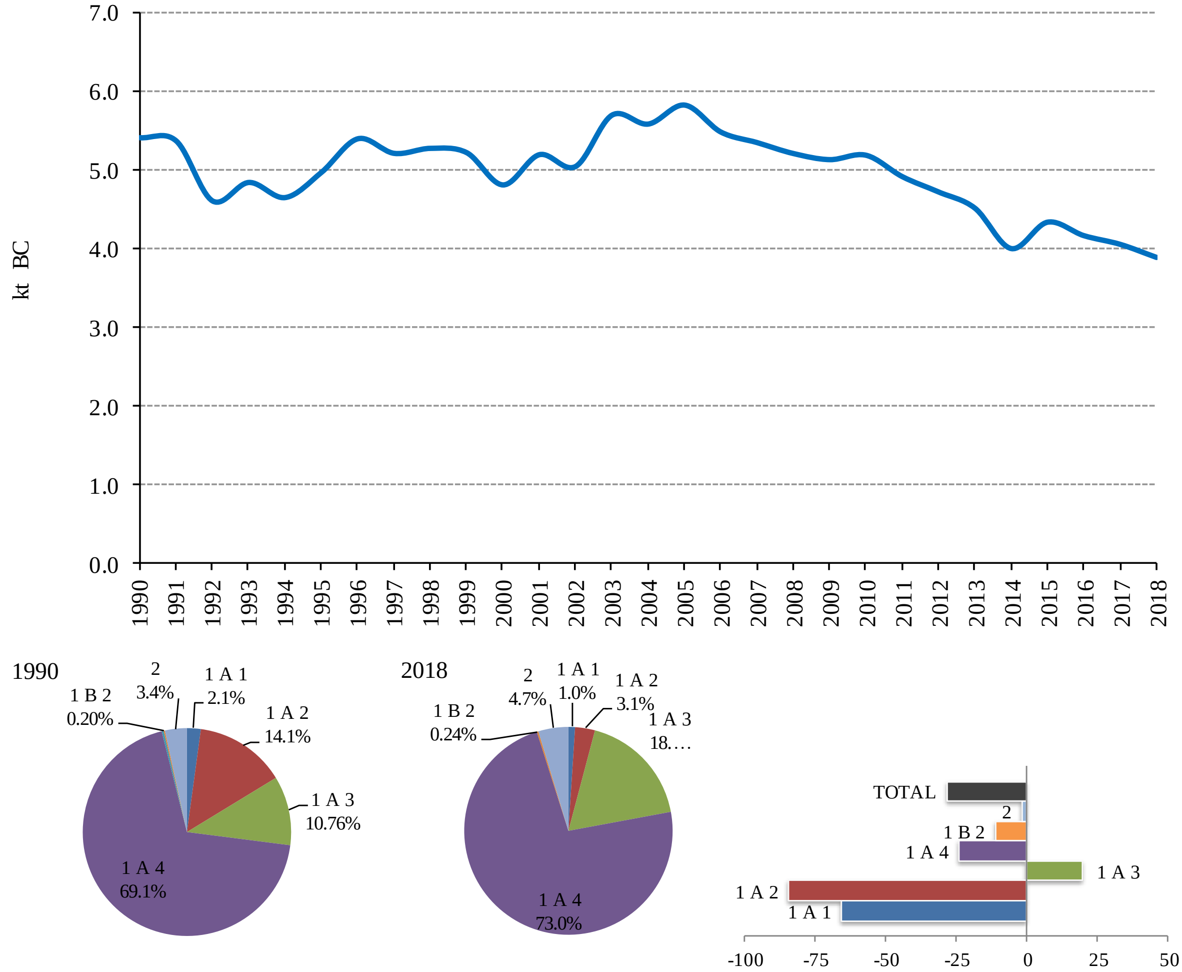


Figure 3.7.4-1 The BC emissions (kt/yr.) and percentage share by sector and variation in BC emissions

Table 3.7.4-1 The BC emissions by SNAP nomenclature in the period 1990-2018

BC											
SNAP	1	2	3	4	5	6	7	8	9	10	TOTAL
Unit	kt	kt	kt	kt	kt	kt	kt	kt	kt	kt	kt
1990	0.12	3.27	0.44	0.054	NA	0.15	579	0.81	0.0102	5.4E-04	5.42
1991	0.10	3.76	0.34	0.042	NA	0.14	468	0.52	0.0091	5.3E-04	5.38
1992	0.11	3.29	0.27	0.031	NA	0.15	529	0.23	0.0065	2.6E-04	4.61
1993	0.11	3.47	0.26	0.026	NA	0.14	644	0.19	0.0083	3.4E-04	4.85
1994	0.16	3.13	0.23	0.029	NA	0.06	674	0.36	0.0068	3.0E-04	4.65
1995	0.19	3.30	0.24	0.019	NA	0.14	788	0.29	0.0056	3.3E-04	4.98
1996	0.16	3.71	0.24	0.021	NA	0.14	842	0.29	0.0052	3.0E-04	5.40
1997	0.14	3.40	0.27	0.026	NA	0.14	947	0.29	0.0062	3.3E-04	5.22
1998	0.16	3.39	0.26	0.025	NA	0.15	926	0.36	0.0057	4.0E-04	5.28
1999	0.16	3.36	0.20	0.029	NA	0.17	960	0.35	0.0069	3.0E-04	5.23
2000	0.075	2.98	0.18	0.028	NA	0.16	960	0.42	0.0060	3.1E-04	4.82
2001	0.054	3.26	0.18	0.025	NA	0.21	1034	0.42	0.0073	3.2E-04	5.20
2002	0.049	3.13	0.18	0.033	NA	0.22	1050	0.38	0.0077	3.5E-04	5.05
2003	0.052	3.59	0.18	0.043	NA	0.23	1210	0.39	0.0079	2.3E-04	5.71

BC											
SNAP	1	2	3	4	5	6	7	8	9	10	TOTAL
Unit	kt	kt	kt	kt	kt	kt	kt	kt	kt	kt	kt
2004	0.045	3.50	0.20	0.050	NA	0.17	1251	0.36	0.0080	3.3E-04	5.59
2005	0.043	3.70	0.18	0.047	NA	0.18	1318	0.36	0.0083	2.7E-04	5.83
2006	0.040	3.35	0.19	0.045	NA	0.18	1321	0.36	0.0098	3.6E-04	5.49
2007	0.044	3.19	0.19	0.046	NA	0.18	1348	0.35	0.0105	3.2E-04	5.36
2008	0.031	3.15	0.18	0.050	NA	0.19	1227	0.38	0.0099	3.6E-04	5.22
2009	0.036	3.25	0.19	0.042	NA	0.14	1168	0.31	0.0088	3.7E-04	5.14
2010	0.029	3.44	0.15	0.038	NA	0.16	1100	0.27	0.0055	3.0E-04	5.19
2011	0.031	3.31	0.13	0.038	NA	0.14	1016	0.25	0.0068	3.3E-04	4.92
2012	0.024	3.25	0.13	0.035	NA	0.14	922	0.21	0.0051	3.7E-04	4.73
2013	0.017	3.19	0.12	0.032	NA	0.12	852	0.19	0.0050	3.7E-04	4.52
2014	0.017	2.77	0.09	0.035	NA	0.10	813	0.17	0.0069	2.8E-04	4.00
2015	0.023	3.13	0.07	0.034	NA	0.10	828	0.15	0.0057	3.4E-04	4.34
2016	0.029	3.00	0.05	0.033	NA	0.10	819	0.13	0.0059	4.3E-04	4.17
2017	0.031	2.87	0.07	0.036	NA	0.11	819	0.12	0.0054	3.4E-04	4.06
2018	0.040	2.78	0.07	0.035	NA	0.15	696	0.11	9.2E-03	3.6E-04	3.89
2018 vs 1990	-65.7%	-14.9%	-84.1%	-35.3%	NA	-0.4%	20.3%	-85.9%	-9.7%	-33.6%	-28.2%
2018 vs 2017	29.0%	-3.0%	-0.9%	-2.5%	NA	32.4%	-15.0%	-5.3%	71.7%	5.7%	-4.1%

3.8. Priority heavy metal emissions (Pb, Cd and Hg)

Heavy metals emissions from anthropogenic sources became of importance to UNECE/LRTAP Convention, after various studies showed that heavy metals attached to air-borne particles can be widely dispersed on very large scales. They are stable and cannot be degraded or destroyed, and therefore they tend to accumulate in soils and sediments. Because of their toxicity and other mentioned properties, heavy metals are also hazardous for living organisms. Recognized danger from heavy metals accelerated UN decision to include the Protocol on heavy metals in the framework of the LRTAP Convention. The Republic of Croatia has signed this Protocol in June 1999 at the meeting of the ministers of environmental protection in Aarhus and ratified it by Low on ratification of the Protocol to the 1979 Convention on long-range transboundary air pollution on Heavy Metals (OG-IT 05/07) in 2007.

Emissions of priority metals are mainly a result of fuel combustion. The emission depends on the type and quantity of combusted fuel, so Cd emission will be greater if in the observed year more fuel oil was used, while the Hg emission increases with higher consumption of natural gas.

3.8.1. Lead (Pb)

The lead emission (Figure 3.8.1-1 and Table 3.8.1-1) in 2018 has amounted to 8.4 t. The Pb emission has decrease by 98.4 % since 1990 and by 4.3% comparing to previous year. Key sources in Pb emission in 2018 were Transport sector (25.1%) with the dominance of road transport, the IPPU sector (25.1 %) with the domination of glass production and production of steel in electric arc furnaces and Small combustion and mobile machinery sector (15.4 %). The lead emission from these activities originates from the lead content in the raw material for production processes, respectively in the fuel.

The lead emission in the historical trend shows several major reductions, which are the result of decreases in the Transport sector and IPPU sector. Transport sector notes a 99.1 % decrease in lead emission since 1990 because of the gradual ban on the use of leaded gasoline fuels. Efforts began in 1996 when the Pb content in leaded gasoline was reduced from 0.6 g/l to 0.74 g/l, while unleaded with 0.02 g/l to 0.013 g/l, then in 2003 Pb content in leaded gasoline was reduced to 0.15 g/l, and in unleaded one at 0.005 g/l and, in 2006, leaded gasoline was completely removed from use. Reduction in 1992 has occurred due to stopping the process of steel production in the Siemens-Martin furnaces. Stopping the process was a result of the war for Croatian independence (1991 - 1995). In addition, the war for Croatian independence caused a reduction in fuel consumption and reduction in overall production in the IPPU sector (Figure 3.8.1-1).

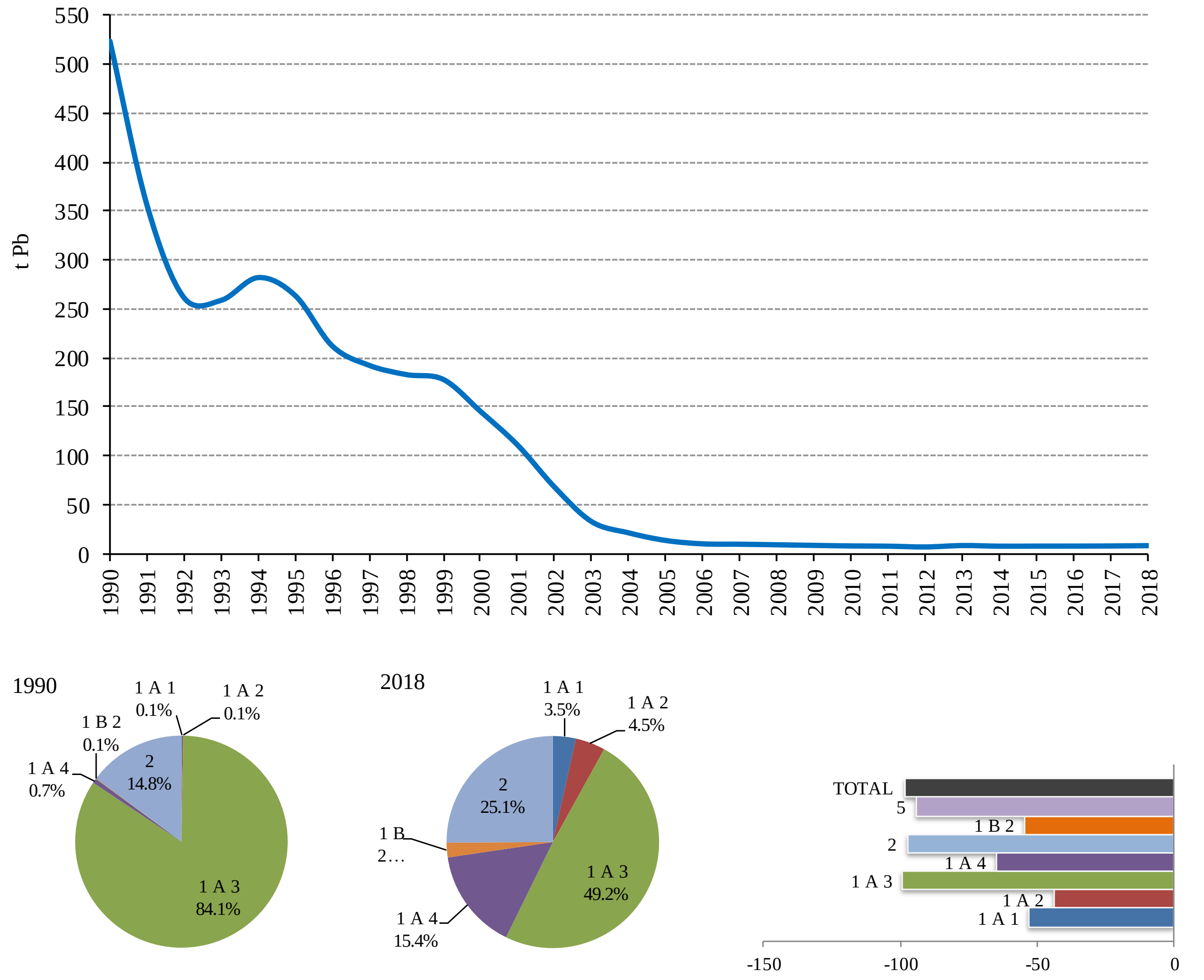


Figure 3.8.1-1 The Pb emissions (t/yr.) and percentage share by sector and variation in Pb emissions

Table 3.8.1-1 The Pb emissions by SNAP nomenclature in the period 1990-2018

Pb											
SNAP	1	2	3	4	5	6	7	8	9	10	Total
Unit	t	t	t	t	t	t	t	t	t	t	t
1990	0.62	1.97	0.59	77.48	NA	0.56	440.0	2.16	0.013	1.2E-04	523.4
1991	0.53	1.79	0.41	29.45	NA	0.56	316.3	6.82	0.012	1.2E-04	355.9
1992	0.67	1.36	0.34	0.89	NA	0.56	254.7	2.85	0.012	5.8E-05	261.4
1993	0.54	1.48	0.29	0.88	NA	0.56	249.1	6.00	0.012	7.4E-05	258.9
1994	0.46	1.27	0.31	0.82	NA	0.56	273.0	5.63	0.012	6.6E-05	282.1
1995	0.51	1.33	0.28	0.69	NA	0.95	254.3	5.58	0.012	7.3E-05	263.6
1996	0.51	1.49	0.27	0.61	NA	1.40	203.1	4.80	0.012	6.5E-05	212.2
1997	0.59	1.37	0.31	0.63	NA	1.38	184.4	3.69	0.013	7.3E-05	192.4

Pb											
SNAP	1	2	3	4	5	6	7	8	9	10	Total
Unit	t	t	t	t	t	t	t	t	t	t	t
1998	0.72	1.39	0.32	0.82	NA	0.94	175.9	2.95	0.015	8.8E-05	183.0
1999	0.75	1.38	0.33	0.77	NA	0.76	170.2	3.75	0.015	6.6E-05	177.9
2000	0.48	1.22	0.41	0.87	NA	0.55	139.1	2.67	0.017	6.9E-05	145.3
2001	0.52	1.28	0.43	0.80	NA	1.30	104.6	1.97	0.018	7.1E-05	111.0
2002	0.57	1.26	0.41	0.76	NA	6.50	57.5	0.92	0.016	7.6E-05	67.9
2003	0.74	1.45	0.42	0.83	NA	9.01	19.7	0.65	0.014	5.0E-05	32.8
2004	0.51	1.38	0.46	1.02	NA	4.86	12.6	0.52	0.014	7.3E-05	21.4
2005	0.58	1.47	0.47	1.03	NA	2.17	7.5	0.41	0.014	6.0E-05	13.7
2006	0.55	1.34	0.54	0.97	NA	1.64	4.8	0.36	0.015	7.9E-05	10.2
2007	0.59	1.26	0.45	1.04	NA	1.15	5.0	0.37	0.016	7.1E-05	9.9
2008	0.55	1.27	0.42	1.12	NA	0.80	4.8	0.34	0.013	7.9E-05	9.3
2009	0.51	1.32	0.39	0.95	NA	0.36	4.8	0.34	0.014	8.1E-05	8.7
2010	0.35	1.42	0.40	1.00	NA	0.14	4.6	0.22	0.005	6.5E-05	8.1
2011	0.40	1.38	0.34	0.94	NA	0.12	4.5	0.22	0.006	7.2E-05	7.9
2012	0.34	1.37	0.35	0.68	NA	0.01	4.1	0.19	0.008	8.2E-05	7.1
2013	0.31	1.35	0.37	0.96	NA	1.14	4.2	0.19	0.005	8.1E-05	8.5
2014	0.30	1.19	0.36	1.06	NA	0.81	4.0	0.19	0.005	6.3E-05	7.9
2015	0.32	1.35	0.34	0.94	NA	0.78	4.0	0.16	0.006	7.5E-05	7.9
2016	0.34	1.31	0.32	0.69	NA	1.00	4.1	0.19	0.006	9.5E-05	8.0
2017	0.27	1.28	0.38	0.73	NA	1.06	4.2	0.18	0.002	7.5E-05	8.1
2018	0.29	1.27	0.37	1.02	NA	1.28	4.0	0.18	0.002	8.0E-05	8.4
2018 vs 1990	-52.8%	-35.8%	-37.7%	-98.7%	NA	129.8%	-99.1%	-91.5%	-84.0%	-33.6%	-98.4%
2018 vs 2017	10.3%	-1.0%	-2.4%	40.5%	NA	20.8%	-4.0%	-0.6%	4.9%	5.7%	4.3%

3.8.2. Cadmium (Cd)

The cadmium emission in 2018 was amounted to 0.84 t. The Cd emission has decrease by 24.9 % since 1990 and increased by 4.1 % in comparison to year before (Figure 3.8.2-1 and Table 3.8.2-1). Majority of Cd emission originates from the fuel combustion in Energy sector (84.3 % in 2018), with domination of Small combustion and mobile machinery sector (71%). The second dominating sector in Cd emission in 2018 was IPPU sector with a contribution of 15.6 %. The Cd emission originates from Cd content in fuels (biomass, fuel oil, coal) and in raw materials at the entrance of the production process.

Total of Cd emissions has a decreasing trend in the period 1990 - 2018, because of reduced consumption of fuel oil and a simultaneous increase in natural gas consumption. In addition, lower consumption of fossil fuels in the energy sector has contributed to the reduction of Cd emissions. Cd emissions has significantly decreased in the period 1991 - 1992 (about 43%), due to stopping the process of steel production in the Siemens-Martin furnaces in Sisak, 1992. Stopping the process was a result of the war for Croatian independence (1991 - 1995). In addition, the war for Croatian independence caused a reduction in fuel consumption and production in IPPU sector. In 2015, the emissions recorded an increase in the Small combustion sector (Residential combustion), and the reason for the mentioned peak is an increase of biomass consumption in the residential sector. In addition, emission dips can be seen in the years 1994, 2000, 2002 and 2014 when, due to the warmer winter, the consumption of biomass for heating was lower.

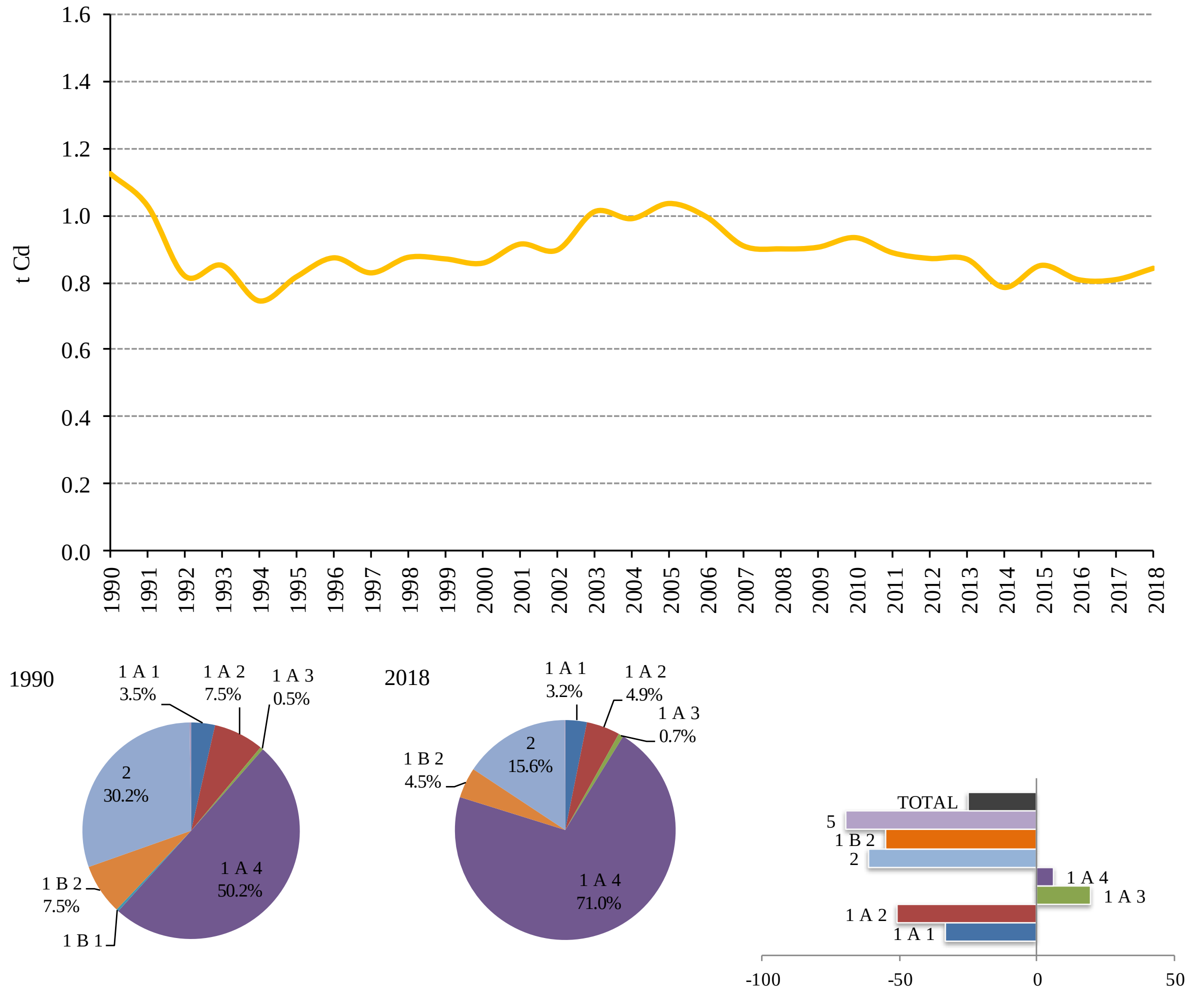


Figure 3.8.2-1 The Cd emissions (t/yr.) and percentage share by sector and variation in Cd emissions

Table 3.8.2-1 The Cd emissions by SNAP nomenclature in the period 1990-2018

Cd											
SNAP	1	2	3	4	5	6	7	8	9	10	Total
Unit	t	t	t	t	t	t	t	t	t	t	t
1990	0.04	0.56	0.08	0.36	NA	0.066	0.004	0.005	0.007	9.6E-04	1.12
1991	0.03	0.66	0.07	0.19	NA	0.062	0.003	0.003	0.005	9.3E-04	1.02
1992	0.03	0.57	0.06	0.09	NA	0.068	0.003	0.002	0.006	4.7E-04	0.82
1993	0.03	0.60	0.05	0.09	NA	0.062	0.003	0.002	0.005	5.9E-04	0.85
1994	0.03	0.55	0.05	0.09	NA	0.027	0.003	0.002	0.005	5.3E-04	0.75
1995	0.03	0.58	0.05	0.09	NA	0.066	0.003	0.002	0.006	5.8E-04	0.82
1996	0.03	0.64	0.05	0.07	NA	0.064	0.004	0.003	0.006	5.2E-04	0.87
1997	0.03	0.59	0.06	0.07	NA	0.063	0.005	0.002	0.006	5.9E-04	0.83
1998	0.03	0.59	0.07	0.10	NA	0.066	0.004	0.003	0.006	7.0E-04	0.88
1999	0.03	0.58	0.07	0.10	NA	0.076	0.005	0.003	0.006	5.3E-04	0.87
2000	0.03	0.52	0.10	0.12	NA	0.074	0.005	0.003	0.007	5.5E-04	0.86
2001	0.03	0.57	0.10	0.11	NA	0.098	0.005	0.003	0.006	5.7E-04	0.91
2002	0.03	0.55	0.09	0.11	NA	0.111	0.005	0.003	0.006	6.1E-04	0.90
2003	0.03	0.63	0.10	0.11	NA	0.120	0.005	0.004	0.006	4.0E-04	1.01
2004	0.03	0.61	0.11	0.13	NA	0.086	0.006	0.004	0.006	5.9E-04	0.99
2005	0.03	0.65	0.12	0.13	NA	0.083	0.006	0.004	0.006	4.8E-04	1.04
2006	0.03	0.60	0.15	0.12	NA	0.081	0.006	0.004	0.006	6.3E-04	1.00
2007	0.03	0.58	0.07	0.13	NA	0.081	0.006	0.004	0.006	5.7E-04	0.91

Cd										
SNAP	1	2	3	4	5	6	7	8	9	10	Total
Unit	t	t	t	t	t	t	t	t	t	t	t
2008	0.03	0.58	0.07	0.13	NA	0.085	0.006	0.005	0.006	6.3E-04	0.90
2009	0.03	0.60	0.07	0.12	NA	0.062	0.006	0.004	0.006	6.5E-04	0.91
2010	0.03	0.65	0.06	0.12	NA	0.072	0.006	0.004	0.003	5.2E-04	0.93
2011	0.03	0.63	0.05	0.10	NA	0.063	0.006	0.004	0.004	5.8E-04	0.89
2012	0.03	0.63	0.05	0.09	NA	0.060	0.005	0.003	0.004	6.6E-04	0.87
2013	0.02	0.63	0.05	0.10	NA	0.054	0.005	0.003	0.004	6.5E-04	0.87
2014	0.02	0.55	0.05	0.11	NA	0.047	0.005	0.003	0.004	5.0E-04	0.79
2015	0.02	0.64	0.04	0.10	NA	0.046	0.005	0.003	0.004	6.0E-04	0.85
2016	0.02	0.62	0.03	0.08	NA	0.046	0.006	0.003	0.004	7.6E-04	0.81
2017	0.02	0.60	0.04	0.08	NA	0.051	0.006	0.003	0.003	6.0E-04	0.81
2018	0.03	0.60	0.04	0.10	NA	0.067	0.006	0.003	0.003	6.4E-04	0.84
2018 vs 1990	-33.2%	6.3%	-51.1%	-72.1%	NA	1.7%	40.4%	-26.4%	-55.5%	-33.6%	-24.9%
2018 vs 2017	14.9%	-0.3%	0.0%	18.8%	NA	31.9%	-4.9%	3.9%	4.5%	5.7%	4.1%

3.8.3. Mercury (Hg)

The mercury emission in 2018 was amounted to 0.40 t (Figure 3.8.3-1 and Table 3.8.3-1). Emission has decreased by 64.4 % since 1990, and by 3.7% since year before. The majority of mercury emission in 2018, resulting from fuel combustion in the Energy sector (74.3 % in total Hg emission). The second sector in dominance in Hg emission in 2018 has the IPPU sector with a contribution of 15.4 % and third sector fugitive emissions from fuels with 12.1%. Mercury emission originates from its content in fuels (e.g. coal, natural gas), in raw materials at the entrance to the production processes (e.g. refining, production of steel and glass) and in waste gas flows that are combusted on flares in refineries and during the exploitation of oil and gas.

In 1990, dominant source in Hg emission was fugitive emissions from fuels, in particularly, fugitive emission from production and processing of natural gas (70.4 % in 1990). In 1993, the process units for removal of mercury from natural gas were put into operation. With this technical measure for mercury emission reduction, the inlet average mercury concentration of 516 $\mu g/m^3$ has decreased at the outlet to 0.12 $\mu g/m^3$ of average mercury concentration (Lit. 6). The above was the reason for reducing Hg emission in observed period. Since 2000, Hg emission has started to increase, due to entry in operation of the second of two thermal power plants on coal in Croatia. In 2017, a drop in Hg emission was recorded due to the reduced work of coal-fired power plants.

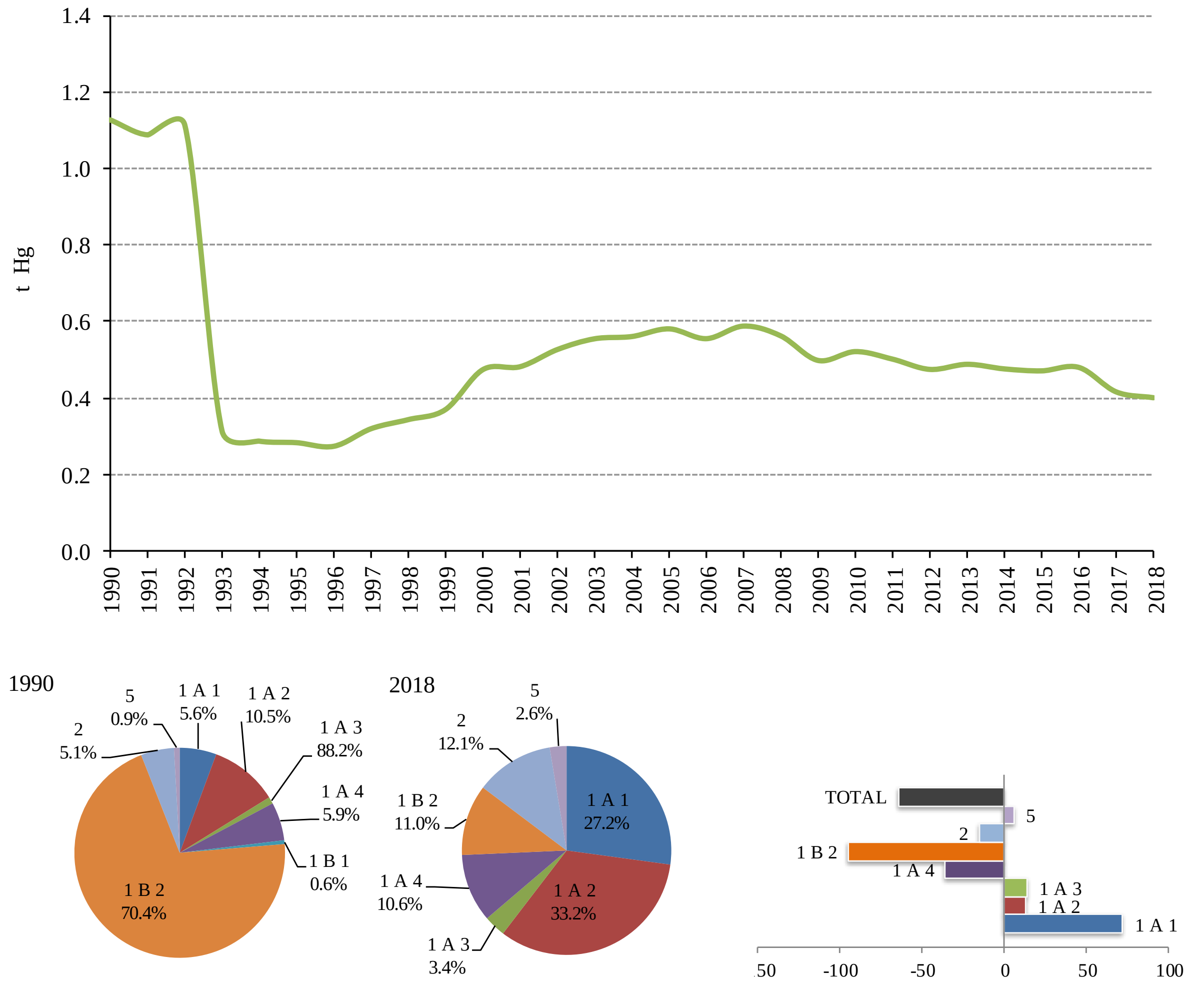


Figure 3.8.3-1 The Hg emissions (t/yr.) and percentage share by sector and variation in Hg emissions

Table 3.8.3-1 The Hg emissions by SNAP nomenclature in the period 1990-2018

Hg											
SNAP	1	2	3	4	5	6	7	8	9	10	Total
Unit	t	t	t	t	t	t	t	t	t	t	t
1990	0.06	0.07	0.12	0.11	0.70	0.05	0.0086	0.0032	0.011	1.52E-04	1.12
1991	0.04	0.06	0.08	0.07	0.77	0.05	0.0064	0.0018	0.010	1.48E-04	1.09
1992	0.06	0.04	0.09	0.06	0.80	0.04	0.0059	0.0014	0.012	7.40E-05	1.11
1993	0.05	0.05	0.08	0.08	2.28E-03	0.05	0.0062	0.0013	0.012	9.46E-05	0.31
1994	0.02	0.04	0.09	0.07	2.04E-03	0.05	0.0067	0.0008	0.012	8.44E-05	0.29
1995	0.03	0.04	0.07	0.07	2.35E-03	0.05	0.0071	0.0011	0.013	9.26E-05	0.28
1996	0.02	0.05	0.08	0.06	2.80E-03	0.05	0.0077	0.0015	0.013	8.31E-05	0.27
1997	0.06	0.04	0.09	0.06	1.99E-03	0.05	0.0086	0.0012	0.013	9.32E-05	0.32
1998	0.06	0.05	0.10	0.07	2.93E-03	0.05	0.0091	0.0011	0.013	1.12E-04	0.34
1999	0.05	0.05	0.12	0.08	1.98E-03	0.05	0.0096	0.0010	0.013	8.46E-05	0.37
2000	0.12	0.04	0.13	0.11	1.93E-03	0.04	0.0097	0.0010	0.013	8.77E-05	0.47
2001	0.12	0.04	0.15	0.09	2.09E-03	0.04	0.0097	0.0010	0.013	9.04E-05	0.48
2002	0.17	0.04	0.15	0.10	7.30E-04	0.04	0.0102	0.0012	0.014	9.70E-05	0.53
2003	0.19	0.05	0.15	0.10	7.50E-04	0.04	0.0108	0.0012	0.014	6.31E-05	0.55
2004	0.18	0.05	0.16	0.10	7.80E-04	0.04	0.0109	0.0011	0.014	9.34E-05	0.56
2005	0.19	0.05	0.16	0.11	7.60E-04	0.04	0.0112	0.0012	0.015	7.66E-05	0.58
2006	0.18	0.05	0.17	0.09	7.10E-04	0.04	0.0117	0.0012	0.015	1.00E-04	0.55
2007	0.19	0.04	0.17	0.11	7.10E-04	0.04	0.0124	0.0013	0.017	8.99E-05	0.59
2008	0.19	0.05	0.17	0.09	5.00E-05	0.04	0.0119	0.0015	0.015	1.01E-04	0.56

Hg											
SNAP	1	2	3	4	5	6	7	8	9	10	Total
Unit	t	t	t	t	t	t	t	t	t	t	t
2009	0.14	0.05	0.14	0.10	4.20E-05	0.04	0.0119	0.0016	0.016	1.04E-04	0.50
2010	0.19	0.05	0.13	0.08	3.90E-05	0.04	0.0115	0.0013	0.010	8.32E-05	0.52
2011	0.20	0.05	0.12	0.07	4.10E-05	0.04	0.0113	0.0013	0.011	9.22E-05	0.50
2012	0.18	0.05	0.11	0.07	4.10E-05	0.04	0.0109	0.0013	0.012	1.05E-04	0.47
2013	0.19	0.05	0.12	0.06	4.10E-05	0.04	0.0109	0.0014	0.010	1.03E-04	0.49
2014	0.19	0.04	0.13	0.05	4.10E-05	0.04	0.0106	0.0015	0.011	7.96E-05	0.48
2015	0.18	0.04	0.12	0.06	4.10E-05	0.04	0.0111	0.0014	0.012	9.59E-05	0.47
2016	0.20	0.04	0.12	0.05	4.10E-05	0.04	0.0114	0.0015	0.011	1.21E-04	0.48
2017	0.11	0.04	0.14	0.06	4.10E-05	0.04	1.2E-02	1.5E-03	0.009	9.57E-05	0.42
2018	0.11	0.04	0.13	0.05	4.10E-05	0.04	1.2E-02	1.6E-03	0.011	1.01E-04	0.40
2018 vs 1990	71.6%	-35.9%	12.6%	-51.6%	-100.0%	-14.3%	36.8%	-49.0%	2.6%	-33.6%	-64.4%
2018 vs 2017	-4.7%	-1.9%	-3.4%	-9.2%	0.0%	-0.8%	-2.4%	5.9%	13.9%	5.7%	-3.7%

3.9. Other heavy metals (As, Cr, Cu, Ni, Se, Zn)

Emissions of other heavy metals (As, Cr, Cu, Ni, Se and Zn) Croatia voluntary reports as an additional air pollutants.

A group of other heavy metals included Arsenic (As), Chrome (Cr), Copper (Cu), Nickel (Ni), Selenium (Se) and Zinc (Zn). Sources of their emissions are different, e.g. the emission of arsenic, chromium and nickel occur because of their presence (trace) in the solid fuel and heavy fuel oil, and partly in the composition of the individual input materials in manufacturing processes such as glass, iron and steel. Copper is mostly emitted because of tire and brake wear, zinc is mostly emitted because of biomass combustion in residential sector, while selenium is emitted due to their presence, in trace, in raw materials for e.g. glass and mineral wool production.

3.9.1. Arsenic (As)

The arsenic emission in 2018 was estimated to 0.55 t (Figure 3.9.1-1 and Table 3.9.1-1). Emission has decreased by 93.6 % since 1990 and increased by 6.9% since year before. The Energy sector is a significant source of arsenic in 2018 (89.3 %). From non-energy sectors, the IPPU is dominant, contributing 10.4% to As emission in 2018 (glass production and steel production with less extent). Arsenic emissions originate from the As content in raw materials and in fuels.

Industrial processes and steelmaking activity in open hearth furnace steel plant was the key source in As emission in 1990. Stopping the steelmaking activity in Siemens-Marten furnace in Sisak, 1992 has resulted with great decline of As emission. Stopping the process was a result of the war for Croatian independence (1991 – 1995). The war has also caused a decrease in fuel consumption and other production activities in IPPU sector.

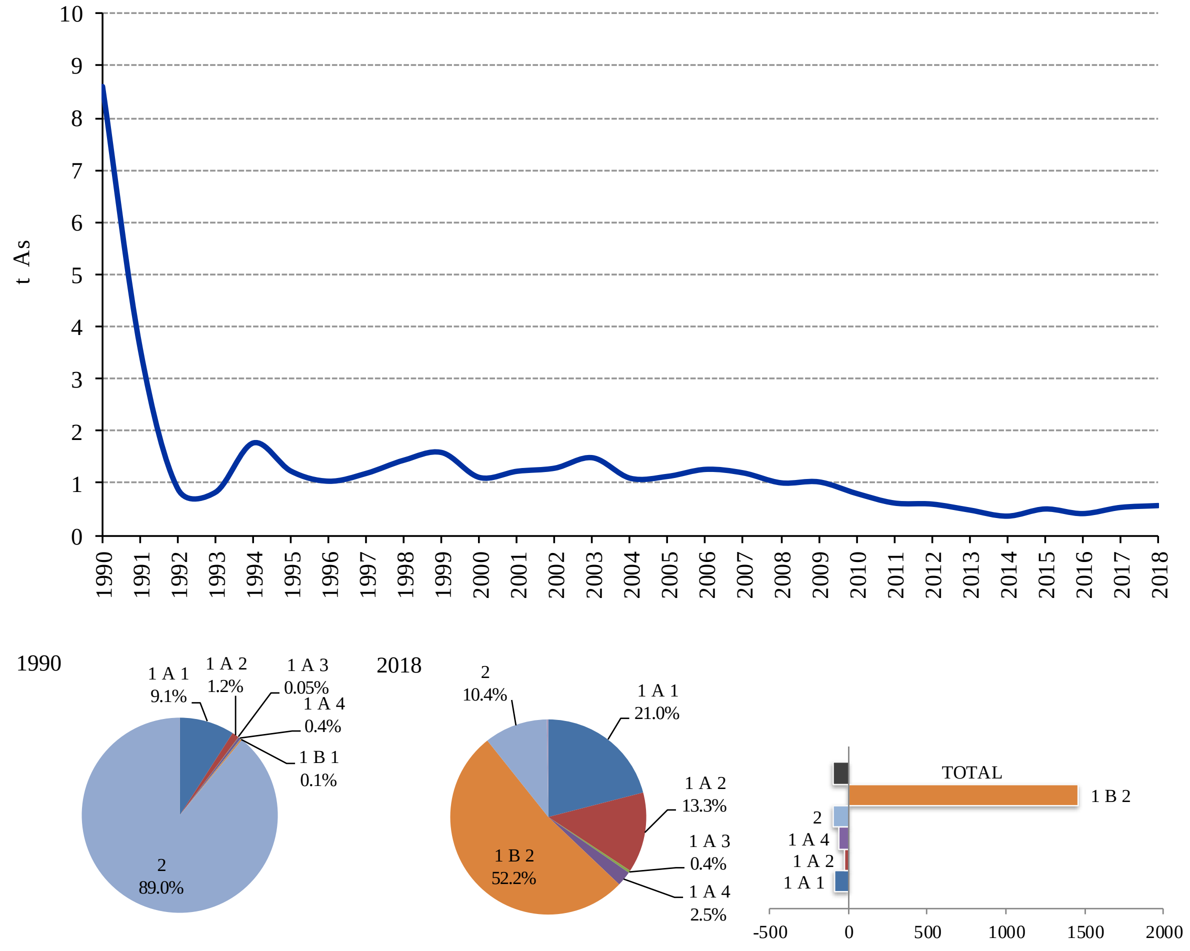


Figure 3.9.1-1 The As emissions (t/yr.) and percentage share by sector and variation in As emissions

Table 3.9.1-1 The As emissions by SNAP nomenclature in the period 1990-2018

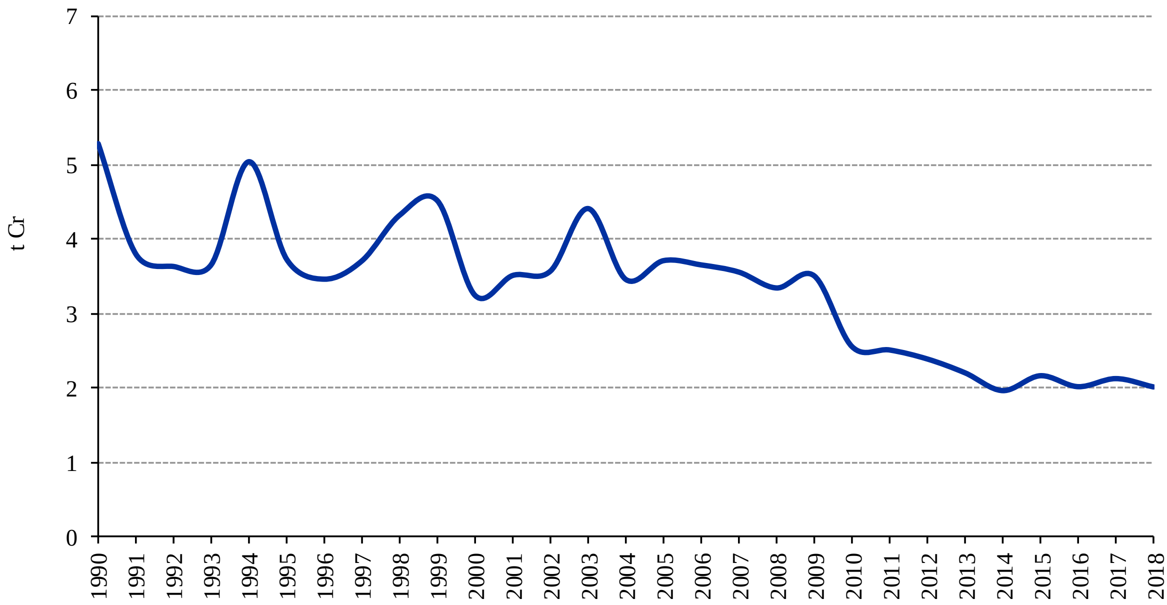
As											
SNAP	1	2	3	4	5	6	7	8	9	10	Total
Unit	t	t	t	t	t	t	t	t	t	t	t
1990	0.78	0.032	0.10	7.67	NA	0.001	0.0003	0.0039	0.0032	6.97E-06	8.59
1991	0.58	0.023	0.06	2.89	NA	0.001	0.0002	0.0034	0.0023	6.77E-06	3.56
1992	0.74	0.017	0.06	0.04	NA	0.001	0.0002	0.0076	0.0037	3.38E-06	0.87
1993	0.69	0.020	0.05	0.05	NA	0.001	0.0002	0.0085	0.0023	4.32E-06	0.81
1994	1.28	0.016	0.06	0.40	NA	0.001	0.0002	0.0013	0.0027	3.86E-06	1.76
1995	0.74	0.017	0.05	0.40	NA	0.002	0.0002	0.0052	0.0033	4.24E-06	1.21
1996	0.61	0.019	0.05	0.33	NA	0.002	0.0002	0.0120	0.0033	3.80E-06	1.02
1997	0.75	0.018	0.05	0.34	NA	0.002	0.0003	0.0087	0.0031	4.26E-06	1.17
1998	0.94	0.018	0.07	0.38	NA	0.002	0.0003	0.0033	0.0032	5.12E-06	1.43
1999	0.99	0.019	0.08	0.47	NA	0.001	0.0003	0.0026	0.0034	3.87E-06	1.57
2000	0.48	0.016	0.12	0.47	NA	0.001	0.0003	0.0020	0.0034	4.01E-06	1.09
2001	0.60	0.016	0.13	0.47	NA	0.002	0.0003	0.0034	0.0032	4.13E-06	1.21
2002	0.60	0.017	0.12	0.52	NA	0.011	0.0003	0.0061	0.0030	4.44E-06	1.27
2003	0.83	0.019	0.12	0.47	NA	0.015	0.0003	0.0058	0.0033	2.88E-06	1.47
2004	0.46	0.017	0.14	0.45	NA	0.008	0.0003	0.0012	0.0028	4.27E-06	1.08
2005	0.54	0.018	0.15	0.39	NA	0.004	0.0003	0.0013	0.0029	3.50E-06	1.12
2006	0.56	0.017	0.18	0.48	NA	0.003	0.0003	0.0014	0.0029	4.58E-06	1.25
2007	0.59	0.015	0.10	0.46	NA	0.002	0.0003	0.0014	0.0029	4.11E-06	1.18
2008	0.55	0.015	0.10	0.32	NA	0.001	0.0003	0.0027	0.0027	4.61E-06	0.99
2009	0.57	0.016	0.09	0.33	NA	0.001	0.0003	0.0022	0.0027	4.74E-06	1.01

As										
SNAP	1	2	3	4	5	6	7	8	9	10	Total
Unit	t	t	t	t	t	t	t	t	t	t	t
2010	0.22	0.017	0.08	0.47	NA	0.000	0.0003	0.0028	0.0023	3.80E-06	0.79
2011	0.26	0.016	0.06	0.26	NA	0.000	0.0003	0.0027	0.0025	4.22E-06	0.60
2012	0.20	0.015	0.06	0.30	NA	0.000	0.0003	0.0027	0.0025	4.78E-06	0.58
2013	0.13	0.015	0.07	0.24	NA	0.002	0.0003	0.0016	0.0023	4.70E-06	0.47
2014	0.11	0.013	0.07	0.15	NA	0.001	0.0003	0.0017	0.0017	3.64E-06	0.35
2015	0.15	0.014	0.07	0.25	NA	0.001	0.0003	0.0017	0.0019	4.38E-06	0.49
2016	0.12	0.014	0.07	0.20	NA	0.002	0.0003	0.0017	0.0020	5.55E-06	0.40
2017	0.12	0.014	0.08	0.30	NA	0.002	0.0003	0.0018	0.0019	4.37E-06	0.52
2018	0.12	0.014	0.07	0.34	NA	0.002	0.000	0.0020	0.0017	4.63E-06	0.55
2018 vs 1990	-85.1%	-56.9%	-25.9%	-95.5%	NA	129.8%	9.0%	-50.3%	-47.2%	-33.6%	-93.6%
2018 vs 2017	-4.3%	-2.6%	-3.8%	14.6%	NA	20.8%	-2.1%	6.4%	-9.3%	5.7%	6.9%

3.9.2. Chromium (Cr)

The chromium emission in 2018 was amounted to 2.0 t (Figure 3.9.2-1 and Table 3.9.2-1). The Cr emission has decreased by 61.8 % since 1990 mostly due to reducing the consumption of heavy fuel oil in stationary energy sectors and simultaneously increasing consumption of natural gas.

The great reduction in Cr emission (by 91%) in comparison to 1990, was happened in IPPU sector, due to stopping the process of pig iron production (blast furnace charging) in Sisak and Split in 1992 and steel production in the open hearth furnace steel plant (Siemens Martin' furnaces) in Sisak, 1992. Stopping these processes were a result of the war for the Croatian independence (1991 – 1995). About 6.3% of Cr emission in 2018 originates from the public electricity and heat production sector whereas the impact of this sector in the nineties was significantly higher (36.3% in 1990). The annual Cr emissions from this source show long-term trend fluctuations between 1990 and 2018, which mostly depends on the type of fuel. Higher consumption of biomass, solid fuel and heavy fuel oil leads to higher Cr emission.



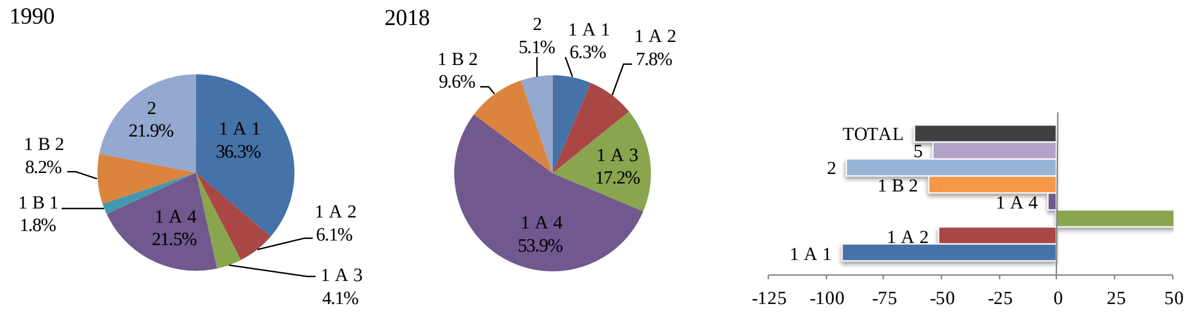


Figure 3.9.2-1 The Cr emissions (t/yr.) and percentage share by sector and variation in Cr emissions

Table 3.9.2-1 The Cr emissions by SNAP nomenclature in the period 1990-2018

Cr											
SNAP	1	2	3	4	5	6	7	8	9	10	Total
Unit	t	t	t	t	t	t	t	t	t	t	t
1990	1.92	1.12	0.32	1.7	NA	0.011	0.21	0.026	0.014	8.71E-05	5.3
1991	1.42	1.24	0.23	0.72	NA	0.011	0.16	0.020	0.010	8.47E-05	3.8
1992	1.81	1.10	0.19	0.34	NA	0.011	0.15	0.016	0.011	4.23E-05	3.6
1993	1.70	1.17	0.17	0.42	NA	0.011	0.17	0.017	0.010	5.41E-05	3.7
1994	3.25	1.04	0.17	0.37	NA	0.011	0.18	0.013	0.011	4.82E-05	5.0
1995	1.92	1.10	0.15	0.33	NA	0.019	0.18	0.016	0.013	5.29E-05	3.7
1996	1.54	1.24	0.15	0.27	NA	0.028	0.20	0.023	0.012	4.75E-05	3.5
1997	1.84	1.15	0.17	0.27	NA	0.028	0.23	0.019	0.012	5.32E-05	3.7
1998	2.37	1.12	0.21	0.34	NA	0.019	0.23	0.016	0.012	6.40E-05	4.3
1999	2.51	1.13	0.20	0.38	NA	0.015	0.25	0.016	0.013	4.83E-05	4.5
2000	1.15	1.00	0.30	0.50	NA	0.011	0.25	0.017	0.014	5.01E-05	3.2
2001	1.41	1.08	0.30	0.44	NA	0.026	0.23	0.020	0.013	5.17E-05	3.5
2002	1.39	1.04	0.27	0.45	NA	0.129	0.25	0.022	0.012	5.54E-05	3.6
2003	1.97	1.20	0.30	0.46	NA	0.179	0.27	0.023	0.012	3.60E-05	4.4
2004	1.06	1.16	0.33	0.50	NA	0.097	0.28	0.018	0.011	5.34E-05	3.5
2005	1.25	1.22	0.36	0.52	NA	0.044	0.29	0.019	0.011	4.38E-05	3.7
2006	1.29	1.12	0.44	0.44	NA	0.033	0.31	0.020	0.011	5.73E-05	3.7
2007	1.35	1.07	0.24	0.51	NA	0.023	0.33	0.021	0.011	5.14E-05	3.6
2008	1.25	1.07	0.23	0.42	NA	0.017	0.32	0.025	0.010	5.76E-05	3.3
2009	1.32	1.12	0.22	0.50	NA	0.008	0.32	0.021	0.011	5.92E-05	3.5
2010	0.43	1.19	0.20	0.40	NA	0.003	0.31	0.021	0.006	4.75E-05	2.6
2011	0.52	1.16	0.16	0.34	NA	0.003	0.30	0.020	0.008	5.27E-05	2.5
2012	0.40	1.15	0.17	0.35	NA	0.000	0.29	0.019	0.008	5.98E-05	2.4
2013	0.22	1.14	0.17	0.32	NA	0.023	0.31	0.017	0.008	5.87E-05	2.2
2014	0.17	1.00	0.16	0.29	NA	0.016	0.30	0.017	0.008	4.55E-05	2.0
2015	0.23	1.15	0.14	0.29	NA	0.016	0.31	0.017	0.009	5.48E-05	2.2
2016	0.12	1.12	0.13	0.28	NA	0.020	0.32	0.017	0.010	6.94E-05	2.0
2017	0.18	1.08	0.16	0.31	NA	0.021	0.36	0.017	0.007	5.47E-05	2.1
2018	0.13	1.08	0.15	0.27	NA	0.025	0.34	0.017	0.007	5.78E-05	2.0
2018 vs 1990	-93.3%	-4.1%	-51.8%	-84.0%	NA	129.8%	65.2%	-32.8%	-49.7%	-33.6%	-61.8%
2018 vs 2017	-27.7%	-0.6%	-2.5%	-14.3%	NA	20.8%	-3.5%	4.0%	3.7%	5.7%	-5.2%

3.9.3. Copper (Cu)

The Cu emissions in 2018 have amounted to 9.5 t (Figure and Table 3.9.3-1). The Transport sector (mostly automobile tire and brake wear) contributes with 78.1% in 2018 and has the domination in the national copper emission.

Emission of copper is currently 25.9% higher than in 1990. Great decline happened in 1991, as a consequence of the war for Croatian independence (1991 – 1995). After decline period, the Cu emission has long-term increase period, mostly due to constant increase of road vehicle population and annual mileage, what leads to higher automobile tire and brake wear. The period of high emissions from 2002 to 2005 with a peak in 2003 was the result of the increasing trend of use of fireworks and signalling rockets (NFR 2.G, SNAP 060601).

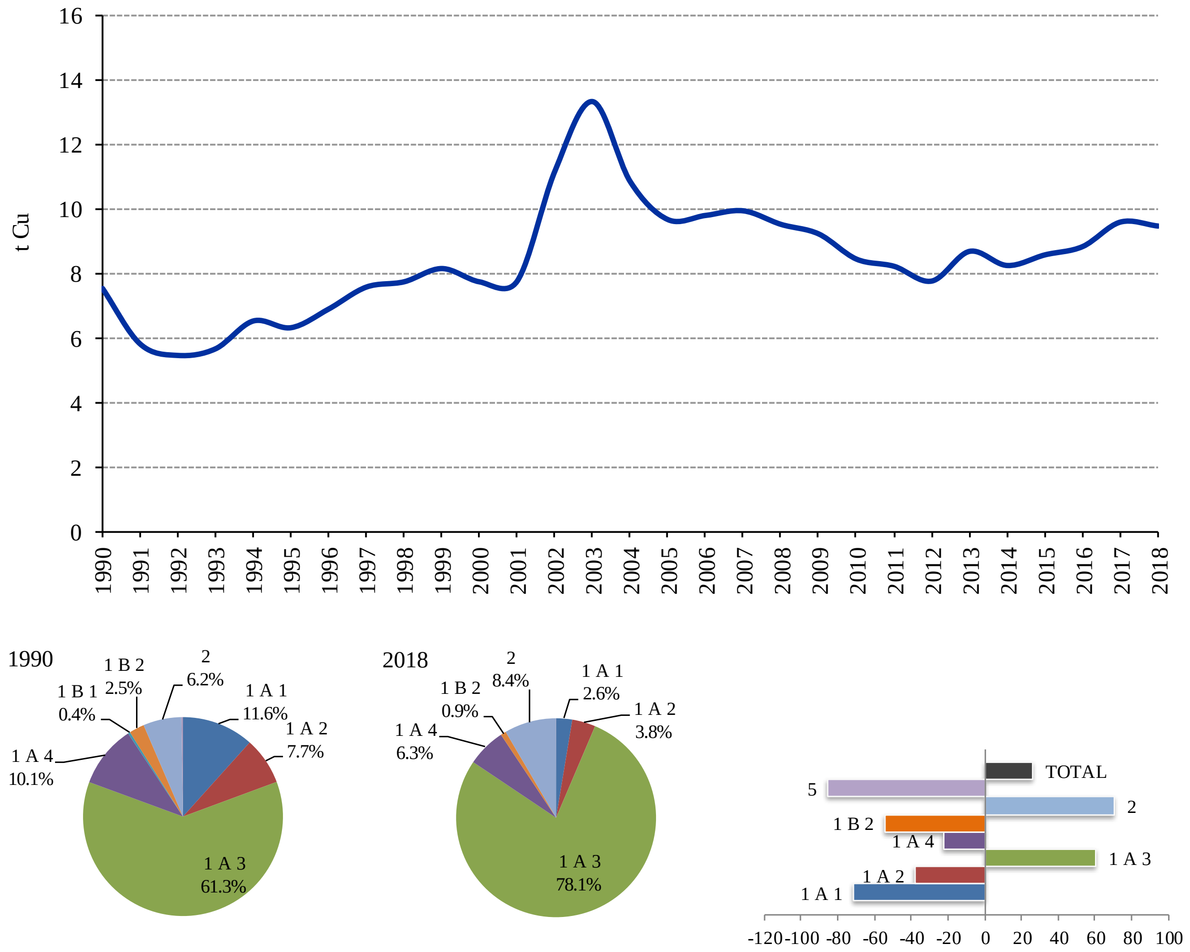


Figure 3.9.3-1 The Cu emissions (t/yr.) and percentage share by sector and variation in Cu emissions

Table 3.9.3-1 The Cu emissions by SNAP nomenclature in the period 1990-2018

Cu											
SNAP	1	2	3	4	5	6	7	8	9	10	Total
Unit	t	t	t	t	t	t	t	t	t	t	t
1990	0.87	0.40	0.35	0.29	NA	0.38	4.50	0.70	0.03	7.95E-05	7.5
1991	0.64	0.38	0.23	0.18	NA	0.38	3.43	0.53	0.02	7.73E-05	5.8
1992	0.80	0.31	0.19	0.12	NA	0.38	3.31	0.30	0.03	3.86E-05	5.4
1993	0.75	0.33	0.16	0.16	NA	0.38	3.58	0.27	0.02	4.93E-05	5.6
1994	1.35	0.29	0.18	0.14	NA	0.34	3.80	0.39	0.02	4.40E-05	6.5
1995	0.83	0.30	0.15	0.13	NA	0.60	3.90	0.36	0.03	4.83E-05	6.3
1996	0.69	0.34	0.15	0.10	NA	0.85	4.33	0.39	0.02	4.34E-05	6.9
1997	0.81	0.31	0.17	0.10	NA	0.84	4.93	0.38	0.03	4.86E-05	7.6
1998	1.02	0.31	0.18	0.13	NA	0.60	5.01	0.45	0.03	5.84E-05	7.7
1999	1.08	0.31	0.19	0.15	NA	0.51	5.41	0.46	0.03	4.41E-05	8.1
2000	0.57	0.28	0.25	0.20	NA	0.39	5.47	0.54	0.04	4.58E-05	7.7
2001	0.68	0.29	0.27	0.18	NA	0.83	4.90	0.57	0.04	4.72E-05	7.8

Cu											
SNAP	1	2	3	4	5	6	7	8	9	10	Total
Unit	t	t	t	t	t	t	t	t	t	t	t
2002	0.69	0.28	0.26	0.18	NA	3.78	5.41	0.55	0.03	5.06E-05	11.2
2003	0.93	0.33	0.25	0.18	NA	5.20	5.84	0.59	0.03	3.29E-05	13.4
2004	0.56	0.31	0.28	0.19	NA	2.83	6.07	0.58	0.03	4.87E-05	10.9
2005	0.64	0.33	0.29	0.20	NA	1.31	6.26	0.61	0.03	3.99E-05	9.7
2006	0.65	0.30	0.34	0.17	NA	1.00	6.67	0.65	0.03	5.23E-05	9.8
2007	0.69	0.29	0.26	0.20	NA	0.73	7.08	0.67	0.03	4.69E-05	9.9
2008	0.63	0.29	0.24	0.16	NA	0.54	6.87	0.77	0.03	5.26E-05	9.5
2009	0.65	0.30	0.21	0.19	NA	0.26	6.91	0.67	0.03	5.40E-05	9.2
2010	0.30	0.32	0.22	0.15	NA	0.15	6.66	0.62	0.01	4.34E-05	8.4
2011	0.36	0.31	0.18	0.12	NA	0.13	6.49	0.61	0.01	4.81E-05	8.2
2012	0.30	0.31	0.18	0.13	NA	0.07	6.19	0.56	0.02	5.45E-05	7.8
2013	0.22	0.30	0.19	0.11	NA	0.70	6.59	0.55	0.01	5.36E-05	8.7
2014	0.20	0.27	0.19	0.09	NA	0.51	6.42	0.54	0.01	4.15E-05	8.2
2015	0.24	0.30	0.18	0.10	NA	0.49	6.72	0.53	0.01	5.00E-05	8.6
2016	0.23	0.29	0.17	0.10	NA	0.61	6.88	0.53	0.01	6.33E-05	8.8
2017	0.22	0.29	0.20	0.11	NA	0.65	7.59	0.53	0.01	4.99E-05	9.6
2018	0.25	0.28	0.19	0.09	NA	0.79	7.32	0.55	0.01	5.28E-05	9.5
2018 vs 1990	-71.8 %	-29.8 %	-45.4 %	-70.4 %	NA	107.4 %	62.6 %	-21.5%	-77.8%	-33.6%	25.9 %
2018 vs 2017	9.5%	-1.0%	-3.9%	-20.2 %	NA	21.6%	-3.6%	3.7%	-4.7%	5.7%	-1.3%

3.9.4. Nickel (Ni)

Emission of nickel in 2018 amounted to 6.0 t (Figure and Table 3.9.4-1). The Ni emission has declined by 64.6 %, since 1990. Majority of Ni emissions in historical trend originate from the public electricity and heat production sector (68.5 % in 1990 and 73.2 % in 2018). The historical trend of Ni emission from this source category shows long-term fluctuations between which mostly depend on the type of fuel in use. Higher consumption of solid fuel and heavy fuel oil leads to higher Ni emissions and vice versa. Decline in Ni emission in 1991 was as a consequence of the war Croatian independence (1991 – 1995). In that period of time there was a reduction in fossil fuel consumptions and stopping the production of steel in the open hearth furnace steel plant in Siemens Martin' furnaces in Sisak, 1992. In recent years (since 2010), the trend records continuous reduction of Ni emission, as a result of the decreasing use of coal as a fuel in Small combustion sector (mainly residential).

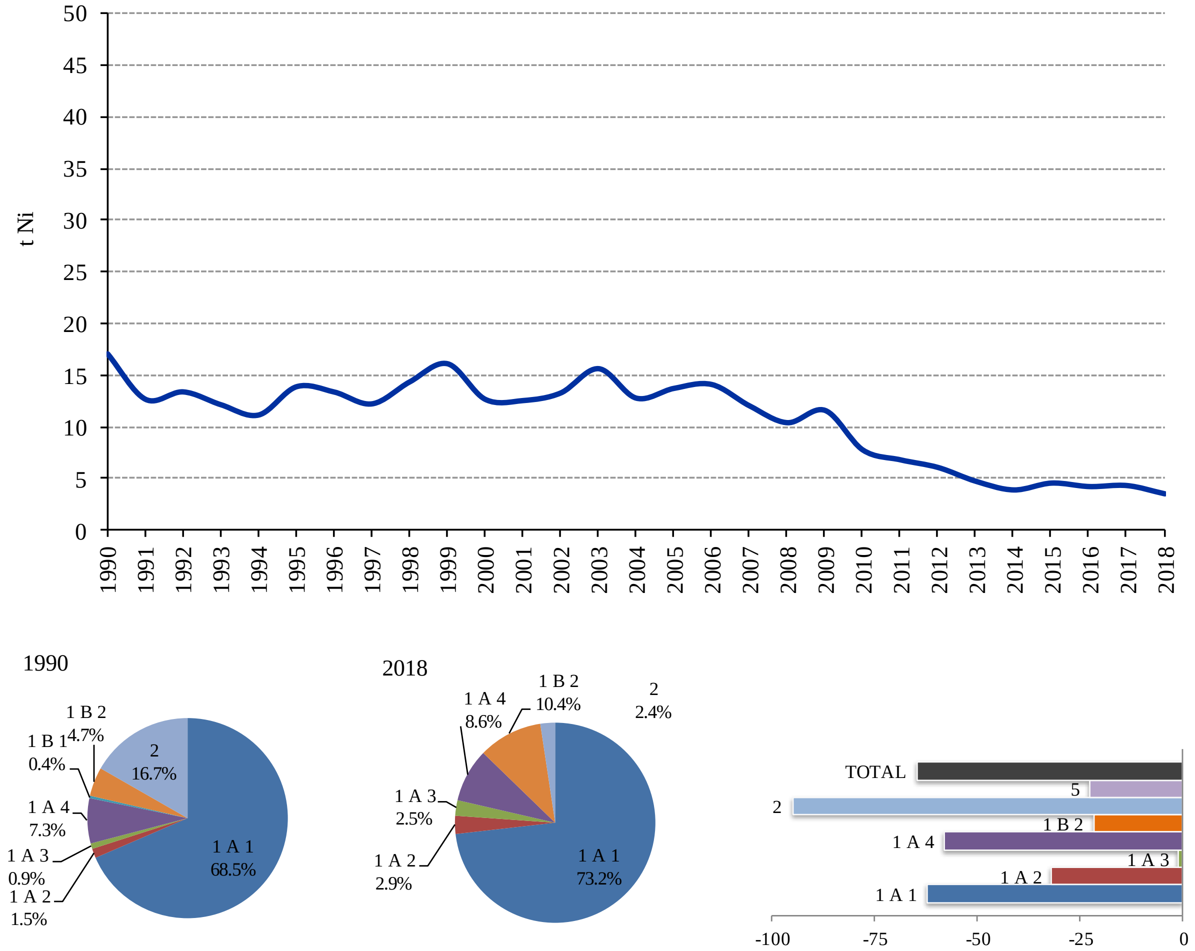


Figure 3.9.4-1The Ni emissions (t/yr.) and percentage share by sector and variation in Ni emissions

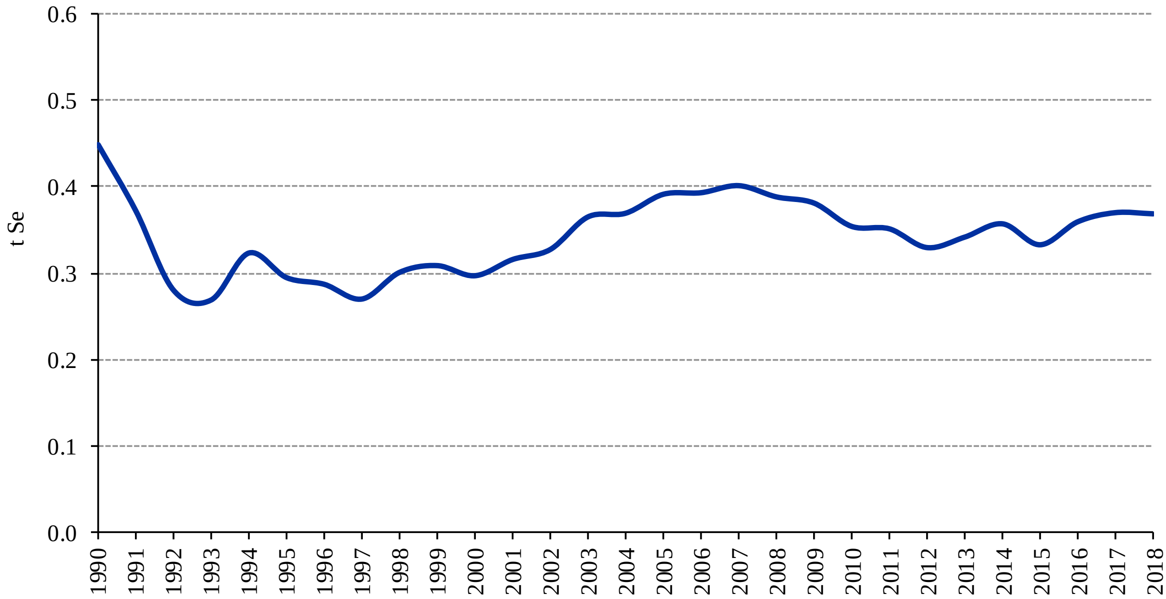
Table 3.9.4-1 The Ni emissions by SNAP nomenclature in the period 1990-2018

Ni											
SNAP	1	2	3	4	5	6	7	8	9	10	Total
Unit	t	t	t	t	t	t	t	t	t	t	t
1990	11.6	1.22	0.25	3.63	NA	0.05	0.04	0.13	0.013	5.7E-05	17.0
1991	9.7	0.81	0.16	1.75	NA	0.05	0.03	0.14	0.009	5.5E-05	12.6
1992	11.1	1.08	0.14	0.62	NA	0.05	0.03	0.34	0.009	2.7E-05	13.3
1993	9.5	1.21	0.11	0.75	NA	0.05	0.03	0.39	0.010	3.5E-05	12.1
1994	9.1	0.97	0.13	0.76	NA	0.03	0.03	0.06	0.010	3.1E-05	11.1
1995	11.6	1.02	0.11	0.74	NA	0.07	0.03	0.24	0.012	3.4E-05	13.8
1996	10.6	1.35	0.10	0.61	NA	0.08	0.04	0.55	0.011	3.1E-05	13.3
1997	9.6	1.28	0.12	0.62	NA	0.08	0.05	0.40	0.010	3.5E-05	12.2
1998	11.5	0.94	0.75	0.78	NA	0.07	0.05	0.15	0.011	4.2E-05	14.3
1999	13.0	1.25	0.73	0.86	NA	0.07	0.05	0.11	0.012	3.1E-05	16.0
2000	8.4	1.09	1.87	1.07	NA	0.06	0.05	0.09	0.012	3.3E-05	12.6
2001	8.5	0.95	1.74	0.96	NA	0.10	0.05	0.16	0.011	3.4E-05	12.5
2002	9.1	1.01	1.44	0.98	NA	0.30	0.05	0.28	0.010	3.6E-05	13.2
2003	11.0	1.07	1.74	0.99	NA	0.40	0.06	0.26	0.011	2.3E-05	15.6
2004	8.3	1.00	2.02	1.09	NA	0.23	0.06	0.05	0.010	3.5E-05	12.7
2005	8.9	0.94	2.52	1.10	NA	0.13	0.06	0.05	0.010	2.8E-05	13.7
2006	8.6	0.82	3.40	0.97	NA	0.11	0.06	0.06	0.010	3.7E-05	14.0
2007	9.4	0.70	0.54	1.11	NA	0.09	0.07	0.06	0.011	3.3E-05	12.0
2008	7.8	0.68	0.65	0.93	NA	0.08	0.06	0.12	0.010	3.7E-05	10.3
2009	9.0	0.66	0.68	1.03	NA	0.05	0.06	0.08	0.011	3.8E-05	11.5

Ni										
SNAP	1	2	3	4	5	6	7	8	9	10	Total
Unit	t	t	t	t	t	t	t	t	t	t	t
2010	5.7	0.64	0.25	0.92	NA	0.04	0.06	0.12	0.005	3.1E-05	7.7
2011	5.1	0.59	0.14	0.75	NA	0.04	0.06	0.11	0.007	3.4E-05	6.8
2012	4.4	0.51	0.17	0.73	NA	0.03	0.06	0.11	0.007	3.9E-05	6.0
2013	3.1	0.45	0.20	0.71	NA	0.07	0.06	0.06	0.007	3.8E-05	4.7
2014	2.4	0.36	0.25	0.65	NA	0.05	0.06	0.06	0.008	3.0E-05	3.8
2015	3.1	0.42	0.14	0.66	NA	0.05	0.06	0.06	0.009	3.6E-05	4.5
2016	2.9	0.41	0.13	0.58	NA	0.06	0.06	0.06	0.010	4.5E-05	4.2
2017	2.9	0.40	0.15	0.65	NA	0.07	0.06	0.06	0.006	3.6E-05	4.3
2018	2.1	0.35	0.14	0.65	NA	0.08	0.06	0.07	0.007	3.8E-05	3.5
2018 vs 1990	-81.9%	-71.0%	-42.8%	-82.1%	NA	50.9%	47.2%	-51.5%	-47.4%	-33.6%	-79.6%
2018 vs 2017	-26.7%	-10.2%	-4.1%	-0.4%	NA	25.1%	-4.3%	5.5%	12.3%	5.7%	-18.7%

3.9.5. Selenium (Se)

Emission of selenium was amounted to 0.33 t in 2018 (Figure and Table 3.9.5-1) and was reduced by 26.5 % since 1990. The dominant sector in the selenium emission is IPPU sector. It has contributed with 55 % in 2018, and in 1990 with 49 % in total Se emission. The domination within IPPU sector has glass production activity, due to the Se content in the raw material. That activity has recorded a decreasing trend in recent years, because of economic crisis since 2007. In 2018, about 17.3 % of Se emissions originated from fuel combustion in manufacturing industry and construction, and 10.6 % from the public electricity and heat production.



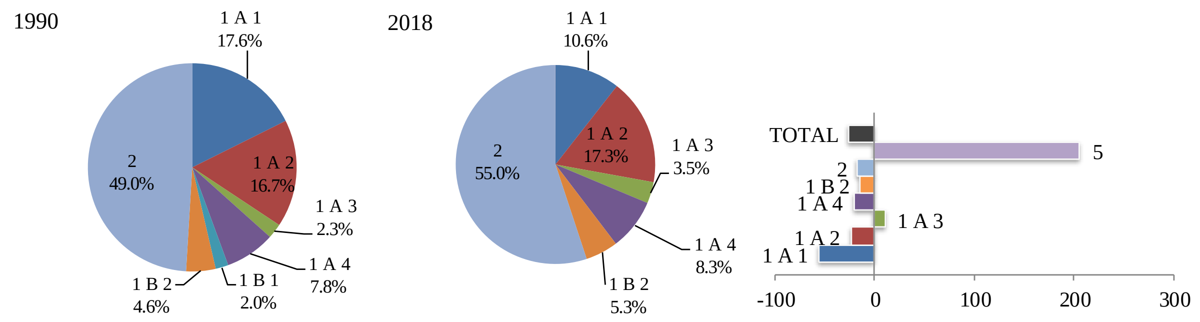


Figure 3.9.5-1 The Se emissions (t/yr.) and percentage share by sector and variation in Se emissions

Table 3.9.5-1 The Se emissions by SNAP nomenclature in the period 1990-2018

Se											
SNAP	1	2	3	4	5	6	7	8	9	10	Total
Unit	t	t	t	t	t	t	t	t	t	t	t
1990	0.079	0.033	0.074	0.25	NA	NA	0.0054	0.0084	0.0026	2.2E-05	0.079
1991	0.059	0.031	0.048	0.22	NA	NA	0.0043	0.0064	0.0018	2.1E-05	0.059
1992	0.065	0.025	0.048	0.13	NA	NA	0.0039	0.0068	0.0017	1.1E-05	0.065
1993	0.063	0.027	0.041	0.13	NA	NA	0.0040	0.0063	0.0020	1.4E-05	0.063
1994	0.091	0.023	0.049	0.15	NA	NA	0.0041	0.0042	0.0020	1.2E-05	0.091
1995	0.068	0.024	0.040	0.15	NA	NA	0.0045	0.0055	0.0024	1.3E-05	0.068
1996	0.067	0.027	0.041	0.14	NA	NA	0.0052	0.0083	0.0022	1.2E-05	0.067
1997	0.068	0.025	0.047	0.12	NA	NA	0.0062	0.0068	0.0021	1.3E-05	0.068
1998	0.077	0.025	0.050	0.14	NA	NA	0.0061	0.0056	0.0022	1.6E-05	0.077
1999	0.080	0.025	0.061	0.13	NA	NA	0.0066	0.0054	0.0023	1.2E-05	0.080
2000	0.055	0.022	0.069	0.14	NA	NA	0.0070	0.0058	0.0024	1.3E-05	0.055
2001	0.057	0.024	0.078	0.14	NA	NA	0.0065	0.0064	0.0022	1.3E-05	0.057
2002	0.062	0.023	0.076	0.15	NA	NA	0.0069	0.0072	0.0020	1.4E-05	0.062
2003	0.075	0.027	0.075	0.17	NA	NA	0.0073	0.0074	0.0021	9.0E-06	0.075
2004	0.056	0.026	0.080	0.19	NA	NA	0.0077	0.0060	0.0020	1.3E-05	0.056
2005	0.059	0.027	0.083	0.21	NA	NA	0.0080	0.0065	0.0020	1.1E-05	0.059
2006	0.058	0.025	0.089	0.20	NA	NA	0.0084	0.0068	0.0019	1.4E-05	0.058
2007	0.063	0.024	0.087	0.21	NA	NA	0.0088	0.0071	0.0021	1.3E-05	0.063
2008	0.052	0.024	0.082	0.21	NA	NA	0.0087	0.0085	0.0019	1.4E-05	0.052
2009	0.058	0.025	0.068	0.21	NA	NA	0.0087	0.0082	0.0022	1.5E-05	0.058
2010	0.040	0.027	0.066	0.21	NA	NA	0.0083	0.0072	0.0011	1.2E-05	0.040
2011	0.040	0.026	0.058	0.21	NA	NA	0.0080	0.0072	0.0014	1.3E-05	0.040
2012	0.035	0.026	0.056	0.20	NA	NA	0.0076	0.0068	0.0016	1.5E-05	0.035
2013	0.026	0.025	0.061	0.21	NA	NA	0.0076	0.0068	0.0015	1.5E-05	0.026
2014	0.024	0.022	0.064	0.23	NA	NA	0.0077	0.0070	0.0016	1.1E-05	0.024
2015	0.028	0.026	0.061	0.20	NA	NA	0.0078	0.0069	0.0019	1.4E-05	0.028
2016	0.027	0.025	0.058	0.23	NA	NA	0.0080	0.0069	0.0022	1.7E-05	0.027
2017	0.026	0.024	0.067	0.24	NA	NA	0.0085	0.0072	0.0013	1.4E-05	0.026
2018	0.026	0.024	0.065	0.24	NA	NA	0.0081	0.0076	0.0014	1.4E-05	0.026
2018 vs 1990	-67.6%	-26.4%	-11.8%	-3.9%	NA	NA	50.5%	-10.5%	-44.3%	-33.6%	-67.6%
2018 vs 2017	-0.2%	-0.7%	-3.6%	0.5%	NA	NA	-4.5%	5.4%	9.7%	5.7%	-0.2%

3.9.6. Zinc (Zn)

The zinc emission in 2017 has amounted to 32.1 t (Figure and Table 3.9.6-1) and has decreased by 12.7 % since 1990. The major sources of Zn emission in Croatia is fuel combustion in energy sector which has contributed with 99.6 % to national total in 2018. Key sources in 2018 were:

Small combustion and mobile machinery sector (78.4%), Transport (15.8%) and Manufacturing industry and construction (7.6%). Zinc is mostly emitted as a result of biomass combustion in residential sector, due to its content in wood.

The historic trend of Zn emission shows a decline because of stopping the steel production in the open hearth furnace steel plant in 1992. Those emission originated from Zn content in the raw material for Siemens Martin' furnaces. Stopping that process in Sisak in 1992, was a result of the war for Croatian independence (1991-1995).

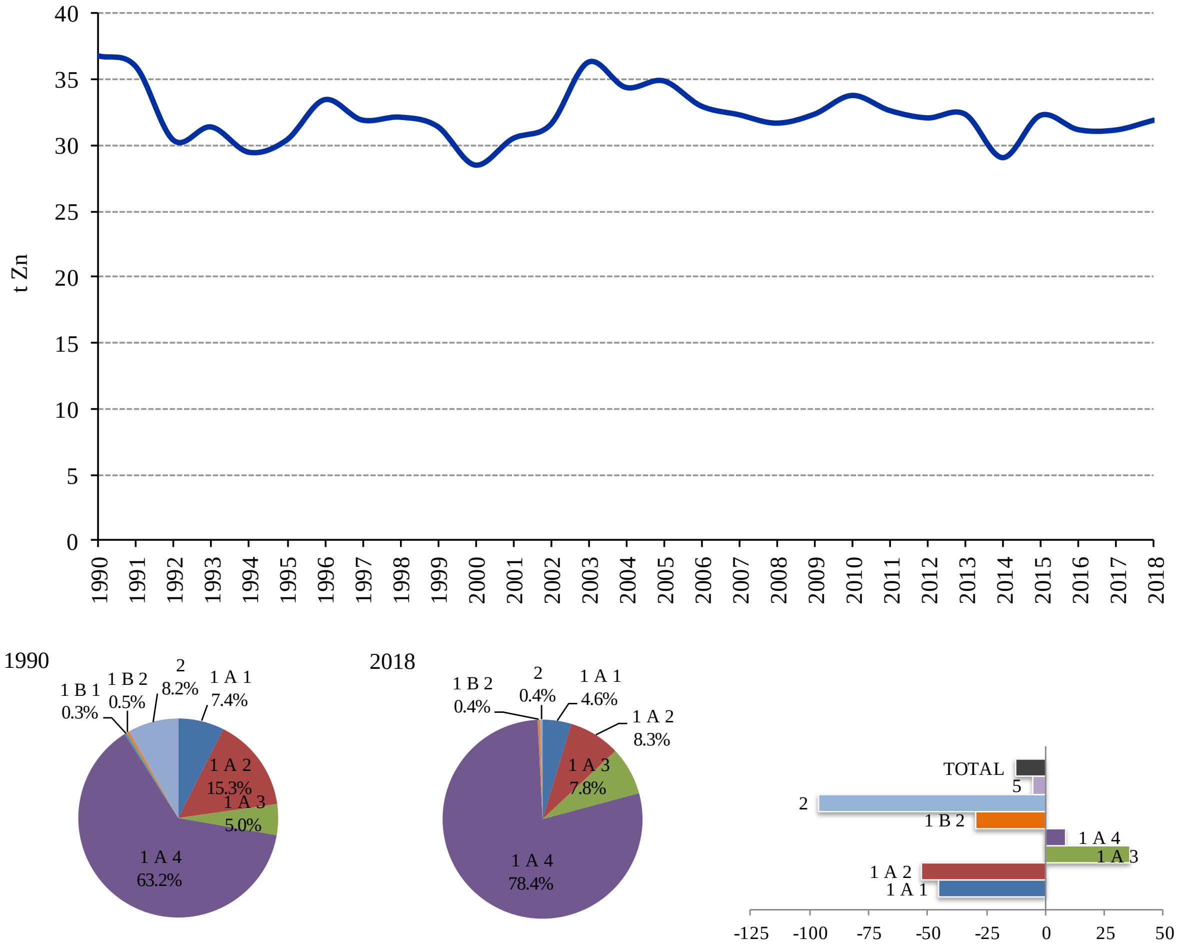


Figure 3.9.6-1 The Zn emissions (t/yr.) and percentage share by sector and variation in Zn emissions

Table 3.9.6-1 The Zn emissions by SNAP nomenclature in the period 1990-2018

Zn											
SNAP	1	2	3	4	5	6	7	8	9	10	TOTAL
Unit	t	t	t	t	t	t	t	t	t	t	t
1990	2.7	23.0	5.5	3.1	NA	0.22	1.7	0.5	0.04	6.10E-04	36.8
1991	2.0	26.4	4.1	1.5	NA	0.21	1.3	0.4	0.03	5.93E-04	35.9
1992	2.1	22.7	3.3	0.6	NA	0.22	1.2	0.2	0.02	2.96E-04	30.4
1993	2.1	24.0	3.1	0.5	NA	0.21	1.3	0.2	0.03	3.78E-04	31.4
1994	2.7	21.6	2.9	0.5	NA	0.20	1.4	0.3	0.03	3.38E-04	29.5
1995	2.4	22.8	2.8	0.3	NA	0.35	1.5	0.2	0.03	3.71E-04	30.4
1996	2.4	25.6	2.7	0.3	NA	0.50	1.6	0.3	0.03	3.33E-04	33.4
1997	2.3	23.5	3.1	0.4	NA	0.49	1.9	0.3	0.03	3.73E-04	31.9
1998	2.4	23.6	3.0	0.5	NA	0.34	1.9	0.3	0.03	4.48E-04	32.1
1999	2.5	23.2	2.6	0.5	NA	0.29	2.0	0.3	0.04	3.38E-04	31.5

Zn											
SNAP	1	2	3	4	5	6	7	8	9	10	TOTAL
Unit	t	t	t	t	t	t	t	t	t	t	t
2000	1.9	20.6	2.9	0.5	NA	0.22	2.1	0.3	0.04	3.51E-04	28.6
2001	1.9	22.6	2.8	0.4	NA	0.48	1.9	0.4	0.04	3.62E-04	30.5
2002	2.1	21.7	2.8	0.3	NA	2.21	2.1	0.4	0.03	3.88E-04	31.6
2003	2.3	25.0	2.9	0.4	NA	3.04	2.3	0.4	0.03	2.52E-04	36.3
2004	2.0	24.3	3.1	0.6	NA	1.65	2.4	0.4	0.03	3.74E-04	34.4
2005	2.0	25.7	3.0	0.5	NA	0.76	2.5	0.4	0.03	3.06E-04	34.9
2006	1.9	23.6	3.3	0.5	NA	0.58	2.6	0.4	0.03	4.01E-04	33.0
2007	2.1	22.8	3.2	0.5	NA	0.42	2.8	0.4	0.03	3.60E-04	32.3
2008	1.7	22.9	2.9	0.7	NA	0.31	2.7	0.5	0.03	4.03E-04	31.7
2009	1.9	23.9	2.8	0.4	NA	0.15	2.7	0.4	0.03	4.14E-04	32.4
2010	1.5	25.7	2.9	0.6	NA	0.08	2.6	0.4	0.02	3.33E-04	33.8
2011	1.7	25.0	2.4	0.5	NA	0.07	2.5	0.4	0.02	3.69E-04	32.6
2012	1.5	25.0	2.6	0.2	NA	0.03	2.4	0.4	0.02	4.18E-04	32.1
2013	1.1	24.8	2.5	0.6	NA	0.40	2.5	0.4	0.02	4.11E-04	32.4
2014	1.2	21.9	2.2	0.7	NA	0.29	2.4	0.4	0.02	3.18E-04	29.1
2015	1.4	25.1	1.9	0.6	NA	0.28	2.6	0.4	0.03	3.83E-04	32.3
2016	1.6	24.3	1.7	0.2	NA	0.35	2.6	0.4	0.03	4.86E-04	31.2
2017	1.6	23.6	2.1	0.2	NA	0.38	2.9	0.4	0.02	3.83E-04	31.2
2018	2.0	23.6	2.1	0.7	NA	0.46	2.8	0.4	0.02	4.05E-04	31.9
2018 vs 1990	-26.8%	2.3%	-62.3%	-78.2%	NA	110.2%	63.8%	-23.7%	-37.9%	-33.6%	-13.2%
2018 vs 2017	25.2%	-0.4%	-1.6%	216.1%	NA	21.5%	-3.8%	4.8%	24.6%	5.7%	2.3%

3.10. Persistent organic pollutants (POPs)

Persistent organic pollutants (POPs) are organic substances with toxic properties, resistant to chemical, photochemical, and biochemical degradation. They can accumulate in the fatty tissues of living organisms and are toxic to humans and wildlife. They also remain stable in the environment for a long period of time and can distribute easily through air, water and across the national border and can be deposited far from their place of their release.

With the aim for POPs emissions reductions, the Executive Body adopted the Protocol on Persistent Organic Pollutants on June 1998 in Aarhus (Denmark) in the framework of LRTAP Convention for urgent global actions to control, reduce and eliminate emissions of these chemicals. Annual reduction of POPs (polycyclic aromatic hydrocarbons (PAHs), Dioxins/furans, and hexachlorocyclohexane) emissions from a specified reference year achieved by taking appropriate effective measures is one of the Protocols basic obligation for countries that are Parties to the Protocol. Each Party should develop and maintain emission inventories for these substances.

In 1996, the Republic of Croatia has started to calculate estimate the POPs emissions in accordance with EMEP/CORINAIR methodology, officially adopted by the Executive Body of the LARTAP Convention. Persistent organic pollutants are divided into three groups: industrial chemicals, polycyclic aromatic hydrocarbons and dioxins and furans (Table 3.10-1). Reporting for HCH – Hexachlorocyclohexane (Lindan) emissions is excluded from the obligation to report since 2015.

Table 3.10-1 Persistent organic pollutants (POPs)

Group	POPs
Dioxins and furans (PCDD/PCDF)	PCDD – polychlorinated dibenzo-dioxins
	PCDF – polychlorinated dibenzo-furans
Polycyclic aromatic hydrocarbons (PAHs)	Benzo(a) pyrene
	Benzo(b) fluoranthene
	Benzo(k) fluoranthene
	Indeno(1,2,3-cd) pyrene
Industrial chemicals or by-product of the chemical synthesis	HCB – Hexachlorobenzene
	PCBs – Polychlorinated biphenyls

3.10.1. Dioxin and furans (PCDD/PCDF)

Dioxins and furans are persistent organic compounds that occur as a product of combustion of organic matter that contains chlorine (Cl) at temperatures between 250°C and 400°C and can occur in all sectors. The largest emission of dioxins and furans occur when burning wood in households. Other processes that contribute to these emissions are the processes of steel production in arc furnaces, fuel combustion in transport sectors, waste incineration and cremation.

In 2018, PCDD/F emission has amounted to 27.8 g I- TEQ (Figure and Table 3.10.1-1). Emission has decreased by 42.7 % since 1990. The main contributor in PCDD/F emission during historic period is fuel combustion in energy sector. A key sources in 2018 were small combustion sector with domination of biomass combustion in residential sector (85.2 % of total PCDD/F emission).

Fluctuations in the trend are directly dependent on the amount of biomass use in small residential furnaces, fuel combustion in other energy sectors and on the amount of waste incinerated. A reduction in emissions in 1991 and 1992 is the result of reduced energy consumption in these sectors in particular biomass and coal, due to the war for Croatian independence (1991 - 1995). A reduction since 2005 is a result of gradual replacement of certain percentage of traditional domestic stoves and manual single house boilers with advanced/ecolabelled stoves and boilers, high efficiency stoves and boilers and pellet stoves and boilers (see Table 4.5-1, Figure 4.5-2). In addition, emission dips can be seen in the years 1994, 2000, 2002 and 2014 when, due to the warmer winter, the consumption of biomass for heating was lower (Figure 4.5-3).

Croatia has the obligation toward the Protocol on POPs to keep PCDD/F emissions beyond the value in base year (1990). In 2018, Croatia is fulfilling an obligation towards the Protocol on POPs.

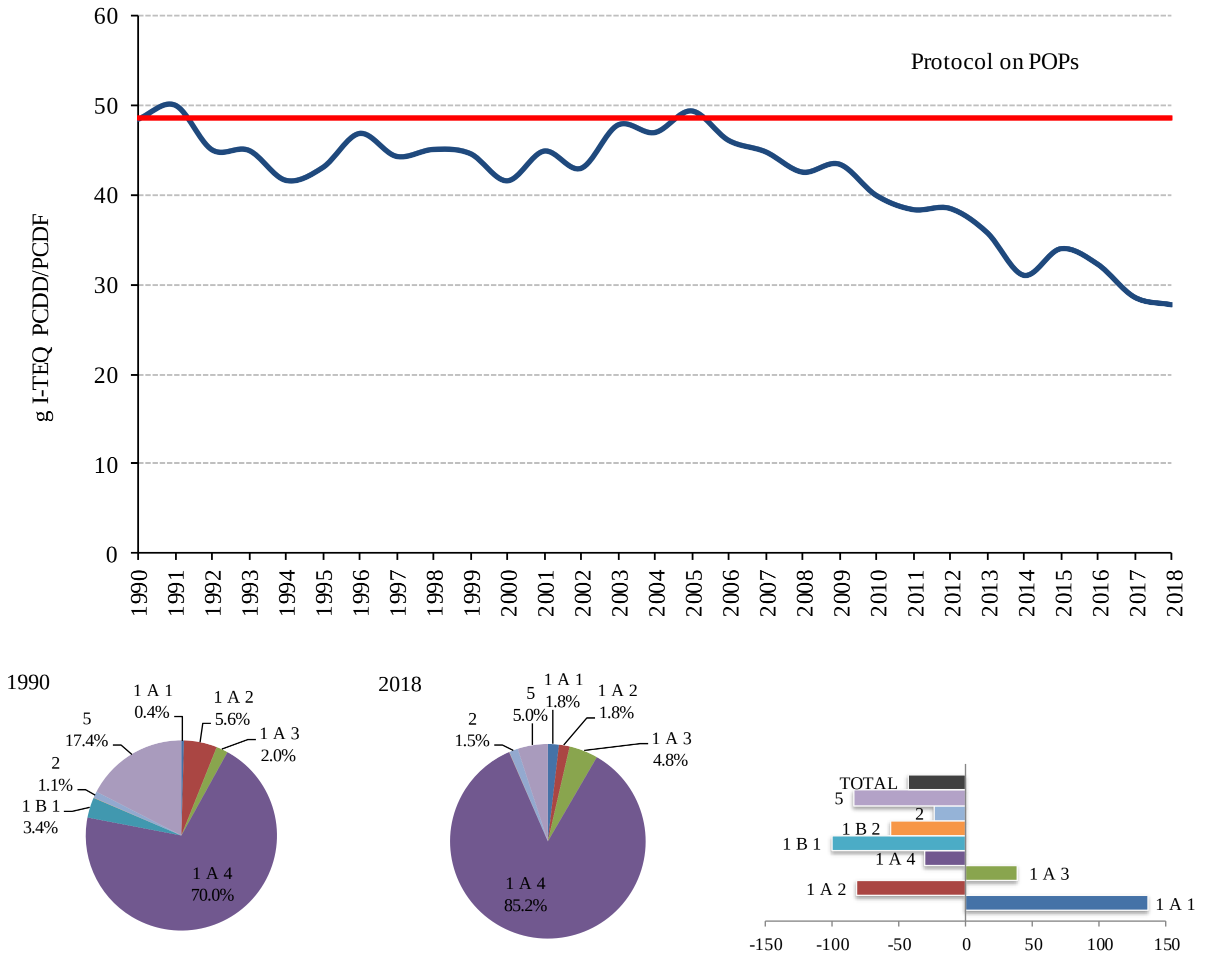


Figure 3.10.1-1 The PCDD/PCDF emissions (g I-TEQ/yr.) and percentage share by sector and variation in PCDD/PCDF emissions

Table 3.10.1-1 The PCDD/PCDF emissions by SNAP nomenclature in the period 1990-2018

PCDD/ PCDF											
SNAP	1	2	3	4	5	6	7	8	9	10	Total
Unit	g I-TEQ	g I-TEQ	g I-TEQ	g I-TEQ	g I-TEQ	g I-TEQ	g I-TEQ	g I-TEQ	g I-TEQ	g I-TEQ	g I-TEQ
1990	0.21	34.0	2.7	2.22	NA	NA	0.60	0.36	8.4	0.5	49.1
1991	0.16	37.9	1.9	1.75	NA	NA	0.47	0.26	7.6	0.5	50.6
1992	0.22	32.2	1.3	1.54	NA	NA	0.46	0.30	9.1	0.3	45.4
1993	0.18	34.0	1.0	1.51	NA	NA	0.49	0.23	7.6	0.3	45.4
1994	0.25	30.7	1.0	1.04	NA	NA	0.53	0.15	8.1	0.3	42.0
1995	0.23	32.4	1.0	0.15	NA	NA	0.60	0.19	8.6	0.3	43.4
1996	0.14	36.3	0.8	0.15	NA	NA	0.64	0.25	8.6	0.3	47.2
1997	0.23	33.4	0.9	0.22	NA	NA	0.72	0.21	8.7	0.3	44.7
1998	0.21	33.7	0.7	0.33	NA	NA	0.76	0.21	9.2	0.4	45.5
1999	0.21	33.2	0.5	0.25	NA	NA	0.81	0.21	9.4	0.3	45.0
2000	0.24	29.6	0.7	0.24	NA	NA	0.83	0.21	9.9	0.3	42.0
2001	0.27	32.5	0.6	0.19	NA	NA	0.83	0.21	10.3	0.3	45.3
2002	0.31	31.2	0.6	0.12	NA	NA	0.86	0.23	9.7	0.3	43.4
2003	0.35	36.1	0.5	0.15	NA	NA	0.97	0.24	9.6	0.2	48.1
2004	0.30	35.2	0.6	0.28	NA	NA	1.01	0.24	9.4	0.3	47.4
2005	0.32	37.4	0.5	0.25	NA	NA	1.08	0.26	9.6	0.3	49.7
2006	0.30	33.5	0.6	0.26	NA	NA	1.17	0.27	10.0	0.4	46.5
2007	0.32	31.5	0.7	0.25	NA	NA	1.28	0.28	10.6	0.3	45.2

PCDD/ PCDF											
SNAP	1	2	3	4	5	6	7	8	9	10	Total
Unit	g I-TEQ	g I-TEQ	g I-TEQ	g I-TEQ	g I-TEQ	g I-TEQ	g I-TEQ	g I-TEQ	g I-TEQ	g I-TEQ	g I-TEQ
2008	0.32	30.8	0.5	0.44	NA	NA	1.23	0.33	9.0	0.4	43.0
2009	0.26	31.3	0.5	0.16	NA	NA	1.22	0.37	9.6	0.4	43.9
2010	0.28	32.9	0.8	0.33	NA	NA	1.15	0.28	4.3	0.3	40.3
2011	0.34	31.2	0.6	0.30	NA	NA	1.11	0.29	4.6	0.3	38.8
2012	0.31	30.3	0.6	0.02	NA	NA	1.06	0.27	5.9	0.4	38.9
2013	0.33	29.3	0.6	0.35	NA	NA	1.00	0.31	3.9	0.4	36.3
2014	0.32	25.1	0.5	0.45	NA	NA	0.99	0.34	3.4	0.3	31.4
2015	0.36	27.9	0.5	0.38	NA	NA	1.03	0.33	3.6	0.3	34.4
2016	0.5	26.3	0.5	0.01	NA	NA	1.05	0.34	3.7	0.4	32.8
2017	0.4	24.7	0.5	0.03	NA	NA	1.06	0.36	1.6	0.3	29.0
2018	0.5	23.7	0.5	0.42	NA	NA	0.94	0.38	1.4	0.4	28.2
2018 vs 1990	136.5%	-30.3%	-81.8%	-81.2%	NA	NA	57.6%	6.2%	-83.5%	-33.6%	-42.6%
2018 vs 2017	32.2%	-4.1%	-4.4%	1526.3%	NA	NA	-10.6%	6.5%	-15.3%	5.7%	-2.9%

3.10.2. Polycyclic aromatic hydrocarbons (PAHs)

There are more than 100 of different polycyclic aromatic hydrocarbons, and annual emission report is provided for four of them as follows: benzo (a) pyrene, benzo (b) fluoranthene, benzo (k) fluoranthene, indeno (1,2,3-cd) pyrene. The four PAHs are those defined by the Aarhus protocol. Emission of PAHs by sectors is presented in Figure 3.10.2-1 and Table 3.10.2-1.

Emissions of PAHs were amounted to 14.0 t in 2018, and have declined by 35.8 % since 1990. The reduction in PAHs emission in 1991 and 1992 has occurred due to decrease in coal consumption in residential sector and also because of stopping the processes of primary aluminium production (with Söderberg anodes) in Šibenik in 1992, pig iron production (blast furnace charging) in Sisak and Split in 1992, and coke production in Bakar in 1994. All previously mentioned happened as a result of the war for Croatian independence (1991 - 1995). A reduction since 2005 is a result of gradual replacement of certain percentage of traditional domestic stoves and manual single house boilers with advanced/ecolabelled stoves and boilers, high efficiency stoves and boilers and pellet stoves and boilers (see Table 4.5-1, Figure 4.5-2). In addition, emission dips can be seen in the years 1994, 2000, 2002 and 2014 when, due to the warmer winter, the consumption of biomass for heating was lower (Figure 4.5-3).

Croatia has the obligation toward the Protocol on POPs to keep the overall PAHs emission beyond the value in base year (1990). Croatia in 2018 fulfils the obligation towards the Protocol on POPs.

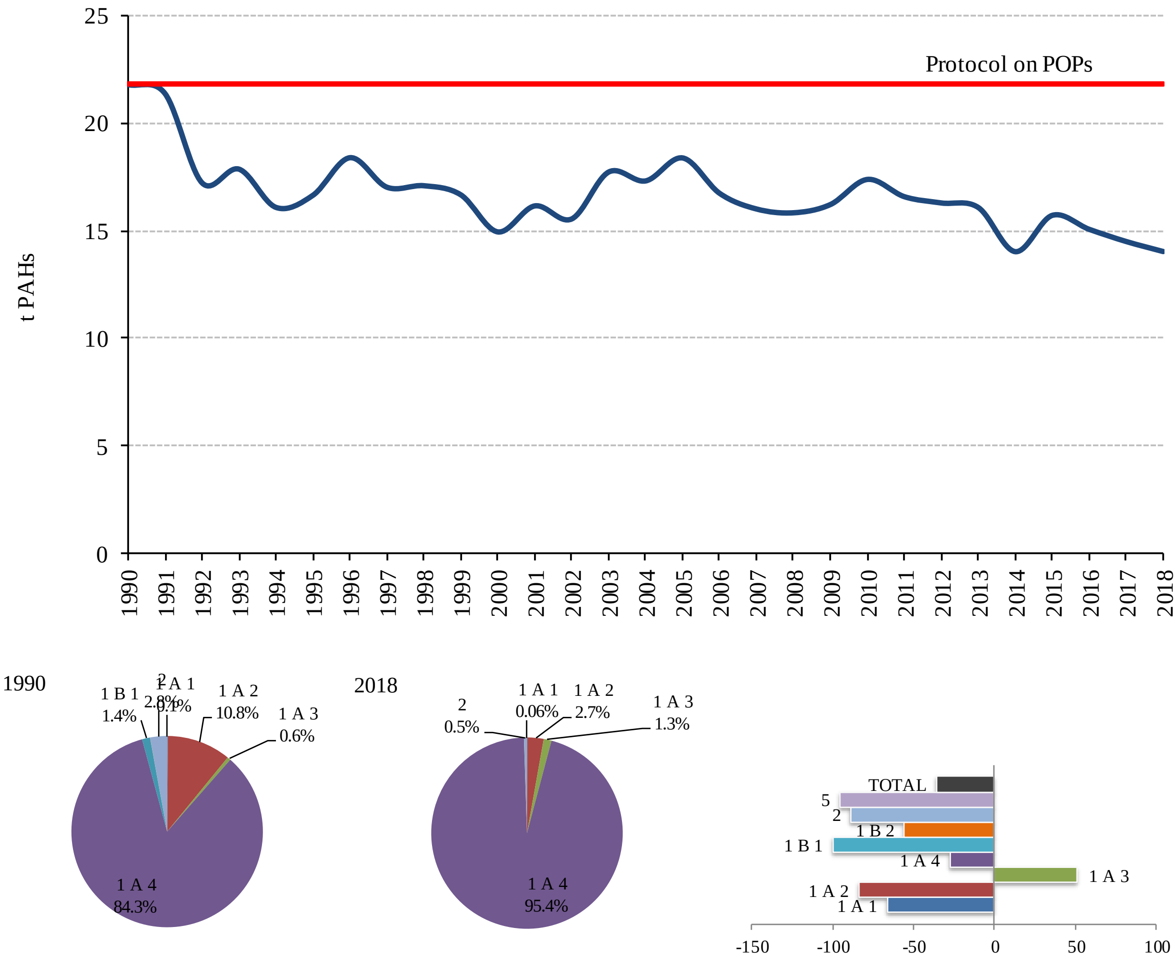


Figure 3.10.2-1 The PAHs emissions (kg/yr.), percentage share by sector and variation in PAHs emissions

Table 3.10.2-1 PAHs emissions by SNAP nomenclature in the period 1990-2018

PAH											
SNAP	1	2	3	4	5	6	7	8	9	10	Total
Unit	t	t	t	t	t	t	t	t	t	t	t
1990	0.026	18.36	2.34	0.92	NA	0.0039	0.07	8.5E-02	1.0E-05	0.0025	21.80
1991	0.019	19.25	1.63	0.37	NA	0.0031	0.05	4.0E-02	8.6E-06	0.0024	21.38
1992	0.025	15.71	1.13	0.27	NA	0.0038	0.05	1.7E-02	8.3E-06	0.0012	17.20
1993	0.023	16.51	0.97	0.26	NA	0.0034	0.06	2.0E-02	8.8E-06	0.0016	17.85
1994	0.045	14.78	0.96	0.18	NA	0.0025	0.06	3.1E-02	8.8E-06	0.0014	16.06
1995	0.025	15.54	0.93	NA	NA	0.0039	0.06	2.8E-02	9.7E-06	0.0015	16.62
1996	0.020	17.38	0.85	NA	NA	0.0040	0.07	3.1E-02	9.2E-06	0.0014	18.38
1997	0.025	15.95	0.88	NA	NA	0.0038	0.08	2.9E-02	2.5E-05	0.0015	17.00
1998	0.033	16.14	0.73	NA	NA	0.0040	0.08	3.3E-02	4.8E-05	0.0018	17.07
1999	0.034	15.89	0.56	NA	NA	0.0046	0.08	3.2E-02	5.6E-05	0.0014	16.64
2000	0.015	14.10	0.63	NA	NA	0.0040	0.09	3.5E-02	7.8E-05	0.0014	14.91
2001	0.019	15.34	0.60	NA	NA	0.0050	0.09	3.6E-02	8.4E-05	0.0015	16.13
2002	0.019	14.75	0.60	NA	NA	0.0054	0.09	3.5E-02	4.8E-05	0.0016	15.52
2003	0.027	17.03	0.47	NA	NA	0.0361	0.11	3.6E-02	1.2E-05	0.0010	17.74
2004	0.014	16.52	0.56	NA	NA	0.2378	0.11	3.7E-02	6.3E-06	0.0015	17.53
2005	0.017	17.59	0.55	NA	NA	0.1437	0.12	4.0E-02	3.9E-06	0.0013	18.51
2006	0.017	15.92	0.56	NA	NA	0.2385	0.13	4.3E-02	1.1E-05	0.0016	16.95
2007	0.018	15.09	0.64	NA	NA	0.2170	0.14	4.5E-02	9.9E-06	0.0015	16.19
2008	0.017	14.99	0.53	NA	NA	0.2482	0.14	5.0E-02	1.0E-05	0.0017	16.05
2009	0.018	15.43	0.53	NA	NA	0.2518	0.14	4.4E-02	4.3E-06	0.0017	16.44

PAH											
SNAP	1	2	3	4	5	6	7	8	9	10	Total
Unit	t	t	t	t	t	t	t	t	t	t	t
2010	0.005	16.46	0.66	NA	NA	0.1551	0.13	4.3E-02	2.1E-06	0.0014	17.51
2011	0.007	15.83	0.49	NA	NA	0.1289	0.13	4.2E-02	2.7E-06	0.0015	16.68
2012	0.006	15.60	0.48	NA	NA	0.0819	0.13	4.0E-02	3.0E-06	0.0017	16.34
2013	0.003	15.34	0.47	NA	NA	0.1092	0.13	4.0E-02	2.9E-06	0.0017	16.15
2014	0.003	13.33	0.41	NA	NA	0.0103	0.13	4.0E-02	3.1E-06	0.0013	13.99
2015	0.005	15.06	0.37	NA	NA	0.0036	0.14	4.1E-02	3.7E-06	0.0016	15.68
2016	0.005	14.45	0.37	NA	NA	0.0028	0.15	4.2E-02	4.3E-06	0.0020	15.03
2017	0.006	13.84	0.40	NA	NA	0.0039	0.17	4.6E-02	2.5E-06	0.0016	14.46
2018	0.009	13.33	0.38	NA	NA	0.0045	0.16	5.0E-02	2.8E-06	0.0017	13.99
2018 vs 1990	-66.1%	-27.4%	-84.0%	NA	NA	16.7%	142.3%	-41.6%	-72.4%	-33.6%	-35.8%
2018 vs 2017	36.7%	-3.7%	-5.8%	NA	NA	16.0%	-4.7%	8.8%	9.4%	5.7%	-3.2%

3.10.3. Hexachlorobenzene (HCB)

Hexachlorobenzene (HCB) is an industrial chemical but is also an integral part of solid fossil fuels and biomass. HCB emission is mainly originate from the use of pesticides in agriculture and forest sector, where HCB is present as a contaminant. According to the Pesticide Leaching Model (PELMO 3.31; Ferrari et al., 2005), all the HCB present as a contaminant will be volatilised. In addition to the use of pesticides, HCB emission occurs from biomass and solid fuel combustion and in minor extent from waste incineration, if it exists in the county.

The HCB emission in 2018 has amounted to 0.56 t (Figure and Table 3.10.3-1). In comparison to 1990, HCB emission has decreased by 92 %, due to the reduction in pesticide use, which is a key source of HCB emission (96.1% in 1990 and 47.3 % in 2018). Public electricity and heat production sector (in particularly, thermal power plants on coal) is the sector with increasing influence in HCB emission over time (0.1% in 1990 and 7.6% in 2018).

An increase in HCB emission, especially in the period 1990-2002, when pesticides with high levels of HCB contamination in active substances were used in Croatia, which have recently been banned. The Republic of Croatia has been reporting in a historical trend HCB emissions from the active substances of the following pesticides: Lindan, Atrazine, Simazin, Pichloram, Chlortalonil and Propazine. In past inventories, the key source of HCB emissions throughout the observed trend was the combustion of biomass in NFR category 1.A.4.b. and Small combustion - residential. In this year's inventory, the only key source in the 1990s is the NFR emissions category 3.D.f. Use of pesticides in agriculture and forest, and in recent years HCB emission has been contributed equally by small combustion appliance and the use of pesticides as two key emission sources.

The Republic of Croatia has the obligation toward the Protocol on POPs to keep the overall HCB emission beyond the value in base year 1990. In 2018, this obligation was fulfilled.

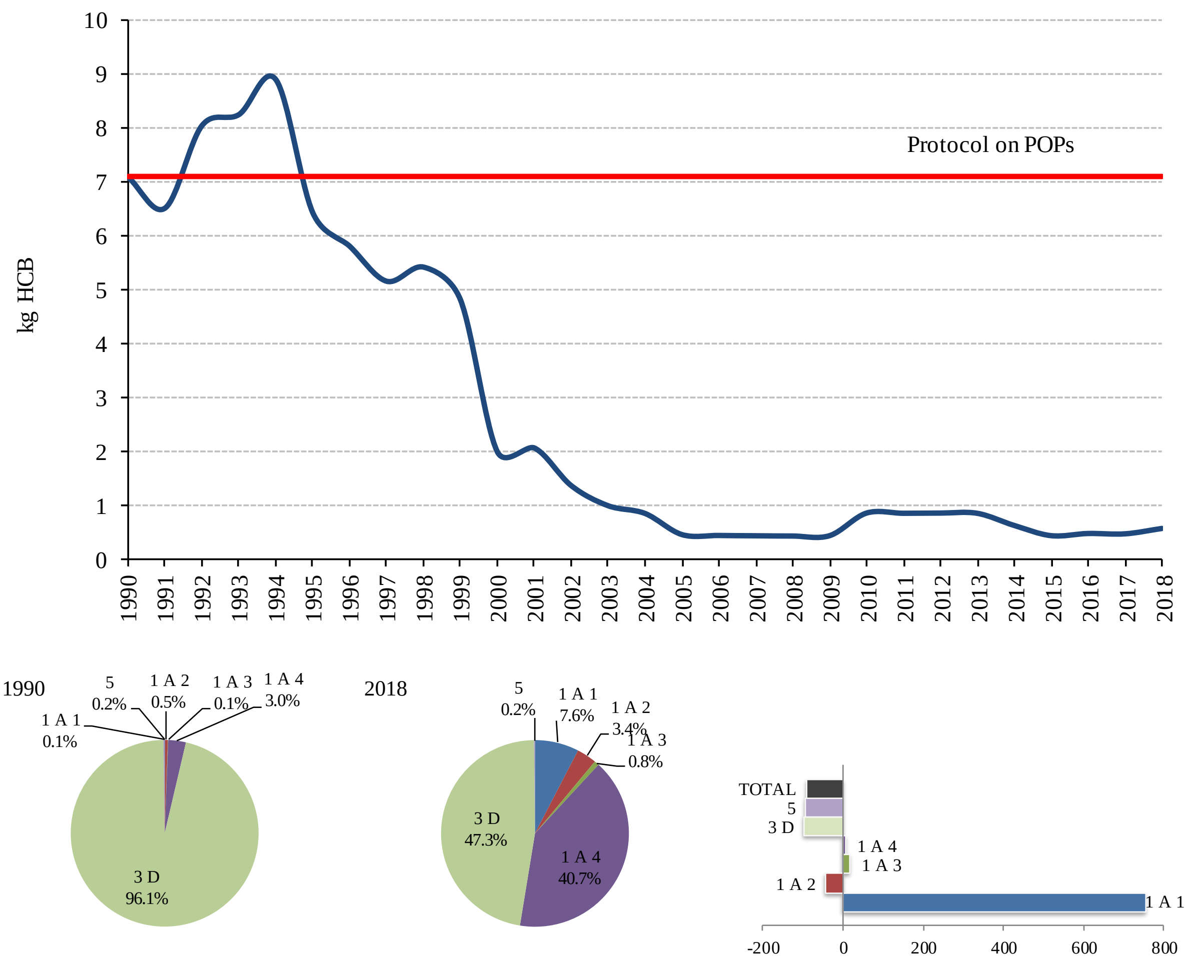


Figure 3.10.3-1 The HCB emission (kg/yr.), percentage share by sector and variation in HCB emissions

Table 3.10.3-1 The HCB emission by SNAP nomenclature in the period 1990-2018

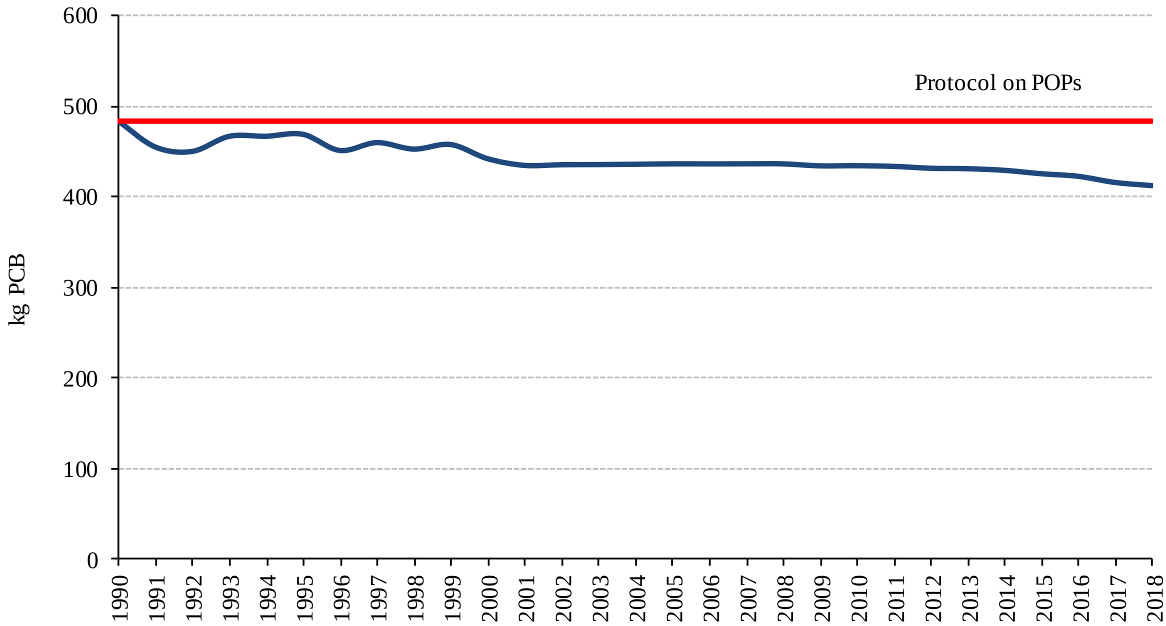
HCB											
SNAP	1	2	3	4	5	6	7	8	9	10	Total
Unit	kg	kg	kg	kg	kg	kg	kg	kg	kg	kg	kg
1990	0,005	0,22	0,034	NA	NA	NA	4.3E-04	3,5E-03	0,0147	6,82	7,09
1991	0,004	0,25	0,027	NA	NA	NA	3.2E-04	2,8E-03	0,0148	6,22	6,52
1992	0,005	0,22	0,024	NA	NA	NA	2.9E-04	4,2E-03	0,0148	7,78	8,05
1993	0,004	0,23	0,022	NA	NA	NA	2.9E-04	3,7E-03	0,0149	7,98	8,26
1994	0,003	0,21	0,021	NA	NA	NA	3.1E-04	1,6E-03	0,0150	8,65	8,91
1995	0,005	0,22	0,020	NA	NA	NA	3.4E-04	2,7E-03	0,0150	6,17	6,43
1996	0,004	0,25	0,020	NA	NA	NA	3.7E-04	4,6E-03	0,0150	5,52	5,81
1997	0,006	0,23	0,024	NA	NA	NA	4.3E-04	3,6E-03	0,0166	4,88	5,16
1998	0,006	0,23	0,024	NA	NA	NA	4.8E-04	2,5E-03	0,0188	5,14	5,42
1999	0,006	0,23	0,022	NA	NA	NA	5.2E-04	2,3E-03	0,0196	4,54	4,81
2000	0,010	0,20	0,024	NA	NA	NA	5.4E-04	2,2E-03	0,0219	1,73	1,99
2001	0,011	0,22	0,024	NA	NA	NA	5.4E-04	2,5E-03	0,0239	1,78	2,06
2002	0,013	0,21	0,024	NA	NA	NA	5.8E-04	3,2E-03	0,0207	1,09	1,36
2003	0,014	0,24	0,025	NA	NA	NA	6.7E-04	3,2E-03	0,0176	0,68	0,99
2004	0,013	0,24	0,027	NA	NA	NA	7.2E-04	2,3E-03	0,0181	0,54	0,84
2005	0,014	0,25	0,026	NA	NA	NA	8.0E-04	2,5E-03	0,0181	0,14	0,45
2006	0,013	0,23	0,029	NA	NA	NA	9.0E-04	2,6E-03	0,0193	0,14	0,43
2007	0,014	0,22	0,028	NA	NA	NA	1.0E-03	2,7E-03	0,0211	0,14	0,43
2008	0,014	0,22	0,026	NA	NA	NA	1.0E-03	3,4E-03	0,0171	0,14	0,42
2009	0,010	0,23	0,025	NA	NA	NA	1.0E-03	3,7E-03	0,0191	0,14	0,43

HCB											
SNAP	1	2	3	4	5	6	7	8	9	10	Total
Unit	kg	kg	kg	kg	kg	kg	kg	kg	kg	kg	kg
2010	0,014	0,25	0,025	NA	NA	NA	9.9E-04	3,1E-03	0,0061	0,55	0,85
2011	0,019	0,24	0,021	NA	NA	NA	9.7E-04	3,1E-03	0,0064	0,55	0,85
2012	0,018	0,24	0,023	NA	NA	NA	9.5E-04	2,9E-03	0,0100	0,55	0,85
2013	0,020	0,24	0,023	NA	NA	NA	9.0E-04	3,1E-03	0,0055	0,55	0,85
2014	0,020	0,21	0,020	NA	NA	NA	9.0E-04	3,4E-03	0,0058	0,36	0,62
2015	0,025	0,24	0,018	NA	NA	NA	9.5E-04	3,3E-03	0,0060	0,13	0,43
2016	0,034	0,24	0,015	NA	NA	NA	9.7E-04	3,3E-03	0,0063	0,17	0,47
2017	0,029	0,23	0,019	NA	NA	NA	9.8E-04	3,5E-03	0,0008	0,18	0,46
2018	0,043	0,23	0,019	NA	NA	NA	8.9E-04	3,8E-03	0,0010	0,27	0,56
2018 vs 1990	754,0%	6,4%	- 42,6%	NA	NA	NA	106.7%	7,1%	-93,4%	-96,1%	- 92,1%
2018 vs 2017	45,1%	- 0,3%	-0,7%	NA	NA	NA	-10.0%	6,5%	17,2%	48,5%	21,5%

3.10.4. Polychlorinated biphenyls (PCBs)

Polychlorinated biphenyls (PCBs) are industrial chemicals. The dominant source of PCBs emission is consumption of POPs and heavy metals sector (NFR 2.K), activity in the scope of industrial processes and product use sector. Other sectors steel production (2.C.1), the clinical waste incineration (6.C.a) and fuel combustion have minor contribution in total PCBs emission in Croatia.

Emission of PCBs in 2018 was estimated to about 411.8 kg (Figure and Table 3.10.4-1). A key source in overall trend, consumption of POPs and heavy metals sector includes PCBs emission from the refrigeration and air conditioning equipment using halocarbons (SNAP 060502), the foam blowing (SNAP 060504 except 060304) and the electrical equipment (SNAP 060507 except 060203). This source has contributed with 99.4 % to national PCBs emission in 2018. Changes in PCBs emission are minimal and are directly depending on the population Figure in Croatia, since the emission from a key source is based on the number of inhabitants of the Republic of Croatia, which has slight downward trend.



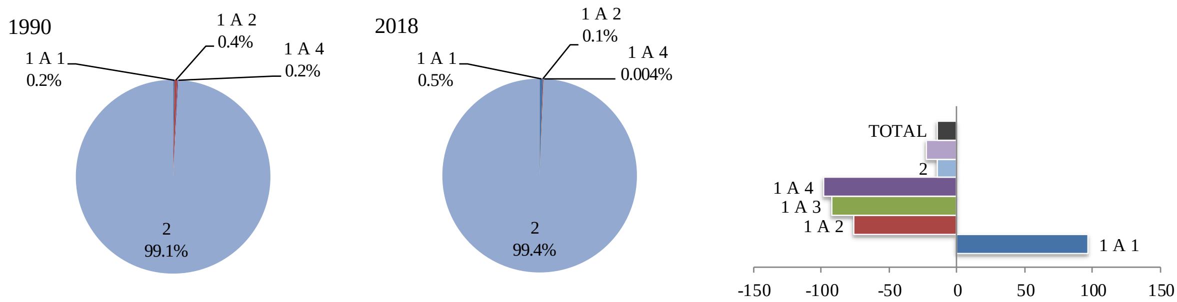


Figure 3.10.4-1 The PCBs emission (kg/yr.), percentage share by sector and variation in PCBs emissions

Table 3.10.4-1 The PCBs emissions by SNAP nomenclature in the period 1990-2018

PCBs											
SNAP	1	2	3	4	5	6	7	8	9	10	Total
Unit	kg	kg	kg	kg	kg	kg	kg	kg	kg	kg	kg
1990	1.1	0.91	2.1	0.85	NA	477.8	NA	4.0E-02	3.4E-03	NA	482.8
1991	0.8	0.47	1.4	0.35	NA	451.3	NA	1.7E-02	3.5E-03	NA	454.3
1992	1.1	0.14	0.9	0.25	NA	447.0	NA	7.3E-03	3.7E-03	NA	449.4
1993	0.8	0.20	0.7	0.19	NA	464.1	NA	7.7E-03	3.9E-03	NA	466.0
1994	0.2	0.10	0.8	0.16	NA	464.9	NA	1.5E-03	4.0E-03	NA	466.1
1995	0.4	0.09	0.7	0.11	NA	466.9	NA	4.9E-03	4.1E-03	NA	468.2
1996	0.2	0.10	0.6	0.11	NA	449.4	NA	1.1E-02	4.2E-03	NA	450.5
1997	1.0	0.09	0.6	0.17	NA	457.3	NA	7.9E-03	4.2E-03	NA	459.1
1998	1.0	0.13	0.5	0.26	NA	450.1	NA	3.4E-03	4.2E-03	NA	452.0
1999	0.9	0.11	0.4	0.19	NA	455.4	NA	2.8E-03	4.1E-03	NA	457.0
2000	2.5	0.10	0.6	0.17	NA	438.1	NA	2.3E-03	4.1E-03	NA	441.4
2001	2.8	0.06	0.6	0.14	NA	430.5	NA	3.4E-03	4.3E-03	NA	434.1
2002	3.5	0.08	0.6	0.08	NA	430.5	NA	5.8E-03	4.5E-03	NA	434.8
2003	3.7	0.10	0.4	0.10	NA	430.6	NA	5.5E-03	4.6E-03	NA	435.0
2004	3.4	0.06	0.5	0.22	NA	431.1	NA	1.7E-03	4.9E-03	NA	435.3
2005	3.7	0.07	0.5	0.18	NA	431.2	NA	1.9E-03	5.0E-03	NA	435.7
2006	3.5	0.06	0.6	0.20	NA	431.4	NA	1.9E-03	5.2E-03	NA	435.7
2007	3.7	0.03	0.6	0.19	NA	431.2	NA	2.0E-03	5.7E-03	NA	435.8
2008	3.9	0.04	0.5	0.35	NA	431.0	NA	3.2E-03	4.9E-03	NA	435.7
2009	2.7	0.03	0.5	0.12	NA	430.3	NA	2.9E-03	5.4E-03	NA	433.6
2010	3.7	0.05	0.7	0.26	NA	429.0	NA	3.2E-03	2.9E-03	NA	433.7
2011	4.1	0.04	0.5	0.24	NA	428.1	NA	3.1E-03	2.9E-03	NA	433.0
2012	3.6	0.04	0.5	0.00	NA	426.8	NA	3.1E-03	3.7E-03	NA	430.9
2013	4.0	0.03	0.6	0.28	NA	425.6	NA	2.3E-03	2.8E-03	NA	430.4
2014	3.9	0.02	0.5	0.37	NA	423.8	NA	2.5E-03	3.0E-03	NA	428.6
2015	3.7	0.02	0.5	0.30	NA	420.4	NA	2.4E-03	3.2E-03	NA	424.9
2016	4.1	0.02	0.5	0.00	NA	417.4	NA	2.5E-03	3.2E-03	NA	422.1
2017	2.3	0.02	0.5	0.01	NA	412.5	NA	2.6E-03	2.3E-03	NA	415.3
2018	2.1	0.02	0.5	0.34	NA	408.8	NA	2.8E-03	2.6E-03	NA	411.8
2018 vs 1990	96.9%	- 98.2%	- 75.8%	-59.9%	NA	-14.4%	NA	-93.0%	-22.3%	NA	- 14.7%
2018 vs 2017	-5.6%	- 28.9%	-6.1%	3421.1%	NA	-0.9%	NA	6.5%	17.2%	NA	-0.8%

4. Energy (NFR 1)

Sector 1 Energy considers emissions originating from fuel combustion activities (NFR 1.A) and fugitive emissions from fuels (NFR 1.B). Following energy activities are reported in Croatian inventory:

- 1.A.1 Energy Industries
    - 1.A.1.a Public electricity and heat production
    - 1.A.1.b Petroleum refining
    - 1.A.1.c Manufacture of solid fuel and other energy industries
- 1.A.2 Manufacturing industries and construction
    - 1.A.2.a Iron and steel
    - 1.A.2.b Non-ferrous metals
    - 1.A.2.c Chemicals
    - 1.A.2.d Pulp, paper and print
    - 1.A.2.e Food processing, beverages and tobacco
    - 1.A.2.f Non-metallic minerals
    - 1.A.2.g.vii Mobile Combustion in manufacturing industries and construction
- 1.A.3 Transport
    - 1.A.3.a Aviation (civil)
        - 1.A.3.a.i (i) International aviation LTO (civil)
        - 1.A.3.a.ii (i) Domestic aviation LTO (civil)
        - Memo item: 1.A.3.a.i (ii) International aviation cruise (civil)
        - Memo item: 1.A.3.a.ii (ii) Domestic aviation cruise (civil)
    - 1.A.3.b Road transport
        - 1.A.3.b.i Road transport: Passenger cars
        - 1.A.3.b.ii Road transport: Light duty vehicles
        - 1.A.3.b.iii Road transport: Heavy duty vehicles
        - 1.A.3.b.iv Road transport: Mopeds & motorcycles
        - 1.A.3.b.v Road transport: Gasoline evaporation
        - 1.A.3.b.vi Road transport: Automobile tyre and brake wear
        - 1.A.3.b.vii Road transport: Automobile road abrasion
    - 1.A.3.c Railways
    - 1.A.3.d Navigation (shipping)
        - 1.A.3.d.ii National navigation (shipping)
        - 1.A.3.d.i(ii) International inland waterways
        - Memo item: 1.A.3.d.i(i) International maritime navigation
    - 1.A.3.e.i Pipeline transport

- 1.A.4 i Small combustion
    - 1.A.4.a.i Commercial / institutional
    - 1.A.4.b.i Residential
    - 1.A.4.c.i Agriculture/Forestry/Fishing
- 1.A.4 ii Non-road mobile source and machinery
    - 1.A.4.a.ii Commercial / institutional: Mobile
    - 1.A.4.b.ii Residential: Mobile
    - 1.A.4.c.ii Agriculture/Forestry/Fishing: Off-road vehicles and other machinery
    - 1.A.4.c.iiiAgriculture/Forestry/Fishing: National fishing
- 1.A.5 Other (including military)
    - 1.A.5.a Other stationary (including military)
    - 1.A.5.b Other, Mobile (including military, land based and recreational boats)
- 1.B.1 Fugitive emissions from solid fuel
    - 1.B.1.a Coal mining and handling
    - 1.B.1.b Solid fuel transformation
    - 1.B.1.c Other fugitive emissions from solid fuel
- 1.B.2 Fugitive emissions from oil and natural gas
    - 1.B.2.a.i Oil - Exploration, production, transport
    - 1.B.2.b Natural gas - Exploration, production, transport
    - 1.B.2.a.iv Refining, storage
    - 1.B.2.a.v Distribution of oil products
    - 1.B.2.c Venting and flaring
    - 1.B.2.d Other fugitive emissions from energy production

For emissions that occur in sector 1.A.3.d.i(ii) International inland waterways Croatia is using notation key “IE” and those emissions are included in the memo item: 1.A.3.d.i(i) International maritime navigation.

For emissions that occur in sector 1.A.3.e i Pipeline transport Croatia is using notation key “NO”.

For emissions that occur in sector 1.A.4.c.iii Agriculture/Forestry/Fishing: National fishing Croatia is using notation key “IE” and those emissions are included in NFR 1.A.3.d.ii (based on total amount of fuel for national navigation, maritime and river transport).

Emissions that occur in sector 1.A.5.a are included in NFR code 1.A.4.a Combustion in commercial and institutional plants. Emissions that occur in sector 1.A.5.b Other, Mobile (including military, land based and recreational boats) are for military noted as confidential, and for land based and recreational boats are included in NFR codes 1.A.4.a.i and 1.A.3.b (i-iv).

4.1. Fuel combustion (NFR 1.A)

This chapter gives an overview of source categories included the scope of NFR code 1.A. Fuel combustion and their contributions in fuel consumption in Croatia. The overview is given for the non-transport sectors (stationary and non-road mobile sources) and for transport sectors. Non-transport sectors includes following source categories: 1.A.1 Energy Industries, 1.A.2 Manufacturing industries and construction, 1.A.4 Small combustion and Non-road mobile source and machinery. Transport sector includes following source categories: 1.A.3.a Aviation (civil), 1.A.3.b Road transport, 1.A.3.c Railways and 1.A.3.d Navigation (shipping).

In Croatia the domination regarding the fuel consumption in 2018, has source category 1.A.4 Small combustion (Figure 4.1-1), which has recorded the smallest decrease of fuel consumption (-3 % since 1990).

Categories 1.A.1 Energy Industries and 1.A.2 Manufacturing Industries and Construction have recorded significantly larger reduction in fuel consumption (as fallow: -45.3% and 51% since 1990). Regarding year before, all categories recorded a decrease in energy consumption as follows: 1.A.1 by 6.8%, 1.A.4 by 1.5% and 1.A.2 by 2.1%.

The greatest reduction in fuel consumption was in 1991, caused by the war for Croatian independences (1991 – 1995).

In the recent past, after 2007 fuel consumption started with continuous decreasing trend due to the economic crisis that is still continuing in Croatia.

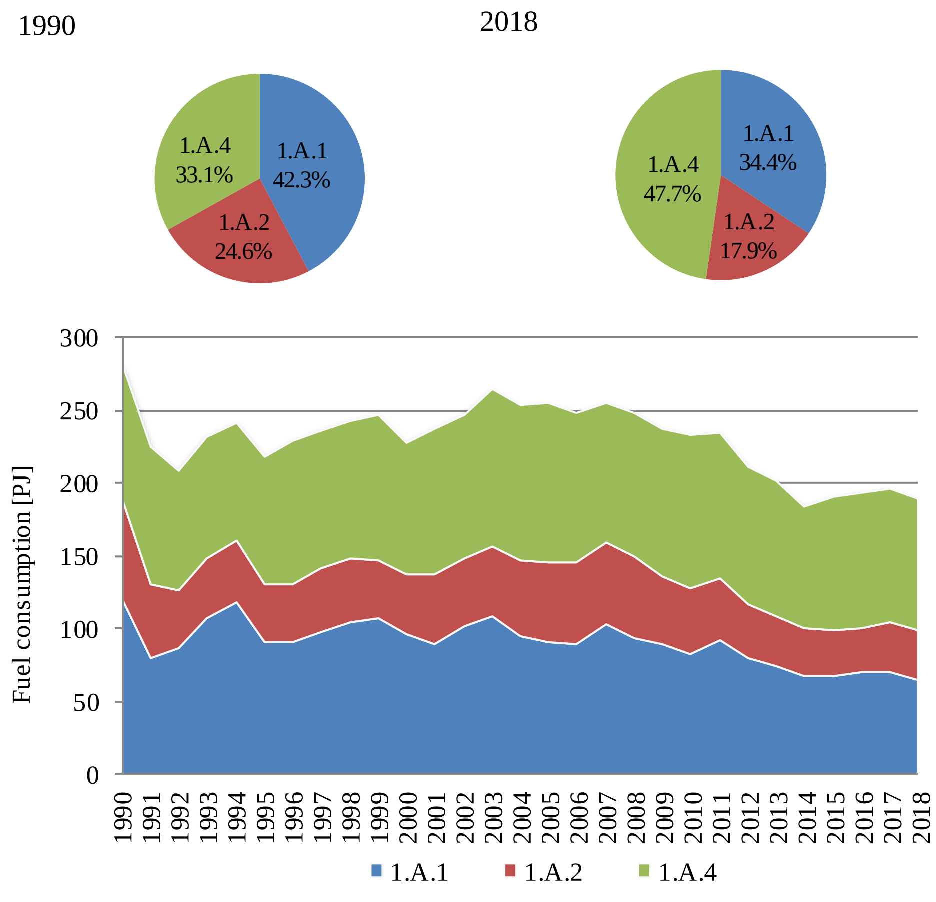


Figure 4.1-1 Activity data on fuel consumption for NFR codes 1.A.1, 1.A.2, 1.A.4

The structure of fuel consumption by type in Croatia is presented in Figure 4.1-2. Overall fuel consumption for the observed sectors in the period 1990 - 2018 has decreased by 32.7 %. The consumption of liquid fuel has reduced by 68.6 %, gaseous fuel by 2 %, solid fuel by 43.5 %, while the biomass consumption has increased by 25.1 %. Consumption of other fuels has been recorded in 1.A.4 since 2007 and is still negligible at the national level (0.15% of total fuel consumption in 1.A).

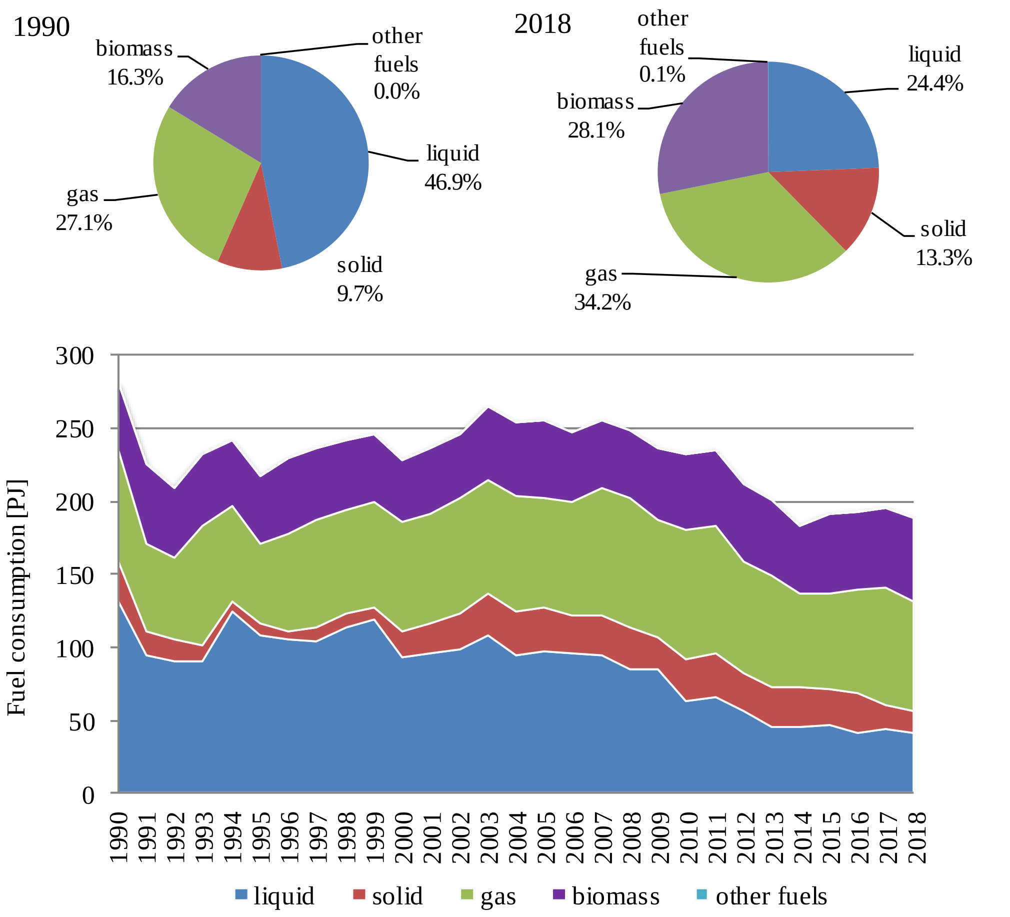


Figure 4.1-2 Activity data on fuel consumption by type for NFR codes 1.A.1, 1.A.2, 1.A.4

The source category 1.A.3 Transport includes fuel combustion in road transport, civil aviation, railways and navigation. The dominant NFR sector regarding fuel consumption in observed period was 1.A.3.b Road transport (Figure 4.1-3).

Road transport has contributed to overall transport fuel consumption in 2018 with 95.5%, and has recorded an increase since 1990 by 70.4%.

The 1.A.3.a Aviation (LTO) has contributed with 1.5% to overall fuel consumption in transport sector in 2018, and has recorded an increase since 1990 by 10.8%.

The 1.A.3.c Railways has contributed with 0.7% to overall transport fuel consumption in 2018, and has recorded a decrease by 65.5% since 1990.

The 1.A.3.d Navigation has contributed with 2.3 % to overall transport fuel consumption in 2018 and has recorded an increase by 15.7 % in comparison to 1990 (Figure 4.1-3).

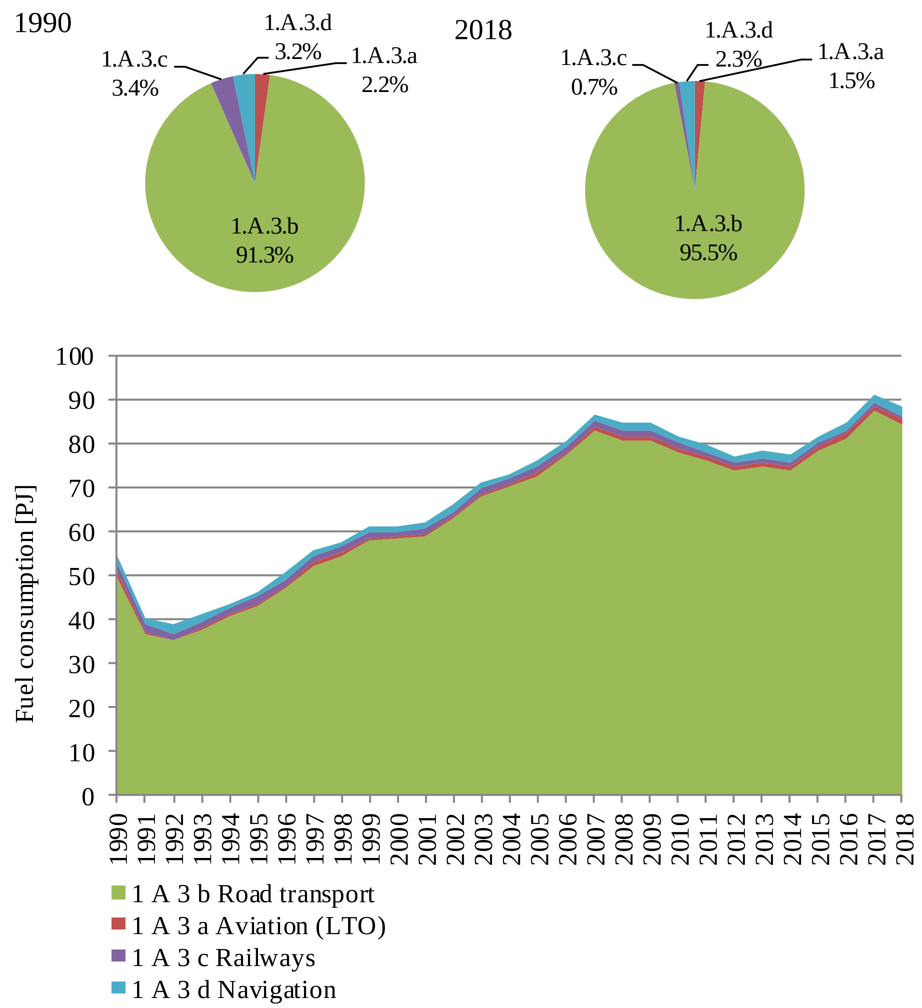


Figure 4.1-3 Consumption and percentage share for fossil fuel by types in 1.A.3 Transport

4.2. Energy industries (NFR 1.A.1)

This chapter gives an overview of source category 1.A.1 Energy industries and it includes information on methodologies, activity data, emission factors and planned improvements.

Source category description

This source category comprises emission from fuel combustion in public electricity and heat production plants (NFR 1.A.1.a), petroleum refining plants (NFR 1.A.1.b), solid transformation plants, oil and gas extraction and coal mining (NFR 1.A.1.c).

Public Electricity and Heat Production (NFR 1.A.1.a)

The source category NFR 1.A.1.a Public electricity and heat production takes into account consumption of fossil fuel from eight LPSs owned by legal entity HEP-Production Ltd, HEP Group. In public electricity and heat production sector the following types of plants are distinguished in Croatia:

- Thermal Power Plants (TPPs), which produce only electricity;

- Public Cogeneration Plants (PCPs), which produce combined heat and electricity;
- Public Heating Plants (PHPs), which produce only heat.

The installed electricity generating capacities in the Republic of Croatia include hydro and thermal power plants, increasing number of wind power plants and other power plants on renewable energy sources and certain number of industrial power plants.

By the end of 2018 electricity generation capacities in Croatia encompassed 17 locations with hydro power plants, 7 locations with thermal power plants, one half of the installed capacities of the nuclear power plant Krško (located in the territory of Slovenia) and large number of Renewable Energy Systems (RES) power plants. Thermal power plants are gas-fired, coal-fired and fuel oil-fired. The majority owner over the generation capacities in the Republic of Croatia is HEP group (State owned company), while private producers own RES generation capacities.

Total available capacities of all power plants in the Republic of Croatia by the end of 2018 amount to 5.000.4 MW. Out of this amount, 2.152 MW is placed in thermal power plants, 2.199,5 MW in hydro power plants, 586,3 in wind power plants, 67,7MW in solar power plants. There is also 348 MW in the nuclear unit Krško (50% of total available capacity) used for Croatian power system.

These capacities do not include generating units in other countries from which the Croatian electric power system has the right to withdraw electricity on the basis of capacity lease and share-ownership arrangements. The capacities in other countries are the following: Thermal power plant Gacko in Bosnia and Herzegovina with total installed capacity of 300 MW, coal-fired; Legal basis – shared ownership for 1/3 of capacity and power for a 25 year period and thermal power plant Obrenovac in the Republic of Serbia with installed capacity 305 MW, coal-fired; Legal basis – capacity and power lease on the basis of a credit for construction. The capacity and power from the above-mentioned facilities is not available, as the status of these facilities has not been resolved yet. The open issues regarding the agreements on investments in these facilities refer to the duration period, the way of treatment of the invested funds and what pricing methods should be applied to electricity deliveries.

Generating capacities of HPPs, TPPs and NPP Krško are presented in the Table 4.2-1.

Table 4.2-1 Generating capacities of HPPs, TPPs and NPP Krško

Facility	Available Power (MW), net output	Fuel type
HPPs	2,199.5	-
NPP Krško*	348.0	uranium oxide (UO_2)
TPP Plomin 1	105.0	coal
TPP Plomin 2**	199.0	coal
TPP Rijeka	303.0	fuel oil
CHP Sisak	623.0	fuel oil / natural gas
CHP Zagreb (east)	422.0	fuel oil / natural gas
CHP Zagreb (west)	50.0	fuel oil / natural gas / extra light oil
CPP Osijek	89.0	fuel oil / natural gas / extra light oil
KTE Jertovec	74.0	fuel oil / natural gas / extra light oil
Other biogas plants	50.6	biogas
Other biomass plants	64.8	biomass
CHP in Industry	157.3	coal / natural gas / fuel oil/ wood
Other small CHP	4.3	natural gas
Total (HE+NE+TE)	5,000.4	
* 50% of NPP Krško is owned by HEP, ** TPP Plomin 2 Ltd. (HEP and RWE Power Co-ownership – share 50% : 50%)		

Source: Energy in Croatia - 2018, Annual energy report, MEE

Petroleum Refining (NFR 1.A.1.b)

The sub-sector 1.A.1.b Petroleum refining takes into account consumption of fossil fuel from two LCPs oil refineries owned by legal entity INA- Oil industry dd. in Rijeka and Sisak, while lubricants are produced in Rijeka and Zagreb. Crude oil is produced from 33 oil fields and gas condensation products from 8 gas-condensations fields, which covers about 35 percent of the total domestic demand. In the refineries, there are two types of fuel combustion – for heating and/or cogeneration and for own use of energy for production processes. Processing capacities of the Croatian refineries are presented in the Table 4.2-2.

Table 4.2-2 Processing Capacities of Oil and Lube Refineries

Processing Capacities	Installed Capacities (1000 t/year)
Oil Refinery Rijeka (Urinj)	
atmospheric distillation	5000
reforming	730
fluidized-bed catalytic cracking (FCC)	1000
visbreaking	600
isomerization	250
hydrodesulphurization (HDS)	1040
mild hydrocracking (MHC)	560
hydrocracking	2600
Oil Refinery Sisak	
atmospheric distillation	4000
reforming	680
fluidized-bed catalytic cracking (FCC)	470
coking	270
vacuum distillation	850
bitumen	350
Lube Refinery Zagreb Ltd.	
lubricants	60

Source: Croatian NIR2019; MEE

Manufacturing of Solid Fuels and Other Energy Industries (NFR 1.A.1.c)

Sub-sector 1.A.1.c Manufacture of solid fuel and other energy industries takes into account consumption of fossil fuel in following activities: Oil and gas extraction, Coal production, Coke plant and NGL-plant. In Croatia, the coal production in the period 1990-1998 was rather low. Last coal mines in Istria were closed in 1999. Coke-oven plant in Bakar, nearby Rijeka, was closed in 1994.

Natural gas is produced from 18 Pannon exploitation fields and three exploitation areas in the Adriatic meeting 44.4 % of total domestic demand in 2018. However, when gas produced in the Adriatic that actually belongs to Croatia is included in the calculation, domestic gas amounts to 37.1 % of Croatian total gas demand. The production of gas from Pannon is somewhat larger than the production from the Adriatic Sea. Most of the Pannonian gas comes from the fields Duboka Podravina and Međimurje (Molve, Kalinovac, Gola, Vučkovec and Zebanec reservoirs). The processing and preparation of gas for transportation from these fields is carried out at the Central Gas Station Molve III. Installed production capacity of Central gas stations Molve III is 5 million m^3 per day.

Methodology, emission factors and activity data

Public Electricity and Heat Production (NFR 1.A.1.a)

Emission sources such as facilities in the scope of source category public electricity and heat production plants observed as a large point source (LPS). For LPS emissions calculation a bottom-up approach is used. Double-check with the national energy balance is always performed. Bottom up approach is used in a way that available direct emission for pollutants from the national Environmental Pollution Register (EPR) entered into CollectER database for each of facilities. According to the Ordinance on the monitoring of emissions of pollutants into air from immovable sources (OG 129/2012) all LPSs for emission monitoring have installed continuous emission measurement system (CEM). Each year this system as well as emissions are subject to inspections of verified laboratories. Methods of measurements according to the requirements of the standards in the Annex I of this Ordinance are used to measure the parameters of the waste gas and the concentrations of the substance in the waste gases. For determining emissions in waste gas, the original measured weighted concentrations are used. The CEM system algorithm is designed to calculate emissions from raw (data before validation) data. The raw measured value (concentration) is multiplied by the raw amount of flue gas. In that way, determined emissions are correct and not underestimated. Validated average values are used only for the purposes of comparison with the emission limit values prescribed by the Regulation. Validated average values are not used for emission calculation.

For emission calculation for area sources (not LPSs) Tier 1 EMEP/EEA methodology was used, with a top-down approach and based on aggregated fuel consumption from the annual national Energy balance.

Emission factors are expressed as the quantity of emissions of pollutant per GJ fuel consumed. It should be noted that emission factors are changing during the observation period due to: (I) chemical composition of each type of fuel (e.g., sulphur content in the solid and liquid fuel), (II) lower heating different values for the same type of fuel and (III) introduction of technologies to reduce emissions. For 1.A.1.a (Electricity production and Combined heat and power generation) emission factors for large-scale boiler capacity> 50 MW are used, while for 1.A.1.a (Heat plants) used the recommended FE sector 1.A.4.c.i (capacity <50 MW) of GB2019. Emission factors together with the direct emissions for 2018 are given in Appendix 4 of this report.

In the 2017 inventory review cycle the TERT notes that this under estimate may be because annual emissions are calculated based on stack measurements. When continuously measurements are used to estimate annual emissions, there is a risk that operators have misinterpreted the IED and have used validated average values (after having subtracted the value of the confidence interval). This results in an under estimated emission of up to 20-30% depending on the pollutant and the confidence limits. The recommendation of the TERT was to organize and conduct surveys among operators, and obligors of continuous measurements according to the Ordinance on the monitoring of emissions of pollutants into the air from stationary sources (OG 129/2012) who reports annual emission based on direct measurements.

As part of the inventory improvement project, the Contractor conducted surveys to HEP-Production d.o.o. which showed that all measured mass concentrations on the CEM system are used for the emission calculation. An example of a survey with a response is given below:

The type of data used to calculate the annual emissions reported to the EPR database	YES/NO
Validated mean mass concentration values (uncertainty corrected)	NO
All measured mass concentrations on the CEM system	YES

Country specific EF for SO_2

For SO_2 emission calculation from combustion of fuel oil and gas oil for area sources (not LCPs), Croatia calculate national emission factors on yearly base. These are calculated on the base of annual fuel amount by type (produced and put on the market) and sulphur amount in fuel by type.

Activity data for each type of fuel consumed in each of the plant along with measured direct emissions for NOx, SO_2, CO and PM_{10} were used, from the EPR database (Tier 2), i.e. the plant specific emission factors were used. For those pollutants for which the LPS doesn't have obligation to report in the EPR database, the default emission factors from GB2019 were used.

Information on inclusion/exclusion of the condensable component from PM_{10} and $PM_{2.5}$ emission factors by NFR source category are provide in Appendix 9 of this Report.

In the case of heavy metals, for which emission factors are not available in GB2019, recommended emission factors from PARC ATMOS were used. Also, a chemical analysis were made for facilities in the scope of public electricity and heat production plants for fuel oil and different coal used in Croatia and emission factors for each of heavy metals (Pb, Cd, Hg and Ni) were determined by comparing with default emission factors for different sources.

Activity data on fuel used by type in sector 1.A.1.a are presented in Figure 4.2-1.

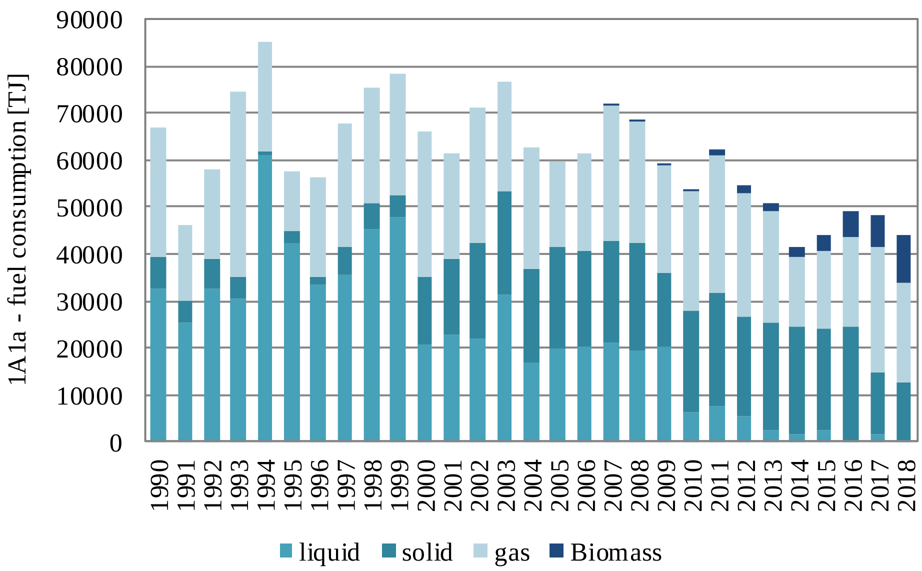


Figure 4.2-1 Activity data on fuel consumption by type for NFR 1.A.1.a

Petroleum Refining (NFR 1.A.1.b)

Methodology for emission calculation is Tier 2 EMEP/EEA, performed by multiplying total fuel sold for petroleum refining activities (disaggregated by fuel type) with emission factors.

The default Tier 2 emission factors from GB2019 are used for emission calculations. Emission factors used for emissions calculation in 2018 are given in Appendix 4 of this report.

Country specific EF for SO_2

For SO_2 emission calculation from combustion of fuel oil and gas oil, Croatia calculate national emission factors on yearly base. These are calculated on the base of annual fuel (produced and put on the market) by type and sulphur amount in fuels by type.

Information on inclusion/exclusion of the condensable component from PM_{10} and $PM_{2.5}$ emission factors by NFR source category are provide in Appendix 9 of this Report.

Activity data on fuel used by type in sector 1.A.1.b are presented in Figure 4.2-2.

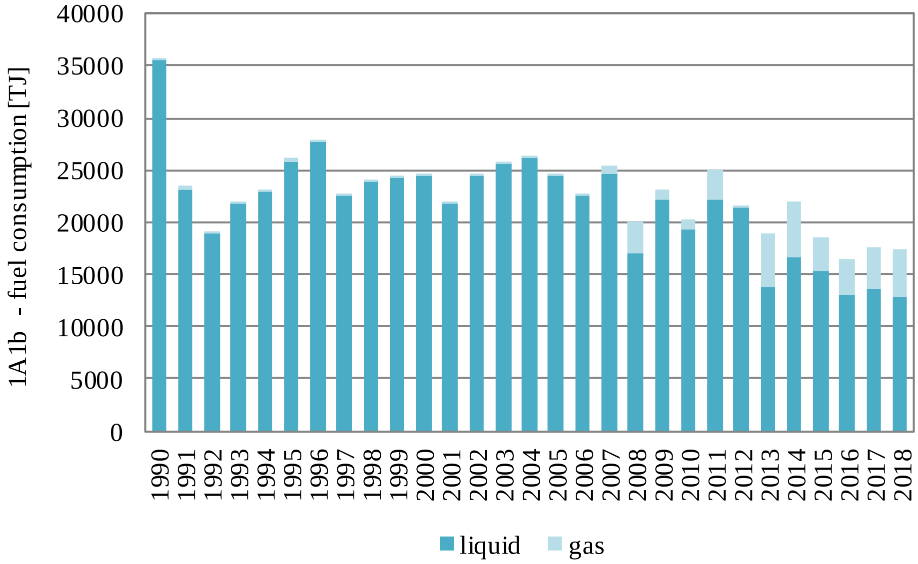


Figure 4.2-2 Activity data on fuel consumption by type for NFR 1.A.1.b

Manufacturing of Solid Fuels and Other Energy Industries (NFR 1.A.1.c)

Methodology for emission calculation is Tier 1 EMEP/EEA, performed by multiplying total fuel sold for activities in the scope of category Manufacturing of solid fuels and other energy industries (disaggregated by fuel type) with emission factors.

The default Tier 1 emission factors from GB2019 are used for emission calculations. For ammonia emission estimation Tier 1 default EMEP/CORINAIR (1999) emission factor was used by fuel type.

Emission factors used for emissions calculation in 2018 are given in Appendix 4 of this report.

Information on inclusion/exclusion of the condensable component from PM_{10} and $PM_{2.5}$ emission factors by NFR source category are provide in Appendix 9 of this Report.

Activity data on fuel used by type in sector 1.A.1.c is presented in Figure 4.2-3.

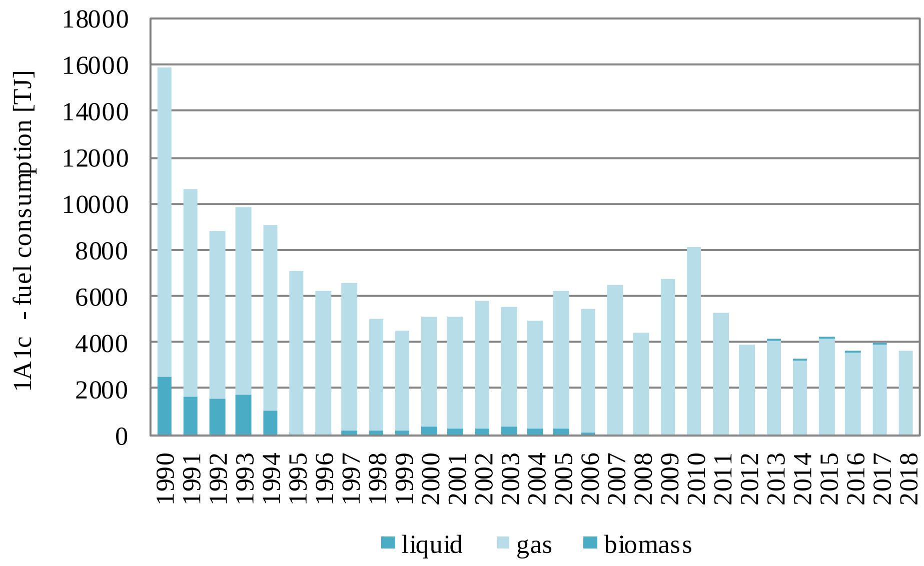


Figure 4.2-3 Activity data on fuel consumption by type for NFR 1.A.1.c

Recalculations and improvements

Public Electricity and Heat Production (NFR 1.A.1.a)

As part of the Inventory Improvement Project, surveys were conducted which showed that all measured mass concentrations on the CEM system are used for the emission calculation. The conclusion of the surveys did not affect inventory emissions.

Petroleum Refining (NFR 1.A.1.b)

There was no recalculation and improvements.

Manufacturing of Solid Fuels and Other Energy Industries (NFR 1.A.1.c)

In sector 1.A.1.c, emission factors from previous Guidelines were used for the emission calculation. The emission factors from 2019 EEA / EMEP Guidelines for all pollutants and for the whole period from 1990 to 2017 are included in IIR 2019. The change in FE from GB 2016 to GB 2019 occurred only in particles.

4.3. Manufacturing industries and construction (NFR 1.A.2)

Source category description

Manufacturing Industries and Construction (NFR 1.A.2) includes emissions from fuel combustion in different industries in Croatia, such as Iron and steel (NFR 1.A.1.a), Non-ferrous metals (NFR 1.A.1.b), Chemicals (NFR 1.A.1.c), Pulp, paper and print (NFR 1.A.1.d), Food processing, beverages and tobacco (NFR 1.A.2.e) and Non-metallic minerals (NFR 1.A.2.f). These are all stationary sources of fuel combustion. In the scope of this source category is also one mobile source Mobile Combustion in manufacturing industries and construction (NFR

1.A.2.g.vii) which is observed within the source category NFR 1.A.4 ii Non road mobile source and machinery.

This sector also includes the emissions from fuel used for the generation of electricity and heat in industry (industrial cogeneration plants and industrial heating plants). In national energy balance fuel consumed in industrial heating plants and cogenerations were not divided by appropriate industrial branches, so in addition to national energy balance so called "Industry analysis balance" was created annually, for the whole period from 1990 to 2018.

Methodology, emission factors and activity data

Methodology for emission estimation for almost all NFR codes in the scope of source category 1.A.2 Manufacturing Industries and Construction is default Tier 1 EMEP/EEA, along with Tier 1 emission factors (GB2019). Croatia estimates all emissions for all pollutants which EF are provided in GB2019 for 1.A.2.a, 1.A.2.b, 1..A2.c, 1.A.2.e for all fuel types specified in annual national energy balances.

For NFR 1.A.2.f Non-metallic minerals code, plant-specific emission factors for SO2, NOx, CO and PM were used for the whole observation period. The Non-metallic minerals sector includes all cement production plants in Croatia that dominate emissions within sector 1.A.2.f Non-metallic minerals and within the overall source category 1.A.2.

For emissions calculation for LPSs in NFR sector 1.A.2.f Non-metallic minerals, a bottom-up approach is used. Bottom-up approach is used in cement production and the mineral wool production in a way that direct emissions available from the national Environmental Pollution Register (EPR) are entered into CollectER database. Double-check with the national energy balance is always performed.

Fuel amounts related to those direct emissions are subtracted from the amount of fuel from an energy balance depending on the fuel type and activities. For facilities for cement production, since 2007 the emissions reported in the EPR are used for SO_2, NOx, CO and NMVOC, which include all the specifics related to fuel, raw materials and production technology in each of facilities. For trend 1990 - 2006 for each plant the plant-specific emission factor are defined.

Information on inclusion/exclusion of the condensable component from PM_{10} and $PM_{2.5}$ emission factors by NFR source category are provide in Appendix 9 of this Report.

Country specific EF for SO_2

For SO_2 emission calculation from combustion of fuel oil and gas oil, Croatia calculate national emission factors on yearly base. This SO_2 EFs are calculated on the base of annual fuel (produced and put on the market) by type and sulphur amount in fuels by type. Furthermore, for source categories: 1.A.2.c and 1.A.2.e there is no Tier 2 SO_2 EFs provide in GB2019 (chapter 1.A.2). In respect of all mentioned above, Croatia considers that SO_2 emission calculation methodology is more detailed than Tier 1.

NOx emission factor

For NOx emission calculation Croatia uses methodology disaggregated by fuel types (gas oil, fuel oil, natural gas, etc.) but not disaggregated by technology. For now Croatia does not have plan for moving from Tier 1 to Tier 2 in respect of technology disaggregation. This recommendation is included in IIR's improvement plan as long term goal.

Activity data on fuel used by type for all activities in the scope of source category 1.A.2 are presented in Figure 4.3-1.

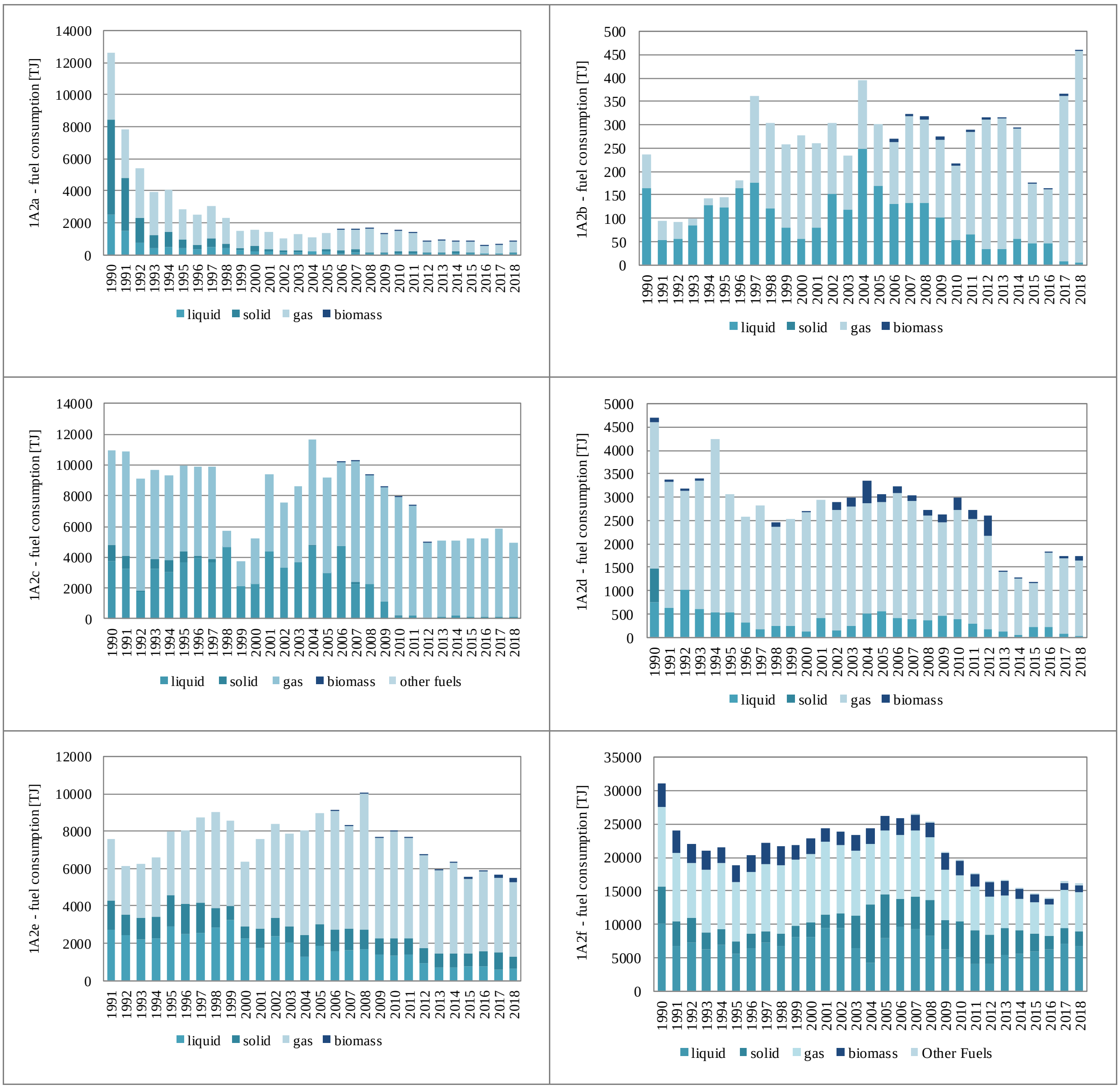


Figure 4.3-1 Activity data on fuel consumption by type for NFR codes 1.A.2.a, 1.A.2.b, 1.A.2.c, 1.A.2.d, 1.A.2.e, 1.A.2.f.

Recalculations and improvements

Emissions from the NFR 1.A.2 Industry and Construction Sector in the 1990-2000 period were presented at an aggregated / sectoral level. For this year submission, improvement of inventory for 1.A.2 was implemented and emissions for the period from1990-2000 are calculated and reported by each industry type (iron and steel, non-ferrous metals, chemical, paper, food, building materials, petrochemical and construction industries) with using GB2019. The improvement was carried out within the framework of the Public Procurement Contract for the provision of the document drafting service, "Improvement of the GHG and Pollutant Emissions for Industry and Construction Sectors for the period 1990 - 2003 and 2013", Executor Ekonerg Ltd. for the Client MEE, February 2020.

4.4. Transport (NFR 1.A.3)

Source category description

Fuel consumption in sector 1.A.3 takes into account fossil fuel consumed in sub-sectors: 1.A.3.a Aviation, 1.A.3.b (i-iv) Road transport, 1.A.3.c Railways, and 1.A.3.d.ii Navigation (shipping). Fuel consumption in sub-sector 1.A.3.d.ii National navigation (Shipping) takes into account fuel consumption for sea and river transport. For emissions that occur in sector 1.A.3.d.i(ii) International inland waterways Croatia is using notation key "IE" and those emissions are included in the memo item: 1.A.3.d.i(i) International maritime navigation. For emissions that occur in sector 1.A.3.e i Pipeline transport Croatia is using notation key "NO".

Aviation (civil) (NFR 1.A.3.a)

The Republic of Croatia has 7 international airports: Zagreb, Split, Dubrovnik, Zadar, Osijek, Rijeka and Pula and 3 national airports: Brač, Mali Lošinj and Osijek for aircraft in commercial air transport.

The scope of the emissions to be included comprises the civil aviation portion of combustion emissions from mobile sources that concerns the movement of people and/or freight by air. The activities comprise of: international airport traffic (LTO-cycles < 914 m), international cruise traffic (>914 m), domestic airport traffic (LTO-cycles < 914 m) and domestic cruise traffic (>914 m). Emissions from two source categories International aviation LTO (civil) (NFR 1.A.3.a.i (i)) and Domestic aviation LTO (civil) (NFR 1.A.3.a.ii (i)) counts in national emission totals, and emissions from two other International aviation cruise (civil) (NFR 1.A.3.a.i (ii)) and Domestic aviation cruise (civil) (NFR 1.A.3.a.ii (ii)) are concerned as memo items, which are excluded from national totals. The scope of the emissions that are included comprises civil commercial use of airplanes, including scheduled and charter traffic for passengers and freight, air taxiing and general aviation. Fuel used at airports for ground transport is excluded from these NFR codes, and are reported under 1.A.3.b Road transport. Fuel for stationary combustion at airports is also excluded and reported under the appropriate stationary combustion category.

Road transport (NFR 1.A.3.b)

Emissions from Road transport source category in Croatian inventory are reporting in following categories of road vehicles: passenger cars (NFR 1.A.3.b.i), light commercial vehicles (< 3.5 t) (NFR 1.A.3.b.ii), heavy-duty vehicles (> 3.5 t) and buses (NFR 1.A.3.b.iii), mopeds and motorcycles (NFR 1.A.3.b.iv), which are exhaust emission sources and gasoline evaporation (NFR 1.A.3.b.v), and tyre and brake wear (NFR 1.A.3.b.vi), and road abrasion (NFR 1.A.3.b.vii) which are fugitive emission sources.

Railways (NFR 1.A.3.c)

Emissions from rail transport concern the movement of goods or people by rail. Exhaust emissions from railways arise from the combustion of liquid fuels in diesel engines, and solid or liquid fuels in steam engines to provide propulsion. Railway locomotives by type in Croatia are: diesel, electric and on steam (the last one in inventory years 1990 and 1991). A few coal-powered locomotives still exist nowadays but they are used for exhibition purposes only. The length of railway lines has decreased in 2014 from 2,722 km to a total of 2,604 km, and it is the same in 2018, of which 90% are single track and the rest are double track railway. The 37% of the total railway length were electrified. Railways source category isn't a key source in Croatia.

Navigation (shipping) (NFR 1.A.3.d)

Navigation (shipping) source category covers all water-borne transport from recreational craft to large ocean-going cargo ships that are driven primarily by high-, slow- and medium-speed diesel engines and occasionally by steam or gas turbines. Exhaust emissions from navigation arise from engines used as main propulsion engines and auxiliary engines used to provide power and services within vessels.

Emissions from Navigation (shipping) source category in Croatian inventory are reporting in following NFR categories: 1.A.3.d.ii National navigation (shipping) and memo item: 1.A.3.d.i(i) International maritime navigation.

The Republic of Croatia has six ports of international economic interest in the cities: Rijeka, Zadar, Šibenik, Split, Ploče and Dubrovnik. The network of inland waterways of the Republic of Croatian is 804 km, of which 539 km are international waterways. Inland ports open to international public transport are: Osijek, Sisak, Slavonski Brod and Vukovar.

Fuels used for international inland waterways are covered in category 1.A.3.d.ii. The use of bunker fuels for international inland navigation, for example from a Croatian sea port upstream a river to a neighboured country (Hungary, Serbia) is not possible. Vessels fuelling in Croatia for a trip on the Danube river to are covered in category 1.A.3.d.ii and that trips from seaport upstream a river are not possible.

Pipeline transport (NFR 1.A.3.e.i)

In Croatia all compressor stations are electric one, so no emissions occurred from this source category. As a confirmation of this claim, in IEA and EUROSTAT energy balance data on consumption of all fuel use for pipeline transport can be found for the whole historical period. In IEA and EUROSTAT energy balance for the whole period, consumption of gas and oil in pipeline transport was 0 TJ. In 2018 for Pipeline transport 3,3 ktoe electricity is consumed.

In Croatian NGL plant natural gas is consumed in compressor station, but according to IEA methodology only fuel used in compressor stations for oil and natural gas transport through pipelines are part of Pipeline transport sector (excluding compressors on plant location).

Data on input and output fuels from NGL plant Ivanić Grad are collected via annual questionnaire (for the whole historical period). Although according to IEA methodology only input and output of fuels in NGL plant accounts in energy balance (excluding own use), in National energy balance own use of fuels in NGL plant are accounted too. Total amount of fuel used for own use in NGL plant is specified in national energy balance in section Energy sector own use-NGL plant. For 2018 in NGL plant only natural gas was used in own use purposes ($34,7*10^6$ m^3). This amount of fuel with all other oil and gas extraction in energy industries are summed in 1.A.1.c sector.

Methodology, emission factors, activity data

Aviation (civil) (NFR 1.A.3.a)

Emissions from Aviation (civil) source category were calculated using Tier 1 EMEP/EEA methodology, along with the recommended Tier 1 emission factors from GB2013. The methodology consists of fossil fuel distribution into domestic and international traffic, along with distribution of jet fuel into the LTO and cruise cycle. For process of jet fuel distribution the Eurocontrol data were used. The Eurocontrol (European Organisation for the Safety of Air Navigation) data are recommended by ERT and secured over the EEA (European Environment

Agency). Quality of Eurocontrol data is checked by the ETC/ACM and can be used for reporting and for checking the quality of data on emissions from aviation to the UNFCCC and the LRTAP reporting. Eurocontrol data are available for the period 2005 - 2018. The Eurocontrol database contains aggregate data on the quantities of fuel, number of flights and emissions for each country as well as for the Republic of Croatia. These aggregated amount of fuel and emissions were calculated using Tier 3 methodology by applying "Advanced Emissions Model" (AEM). Quantities of fuel in the Eurocontrol database do not match completely to the amount of fuel in the energy balance of the Republic of Croatia for the period 2005 - 2018 due to estimation with model. With respect to previously mentioned, for jet fuel distribution, real amounts of jet fuel from national energy balance were used and were distributed in accordance with the Eurocontrol jet fuel data distribution. Methodological issues remain a Tier 1, because aviation sector is not a key source category in Croatian inventory. Emission factors are presented in Appendix 4.

Two type of activity data are used for emission calculation from Aviation source category: fuel sold for aviation activities and data for number of LTO cycle regarding Croatia, (preferably with a destination for international LTO and general knowledge of the type of aircraft performing the aviation activity). Sources for those activity data are annual national energy balances for fuel sold, and Eurocontrol database for number of LTO cycle for national and international movements. Two types of fuels are used for aviation activities in Croatia: Jet kerosene for national and international traffic and aviation gasoline only for domestic LTO aviation. The Eurocontrol data will be used as alternative source as long as Croatia will not have available and reliable data regarding number of LTO cycle. Based on Eurocontrol data for Croatia on number of flights in the LTO cycle on domestic and international routes, the average (87%) is international LTO flights. The Eurocontrol data on the amount of fuel for international long distances flights (flights outside the territory of Europe) were also taken into account to get average share of fuel consumed for international LTO long distances flights in total fuel consumed for international LTO flights.

The Tier 1 emission factors from GB2013 were used for emission calculation. Default emission factors are stratified due to fuel type (jet kerosene or aviation gasoline), and additional for jet kerosene additional stratification to four different NFR codes and representative aircraft basis. For emission calculation from jet kerosene combustion proposed emission factors for average fleet were used both for LTO and cruise. Additionally, for international LTO traffic the average fleet emission factors regarding short or long distance flights were used. Regarding combustion of gasoline in cars, heavy metals and ammonia emission factors from COPERT 5 were used. Regarding combustion of kerosene for stationary combustion, heavy metals, PCDD/PCDF and PAH_S emission factors for NFR 1.A.2 were used. According to the methodology described in GB2019, it is necessary to designate a characteristic aircraft for the country, for which it is necessary to collect detailed data on aircraft at all airports in the Republic of Croatia. Since this is an inventory improvement that requires additional data to be collected, this methodology did not use GB2019 methodology, but GB2013 methodology.

Information on inclusion/exclusion of the condensable component from PM_{10} and $PM_{2.5}$ emission factors by NFR source category are provide in Appendix 9 of this Report.

Country specific EF for SO_2

For SO_2 emission calculation from combustion of fuel gasoline and kerosine, Croatia calculate national emission factors on yearly base. This SO_2 EFs are calculated on the base of annual fuel (produced and put on the market) by type and sulphur amount in fuels by type.

Activity data on fuel used for all activities in the scope of source category 1.A.3.a are presented in Figure 4.4-1.

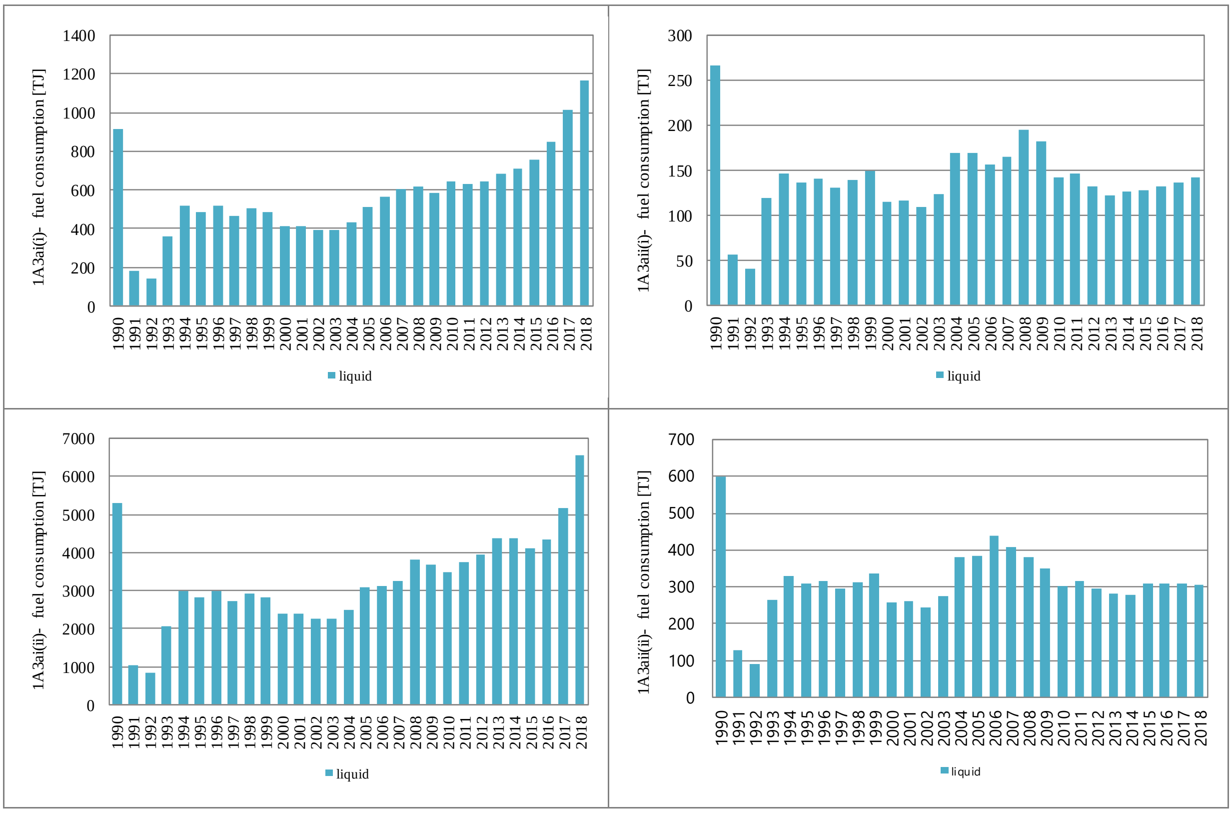


Figure 4.4-1 Activity data on fuel consumption for NFR codes 1.A.3.a.i(i), 1.A.3.a.ii(i), 1.A.3.a.i(ii), 1.A.3.a.ii(ii)

Road transport (NFR 1.A.3.b)

The COPERT 5 package (Tier 2/3 method) was used for air emission calculation from sub-sectors 1.A.3.b(i-vi) Road transport, which requires a detailed set of data as following:

a) type of vehicles (passenger cars, light duty vehicles, heavy duty vehicles, buses, mopeds, motorcycles),

b) type of motor (gasoline four-stroke, gasoline two-stroke, diesel, rotation motor and electromotor),

c) cylinder capacity (<0.8 lit, 0.8-1.4 lit 1.4-2.0 lit, >2.0 lit),

d) weight class (Rigid<7.5 t, 7,5-12 t, 12-14 t, 14-20 t, 20-26 t, 26-28t, 28-32 t, >32t, Articulated 14-20 t, 20-28 t, 28-34 t, 34-40 t, 40-50 t, 50-60 t) and

e) age of vehicles (distribution of vehicles per ECE categories according to EC directives).

Required detail dataset regarding vehicles characteristics are contained in the Croatian vehicle database. Besides mentioned data, data on amounts of all types of liquid and gaseous fuels consumed in road transportation are also required. The source of fuel sold for road transport is annual national energy balances. Also average monthly minimal and maximal temperature data are required by COPERT model. Required statistical data on temperature were collected yearly for ten biggest towns in Croatia.

To calculate the SO_2 emissions from gasoline and diesel combustion, Croatia uses national values of the amount of S in each type of fuel (produced and placed on the market) and enters the annual budgeted factors into COPERT.
National gas vapour pressure values are entered in accordance with the legal regulations of the Republic of Croatia.

Additional data like: highway, rural and urban transport mileage, average speed of various vehicles and different road types, average daily trip distance, beta value (the fraction of the monthly mileage driven before the engine and any exhaust components have reached their nominal operation temperature) are expert judgement or COPERT default data. Two assumptions/adjustments were applied when using COPERT model:

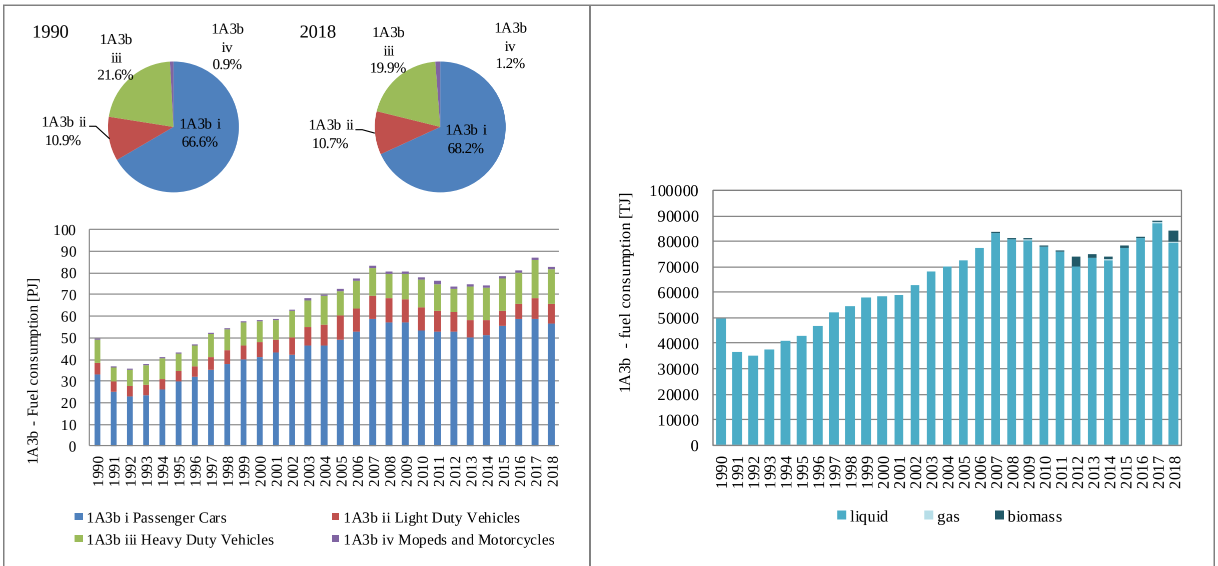
- gasoline or diesel oil tank-filled abroad and consumed in Croatia is equal to amount of same type of fuels tank-filled in Croatia and consumed abroad (this is due to a large number of tourist destination and transit trips in Croatia), so effect of this consumption pattern in neutral to fuel balance;
- fuel consumption calculated by COPERT, taking into account number of vehicles and annual average vehicle mileage, should be to a highest possible degree equal to consumption of fuels from the national energy balance (the difference should not be greater than 1%).

Information on inclusion/exclusion of the condensable component from PM_{10} and $PM_{2.5}$ emission factors by NFR source category are provide in Appendix 9 of this Report.

Country specific EF for SO_2

For SO_2 emission calculation from combustion of fuel gasoline and kerosine, Croatia calculate national emission factors on yearly base. This SO_2 EFs are calculated on the base of annual fuel (produced and put on the market) by type and sulphur amount in fuels by type.

The dominant fuel consumption activity in the road transport source category in 2018 has 1.A.3.b.i Passenger cars (67.0%) and 1.A.3.b.iv Mopeds and Motorcycles has the smallest contribution (1.2%). The sub-sector 1.A.3.b.ii Light Duty Vehicles has contributed with 10.6% to overall fuel consumption within the road transportation in 2018, and 1.A.3.b.iii Heavy duty vehicles with 21.2%. The trend of fuel consumption in road transportation has growing character (by 58%) in period from 1990 to 2017. The increase in the fuel consumption was the largest in sub-sectors 1.A.3.b.iv Mopeds and Motorcycles (by 2.5 times since 1990) and 1.A.3.b.ii Light duty vehicles (1.7 times since 1990). In sub-sectors 1.A.3.b.iii Heavy duty vehicles and 1.A.3.b.i Passenger cars fuel consumption have increased by 57.5% and 59.1% respectively. The Figure 4.4-2 shows the fuel consumption by type of vehicle in road transport.



Fuel consumption by type of vehicle	*Fuel consumption by fuel type*

Figure 4.4-2 Fuel consumption by type of vehicle and type of fuel used in road transport

The total number of vehicles in the period 1990 - 2018 was increased by 60.8 % (Figure 4.4-3 and Table 4.4-1). The increase was largely a result of increasing number of passenger cars by 53.1 % because they presented 83.3 % of the total number of vehicles in road traffic in 2018. The number of light duty vehicles increase by 2 times, mopeds and motorcycles by 3.4 times and heavy duty vehicles by 1.6% in the observing period. The type and class of vehicle, their speed and driving share on each type of road are shown in Table 4.4-2.

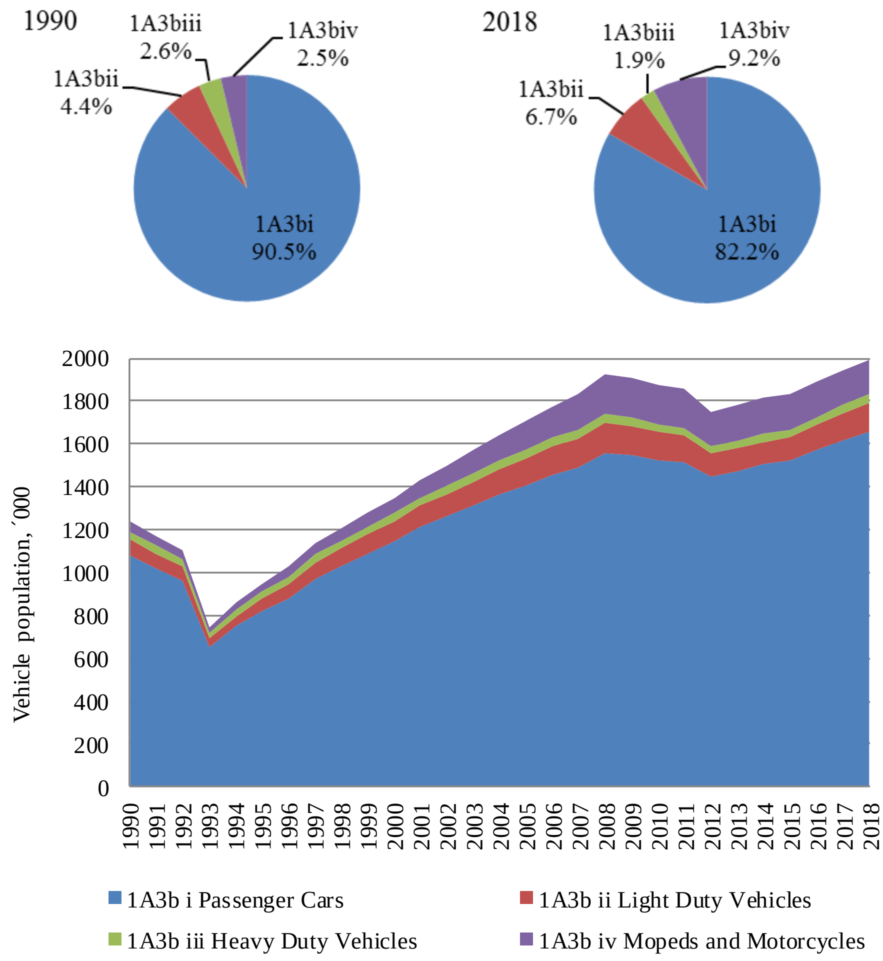


Figure 4.4-3 Number of each type of vehicle in the road transportation

Table 4.4-1 Number of road motor vehicles by type ('000)

Vehicle type, Year / unit	Passenger Cars ´000	Light Duty Vehicles ´000	Heavy Duty Vehicles ´000	Mopeds Motorcycles ´000
1990	1083.111	68.789	39.887	46.166
1991	1024.491	65.068	37.727	43.668
1992	964.257	61.241	35.504	41.100
1993	649.782	41.269	23.923	27.696
1994	750.494	47.665	27.635	31.989
1995	817.290	59.526	31.283	37.596
1996	877.072	69.847	33.923	44.525
1997	966.986	81.576	36.219	52.937
1998	1025.723	86.299	36.370	59.891
1999	1088.304	89.549	36.188	66.301
2000	1147.519	93.195	36.257	72.800
2001	1213.592	98.779	37.123	80.455
2002	1260.431	106.338	38.512	90.974

Vehicle type, Year / unit	Passenger Cars ´000	Light Duty Vehicles ´000	Heavy Duty Vehicles ´000	Mopeds Motorcycles ´000
2003	1311.403	114.565	39.908	104.299
2004	1360.190	120.870	40.629	117.637
2005	1405.499	126.630	40.819	132.904
2006	1458.011	131.089	41.210	147.931
2007	1491.828	133.836	41.259	163.645
2008	1558.131	137.680	42.699	190.078
2009	1546.680	133.298	40.654	191.584
2010	1526.800	127.920	38.031	183.619
2011	1517.328	123.849	36.421	176.582
2012	1446.673	112.988	33.101	158.487
2013	1475.062	109.693	34.408	164.400
2014	1503.412	106.389	35.742	170.296
2015	1523.720	110.039	35.389	162.599
2016	1570.167	117.682	38.219	161.581
2017	1614.445	127.218	39.230	162.252
2018	1658.528	135.687	40.533	156.088

Source: MIA, Processing: Ekonerg Ltd.

Table 4.4-2 Type and class of vehicle, their speed and driving share on each type of road

Sector	Subsector	Trip speed (km/h)			Driving share, %		
		Urban	Rural	Highway	Urban	Rural	Highway
Passenger Cars	Gasoline 0,8 - 1,4 l	30	60	110	40	35	25
	Gasoline 1,4 - 2,0 l	30	60	110	40	35	25
	Gasoline >2,0 l	30	60	110	40	35	25
	Diesel 1,4 - 2,0 l	30	60	110	40	35	25
	Diesel >2,0 l	30	60	110	40	35	25
	LPG	30	60	110	40	35	25
	CNG	30	60	110	40	35	25
	2-Stroke	30	60	110	40	35	25
	Hybrid Gasoline	30	60	110	40	35	25
Light Duty Vehicles	Gasoline <3,5 t	30	60	100	30	50	20
	Diesel <3,5 t	30	60	100	30	50	20
Heavy Duty Vehicles	Gasoline >3,5 t	30	50	80	30	55	15
	Rigid <=7,5 t	30	50	80	30	55	15
	Rigid 7,5 - 12 t	30	50	80	30	55	15
	Rigid 12 - 14 t	30	50	80	30	55	15
	Rigid 14 - 20 t	30	50	80	30	55	15
	Rigid 20 - 26 t	30	50	80	30	55	15
	Rigid 26 - 28 t	30	50	80	30	55	15
	Rigid 28 - 32 t	30	50	80	30	55	15
	Rigid >32 t	30	50	80	30	55	15
	Articulated 14 - 20 t	30	50	80	30	55	15
	Articulated 20 - 28 t	30	50	80	30	55	15
	Articulated 28 - 34 t	30	50	80	30	55	15
	Articulated 34 - 40 t	30	50	80	30	55	15
	Articulated 40 - 50 t	30	50	80	30	55	15
	Articulated 50 - 60 t	30	50	80	30	55	15
Buses	Urban Buses Midi <=15 t	30	50	0	90	10	0
	Urban Buses Standard 15 - 18 t	30	50	0	90	10	0
	Urban Buses Articulated >18 t	30	50	0	90	10	0
	Urban CNG Buses	30	50	0	90	10	0

Sector	Subsector	Trip speed (km/h)			Driving share, %		
		Urban	Rural	Highway	Urban	Rural	Highway
	Coaches Standard <=18 t	30	50	90	25	65	10
	Coaches Articulated >18 t	30	50	90	25	65	10
Mopeds	2-stroke <50 cm^3	30	50	0	70	30	0
	4-stroke <50 cm^3	30	50	0	70	30	0
Motorcycl es	2-stroke >50 cm^3	30	50	0	60	40	0
	4-stroke <250 cm^3	30	50	70	48	50	2
	4-stroke 250 - 750 cm^3	30	50	80	45	51	4
	4-stroke >750 cm^3	30	50	90	35	60	5

Data source: COPERT default

Railways (NFR 1.A.3.c)

Emissions from Railway source category were calculated using Tier 1 EMEP/EEA methodology, due to this sector is not a key source. The default Tier 1 emission factors, stratified by fuel types, are from GB2019. For diesel and gas oil recommended FE for NFR 1.A.3.c are used, while for the solid fuel (coal and lignite), heavy fuel oil, kerosene and diesel recommended FE for NFR 1.A.4.a are used. Relevant activity data for Tier 1 approach is fossil fuel consumption data by fuel types from annual national energy balances (Figure 4.4-4).

Information on inclusion/exclusion of the condensable component from PM_{10} and $PM_{2.5}$ emission factors by NFR source category are provide in Appendix 9 of this Report.

Country specific EF for SO_2

For SO_2 emission calculation from combustion of following fuels: coal, residual fuel oil, gas oil, diesel, kerosine and gasoline, Croatia calculate national emission factors on yearly base. This SO_2 EFs are calculated on the base of annual fuel (produced and put on the market) by type and sulphur amount in fuels by type.

In the national energy balance there is no recorded coal consumption in rail transport since the 1991. Despite that, two coal locomotives were identified in the national register of locomotives. However, they are used only for exhibition purposes and the symbol “NO” is used for the coal consumption in rail transport, which is in accordance with the national energy balance.

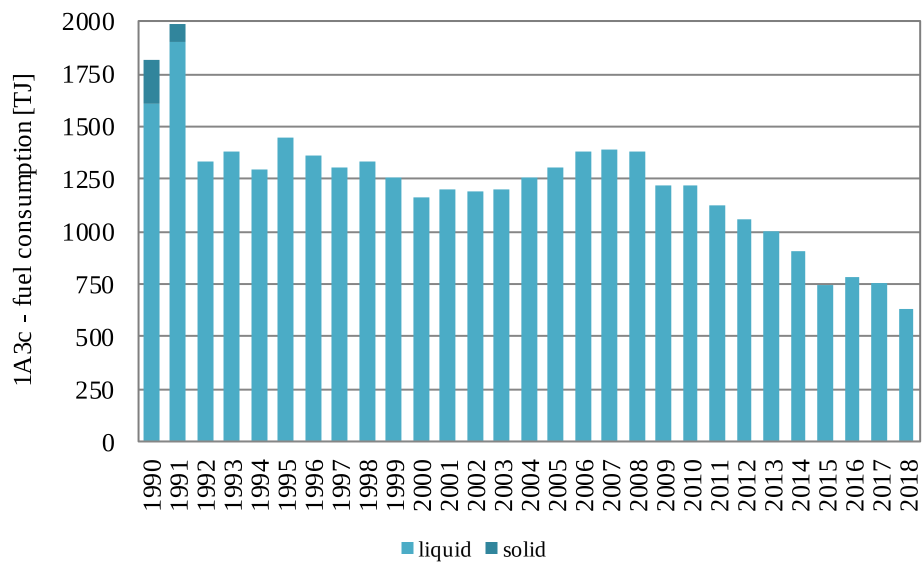


Figure 4.4-4 Activity data on fuel consumption for NFR 1.A.3.c

Navigation (shipping) (NFR 1.A.3.d)

Emissions from Navigation source category for NFR codes 1.A.3.d.ii(i) and 1.A.3.d.i(i) were calculated using Tier 1 EMEP/EEA methodology, due to this sectors are not a key source. Emissions from 1.A.3.d.i(i) International bunkers of ships are not included in the national total emissions and are shown as memo items.

Emission factors are expressed as the quantity of pollutant emissions per GJ fuel consumed by types. Recommended Tier 1 EF from GB2019 were used for fuel: gasoline and fuel oil and for diesel the Tier 2 FE from GB2019 were used, assuming for small recreational boats that they are conventional type. For pollutants for which EF are not recommended in GB2019, EF from *The EMEP / CORINAIR Atmospheric emission inventory Guidebook - Second Edition (1999)* and *The Emission factors manual PARC ATMOS - Emission factors for air pollutants (1992)* were used.

Information on inclusion/exclusion of the condensable component from PM_{10} and $PM_{2.5}$ emission factors by NFR source category are provide in Appendix 9 of this Report.

Country specific EF for SO_2

For SO_2 emission calculation from combustion of following fuels: residual fuel oil, diesel and gasoline, Croatia calculate national emission factors on yearly base. This SO_2 EFs are calculated on the base of annual fuel (produced and put on the market) by type and sulphur amount in fuels by type.

For Bunker Fuel Oil the sulphur content of fuel for pre-2006 was 2.7% wt. [source: Lloyd's Register, 1995]; For European Union as specified in the Directive 2005/33/EC 1.5 % wt. from 11th August 2006 for Baltic sea and in EU territorial seas, exclusive economic zones and pollution control zones; and 0.1 % wt. from 1 January 2010 for inland water way vessels and ships at berth in Community.

Emission factors used are presented by NFR sectors and pollutants in Appendix 4.

Relevant activity data for Tier 1 approach is fossil fuel consumption data by fuel types from annual national energy balances. International bunkers of ships are included in the national energy balance as a separate data only from 1994 onwards, while for period from 1990 to 1994 the data is based on expert judgment. Trends of fuel consumed in NFR sectors 1.A.3.d.ii(i) and 1.A.3.d.i(i) are shown in Figure 4.4-5.

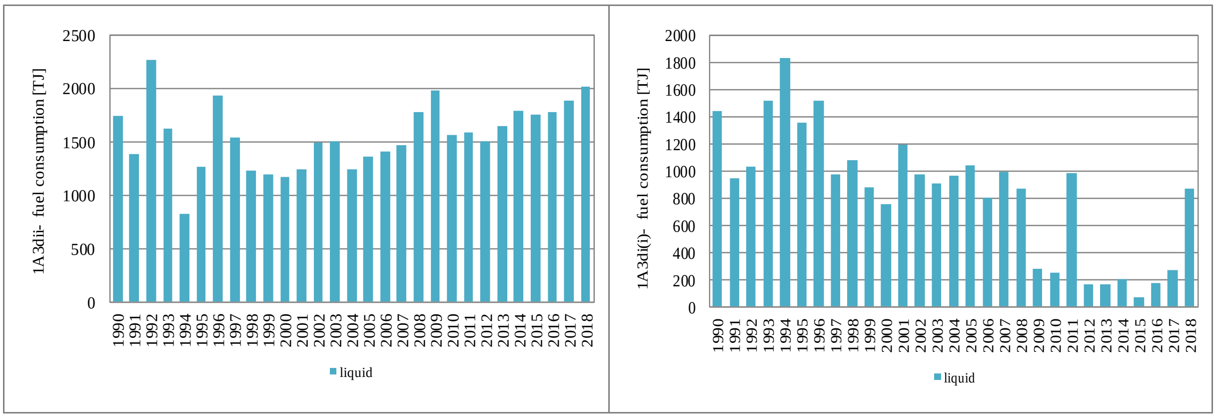


Figure 4.4-5 Activity data on fuel consumption for NFR codes 1.A.3.d.ii, and 1.A.3.d.i(i)

It has to be noted that inland navigation is strongly dependent on the navigability and that therefore fluctuations of this size are rather likely.

As the fuel consumption data for national navigation and international inland waterways are not separated in the national energy balance, emissions from Category 1.A.3.di (ii) International inland waterways are included in Category 1.A.3.d.ii National navigation (shipping), and the mark "IE" was used. International inland waterways transport can take place along the river Danube, and since international inland waterways transport with the beginning in the Croatian sea is not possible, there is no risk of underestimating national emissions by this approach.

It should be noted that in the national energy balance, all consumption of biofuels is allocated to the road transport sector. The calculations in this report are done accordingly, even though biofuels can be used in other sectors, i.e. in railways, navigation, small non-road vehicles and machinery and aviation.

Recalculations and improvements

Aviation (civil) (NFR 1.A.3.a)

There was no recalculation or other improvement for these source categories.

Road transport (NFR 1.A.3.b)

The reason for the small differences in emissions is the new vehicle categorization, which is more detailed in the COPERT 5 model than in the COPERT 4 in all types of subcategories. The most important changes by categories are:

- Passenger cars: in the COPERT 5 model a category of small vehicles with a cylinder size of less than 0.8 litters was added while in COPERT 4 these vehicles were part of the 0-1.4 lit category. The EURO 6 2017-2019 standard for vehicles manufactured in the period 2017-2019 and the Passenger cars that use both LPG and CNG as fuel are distributed in the COPERT 5 model by cylinder capacity, which was not the case in COPERT 4. In COPERT 4 those vehicles were summed in one category.
- Light commercial vehicles: The EURO 6 2017-2019 standard for vehicles manufactured in the period 2017-2019 have been added for all vehicle categories. Light commercial vehicles in the COPERT 5 database can be subdivided into three sub-categories (N1-I, N1-II and N1-II), but the Croatian Vehicle Database does not have such data, so all light commercial vehicles are categorized as N1-I.
- Heavy Duty Trucks: The distribution of vehicles in COPERT 5 is identical to the COPERT 4 distribution. Although the model has not changed in this part, significant progress has been made in the Inventory. Until now, an auxiliary table has been used to switch total number of HDV from weight class <3.5 t, 3.5-7.5 t, 7.5-16 t, 16-32 t, >32 t, to the required categories for COPERT model (Rigid<7.5 t, 7,5-12 t, 12-14 t, 14-20 t, 20-26 t, 26-28t, 28-32 t, >32t, Articulated 14-20 t, 20-28 t, 28-34 t, 34-40 t, 40-50 t, 50-60 t). When changing to COPERT 5, model for sorting Croatian vehicle database was changed too in a way that actual registered weight class is used to match COPERT 5 categories. So now, in COPERT model, HDV vehicles are in the appropriate categories as registered in the Croatian vehicle database. This recalculation is made for whole period from 1990-2018.

- L category: Quad & ATVs as well as Micro-car categories are added in COPERT 5. Croatian model for sorting vehicles was changed so these vehicles can be exported and entered in COPERT 5.
- National gas vapour pressure values are entered in accordance with the legal regulations of the Republic of Croatia instead of using the values recommended by the COPERT 5 model.

Railways (1.A.3.c)

There was no recalculation or other improvement for these source categories.

Navigation (shipping) (1.A.3.d)

All relevant emissions for the period from 1994 to 2017 were recalculated due to correction of data on the fuel consumption for 1.A.3.d.i(i) International navigation (bunkers).

4.5. Small combustion (NFR 1.A.4.i)

Source category description

The source category 1.A.4.i Small combustion in Croatia takes into account stationary combustion under NFR sectors 1.A.4.a.i Commercial/Institutional, 1.A.4.b.i Residential, 1.A.4.c.i Agriculture/Forestry. The sectors cover combustion installations activities in the following sectors which, have a thermal capacity ≤ 50 MW_{th}. Small combustion activities are commercial and institutional heating, residential heating and cooking, agriculture/ forestry and other stationary combustion (including military). Residential heating includes fireplaces, stoves, cookers, small boilers (< 50 kW) while institutional/ commercial/ agricultural/ other heating include heating - boilers, space-heaters (> 50 kW), and smaller-scale combined heat and power generation (CHP).

Emissions from smaller combustion installations are significant due to their numbers, different type of combustion techniques employed, and range of efficiencies and emissions. Many of them have no abatement measures nor low efficiency measures. In the residential sector in particular, the installations are very diverse, strongly depending on national and regional factors including quality of fuel supply.

Methodology, emission factors, activity data

Commercial/Institutional (NFR 1.A.4.a)

Methodology for emission calculation is Tier 1 EMEP/EEA, performed by multiplying total fuel sold (disaggregated by fuel type) with emission factors. Sector NFR 1.A.4.a Commercial/Institutional is not a key source.

Information on inclusion/exclusion of the condensable component from PM_{10} and $PM_{2.5}$ emission factors by NFR source category are provide in Appendix 9 of this Report.

Country specific EF for SO_2

For SO_2 emission calculation from combustion of following fuels: coals, residual fuel oil, kerosene and gas oil, Croatia calculate national emission factors on yearly base. This SO_2 EFs are calculated on the base of annual fuel (produced and put on the market) by type and sulphur amount in fuels by type.

For SO_2 emission calculation from combustion of following fuels: petroleum coke, gas works gas, LPG, natural gas and wood, Croatia use default EF SO_2 from GB2019.

Emission factors are expressed as the quantity of emissions of pollutants per GJ fuel consumed.

All emission factors are default Tier 1 from GB2019, and are presented by NFR sectors in Appendix 4 of this report.

Structure of fuel combustion in Commercial/Institutional sector for period 1990 – 2018 is presented in Figure 4.5-1.

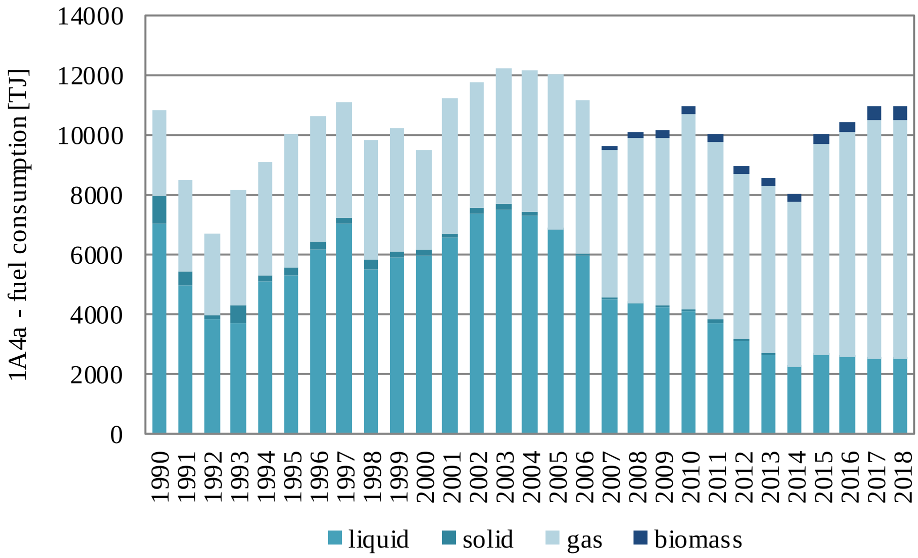


Figure 4.5-1 Activity data on fuel consumption by fuel type for NFR 1.A.4.a

Residential (NFR 1.A.4.b.i)

Within Small combustion source category only 1.A.4.b.i Residential is a key source, so Tier 2 EMEP/EEA methodology was applied for emission calculation. Tier 2 methodology was applied. The application of Tier 2 methodology implies knowledge of the structure and combustion techniques applied in residential since 1990 onwards for the territory of the Republic of Croatian. The model was created for solid and biomass fuel types on technology (furnaces) installed with assumed time of entering of certain technologies into usage.

For this year's inventory improvement emission calculation from biomass combustion in Residential was carried out and a new model for biomass was created. So far, the inventory has used a model that included IIASA GAINS data for the Republic of Croatia and expert assessment of the share for low emission technologies according to Table 4.5-1. These shares were also used to create the current emission projections. For the years between the years listed in the Table 4.5-1, the shares of each technology are calculated using the linear interpolation method.

Table 4.5-1 Technology shares according to IIASA GAINS model and expert assessment for the Republic of Croatia

Technology type for biomass combustion	GAINS model		Expert assessment		
	1990	2005	2010	2030	2050
Open fireplaces	4.4%	5.9%	6.0%	8.0%	10.0%
Boilers (manual feed)	39.4%	29.4%	18.4%	5.8%	5.0%
Conventional stoves	56.2%	64.7%	44.5%	11.0%	0.0%
Advanced /ECO-labelled stoves	0%	0%	31.0%	62.8%	60.0%
Pellet stoves and boilers	0%	0%	0.1%	12.3%	25.0%

Source: IIASA GAINS; Ekonerg Ltd.

During 2017, households were surveyed in four agglomerations of the Republic of Croatia, five zones and one city related to the use of energy in households and present biomass combustion technologies. The surveys were carried out within the framework of the project: "Creating a register of pollutants with spatial distribution in the high resolution EMEP grid". In addition to these surveys, the creation of a new model for biomass also includes surveys conducted in 2019 by the EIHP on the same topic and surveys conducted with sellers of biomass stoves and boilers. As the surveys conducted in 2017 did not provide any response for the presence of technology - ECO-labelled stoves / boilers that were included in the previous emission inventory (Table 4.5-1), and answers were provided for the existence of highly efficient stoves / boilers it was necessary to further explore the representation of these two technologies in the domestic market. The study confirmed that ECO-labelled stoves/boilers are sold domestically, but because of the expensiveness of these and the absence of subsidies, their sales are not high. Based on the information received, it is estimated that they are installed in households at a slightly higher percentage than pellet stoves / boilers. The results of the surveys, statistical analysis of the results, proposed and selected new shares of biomass combustion technologies in small combustion plants and other details related to the creation of a new model for biomass within this emission category are presented in the document "The Report on improvement made for the Energy Sector" part of the Agreement for the service for preparation of Improvement of emission inventories under LRTAP Convention for sectors: Energy, Agriculture and Production Processes 800/02-19/39JN, Executor: Ekonerg Ltd. for the Client: MEE.

A combined set of averages for zones and agglomerations with processed results of surveys conducted in 2019 was selected for the proposal of new shares (Table 4.5-2) were considered, which takes into account the whole of Croatia. In this way, a more complete picture of the representation of a particular technology is obtained, which also includes the specifics of each of agglomeration, one city and zones, since they are used in the assessment of air quality.

Table 4.5-2 Three sets of combustion technology share according to the results of the surveys in 2017 and 2019 with the estimated set share for 2017

Technology type for biomass combustion	Survey analysis results for 2017 for agglomerations and one city	Survey analysis results for 2017 for zones	EIHP survey analysis results for 2019 for Croatia	Estimated set for 2017
Open fireplaces	12.5%	5.3%	13.29%	10.4%
Boilers (manual feed)	11.2%	21.4%	22.39%	18.3%
Conventional stoves	32.9%	34.7%	39.72%	35.8%
Advanced /ECO-labelled stoves	14.1%	10.6%	10.93%	11.9%
high-efficiency stoves	28.1%	21.1%	12.86%	20.7%
Pellet stoves and boilers	1.3%	7.0%	0.80%	3.0%
Total	100.0%	100.0%	100%	100.0%

Source: Ekonerg Ltd.

The estimated set for 2017, i.e. new shares of biomass combustion technologies in residential, indicated that the share of fireplaces technology proposed by IIASA GAINS for Croatia was partially underestimated, so new estimation of share for 1990 and 2005 were started. The estimate included a linear interpolation method using the results of surveys, i.e. the estimated set of technology shares for 2017, GAINS share data for Croatia for 1990, 2005 and 2010 as a starting point for correction and GAINS increase / decrease factors between 2005 and 1990 and between 2010 and 2005. With the help of the increase / decrease factors for the years 2005 and 2010 and the estimated set of technology shares for 2017, the shares for the historical year 2005 were first corrected. With the help of the increase / decrease factors for 1990 and 2005 and the obtained corrected shares for the historical 2005, the shares for the historical 1990 were then adjusted. Additionally for 2030 and 2050, new shares of a technology that should be included when creating the next projection are estimated indicatively. For the years between 1990-2005, 2005 - 2010, 2010 - 2017, 2017 - 2030 and 2030 - 2050 the shares of each technology were calculated using the linear interpolation method.

The results of the corrections made and the newly proposed model for biomass are presented in Table 4.5-3.

Table 4.5-3 Technology shares based on survey results, research-based expert assessment and IIASA GAINS model

Technology type for biomass combustion	1990	2005	2017	2030	2050
Open fireplaces	8.5%	10.0%	10.4%	8%	5%
Boilers (manual feed)	33.0%	23.0%	18.3%	8%	5%
Conventional stoves	58.5%	67.0%	35.8%	12%	0%
Advanced /ECO-labelled stoves	0%	0%	11.9%	32%	60%
high-efficiency stoves	0%	0%	20.7%	20%	5%
Pellet stoves and boilers	0%	0%	3.0%	20%	25%

Source: Ekonerg Ltd.

Due to new shares and the inclusion of additional technology (high energy efficiency stoves) for combustion of biomass in residential, there have been significant changes in the emissions of those pollutants whose emissions depend on the combustion technology (NOx, NMVOC, NH_3, CO, particulates, dioxins / furans, PAHs and PCBs). This resulted in a reduction of NOx emission and increase in the emission of the other mentioned pollutants. Heavy metals, SO_2 and HCB emissions were not affected by this improvement. The improvement assumes that the impact of new technologies has been started since 2005, when the market sale / use of technologies with lower emissions were approximately start in Croatia. It is believed that this increase will, from the PM emission point of view, give a more realistic national picture of both the emissions and the correlation of these emissions with the concentrations of particulate matter in the air and the assessment of air quality in zones and agglomerations.

For coal, two types of technology were assumed: (I) coal combustion in heating stoves and (II) coal combustion in single house boilers (<50 kW) (table 4.5-4). For years in the period 1990 - 2005 the representation of each of technology are calculated by linear regression method, and for years between 2010 and 2030, the extrapolation method was used.

Table 4.5-4 Technology structure for solid fuel and biomass distribution in residential sector

Fuel type	Technology	2005	2010	2030
Solid fuel	single house boilers (<50 kW)	61.5%	66.7%	1.8%
	heating stoves	38.5%	33.3%	98.2%

Source: the GAINS model

For liquid and gaseous fuels, the GAINS model does not presume different technologies, so for those fuels it is assumed that correspond technologies defined by the GB2019 are represented in equal proportions for the period since 1990 (table 4.5-5). For liquid fuels two possible technologies in accordance with GB2019 were considered: (I) liquid fuel combustion in heating stoves and (II) liquid fuel combustion in single house boilers (<50 kW). For gaseous fuels two possible technologies in accordance with GB2019 were considered: (I) gaseous fuel combustion in fireplaces and (II) gaseous fuel combustion in single house boilers (<50 kW). It is also assumed that advanced technologies such as energy efficient stoves burning wood, advanced / ecolabelled stoves and boilers burning wood and pellet stoves and boilers burning wood pellets are for now minimally represented in Croatia and as such are neglected in the calculation.

Table 4.5-5 Technology structure for liquid and gaseous fuel distribution in residential sector

Fuel type	Technology	Period since 1990
Liquid fuel	heating stoves	50%
	single house boilers (<50 kW)	50%
Gaseous fuel	fireplaces	50%
	single house boilers (<50 kW)	50%

Source: the EMEP/EEA GB2019

Two types of solid fuel were used in the residential sector in the Republic of Croatia; lignite and sub-bituminous coal, of liquid fuel: residual fuel oil, gas oil and kerosene, and of gaseous fuels: liquefied petroleum gas, natural gas and LPG gas. Structure of fuel combustion in Residential sector for period 1990 – 2018 is presented in Figure 4.5-3.

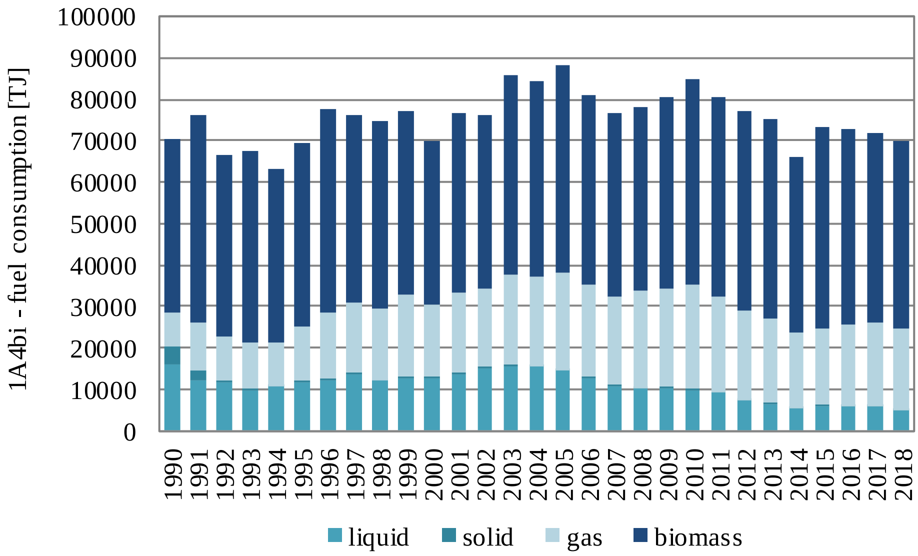


Figure 4.5-3 Activity data on fuel consumption by fuel type for NFR 1.A.4.b.i

Emission factors are expressed as the quantity of emissions of pollutants per GJ fuel consumed. Emission factors are stratified by fuel types and are default Tier 2 from GB2019 except for SO_2.

Information on inclusion/exclusion of the condensable component from PM_{10} and $PM_{2.5}$ emission factors by NFR source category are provide in Appendix 9 of this Report.

Country specific EF for SO_2

For SO_2 emission calculation from combustion of following fuels: coals, residual fuel oil, gas oil and kerosine, Croatia calculate national emission factors on yearly base. This SO_2 EFs are calculated on the base of annual fuel (produced and put on the market) by type and sulphur amount in fuels by type. National SO_2 emission factor for solid fuels assumed two type that are used in Croatia: lignite and sub-bituminous coal with net calorific value of 12.25 GJ/t and 18.2 GJ/t respectively, with their average value of sulphur content of 1.67%, and sulphur ash retention factor of 0.1.

For SO_2 emission calculation from combustion of following fuels: petroleum coke, gas works gas, liquefied petroleum gases, natural gas and wood, Croatia use default EF SO_2 from GB2019.

All factors are presented for last historic year by NFR sectors in Appendix 4 of this report.

Agriculture/Forestry (NFR 1.A.4.c.i)

Methodology for emission calculation is Tier 1 EMEP/EEA, performed by multiplying total fuel sold (disaggregated by fuel type) with emission factors. Sector NFR 1.A.4.c.i Agriculture/Forestry is not a key source. Emission factors are expressed as the quantity of emissions of pollutants per GJ fuel consumed.

Information on inclusion/exclusion of the condensable component from PM_{10} and $PM_{2.5}$ emission factors by NFR source category are provide in Appendix 9 of this Report.

All emission factors are default Tier 1 from GB2019, and are presented by NFR sectors in Appendix 4 of this report. Structure of fuel combustion in Agriculture/Forestry sector for observed period is presented in Figure 4.5-4.

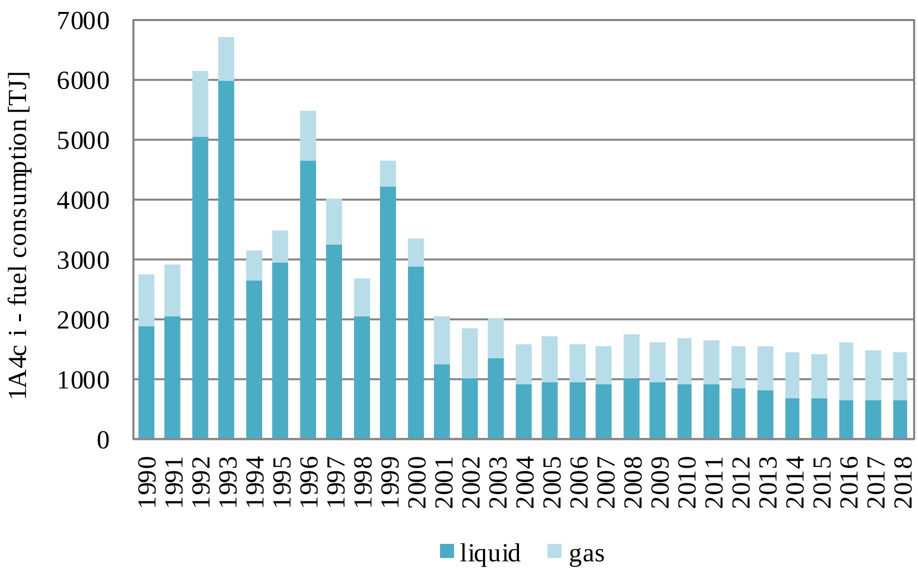


Figure 4.5-4 Activity data on fuel consumption by fuel type for NFR 1.A.4.c.i

Recalculations and improvements

Commercial/Institutional (NFR 1.A.4.a)

Updating of emission factors according to GB2019 and recalculation of particulate matter (PM, TSP and BC) for liquid fuels and biomass for the whole observed period. Recalculation resulted in an increase in PM, TSP and BC emissions due to an increase in the recommended FEs for liquid fuels and biomass.

Residential (NFR 1.A.4.b.i)

The new model for biomass in small residential combustion has led to significant changes in the emissions of those pollutants whose emissions depend on combustion technology (NOx, NMVOC, NH_3, CO, particles, dioxins / furans, PAHs and PCBs). This resulted in a reduction of NOx emission and an increase in the emissions of other mentioned pollutants in the period 1990-2017. The new model did not affect the emissions of heavy metals, SO_2 and HCB.

Updating of emission factors according to GB2019 and recalculation of particulate matter (PM, TSP and BC) for pellet stoves and boilers burning wood pellets for the whole observed period. Recalculation resulted in an increase in PM, TSP and BC emissions due to an increase in the recommended FEs.

Agriculture/Forestry (NFR 1.A.4.c.i)

There was no recalculation or other improvement for these source categories.

4.6. Non-road mobile sources and machinery (NFR 1.A.4.ii, 1.A.2.g.vii)

Source category description

Non-road mobile sources and machinery source category covers a mixture of 'other' equipment. In Croatian inventory emissions are reported in following NFR sectors in the scope of 1.A.4.ii Non road mobile source and machinery: 1.A.4.b.ii Residential, 1.A.4.c.ii Agriculture/Forestry and 1.A.2.g.vii Mobile Combustion in manufacturing industries and construction. Types of equipment used in manufacturing industries and construction (hereafter Industry) include: Asphalt pavers/concrete pavers (SNAP 080801), Plate compactor/tampers/rammers (SNAP 080802), Rollers (SNAP 080803), Trenchers/mini excavators (SNAP 080804), Excavators (wheel / crawler type) (SNAP 080805), Cement and mortar mixers (SNAP 080806), Cranes (SNAP 080807), Graders/scrapers (SNAP 080808), Off-highway trucks (SNAP 080809), Bulldozers (SNAP 080810), Tractors / loaders/backhoes (SNAP 080811), Skid steer loaders (SNAP 080812), Dumpers/tenders (SNAP 080813), Aerial lifts (SNAP 080814), Fork lifts (SNAP 080815), Generator sets (SNAP 080816), Pumps (SNAP 080817), Air/gas compressors (SNAP 080818), Welders (SNAP 080191), Refrigerating units (SNAP 080820), Other general industrial equipment (sweepers, scrubbers, broomers, pressure washers, slope and brush cutters, swappers, piste machines, ice rink machines, blowers, vacuums, etc.) (SNAP 080821), Other material handling equipment (conveyors, tunnel locomotives, snow clearing machines, industrial tractors, pushing tractors) (SNAP 080822), and Other construction equipment (paving and surfacing equipment, bore/drill rigs, crushing equipment, peat break machines, concrete breakers/saws, pipe layers, etc.) (SNAP 080823). Types of equipment used in Agriculture/Forestry include: Two-Wheel Tractors (SNAP 080601), Agricultural tractors (SNAP 080602), Harvesters/combiners (SNAP 080603), Others (e.g. sprayers, manure distributors, mowers, balers, tillers, swatchers) (SNAP 080604), Professional chain saws/clearing saws (SNAP 080701), Professional chain saws/clearing saws (SNAP 080701), Forest tractors/harvesters/skidders (SNAP 080702), Others (tree processors, haulers, fellers, forestry cultivators, shredders and log cultivators) (SNAP 080703). Types of equipment used in Residential (Household and gardening) include: Trimmers/edgers/brush cutters (SNAP 080901), Lawn mowers (SNAP 080902), Hobby chain saws (SNAP 080903), Snow mobiles/skidoos (SNAP 080904), Other household and gardening equipment (SNAP 080905), Other household and gardening vehicles (all-terrain vehicles, off-road motor cycles, golf carts, etc.) (SNAP 080906)

For all types of equipment, the emissions originate from the combustion of fuel to power the equipment.

For emissions that occur in sector 1.A.4.c.iii Agriculture/Forestry/Fishing: National fishing Croatia is using notation key "IE" and those emissions are included in NFR 1.A.3.d.ii (based on total amount of fuel for national navigation, maritime and river transport).

Methodology, emission factors and activity data

The source categories 1.A.4.b.ii, 1.a.2.g.vii and 1.A.4.c.ii form the category Non-road mobile sources and machinery is a key source in Croatian inventory and Tier 2 technology-dependent advance method proposed in EMEP/EEA GB2019 is used. In essence, this advance method involves sub-dividing the fuel consumption of fuel type used by the NFR sectors into the different technology types.

Emission factors are expressed as the quantity of emissions of pollutants per tonnes of fuel consumed. All emission factors are default Tier 2 from GB2019, stratified by fuel type, NFR sector, pollutant and are grouped according to the EU emission legislation stages, and three additional layers are added to cover the emissions from engines prior to the first EU legislation stages.

Information on inclusion/exclusion of the condensable component from PM_{10} and $PM_{2.5}$ emission factors by NFR source category are provided in Appendix 9 of this Report.

For heavy metals and POPs, GB2016 is proposing the use of emission factors for Tier 1. That is because for some pollutants (e.g. heavy metals, SO_2 and CO_2,) the emission factors are independent of the equipment technology, i.e. are simply fuel derived. The key species, which do vary with differing equipment technologies, are particulate matter, NOx, NMVOC and CO.

Country specific EF for SO2

For SO_2 emission calculation from combustion of following fuels: diesel, gasoline, kerosene, gas oil and residual fuel oil, Croatia calculate national emission factors on yearly base. This SO_2 EFs are calculated on the base of annual fuel (produced and put on the market) by type and sulphur amount in fuels by type.

For SO_2 emission calculation from combustion of following fuels: gas works gas, liquefied petroleum gases and natural gas, Croatia use default EF SO_2 from GB2019.

Basic activity data is the fuel consumption data for the different NFR categories from national energy balance annually (Figure 4.6-1). These fuel consumption data are split by the relative proportion of engine technology (< 1981, 1981–1990, 1991–Stage I, Stage I, Stage II, Stage IIIA, Stage IIB, Stage IV) for each particular inventory year. Alternative approach uses data derived from Winther & Nielsen (2006) to split the total fuel consumption into engine technology layers for each inventory year. The percentage split of total fuel consumption as a function of engine age are given for diesel machinery in 1.A.2.g.vii, 1.A.4.c.ii (Agriculture) and 1.A.4.c.ii (Forestry), and for gasoline two-stroke and four-stroke machinery. The layer share of fuel consumption per engine age and inventory year for diesel-fuelled non-road machinery and gasoline fuelled non-road machinery are used. For splitting gasoline consumption between two-stroke and four-stroke gasoline machinery, the Danish fuel consumption percentage split (25/75) is used in all inventory years, having in mind that it is regarded as very uncertain.

In accordance with the distribution in the national energy balance, the consumption of fuels for off-road mobile machinery in category 1.A.4.a.ii Commercial / institutional: Mobile are included in Category 1.A.4.b.ii Residential: Mobile and 1.A.4.c.ii Agriculture/Forestry/Fishing: Off-road vehicles and other machinery, therefore the "IE" mark is used.

Also, fuel consumption in category 1.A.4.c.iii is included in category 1.A.3.d.ii National navigation (shipping) (based on the total amount of fuel intended for combustion in domestic air, sea and river transport) and the “IE” mark is used accordingly.

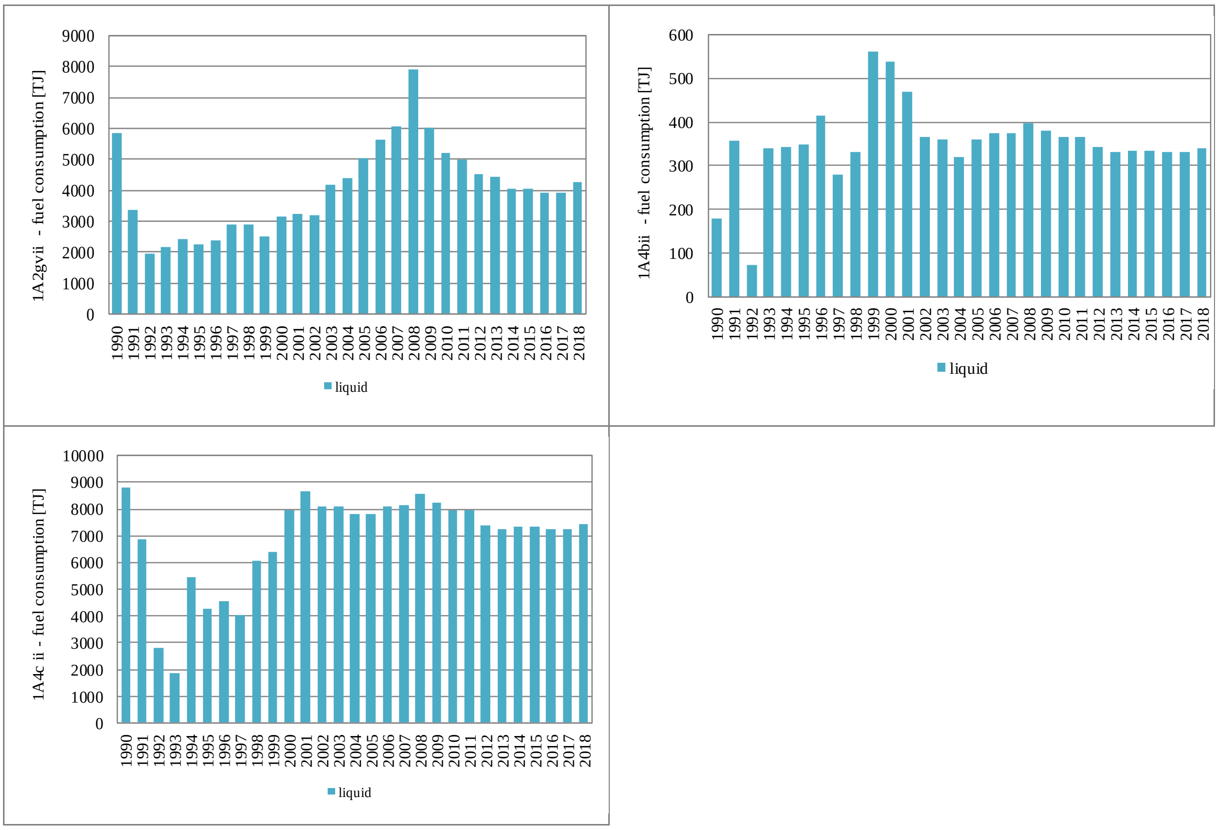


Figure 4.6-1 Activity data on fuel consumption for NFR codes 1.A.2.g.iv, 1.A.4.b.ii and 1.A.4.c.ii

Recalculations and improvements

Non-road mobile sources and machinery: Industry (NFR 1.A.2.g.vii)

Recalculation was performed for the period 1990 – 1995 due to correction of activity data for gasoline consumption.

Residential (NFR 1.A.4.b.ii)

Agriculture/Forestry (NFR 1.A.4.c.ii)

There was no recalculation or other improvement for these source categories.

4.7. Other sectors (NFR 1.A.5.a, 1.A.5.b)

Source category description

Category 1.A.5 is included in IIR in order to improve the transparency of inventory information on military emissions. All military emissions in sector 1.A.5 are specified as included elsewhere (IE).

In national energy balance military fuel consumed are included in 1.A.4.a.i, 1.A.3.a, 1.A.3.b and 1.A.3.d. Data on fuel sold for each category are collected via annual questionnaire by Croatian statistical office. This amount of fuel include as well fuel used for military purposes. Table 4.7-1 shows the link between the source category 1.A.5 and other source categories, where military emissions are included.

Dividing military from national specification is not possible because data for military only are not available and it is not economically justified because fuel used for military purposes is negligibly small for the whole historical period. It is most likely that contribution of military is below the threshold of significance.

Table 4.7-1 Military emissions specification

<table>
<tr><th>NFR code</th><th>Sector name</th><th>Notation key</th><th>NFR code where emissions are reported</th><th>Sector name where emissions are reported</th></tr>
<tr><td>1.A.5.a</td><td>Other stationary (including military)</td><td>IE</td><td>1.A.4.a.i</td><td>Commercial/Institutional: Stationary</td></tr>
<tr><td rowspan="5">1.A.5.b</td><td rowspan="5">Other, Mobile (including military)</td><td rowspan="5">IE</td><td>1.A.3.a.i(i), 1.A.3.a.ii(i)</td><td>Domestic and International aviation LTO (civil)</td></tr>
<tr><td>1.A.3.b.i, 1.A.3.b.ii, 1.A.3.b.iii, 1.A.3.b.iv</td><td>Road transport</td></tr>
<tr><td>1.A.3.d.ii</td><td>National navigation (shipping)</td></tr>
<tr><td>1.A.3.a.i(ii), 1.A.3.a.ii(ii)</td><td>International and Domestic aviation cruise (civil)</td></tr>
<tr><td>1.A.3.d.i(i)</td><td>International maritime navigation</td></tr>
</table>

4.8. Fugitive emissions form fossil fuel (NFR 1.B)

Source category description

Source category NFR 1.B encompasses fugitive emissions from coal, oil and natural gas. During all stages of the production and use of fossil fuels, from the extraction to their final use, fuel components can be released in the form of fugitive emissions.

Emission Calculation Improvement Project, led by the MEE, was carried out for the activity of natural gas transmission (1.B.2.b.ii; SNAP 050600) and NMVOC emission was recalculated for the whole time series in this source category.

Fugitive emissions from solid fuels (NFR 1.B.1)

This source category includes emissions from coal mining and handling (NFR 1.B.1.a), solid fuel transformation (NFR 1.B.1.b), and other fugitive emissions from solid fuels (NFR 1.B.1.c).

In Croatian inventory, this category encompasses emissions from coal mining and handling, which was present in Croatia until 1999, as well as emissions from coal transformation (coke production), which was present until 1994. From 1990 to 1999, coal production in Croatia has been on a steady decline. Only Istrian underground coal mines were active and they produced 0.015 - 0.174 mil. t of coal.

For other fugitive emissions from solid fuels (NFR 1.B.1.c) Croatia does not report emissions, i.e. the notation key "NO" is used.

All underground and surface excavation activities result in fugitive emissions of CH_4, NMVOC and particulate matter, which arise during coal mining and handling. In addition, coke plant is a major source of fugitive emissions such as: SOx, NOx, NMVOC, CH_4, CO_2, CO, NH_3, particulate matter and heavy metals as well as PAHs.

Fugitive emissions from oil and natural gas (NFR 1.B.2)

This source category includes subcategories: Oil - Exploration, production, transport (NFR 1.B.2.a.i), Fugitive emissions oil - Refining, storage (NFR 1.B.2.a.iv), Distribution of oil products (NFR 1.B.2.a.v), Natural gas – Exploration, production, transport (NFR 1.B.2.b), Venting and flaring (NFR 1.B.2.c), and Other fugitive emissions from energy production (NFR 1.B.2.d) – for which Croatia does not report emissions, i.e. the notation key "NO" is used.

This category encompasses fugitive emissions from various activities of exploration and production, refining, storage transport, processing and distribution of crude oil, petroleum products (gasoline) and natural gas. Fugitive emissions in this category also include emissions arising from gas flared on oil-and gas-production installations for safety, and emissions due to venting activities in oil and gas production.

Oil - Exploration, production, transport (NFR 1.B.2.a.i)

Exploration, production and transport of oil in the Republic of Croatia is carried out by the company INA-Industrija nafte, within the business segment „Exploration & Production of oil and gas“ (former INA NAFTAPLIN). Number of active oil fields has changed over the years of the time series. The greatest quantities of oil come from the eight most significant fields, which contain 83% of total reserves discovered in Croatia. During the war (1991-1995), a significantly smaller number of oil fields were active. All fields in Croatia are “on shore” fields.

Natural gas - Exploration, production, transport (NFR 1.B.2.b)

Exploration and production of natural gas in Croatia is carried out by the company INA-Industrija nafte, within the business segment „Exploration & Production of oil and gas“. Main gas fields, with 70% of total reserves, are located in the three largest gas and gas condensate fields: Molve, Kalinovac and Stari Gradac. Molve provides between 70% - 75% of gas and condensate per year in Croatia. One of the old gas fields - Okoli, in the Sava Depression, has been turned into underground gas storage of the capacity of 500 mil. m^3. Additional information are provided in Chapter 4.2. (NFR 1.A.1), under the NFR 1.A.1.c category description.

Transmission is carried out by the transmission system operator - Plinacro Ltd and distribution system operators (36 companies). In addition, this category includes Hg emission that originates from the process of cleaning natural gas at the central gas station (Molve). Natural gas produced in Croatian gas fields contains a significant amount of Hg (516 $\mu g/m^3$), which has not been extracted from natural gas until 1992. In 1993, technology for Hg emission reduction was put in operation, resulting in reduced emission to about 0.12 $\mu g/m^3$.

Transmission system consists of international, main, regional and branch pipelines and supporting facilities, reducing and metering stations of various capacities, and other facilities and systems that enable reliable and secure gas transmission. Basic information regarding Croatian transmission system are shown in Table 4.8-1.

Table 4.8-1 Basic information on the natural gas transmission system of the Republic of Croatia

Natural gas transmission system of the Republic of Croatia	
Number of transmission system operators	1
The total length of pipelines	2693 km
Interconnections / transmission system operators:	Rogatec / Plinovodi Ltd (SLO) Drávaszerdahely / FGSZ Ltd. (HU)
Underground gas storage / gas storage system operator:	Okoli / Podzemno skladište plina Ltd
Inputs from domestic production / gas producer	UMS CPS Molve / INA - d.d. UMS Etan, Ivanić Grad / INA - d.d. UMS PS Ferdinandovac / INA - d.d. UMS PS Gola / INA - d.d. UMS PS Hampovica / INA - d.d. UMS Terminal Pula / INAGIP Ltd
Number of connections for end users connected to transmission system:	36
Number of connections to the distribution systems and the number of distribution system operators:	Number of ports: 158 Number of operators: 36
Number of balancing zones:	1

Source: Plinacro Ltd. (http://www.plinacro.hr)

Fugitive emissions oil - Refining, storage (NFR 1.B.2.a.iv)

Refining/storage is carried out in oil refineries at two locations, in Rijeka (RNR) and Sisak (RNS). Production capacities of the refineries are shown in Table 4.2-2. Emissions calculation for RNS refinery includes emissions from FCC regenerators (without CO boiler), catalytic reforming unit, coking plant (since 1994) and Claus installation (since 2007). For RNR refinery, emissions include FCC regenerators (without CO boiler), catalytic reforming unit (two units) and Claus installation (since 1997). In addition, emissions from storage and handling of petroleum products in refineries are included in calculations.

Distribution of oil products (NFR 1.B.2.a.v)

In Croatia, distribution of oil products takes place through the following activities:

- shipping and delivery of products at refinery dispatch stations (SNAP 050501),
- transport and depot stations (SNAP 050502), and
- reloading and handling of oil products at service stations (retail trade) (SNAP 050503).

Distribution is carried out by the company INA-Industrija nafte, within the business segment „Consumer Services & Retail". Only gasoline is considered to be significant oil product for NMVOC emission occurring at the refinery site.

Shipping and delivery of products at refinery dispatch stations

Shipping and delivery of oil products is carried out at two refinery dispatch stations - in Sisak and Rijeka.

Shipping and delivery of gasoline in RNS refinery is carried out by road and rail transport, and by barge transport on the Sava River, at the port for receiving and unloading of crude oil and for loading the products on the barges. Shipping and delivery of gasoline, derivatives and tert-butyl methyl ether (MTBT) in RNR refinery is carried out through the terminals for road, rail and marine transport.

Gasoline transport and depot stations

Emissions from gasoline transport, in accordance with GB2019, were identified as negligible. This section includes emissions from gasoline storage at terminals. According to GB2019, the methodology for calculating emissions from gasoline storage at terminals in refineries is covered under the category 1.B.2.a.iv.

Service stations

Handling and manipulation of gasoline is carried out and at service stations. Majority of emissions at service stations are emissions from gasoline tanks, and GB2019 proposes only gasoline emission factors.

Venting and flaring (NFR 1.B.2.c)

Flaring represents controlled release of pollutants, including NOx, NMVOC, SOx, CO, particles and heavy metals into the atmosphere. The inventory includes emissions from the two subcategories: flares in refineries and flares in gas and oil extraction.

Methodology, emission factors and activity data

Coal mining and handling (NFR 1.B.1.a)

Fugitive emissions from NFR 1.B.1.a (SNAP 050102 Underground mining and SNAP 050103 Storage of solid fuel) are calculated by Tier 1 EMEP/EEA methodology and with „top-down“ approach – by multiplying process specific activity data by corresponding EMEP/EEA Tier 1 emission factors (GB2019).

Information on inclusion/exclusion of the condensable component from PM_{10} and $PM_{2.5}$ emission factors by NFR source category are provided in Appendix 9 of this Report.

All emission factors used for the preparation of the IIR are presented by NFR sectors and pollutants in Appendix 4.

The source of activity data for the total mass of coal produced by underground mining for NFR 1.B.1.a is national energy balance. Annual amounts of coal produced are presented in Table 4.8-2.

Solid fuel transformation (NFR 1.B.1.b)

Fugitive emissions from NFR 1.B.1.b Fugitive emissions from solid fuel: solid fuel transformation (SNAP 040201 Coke oven (door leakage and extinction)) are calculated by Tier 1 EMEP/EEA methodology and „top-down“ approach, i.e. by multiplying process specific activity data by corresponding EMEP/EEA Tier 1 emission factors (GB2019).

Information on inclusion/exclusion of the condensable component from PM_{10} and $PM_{2.5}$ emission factors by NFR source category are provided in Appendix 9 of this Report.

All emission factors used for the preparation of the IIR are presented in Appendix 4.

Source of activity data for the production of coke is national energy balance. Annual amounts of coke produced are presented in Table 4.8-2.

Other fugitive emissions from solid fuel (NFR 1.B.1.c)

This category is not present in Croatia, thus notation key "NO" is used.

Oil - Exploration, production and transport (NFR 1.B.2.a.i)

Fugitive emissions from NFR 1.B.2.a.i are calculated by Tier 2 EMEP/EEA methodology, i.e. by multiplying process specific activity data by corresponding Tier 2 emission factors (GB2019).

Information on inclusion/exclusion of the condensable component from PM_{10} and $PM_{2.5}$ emission factors by NFR source category are provided in Appendix 9 of this Report.

All emission factors used for the preparation of the IIR are presented by NFR sectors and pollutants in Appendix 4.

Relevant activity data is annual mass of crude oil produced, which is taken from the national energy balance (Table 4.8-2).

Table 4.8-2 Activity data for NFR 1.B.1.a, 1.B.1.b, 1.B.1.c, 1.B.2.i and 1.B.3

NFR	1.B.1.a	1.B.1.b	1.B.1.c	1.B.2.a.i	1.B.3
Name	Coal mining / handling (quantities of coal produced)	Solid fuel transformation (quantities of coke produced)	Other fugitive emissions from solid fuel	Oil - Exploration, production and transport (quantities of crude oil produced)	Other fugitive emissions not included in 1.B.2
Unit	kt	kt	-	kt	-
1990	173.7	556.0	NA	2696.2	NO
1991	154.8	456.0	NA	1930.9	NO
1992	120.3	408.0	NA	1742.9	NO
1993	115.1	422.0	NA	1727.1	NO
1994	103.2	277.0	NA	1576.6	NO
1995	82.2	NO	NA	1500.3	NO
1996	66.3	NO	NA	1469.1	NO
1997	48.5	NO	NA	1496.2	NO
1998	50.8	NO	NA	1389.4	NO
1999	15.3	NO	NA	1292.7	NO
2000	NO	NO	NA	1213.9	NO
2001	NO	NO	NA	1120.8	NO
2002	NO	NO	NA	1108.5	NO
2003	NO	NO	NA	1052.1	NO
2004	NO	NO	NA	1001.0	NO
2005	NO	NO	NA	946.0	NO
2006	NO	NO	NA	917.4	NO
2007	NO	NO	NA	879.1	NO
2008	NO	NO	NA	835.4	NO
2009	NO	NO	NA	776.2	NO
2010	NO	NO	NA	720.4	NO
2011	NO	NO	NA	664.4	NO
2012	NO	NO	NA	599.9	NO
2013	NO	NO	NA	600.7	NO
2014	NO	NO	NA	593.2	NO

NFR	1.B.1.a	1.B.1.b	1.B.1.c	1.B.2.a.i	1.B.3
Name	Coal mining / handling (quantities of coal produced)	Solid fuel transformation (quantities of coke produced)	Other fugitive emissions from solid fuel	Oil - Exploration, production and transport (quantities of crude oil produced)	Other fugitive emissions not included in 1.B.2
Unit	kt	kt	-	kt	-
2015	NO	NO	NA	670.2	NO
2016	NO	NO	NA	737.1	NO
2017	NO	NO	NA	744.5	NO
2018	NO	NO	NA	732.1	NO

Sources: MEE with assistance of EIHP, CBS; Processing: Ekonerg Ltd.

Refining / storage (NFR 1.B.2.a.iv)

Fugitive emissions from refining / storage (NFR 1.B.2.a.iv) were calculated using the Tier 2 EMEP/EEA methodology (GB2019) and "bottom-up" approach; multiplying relevant activity data by recommended EMEP/EEA Tier 2 emission factors for specific process activities.

Information on inclusion/exclusion of the condensable component from PM_{10} and $PM_{2.5}$ emission factors by NFR source category are provided in Appendix 9 of this Report.

All emission factors used for the calculation are presented by NFR sectors and pollutants in Appendix 4.

Activities within NFR 1.B.2.a.iv Refining/storage include: SNAP 040102a Catalytic Cracking unit regenerators, Partial burn without CO boiler, SNAP 040102b Catalytic reforming units, SNAP 040103 Sulphur recovery plants, SNAP 040104 Storage and handling of petroleum products in refinery, SNAP 040103 Other - Fluid coking units. For catalytic cracking unit regenerators, the proposed Tier 2 emission factors are for partial burn without a CO boiler, and with a primary cyclone installed. Other abatement technology was not taken into account. The existing facilities at refineries do not have abatement technology installed within the catalytic cracking activity.

Data on total annual amount of fresh feed for each type of unit, and annual sulphur production (Claus installation) were obtained from MEE (survey requests to refineries). Activity data for calculating emissions from storage and handling of oil products in refineries is annual total throughput of crude oil in each refinery, which is taken from national energy balance. Detail activity data for NFR 1.B.2.a.iv are presented in Table 4.8-3.

Table 4.8-3 Activity data for NFR 1.B.2.a.iv, represented by the relevant SNAP codes

SNAP	040102a	040102b	040105	040103	040104
SNAP, Name	Catalytic Cracking unit regenerator (total amount of fresh feed)	Catalytic reforming unit (total amount of fresh feed)	Other - Fluid coking unit (total amount of fresh feed)	Sulphur recovery plant (sulphur production)	Storage and handling of petroleum products in refinery (crude oil throughput)
Unit	1000 m^3	1000 m^3	1000 m^3	kt product	kt product
1990	1281.4	1604.8	NO	NO	6860.7
1991	894.9	1025.8	NO	NO	4510.9
1992	698.1	765.2	NO	NO	3935.0
1993	945.7	1090.0	NO	NO	4914.8
1994	842.2	965.9	160.1	NO	4994.3
1995	883.4	1240.1	160.2	NO	5336.1
1996	702.8	1219.0	130.6	NO	5112.7
1997	699.9	1105.8	139.1	2.2	5112.0
1998	898.9	1035.1	154.9	5.3	5007.5

SNAP	040102a	040102b	040105	040103	040104
SNAP, Name	Catalytic Cracking unit regenerator (total amount of fresh feed)	Catalytic reforming unit (total amount of fresh feed)	Other - Fluid coking unit (total amount of fresh feed)	Sulphur recovery plant (sulphur production)	Storage and handling of petroleum products in refinery (crude oil throughput)
Unit	1000 m^3	1000 m^3	1000 m^3	kt product	kt product
1999	1037.2	1136.6	194.7	5.9	5474.8
2000	1385.2	1208.7	190.5	8.3	5162.8
2001	1217.4	1159.5	190.5	6.7	4831.6
2002	1247.8	1028.7	214.2	7.1	4830.0
2003	1242.7	1204.5	189.3	7.5	4861.7
2004	1348.9	1184.5	176.8	8.5	5079.3
2005	1394.2	1048.2	149.6	8.1	4944.7
2006	1138.2	1033.7	192.0	6.7	4716.4
2007	1369.9	1067.4	181.2	8.9	5077.4
2008	1066.0	925.7	116.8	9.5	4308.7
2009	1330.0	1048.7	122.4	10.0	4824.4
2010	1027.8	931.0	184.8	6.4	4256.6
2011	836.2	743.1	91.2	16.3	3502.7
2012	906.2	775.1	109.4	17.5	2924.9
2013	753.7	729.7	83.7	15.9	3062.5
2014	632.8	661.9	38.5	19.4	2444.4
2015	664.6	681.1	90.0	17.5	2998.2
2016	665.4	718.6	62.0	21.7	3250.5
2017	744.3	871.7	107.9	24.2	3562.5
2018	567.4	847.7	127.7	23.3	3697.6

Sources: MEE (survey request: oil refineries); Processing: Ekonerg Ltd

Distribution of oil products (NFR 1.B.2.a.v)

Fugitive emissions from NFR 1.B.2.a.v Distribution of oil products (SNAP 050400 Liquid fuel distribution (except gasoline distribution), SNAP 050502 Refinery dispatch station, and SNAP 050503 Service stations (including refuelling of cars) were calculated by Tier 2 EMEP/EEA methodology (GB2019) and "bottom-up" approach, i.e. by multiplying relevant activity data by the recommended EMEP / EEA Tier 2 emission factors, both stratified according to different techniques in the distribution of oil products. According to the proposed methodology, emissions from refinery, storage tanks, are reported in 1.B.2.a.iv and emissions from loading of mobile containers in refinery are reported in 1.B.2.a.v.

For source category SNAP 050502 Transport and depots (except 050503), according to GB2019, emissions from transport were identified as negligible, emissions from filling mobile containers at depots are calculated in the scope of refinery dispatch stations, and emissions at depots (gasoline storage) are covered in 1.B.2.a.iv.

Detail country specific activity data are collected:

- loading facilities at refinery dispatch stations, depots and storages - volume of volatile products loaded into different transport modes (road, rail and marine tankers); loading practices for specific modes of transport (top, bottom or combined); type and extent of emission control measures in place. Data source is national oil company;
- service stations - quantity of gasoline sold; type and extent of emission control measures in place (Stage IB, Stage II). Data source is national oil company, together with national energy balance;
- average ambient temperature. Data source is Meteorological and hydrological service;

- Reid Vapour Pressure (RVP) of distributed volatile products (gasoline) is calculated from the annual average RVP value and average temperature data.

Activity data for NFR 1.B.2.a.v are presented in Table 4.8-4.

Table 4.8-4 Activity data for NFR 1.B.2.a.v, presented by relevant SNAP codes

Activity	Service stations, Storage tank filling	Service stations, Storage tank breathing	Service stations, Automobile refuelling	Service stations, Automobile refuelling: drips and spills	Refinery dispatch stations, Road tankers	Refinery dispatch stations, Rail tankers	Refinery dispatch stations, Marine tankers
SNAP	50503	50503	50503	50503	50501	50501	50501
Unit	kt gasoline	kt gasoline	kt gasoline	kt gasoline	kt gasoline	kt gasoline	kt gasoline
1990	764.0	764.0	764.0	764.0	426.4	399.9	995.3
1991	590.5	590.5	590.5	590.5	324.5	304.3	757.5
1992	511.4	511.4	511.4	511.4	227.5	213.4	531.1
1993	497.0	497.0	497.0	497.0	298.6	280.0	697.1
1994	545.6	545.6	545.6	545.6	321.0	301.1	749.4
1995	575.1	575.1	575.1	575.1	360.7	338.2	842.0
1996	626.0	626.0	626.0	626.0	319.6	299.7	746.0
1997	678.0	678.0	678.0	678.0	325.7	305.5	760.4
1998	737.3	737.3	737.3	737.3	338.8	317.7	790.9
1999	781.7	781.7	781.7	781.7	296.2	277.8	691.5
2000	784.4	784.4	784.4	784.4	313.5	293.9	731.7
2001	753.8	753.8	753.8	753.8	293.1	274.8	684.1
2002	759.0	759.0	759.0	759.0	301.1	282.3	702.8
2003	757.3	757.3	757.3	757.3	315.9	296.3	737.5
2004	723.7	723.7	723.7	723.7	319.1	299.3	744.9
2005	709.6	709.6	709.6	709.6	333.5	312.7	778.5
2006	711.3	711.3	711.3	711.3	325.4	305.1	759.5
2007	725.3	725.3	725.3	725.3	341.1	319.9	796.3
2008	696.3	696.3	696.3	696.3	308.2	250.8	730.1
2009	692.3	692.3	692.3	692.3	269.8	286.5	871.4
2010	650.5	650.5	650.5	650.5	229.4	275.6	819.1
2011	634.9	634.9	634.9	634.9	192.0	243.3	651.6
2012	590.1	590.1	590.1	590.1	178.4	234.4	746.5
2013	576.2	576.2	576.2	576.2	170.8	198.3	657.7
2014	532.7	532.7	532.7	532.7	141.8	241.7	562.9
2015	531.5	531.5	531.5	531.5	132.3	238.0	690.0
2016	533.4	533.4	533.4	533.4	278.5	177.5	557.8
2016	513.2	513.2	513.2	513.2	354.7	133.7	676.8
2017	498.7	498.7	498.7	498.7	329.3	249.3	450.1
2018	764.0	764.0	764.0	764.0	426.4	399.9	995.3

Source: MEEC with EIHP, MEE, INA d.d; Processing: Ekonerg Ltd

Venting and flaring (NFR 1.B.2.c)

Fugitive emissions from NFR 1.B.2.c Venting and Flaring are calculated for two SNAP categories: SNAP 090203 Flaring in oil refinery and SNAP 090206 Flaring in gas and oil extraction. For the calculation of emissions from SNAP 090203, EMEP/EEA Tier 2 approach is used (except for SO_2 and NMVOC emission). For the calculation of emissions from SNAP 090206 EMEP/EEA, Tier 1 approach is used. Both the activity data and the emission factors are stratified according to different activities that occur in Croatia. Emission calculation is carried out by multiplying process specific activity data for the specific technology by the corresponding EMEP/EEA emission factor (GB 2019).

Information on inclusion/exclusion of the condensable component from PM_{10} and $PM_{2.5}$ emission factors by NFR source category are provided in Appendix 9 of this Report.

All emission factors used for the preparation of the IIR are presented by NFR sectors and pollutants in Appendix 4.

Activity data for SNAP 090203 is the annual flared amount in refineries. The data for the flared amount for each refinery were collected for the period since 2010. The source of data is INA d.d. Quantities of gas flared in refineries in the period 1990-2009 are not available, thus they were estimated using the average value of known quantities of flared gas in the period 2010-2014 and estimated quantities of crude input for each refinery. The average crude oil density in Croatia is assumed to be 0.86 kg/dm^3.

For NMVOC and SO_2 emission calculation, Tier 1 approach is used, because data on flared gas composition are not available. Activity data used for Tier 1 approach is the annual total throughput of refineries. Furthermore, data on total amount of crude oil input to the refineries are used, along with amount of fuel used by type in each refinery.

Source of data for the total amount of crude oil is national energy balance. Source of data for the annual amount of fuels for the period since 2008 is the national EPR, and for the period 1990-2004 documentation for the preparation of the Energy Development Strategy of the Republic of Croatia (OG 130/09), obtained from the company INA d.d. For the remaining period 2005-2007, amount of fuels by type and refinery were estimated by linear interpolation method. Data on annual fuel amounts are used to determine annual amount of crude oil input to each refinery. Data on total crude oil are confidential.

Activity data for SNAP 090206 is the annual volume of gas flared in oil and gas extraction. Data were collected for the period since 2009. Annual volume of gas flared in gas and oil extraction in the period 1990 - 2008 is not available, and it was estimated using average value of the known quantities of annual gas flared in the period since 2009 and the annual volume of total gas and crude oil extracted in Croatia. It is assumed that the average density of natural gas is 0.73 kg/m^3.

Table 4.8-5 gives the overview of activity data for NFR 1.B.2.c Venting and Flaring.

Table 4.8-5 Activity data for NFR 1.B.2.c Venting and Flaring

Activity data	Gas flared in refineries	Crude oil throughput in refineries	Gas flared in gas and oil extraction
Unit	TJ	Gg	1000 m^3
1990	939.1	6860.7	22313.5
1991	775.9	4510.9	19824.6
1992	402.2	3935	14265.6
1993	696.6	4914.8	18026.0
1994	675.7	4994.3	14848.5
1995	879.9	5336.1	12105.4

Activity data	Gas flared in refineries	Crude oil throughput in refineries	Gas flared in gas and oil extraction
Unit	TJ	Gg	1000 m^3
1996	850.6	5112.7	11294.2
1997	893.1	5112	13585.2
1998	1023.9	5007.5	12421.7
1999	1068.3	5474.8	14990.7
2000	1153.3	5162.8	12960.6
2001	1083.0	4831.6	15899.0
2002	1015.3	4830	16767.5
2003	1052.1	4861.7	17314.6
2004	907.2	5079.3	17381.3
2005	901.8	4944.7	18055.0
2006	922.7	4716.4	21453.9
2007	973.2	5077.4	22865.1
2008	998.5	4308.7	21578.8
2009	996.4	4824.4	19029.6
2010	638.0	4256.6	12015.5
2011	818.6	3502.7	14906.3
2012	939.0	2924.9	11197.6
2013	888.3	3062.5	10813.9
2014	947.7	2444.4	15176.4
2015	1159.4	2998.2	12451.5
2016	1336.3	3250.5	12911.5
2017	765.0	3562.5	11799.2
2018	832.3	3697.6	20263.2

Source: MEEC with EIHP, MEE, INA d.d.; Processing: Ekonerg Ltd.

Natural gas - Exploration, production, transport (NFR 1.B.2.b)

Emissions from the exploration, production and transport of natural gas are calculated by applying the Tier 2 EMEP/EEA methodology (GB2019). To apply the Tier 2 approach, both the activity data and the emission factors need to be stratified according to the different activities within this source category – exploration/production and transport of natural gas.

For the calculation of NMVOC emission from natural gas exploration/production (1.B.2.b.i; SNAP 050300), data on gas production taken from energy balance are used together with recommended emission factor (GB 2019).

For the activity of natural gas transmission (1.B.2.b.ii; SNAP 050600), a project of emission calculation improvement, led by the MEE, was conducted for this submission. For the calculation of NMVOC emission, data on annual CH_4 emission reported to the EPR by the company Plinacro Ltd were used (available since 2011). In natural gas transmission system, the only loss in the network occurs during the maintenance of pipeline sections. According to Plinacro Ltd, there is a very good network maintenance and loses are minimized, but they are considerably different for each year. NMVOC emission was calculated using the equation 1.

$$E_{NMVOC} = E_{CH4} \text{ x } (W_{NMVOC} / W_{CH4}) \qquad \text{(Equation 1)}$$

where:

W_{NMVOC} - the weight-% NMVOC

W_{CH4} - the weight-% of CH_4, according to gas quality of the current year

E_{CH4} - the annual CH_4 emission reported in the EPR

All values refer to the volume of gas of 1 m^3 in standard conditions, in which the absolute pressure of gas equals 101.325 Pa (1.01325 bar) and temperature of gas is 288.15 K (15° C).

Standard gas quality in Croatia is regulated by law, and gas quality monitoring and reporting is in the legal competence of Plinacro Ltd.[28]

Activity data for natural gas transmission, which had hitherto been used in calculations, were obtained from Plinacro Ltd, and were available for the period since 2002. Data for the period 1990-2001 were estimated based on data on natural gas production and the average share of transmitted gas in the total amount of natural gas produced. For this inventory, in the scope of emission calculation improvement project, data on gas transmission (consumption) for the whole time series were taken from national energy balance, and they are now also harmonized with data used in the NIR.

Based on specific data on CH_4 emission available since 2011 and specific data on mass composition of natural gas, specific NMVOC emission factors were calculated (CH_4 emission data were formerly available since 2010, and now data were collected for the period since 1998, with all input data updated).

For all data that remained unavailable, an estimate was carried out, based on the available data. For CH_4 emission, average annual emission of the 5 closest years with available data was used, i.e. average of CH_4 emissions during 2011-2015. For 2016, CH_4 emission was not reported in EPR, thus average value of the years 2015 and 2017 was taken. Moreover, data on annual gas composition for the period 1990-1997 were estimated on the basis of average annual gas composition in the 5 closest years, i.e. 1998-2002.

NMVOC emission factors for natural gas transmission are given in table 4.8-6. Used activity data for NFR 1.B.2.b are given in table 4.8-7.

Table 4.8-6 Tier 2 emission factors for NMVOC emission calculation for NFR 1.B.2.b.ii

Activity		Transmission of natural gas (transport + distribution)
Category		1.B.2.b.ii
Pollutant		NMVOC
Tier 2 emission factor, g/1000m^3	1990	3.95
	1991	4.26
	1992	4.11
	1993	3.89
	1994	4.14
	1995	4.48
	1996	3.99
	1997	3.85
	1998	3.51
	1999	3.53
	2000	3.44
	2001	4.15
	2002	4.55
	2003	7.02
	2004	4.83
	2005	3.68

[28] As of October 1 2019, the gas quality monitoring system by chromatographs has been implemented in accordance with the amendments to the Network Rules, and the method of publishing gas quality information has also been amended. In accordance with the Network Rules of the Transmission System, as of October 1, Plinacro Ltd publishes information on the gas quality monitoring system and on the determined gas quality.

	2006	3.51
	2007	3.59
	2008	3.84
	2009	4.91
	2010	2.47
	2011	5.40
	2012	15.58
	2013	10.35
	2014	20.49
	2015	4.27
	2016	4.36
	2017	2.86
	2018	15.29

Table 4.8-7 Activity data for NFR 1.B.2.b

NFR	1.B.2.b.i	1.B.2.b.i	1.B.2.b.ii	1.B.2.b.ii
SNAP	050300	050300	050600	050600
Name	Natural gas production	Natural gas production	Natural gas transmission	Natural gas transmission
Unit	1000 m^3	GJ	1000 m^3	TJ
1990	1982300	68.9	2686600	0.091
1991	1824300	63.4	2487400	0.087
1992	1803000	62.7	2578800	0.089
1993	2049000	71.3	2723000	0.096
1994	1792000	62.3	2562000	0.089
1995	1966400	68.4	2367900	0.083
1996	1785600	62.1	2653400	0.093
1997	1717200	59.7	2750500	0.101
1998	1570100	54.6	2644300	0.092
1999	1550550	53.9	2680800	0.094
2000	1638500	57.0	2704800	0.095
2001	2010400	69.9	2834200	0.099
2002	2120300	73.7	2901800	0.101
2003	2189600	76.1	2884400	0.100
2004	2198100	76.4	3009300	0.105
2005	2283400	79.4	2909900	0.101
2006	2713500	94.4	2877800	0.100
2007	2892100	100.6	3306700	0.114
2008	2729400	94.9	3205100	0.110
2009	2704800	94.1	2959400	0.102
2010	2727200	94.8	3241500	0.111
2011	2471400	85.9	3165000	0.109
2012	2013100	70.0	2971700	0.102
2013	1856100	64.5	2809900	0.096
2014	1747000	60.8	2443600	0.085
2015	1780500	61.9	2519200	0.087
2016	1647200	68.9	2611400	0.091
2017	1483500	63.4	3008300	0.105
2018	1230100	62.7	2770500	0.096

Source: National energy balance; processing: Ekonerg Ltd.

After the implementation of the improvement project, as expected, the greatest differences in emissions are present in the period until 2010, and in 2017. The reason for this is the use of new, more accurate data (primarily data on the average annual composition of natural gas), and avoiding the use of estimates of unavailable data to a greater extent. Because CH_4 emissions data are available in the EPR database from 2011 onwards, NMVOC emission calculated from CH_4 emission for that period are much less different (differences relate primarily to the rounding of decimals), with the exception of 2017, for which data on natural gas composition were collected and updated.

Since most of the emissions in NFR category 1.b.2.b are emissions from natural gas production, differences resulting from the use of the former and the new approach, are not so significant at the level of the entire category.

Generally, emissions from production have increased significantly since 2002 due to an increase in the amount of extracted gas, and have dropped after 2010 due to a decrease in gas extraction. Emissions from transmission from 2011 onwards depend on the amounts of CH_4 released during maintenance activities (which vary considerably over the years) and on the composition of natural gas, making the emission trend uneven. In the period 1990-2010, these emissions are more uniform because they depend only on annual differences in the composition of natural gas, since the assumed amount of CH_4 released is the same for all years (average value of available data).

Other fugitive emissions from energy production (NFR 1.B.2.d)

Emissions in this category are calculated based on the use of geothermal energy for electricity generation. Such activities are not present in Croatia and the notation key "NO" was used.

Recalculations and improvements

Natural gas - Exploration, production, transport (NFR 1.B.2.b)

For the activity of natural gas transmission (1.B.2.b.ii; SNAP 050600), an emission calculation improvement project, led by the MEE, was carried out, in the scope of which new data were collected. In accordance with the aforesaid, NMVOC emission was recalculated for the whole time series in this source category.

Venting and flaring (NFR 1.B.2.c)

Emissions were recalculated for the whole time series for the activity of flaring in oil refinery, due to updated (Tier 2) emission factors from the new GB2019. This has affected the values of emissions of NOx, CO, Pb, Cd, Hg, As, Cr, Cu, Ni and Zn, with inclusion of Se emissions in calculation for this activity.

5. Industrial processes and product use (NFR 2)

This chapter gives an overview of Industrial processes and product use sector and contains information on methodologies, activity data, emission factors, recalculations and planned improvements. Industrial processes include emissions that originate from various process activities. Emissions from fuel combustion in industry are allocated to NFR 1.A.2.f.i. Product use covers solvents and solvent-based products. Solvents are chemical compounds, which are used to dissolve substances such as paints, glues, ink, rubber, etc. or for cleaning purposes (degreasing). Since solvents consist mainly of NMVOC, solvent use is a major source of anthropogenic NMVOC emissions. Once released into the atmosphere, NMVOCs react with reactive molecules (mainly HO-radicals) to form CO_2.

This source category includes the following sub-sectors:

- 2.A Mineral product
  - 2.A.1 Cement production
  - 2.A.2 Lime production
  - 2.A.3 Glass production
  - 2.A.5.a Quarrying and mining of minerals other than coal
  - 2.A.5.b Construction and demolition
  - 2.A.5.c Storage, handling and transport of mineral products
  - 2.A.6 Other mineral products

- 2.B Chemical industry
  - 2.B.1 Ammonia production
  - 2.B.2 Nitric acid production
  - 2.B.10.a Other (production of carbon black, ethylene, styrene, NPK fertilizers, ammonium phosphate, formaldehyde, ethyl benzene, polystyrene, polyvinylchloride, polyethylene LD, vinyl chloride, propylene, urea and sulfuric acid)
  - 2.B.7 Soda ash production

- 2.C Metal production
  - 2.C.1 Iron and Steel production
  - 2.C.1.1 Steel production
  - 2.C.1.2 Iron production
  - 2.C.1.5 Other (Rolling mills)
  - 2.C.2 Ferro alloys production
  - 2.C.3 Aluminium production

- 2 D – 2 L Other solvent and product use

- 2.D.3.a Domestic solvent use including fungicides
- 2.D.3.b Road paving with asphalt
- 2.D.3.c Asphalt roofing
- 2.D.3.d Coating applications
- 2.D.3.e Degreasing
- 2.D.3.f Dry cleaning
- 2.D.3.g Chemical products
- 2.D.3.h Printing
- 2.D.3.i, 2.G Other solvent and product use
- 2.H.1 Pulp and paper industry
- 2.H.2 Food and beverages industry
- 2.H.3, 2.L Other industrial processes including production, consumption, storage etc. of bulk products
- 2.I Wood processing
- 2.J Production of POPs
- 2.K Consumption of POPs and heavy metals

In general, method for emissions calculation includes multiplying activity data by the corresponding emission factors. The methodology for all activities within this sector is presented in detail in the following sections.

Emission factors are expressed as a quantity of pollutant emission per unit of production/consumption or per population. Used emission factors are for the most part taken from the *EMEP/EEA Guidebook – 2019*. The source of the emission factors used is indicated in the description of each category, and an overview of all emission factors by NFR codes and pollutants is given in Appendix 4.

The following sources of information are generally used for activity (or emissions) data for Industrial processes and product use sector:

- National production statistics obtained from the CBS (Annual Statistical Reports, Industrial production, Annual PRODCOM Results),
- EUROSTAT database,
- Annual population estimates obtained from the CBS,
- Data on direct emissions as reported annually by facilities in legally required forms under the Croatian EPR,
- Plant specific data collected by direct contacts with facilities. mainly for LCPs (e.g. facilities for production of cement, lime, sugar etc.),
- National energy balance.

5.1. Mineral products (NFR 2.A)

Source category description

This source category covers process-related emissions resulting from various activities in the production and use of a variety of mineral industry products. The following processes are included: Cement production (NFR 2.A.1, SNAP 040612), Lime production (NFR 2.A.2, SNAP 040614), Glass production (NFR 2.A.3, SNAP 040613), Quarrying and mining of minerals other than coal (NFR 2.A.5.a, SNAP 040623), Construction and demolition (NFR 2.A.5.b, SNAP 040624) and Storage, handling and transport of mineral products (NFR 2.A.5.c). For source category 2.A.5.c, Croatia is using notation key “IE”, since PM emissions from this category are included in other NFR 2.A codes.

Cement production (NFR 2.A.1)

Cement production includes: raw materials extraction and pre-processing, heating the raw materials in a kiln to produce clinker, blending and grinding of clinker to cement, storage, packing and delivery of cement.

The main emissions from cement production are emissions from kiln systems. However, only emissions of particulate matter, which mainly originate from pre- and after-treatment are considered in this sector. Emissions from the kiln are a combination of combustion and process emissions but the emissions of other pollutants are assumed to originate mainly from fuel combustion, and are therefore allocated to the Energy sector.

During the reporting period, there were seven factories in operation in Croatia. Four factories were active during the whole time series. One of them produces aluminate (aluminous) cement, while all other factories in Croatia (including the ones that are inactive today) produced Portland cement. In the aluminate cement factory, Portland cement was also produced in another production line until 1997.

One factory was closed in July 1994 and two other factories worked intermittently during the reporting period (one of them was active from 1990 to 1995 and again since 1998 (and is still active), and the second one from 1990 to 2009 and during 2014).

Production varied depending on the economic situation and demand on the market. Overall production at the national level decreased in the period 1991-1995 as a result of the war. In the period 1996-2007, production increased with the escalation in construction sector activities. The trend after 2008 is a result of the economic crisis, followed by a slow recovery after 2012.

Lime production (NFR 2.A.2)

Basic types of processes occurring within the lime work operations include: quarrying and crushing of minerals, combustion of fuels in lime kilns, storage, packing and delivery of produced lime.

As in cement production, only emissions of particulate matter from lime production are considered in this sector. Emissions from the kiln are a combination of combustion and process emissions but the emissions of other pollutants are assumed to originate mainly from fuel combustion and are therefore allocated to the Energy sector.

During the reporting period, five lime factories were active in Croatia, with two of them producing both quicklime and dolomitic lime and three producing only quicklime. One factory ceased its operations in 2009, one in 2010 and one in 2011. Furthermore, two of the factories that were active since 1990 and are still in operation had a varying production and even periods of halted operations over the years (one did not produce lime from 1992 to 1997, as it was severely damaged during the war, and the second one during 2009 due to technical reasons). Production of dolomitic lime was stopped in the period 1991-1995.

In addition, non-marketed quicklime is being produced for the needs of sugar refining in three sugar factories. Production data are available since 1991 for one factory, since 1992 for the second factory and since 1999 for the third factory. Sugar was being produced in those factories prior to these years but there are no records on lime production (factories report that those data have not been kept in their archives, and moreover, non-marketed lime is not included in national statistics)[29].

During 1990 and 1991, a certain amount of non-marketed quicklime reagent was also produced in pig iron production plant.

Apart from the abovementioned, there was no other identified non-marketed lime production in Croatia.

Production trend is very similar to trends in the cement industry due to the same dependence on the economic situation and market demands.

Glass production (NFR 2.A.3)

This source category includes production and processing of flat glass and container glass, as well as mineral wool production, which include a series of steps – from the preparation of raw materials, to melting in a furnace, to final steps in product finishing. Emissions from glass production (apart from the main emission - CO_2, originating from the carbonisation process) include heavy metals, black carbon and dust, while emissions from mineral wool production include NH_3, NMVOC and dust.

During the reporting period, two glass producing factories were in operation in Croatia; one of them producing container glass and the other producing flat glass. In 2009, the second factory has ceased its glass production operations, and since then, together with several other factories in Croatia, it only processes imported glass (using mostly operations like cutting, grinding, paint application, laminating etc.). Total national quantities of final glass products (including products from glass producing and glass processing factories) are included in this category.

Mineral wool production plant began its operations in 2007.

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

Quarrying and mining of minerals other than coal in Croatia include quarrying of ornamental and building stone, limestone, gypsum, etc., gravel, sand and clay excavation, extraction of salt as well as mining and quarrying of other minerals.

These activities, which include extraction (with the use of mining explosives, if needed), transportation and crushing of minerals, result in emission of particulate matter. National production statistics by type of minerals is a source of activity data for emission calculation.

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[29] It should be noted that sugar factories were affected by warfare during and immediately after the war, and their production activities were discontinued or significantly reduced, with frequent interruptions. Since it was an atypical period of production, even taking aside the possibility of lime not being produced on-site, estimates of missing data are impaired by incomparability with typical production conditions during non-war years.

Construction and demolition (NFR 2.A.5.b)

Construction of infrastructure and buildings is an important source of fugitive particulate matter emissions. In construction industry, there are many activities that result in emissions, such as land clearing and demolition, equipment movements and other various construction activities.

The basis for the calculations is national statistical data on construction and demolition activities. Specifically, data on annual floor area of the building constructed or demolished are used.

Methodology, emission factors and activity data

Cement production (NFR 2.A.1)

Methodology for emission calculation is based on Tier 2 EMEP/EEA approach, for all factories except one. For the one factory, which ceased its operations in 1994, it was not possible to collect the data needed for higher tier approach, thus Tier 1 method had to be used. All emission factors for cement production emission are taken from GB2019.

As mentioned, for six factories, it was decided in direct contacts with operators to include Tier 2 emission factors for PM, with inclusion of existing abatement technologies in all facilities: ESP on main stack and smaller fabric filters for moderate control of fugitive sources, for the whole time series.

For the remaining, seventh factory, Tier 1 emission factors assume an „averaged“ or typical technology and abatement implementation and integrate all different sub-processes in the cement production between feeding the raw material into the process and the final shipment off the facility.

Information on inclusion/exclusion of the condensable component from PM_{10} and $PM_{2.5}$ emission factors by NFR source category are provided in Appendix 9 of this Report.

Besides TSP, $PM_{2.5}$ and PM_{10} emissions, BC emissions are reported for 1990 onwards and are calculated as a fraction of $PM_{2.5}$ according to GB2019.

Activity data on clinker production were taken from the NIR. Originally, these data were collected by a survey of all cement manufacturers and cross-checked with national statistics on clinker production.

Activity data on clinker production are presented in Table 5.1-1. Emission factors used for the preparation of the IIR 2020, presented by NFR sectors and pollutants, are given in Appendix 4.

Lime production (NFR 2.A.2)

Methodology for emission calculation is based on Tier 2 EMEP/EEA approach. Tier 2 controlled PM emission factors from GB2019 are used. In all facilities, kilns are equipped with fabric filters, and lime hydrators are equipped with de-dusting bag filters. Also, fabric filters for emissions control from conveyor belts are present in all facilities.

Information on inclusion/exclusion of the condensable component from PM_{10} and $PM_{2.5}$ emission factors by NFR source category are provided in Appendix 9 of this Report.

Besides TSP, $PM_{2.5}$ and PM_{10} emissions, BC emissions are reported for 1990 onwards and are calculated as a fraction of $PM_{2.5}$ according to GB2019.

Data on the amount of lime produced in Croatia includes the amount of lime produced in lime factories and sugar factories, and lime produced for the needs of pig iron production (in 1990 and 1991). Activity data were taken from the NIR. Originally, these data were collected by a survey of all lime manufacturers and cross-checked with national statistics on lime production.

Activity data on lime production are presented in Table 5.1-1. Emission factors used for the preparation of the IIR 2020, presented by NFR sectors and pollutants, are given in Appendix 4.

Glass production (NFR 2.A.3)

Methodology for emission calculation is based on Tier 1 EMEP/EEA approach. Recommended Tier 1 emission factors from GB2019 were used.

Croatia recognizes the likelihood of overestimation of emissions from glass production since default emission factors include emissions from both melting and non-melting activities, while national statistics (which is a main source of activity data) does not distinguish between produced and processed glass. This results in products made from imported glass (without any melting activities occurring in Croatia) being included in activity data for this category.

Methodology for emission calculation for mineral wool production is based on Tier 3 EMEP/EEA approach, i.e. it is based on continuously measured and verified annual emissions. Facility specific emission factors for NH_3, NMVOC and PMs were calculated based on measured emissions and annual production capacity.

Information on inclusion/exclusion of the condensable component from PM_{10} and $PM_{2.5}$ emission factors by NFR source category are provided in Appendix 9 of this Report.

Activity data on glass and mineral wool production are taken from the Annual Statistical Reports, Industrial production, Annual PRODCOM Results (CBS) and from EPR facilities reports. The activity data on glass production, which include also the data for mineral wool production, are presented in Table 5.1-1. Emission factors used for the preparation of the IIR 2020, presented by NFR sectors and pollutants, are given in Appendix 4.

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

Methodology for emission calculation for quarrying and mining of minerals other than coal is based on Tier 1 EMEP/EEA approach. The recommended Tier 1 emission factors from GB2019 were used. The activity data on quarrying and mining of minerals other than coal are taken from the Annual Statistical Reports, Industrial production, Annual PRODCOM Results (CBS) and they are presented in Table 5.1-1.

Information on inclusion/exclusion of the condensable component from PM_{10} and $PM_{2.5}$ emission factors by NFR source category are provided in Appendix 9 of this Report.

Emission factors used for the preparation of the IIR 2020, presented by NFR sectors and pollutants, are given in Appendix 4.

Construction and demolition (NFR 2.A.5.b)

Methodology for emission calculation for construction and demolition is based on Tier 1 EMEP/EEA approach, which includes multiplying annual amount of floor area of the building constructed by the appropriate emission factor. The recommended Tier 1 emission factors from GB2013 were used. The plan is to recalculate emissions for the entire reporting period for this category after collecting the required activity data according to Tier 1 EMEP/EEA GB2019 methodology. Several inquiries have been addressed to relevant entities so far, but some of the information provided is not structured at the required level and it will evidently be necessary to carry out significant estimates of missing data and/or to adapt the emission calculation methodology to the data available. Given that for this year's inventory the emissions calculation improvements were focused on several other categories, recalculation of emissions from this activity is currently planned for one of the next submissions.

Information on inclusion/exclusion of the condensable component from PM_{10} and $PM_{2.5}$ emission factors by NFR source category are provided in Appendix 9 of this Report.

Emission factors used for the preparation of the IIR 2020, presented by NFR sectors and pollutants, are given in Appendix 4. Activity data, taken from the Annual Statistical Reports, are presented in Table 5.1-1.

Table 5.1-1 Activity data for NFR 2.A.1, 2.A.2, 2.A.3, 2.A.5.a and 2.A.5.b

NFR	2.A.1	2.A.1	2.A.2	2.A.3	2.A.5.a	2.A.5.b
	Clinker (Tier 2 approach)	Clinker (Tier 1 approach)	Lime production	Glass and mineral wool production	Quarrying and mining of minerals other than coal	Construction and demolition
Unit	kt	kt	kt	kt	Mt	m^2
1990	1919.2	143.3	232.3	275.5	27.0	2826634
1991	1209.3	127.8	165.4	252.9	18.9	2119965
1992	1428.6	137.7	124.5	143.9	18.5	1411541
1993	1214.5	90.6	134.5	134.4	16.8	1345926
1994	1537.9	45.8	140.1	162.2	19.8	1499057
1995	1197.6	NO	139.7	166.8	20.4	1918453
1996	1306.3	NO	175.7	153.8	23.2	2359648
1997	1533.8	NO	186.9	127.3	17.6	2216206
1998	1649.1	NO	195.4	148.3	18.8	2206747
1999	2151.0	NO	189.1	136.3	19.4	2012288
2000	2382.1	NO	193.0	139.1	20.8	717801
2001	2739.2	NO	239.4	150.3	23.7	2061231
2002	2698.6	NO	269.3	158.5	26.2	2942136
2003	2692.1	NO	249.3	187.0	31.2	3438150
2004	2852.2	NO	284.0	210.6	33.2	3449089
2005	2926.6	NO	309.6	227.8	30.9	4089576
2006	3104.4	NO	366.2	228.7	35.9	4570084
2007	3160.5	NO	376.6	237.5	37.5	5218050
2008	2995.1	NO	367.4	255.1	43.9	4882190
2009	2439.1	NO	251.0	280.9	35.0	3967687
2010	2320.5	NO	222.5	295.2	24.2	3388897
2011	2071.7	NO	182.1	320.5	25.6	2703950
2012	1996.5	NO	139.6	300.1	24.9	2727335
2013	2198.3	NO	127.0	327.4	23.7	1961243
2014	2318.5	NO	135.6	364.9	23.5	1695871
2015	2155.8	NO	134.2	334.8	24.3	1924884
2016	2055.2	NO	125.1	378.1	23.0	1853646
2017	2411.1	NO	145.7	395.0	23.7	2065404
2018	2325.8	NO	146.3	404.6	24.2	2249797

Source: CBS, survey results from cement and lime producers and EPR data base; Processing: Ekonerg Ltd

Recalculations and improvements

Cement production (NFR 2.A.1)

Recalculation was performed for the period 1990-1994, due to transition to Tier 1 approach for one plant, for which no information on technology and processes could be collected, since it ceased operations in 1994. Hitherto, it has been assumed that this plant used the same abatement technology as the remaining six factories that were active at the same time. However, Croatia has recently revised this sub-sector using what is considered to be the most accurate currently available and verifiable data. Production at this factory was stopped more than 25 years ago, mainly due to war activities, making it unlikely to collect or verify more detailed activity data needed for a higher tier approach. Therefore, it was concluded that there was no realistic possibility of improving the emission calculation under the circumstances.

There was no recalculation or other improvement for other source categories.

5.2. Chemical industry (NFR 2.B)

Source category description

This sub-chapter gives an overview of the production of various inorganic and organic chemicals in the Republic of Croatia. The following activities are included: Ammonia production (NFR 2.B.1, SNAP 040403), Nitric acid production (NFR 2.B.2, SNAP 040402), Other chemical industry (NFR 2.B.10.a, SNAP 0404 and 0405) and Storage, handling, transport of chemical products (NFR 2.B.10.b).

Other chemical industry includes production of various chemical products: Sulphuric acid (SNAP 040401), Ammonium phosphate (SNAP 040406), NPK fertilizers (SNAP 040407), Urea (SNAP 040408), Carbon black (SNAP 040409), Ethylene (SNAP 040501), Propylene (SNAP 040502), 1,2 dichloroethane (SNAP 040503), Vinyl chloride (SNAP 040504), Polyethylene LD (SNAP 040506), Polyvinylchloride (SNAP 040508), Styrene (SNAP 040510), Polystyrene (SNAP 040511), Formaldehyde (SNAP 040517) and Ethyl benzene (SNAP 040518).

Adipic acid production (2.B.3) and Carbide production (2.B.5) are not in Croatia.

For source category 2.A.10.b Croatia is using notation key “IE”, since PM emissions are included in other NFR 2.B codes.

Ammonia production (NFR 2.B.1, SNAP 040403)

One ammonia manufacturer has been in operation in Croatia during the whole time series. Natural gas is used as both feedstock and fuel in the production process. Ammonia is produced by catalytic steam reforming of natural gas, in which hydrogen is chemically separated from natural gas and combined with nitrogen to produce ammonia. Ammonia production process results in emissions of NOx, NMVOC, CO and NH_3.

Installation of the unit for separation of ammonia and hydrogen from a portion of synthesis gas that is incinerated in the primary reformer (installed in April 2009), made it possible to return these two components to production process (instead of incinerating them). The ammonia is extracted in a high pressure scrubber in contact with water, and the resulting ammonia water is stripped. This technology has led to an evident reduction in total NOx emissions (as NO_2) in 2009.

The same manufacturer also produces nitric acid, sulphuric acid and mineral fertilizers. Also, the same manufacturer was producing carbon black until 2009.

Nitric acid production (NFR 2.B.2, SNAP 040402)

There is one manufacturer of nitric acid in Croatia, with two units-plants, one of which has two production lines. In the production process, ammonia, which is used as feedstock, is vaporized, mixed with air and burned over a platinum/rhodium alloy catalyst. Both plants utilize dual-pressure production processes. Nitric acid is used in the manufacture of fertilizers by the same facility.

Nitric acid production results in NOx emission.

In July 2010, abatement technologies (Selective Catalytic Reduction-SCR) for removing NOx (as NO_2) were installed at Plant 1. This has resulted in evident reduction in NOx emissions in 2011. The causes of the fluctuation in emissions were technical problems associated with the operation of the installed SCR (loss of catalyser and system reconstruction, as well as frequent shutdowns and start-ups of the plants). At Plant 2, this technology was put into trial operation in December 2017.

Other chemical industry (NFR 2.B.10.a, SNAP 0404 and 0405)

Other chemical industry includes production of various chemical products such as sulphuric acid, ammonium phosphate, NPK fertilizers, urea, carbon black, ethylene, propylene, vinyl chloride, polyethylene LD, 1,2 dichloroethane, polyvinylchloride, styrene, polystyrene, formaldehyde and ethyl benzene, which results in emission of various pollutants, as described below. Production of the following chemical products was shut down: ammonium phosphate and carbon black in 2009; ethylene, propylene, polyethylene LD and polystyrene in 2011; 1,2 dichloroethane in 2001; vinyl chloride in 2002; polyvinylchloride in 2000, styrene and ethyl benzene in 1991 (with a short reactivation of ethyl benzene production during 1995 and 1996). Production of polyethylene LD was reactivated in 2014 and 2015 and was stopped again in 2016. Production of sulphuric acid was stopped for two years, in 2010 and 2011.

Methodology, emission factors and activity data

Ammonia production (NFR 2.B.1, SNAP 040403)

Emission calculation is based on the Tier 2 EMEP/EEA methodology. Tier 2 EFs from GB2019 were used for all emissions except for NOx, for which the facility specific annual emission factors were used since 1998 (direct emissions measurements divided by quantities of ammonia produced, for each year). For the period 1990-1997, an average NOx emission factor was calculated and used, based on available direct emissions measurements.

It is assumed that annual changes in the composition of natural gas (feedstock) and technical problems related to the operation of the installed emission reduction technology are the reason for occasional fluctuations in NOx emission factors. Other official explanations were not obtained.

Data on ammonia production and natural gas composition were collected from the survey of the manufacturer and verified by comparison with Annual Statistical Reports, Industrial production, Annual PRODCOM Results (CBS). Data of direct emissions measurements are taken from EPR database.

Information on inclusion/exclusion of the condensable component from PM_{10} and $PM_{2.5}$ emission factors by NFR source category are provided in Appendix 9 of this Report.

Nitric acid production (NFR 2.B.2, SNAP 040402)

Emissions calculation is based on Tier 2 EMEP/EEA methodology. Since 1998, facility specific emission factors were calculated from periodically measured NOx emissions and annual production capacity. For the period 1990-1997, an average NOx emission factor was calculated and used, based on available direct emissions measurements. Data on the production of nitric acid (100 percent HNO_3 from both plants) were collected from the survey of the manufacturer and verified by comparison with Annual Statistical Reports, Industrial production, Annual PRODCOM Results (CBS). Data are presented in Table 5.2-1. Information on inclusion/exclusion of the condensable component from PM_{10} and $PM_{2.5}$ emission factors by NFR source category are provided in Appendix 9 of this Report.

Other chemical industry (NFR 2.B.10.a, SNAP 0404 and 0405)

Emission factors are expressed as the quantity of pollutants emission per unit of production. For Polyethylene Low Density, PVC (suspension PVC and emulsion PVC), Styrene, Polystyrene (expandable - EPS) and Ethyl benzene, Ethylene, Propylene, 1,2 dichloroethane, Vinyl chloride, Formaldehyde and Ammonium phosphate production, Tier 2 methodology with Tier 2 emission factors from GB2019 were used.

For NPK fertilizers production, since 1998 (for TSP since 2007), facility specific NOx, NH_3 and TSP emission factors were calculated from direct measurements of emissions and annual production capacity. For the period 1990-1997 (for TSP 1990-2006), an average NOx, NH_3 and TSP emission factors were calculated and used, based on available measurements.

For Sulphuric acid production, SO_2 emissions were reported. Direct SO_2 emissions are facility specific emission since 1998. For the period 1990-1997, an average SO_2 emission factor was calculated and used, based on available direct SO_2 emissions measurements and annual production capacity.

For Urea production, NH_3, TSP, $PM_{2.5}$, PM_{10} and BC emissions were reported. For TSP, $PM_{2.5}$, PM_{10} and BC emission calculation, Tier 2 emission factors from GB2019 were used. Regarding NH_3, direct facility specific emissions measurements since 1998, were used. For the period 1990 to 1997, an average NH_3 emission factor was calculated and used, based on available direct NH_3 emissions measurements and annual production capacity.

For Carbon black production, Tier 2 EMEP/EEA GB2019 methodology and Tier 2 emission factors were used for SO_2, NOx, NMVOC, CO and TSP emission calculation. Those emissions were reported for the period 1990 – 2009. For the period 2000-2009, facility specific direct CO emissions were reported.

For Ammonium phosphate production, Tier 2 emission factors from GB2019 were used for TSP, PMs and BC emission estimation.

Information on inclusion/exclusion of the condensable component from PM_{10} and $PM_{2.5}$ emission factors by NFR source category are provided in Appendix 9 of this Report.

Data on the production of ammonia, nitric acid, sulfuric acid, NPK fertilizer and urea were collected from the survey of the manufacturers of these inorganic chemicals in Croatia and verified by comparison with Annual Statistical Reports, Industrial production, Annual PRODCOM Results (CBS). For all other chemicals in the scope of this source category, activity data are taken from national statistic (Annual Statistical Reports, Industrial production, Annual PRODCOM Results (CBS)). Activity data for this category are presented in Tables 5.2-1 and 5.2-2. Emission factors used for the preparation of the IIR 2020, presented by NFR sectors and pollutants, are given in Appendix 4.

Table 5.2-1 Activity data for NFR 2.B.1, 2.B.2 and 2.B.10.a, represented by the relevant SNAP codes

NFR	2.B.1	2.B.2	2.B.10.a				
Name	Ammonia	Nitric acid	Carbon black	Sulphuric acid	Ammonium phosphate	NPK fertilisers	Urea
SNAP	040403	040402	040409	040401	040406	040407	040408
Unit	t	t	t	t	t	t	t
1990	344947	332459	30624	241759	66711	556522	280354
1991	347524	291997	18783	187009	42365	532082	328029
1992	425719	381797	13479	278434	53635	716537	356995
1993	344812	287805	17123	178269	43719	482845	273226
1994	350184	311236	21468	265550	48193	554370	278981
1995	377589	299297	27185	233122	65332	548305	314137
1996	373728	278683	26735	223201	52067	516058	383822
1997	402407	292892	24214	202191	47760	536732	361730
1998	301758	220508	24087	164011	40661	457556	279110
1999	387159	260198	20627	192587	47557	523246	360427
2000	395024	306201	20029	199585	32112	583243	352553
2001	315388	257534	21180	126284	19080	407087	279682
2002	285937	249992	19416	135224	24496	468376	265811
2003	321598	235583	21295	123248	22131	499870	336593
2004	404157	375926	20272	186318	52782	554096	396655
2005	398547	280746	18498	220625	65840	582543	372627
2006	388821	277590	26264	259014	78936	365118	370549
2007	430154	306619	23724	243149	75040	862263	407863
2008	444925	312928	16904	256988	76418	526041	405950
2009	375284	261478	3976	91486	32203	230963	389071
2010	438662	336795	NO	NO	NO	440289	439310
2011	447499	332713	NO	NO	NO	447284	445160
2012	416358	288207	NO	4465	NO	373566	428931
2013	417505	297545	NO	4584	NO	223515	439062
2014	458049	307296	NO	7687	NO	208530	465373
2015	455235	344638	NO	35333	NO	344827	447934
2016	420372	293260	NO	63792	NO	238178	393544
2017	468795	322185	NO	55352	NO	276863	464367
2018	396690	289498	NO	57469	NO	267410	361142

Source: CBS, EPR, survey request: fertilizers producers; Processing: Ekonerg Ltd

Table 5.2-2 Activity data for NFR 2.B.10.a, represented by the relevant SNAP codes

NFR	2.B.10.a									
Name	Styrene	Ethylene	Propylene	1,2 dichloro-ethane	Vinyl-chloride	Poly-ethylene LD	PVC	Polystyrene	Ethyl-benzene	Formaldehyde
SNAP	040510	040501	040502	040503	040504	040506	040508	040511	040518	040517
Unit	t	t	t	t	t	t	t	t	t	t
1990	8923	72631	17586	72653	98976	171800	104602	46913	2725	22.0
1991	NO	66871	15272	68325	88135	136039	67934	33719	288	22.0
1992	NO	68318	13349	92089	118570	141614	70969	44389	NO	22.0
1993	NO	68634	9026	79608	103851	144415	44259	64269	NO	22.0
1994	NO	65285	7127	97528	128257	130805	79038	67498	NO	22.0
1995	NO	67547	8221	84374	112560	145235	93897	55805	4162	25.0
1996	NO	64782	7796	48631	63124	144100	45456	64121	2922	22.0
1997	NO	63554	7631	26264	35488	145439	47805	78580	NO	22.0
1998	NO	60148	6535	31308	41115	184493	73647	99960	NO	30.0
1999	NO	60295	6981	47686	62236	179745	31304	84928	NO	21.0
2000	NO	38918	6443	71364	64875	83983	2953	20172	NO	19.0
2001	NO	46632	5542	64442	14432	113146	NO	33168	NO	20.0
2002	NO	43554	5074	NO	6950	112771	NO	45439	NO	19.0

NFR	2.B.10.a									
Name	Styrene	Ethylene	Propylene	1,2 dichloro-ethane	Vinyl-chloride	Poly-ethylene LD	PVC	Polystyrene	Ethyl-benzene	Formaldehyde
SNAP	040510	040501	040502	040503	040504	040506	040508	040511	040518	040517
Unit	t	t	t	t	t	t	t	t	t	t
2003	NO	41252	4622	NO	NO	160944	NO	46361	NO	14.2
2004	NO	49886	5135	NO	NO	193430	NO	35331	NO	16.3
2005	NO	50263	4860	NO	NO	191958	NO	54617	NO	15.6
2006	NO	48824	4740	NO	NO	123217	NO	58721	NO	11.5
2007	NO	45438	4498	NO	NO	119015	NO	69841	NO	10.2
2008	NO	43045	4053	NO	NO	119838	NO	60471	NO	5.4
2009	NO	38797	3174	NO	NO	115646	NO	56359	NO	6.9
2010	NO	36271	2909	NO	NO	139032	NO	54194	NO	6.3
2011	NO	23323	2068	NO	NO	83920	NO	12849	NO	5.9
2012	NO	NO	NO	NO	NO	NO	NO	NO	NO	5.5
2013	NO	NO	NO	NO	NO	NO	NO	NO	NO	4.2
2014	NO	NO	NO	NO	NO	577	NO	NO	NO	3.9
2015	NO	NO	NO	NO	NO	610	NO	NO	NO	2.0
2016	NO	NO	NO	NO	NO	NO	NO	NO	NO	2.0
2017	NO	NO	NO	NO	NO	NO	NO	NO	NO	3.0
2018	NO	NO	NO	NO	NO	NO	NO	NO	NO	1.0

Source: CBS, Processing: Ekonerg Ltd

Recalculations and improvements

Ammonia (NFR 2.B.1, SNAP 040403)

Recalculation was made for NH_3 emission for 1999, due to a correction of error in EF input for this year.

There was no recalculation or other improvement for other source categories.

5.3. Metal production (NFR 2.C)

Source category description

This sub-chapter gives an overview of the production of various metals in the Republic of Croatia. The following primary metal production processes are present in Croatia: Iron and steel production (NFR 2.C.1, SNAP 0402), Ferroalloys production (NFR 2.C.2, SNAP 0403) and Aluminium production (NFR 2.C.3, SNAP 0401). There is no primary production of other metals such as magnesium, lead, zinc, copper, nickel etc. in Croatia.

Emission Calculation Improvement Project, led by the MEE, was conducted for the activity of steel production in EAFs, which included updating the activity data in order to harmonize them with the NIR.

Iron and steel production (NFR 2.C.1, SNAP 0402)

In the scope of iron and steel production, the following activities were present in Croatia during the time series: Steel production (NFR 2.C.1.1, SNAP 040205 - Open hearth furnace steel plant and SNAP 040207 - Electric furnace steel plant), Iron production (NFR 2.C.1.2 SNAP 040202 - Blast furnace charging) and Other (Rolling mills) (NFR 2.C.1.5 SNAP 040208 – Rolling mills).

Production of pig iron in one plant was carried out until the end of 1991, when it was shut down due to the inability of iron ore delivery during the war, as well as reduction and subsequently a cessation of the production of steel in open hearth furnaces (OHF) in the same year. It should be noted that sinter and pellets required for the production of iron were being imported and their production was not present in Croatia.

Emissions from lime produced for the needs of pig iron production are included in sub-sector 2.A.2.

Production of steel in electric arc furnaces (EAF), in two plants, was present during the whole time series. One plant was producing steel during the entire reporting period, with the exception of 2016. The second plant was active in the period 1990-2008 and in 2013 and 2014. Both plants used EAFs during the entire period, in which liquid steel was produced and then processed to finished products by casting and rolling. All production of steel in Croatia was stopped during 2016.

Since 1990, there were two rolling mills processes present in Croatia, hot and cold. In 2009, cold rolling mill process was stopped.

Pig iron production results in process emission of PM, heavy metals, PCBs, PAH and PCDD/F. In OHF, process emissions consist mainly of PM, heavy metals and NMVOC, as well as PCBs, PAH, and PCDD/F, while in EAF, process NOx and CO emissions are also generated. In the rolling mills, PM emissions are generated (also with NMVOC present in hot process).

Ferroalloys production (NFR 2.C.2, SNAP 0403)

Ferroalloys are alloys of iron and metals such as silicon, manganese and chromium. Ferroalloys production typically involves the use of electric arc furnaces and raw materials with relatively variable physical properties.

There were two factories producing ferroalloys in Croatia. One factory ceased its production in 1994, while the second factory stayed in operation until 2003. Only nationally aggregated statistical data on production quantities are available. The production fluctuated over the years, mainly as a result of discontinuous operations caused by the war in Croatia.

Ferroalloys production results in process emission of particulate matter.

Aluminium production (NFR 2.C.3, SNAP 0401)

Primary aluminium is produced in two steps. First, bauxite ore is ground, purified and calcined to produce alumina (Al_2O_3). The alumina is then electrically reduced to aluminium by smelting in large pots.

Primary aluminium production in Croatia was halted in 1991, mainly due to war activities.

Two types of technologies were applied in Croatia: prebaked anodes with side feed and prebake anodes with central feed.

One plant in Croatia manufactures aluminium castings by the pressure injection process. It does not deal with primary or secondary aluminium production, nor with production of aluminium from bauxite or recycled aluminium. Therefore, there are no relevant emissions from this plant.

Primary aluminium production results in emission of NOx, CO, SOx, TSP, PM, BC, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene and indeno[1,2,3-cd]pyrene.

Methodology, emission factors and activity data

Iron and steel production (NFR 2.C.1, SNAP 0402)

Emission calculation is based on the Tier 2 of the EMEP/EEA methodology and implies multiplication of annual amount of products by the appropriate emission factor for a specific production process of metal.

Emission factors are expressed as the quantity of emissions of pollutants per unit of production.

Information on inclusion/exclusion of the condensable component from PM_{10} and $PM_{2.5}$ emission factors by NFR source category are provided in Appendix 9 of this Report.

All emission factors are in accordance with the GB2019. Emission factors used for the preparation of the IIR 2020, presented by NFR sectors and pollutants, are given in Appendix 4.

For the activity of steel production in EAFs, an Emission Calculation Improvement Project was conducted, led by the MEE, which included updating the activity data in order to harmonize them with the NIR. After the in-country review of the NIR, all data under this activity were revised, and in addition to minor adjustments, it was also established that steel production data for the period 2012-2017 by mistake also contain quantities of cast iron produced. These data in the NIR were separated as a separate subcategory after the review, but since iron foundries are not included in the calculation of emissions according the EMEP/EEA methodology, they were completely excluded from NFR 2.C.1.

Activity data on iron production in blast furnaces, as well as steel production in OHF, were also taken from the NIR.

Activity data for rolling mills for the period 1990-2008 were taken from the scientific article „Sofilić et all, Archives of Metallurgy and Materials; Vol. 53, 2009, Issue 2“, and for the period after 2008, data were taken from the Annual Statistical Reports, Industrial production, Annual PRODCOM Results (CBS).

Ferroalloys production (NFR 2.C.2, SNAP 0403)

Emission calculation is based on the Tier 1 EMEP/EEA methodology and implies multiplication of annual amount of products by the proposed emission factor.

Emission factors are expressed as the quantity of emissions of pollutants per unit of production. All emission factors are taken from GB 2019.

Information on inclusion/exclusion of the condensable component from PM10 and PM2.5 emission factors by NFR source category are provided in Appendix 9 of this Report.

Annual production of ferroalloys was extracted from statistical reports published by Central Bureau of Statistics.

Aluminium production (NFR 2.C.3, SNAP 0401)

Emission calculation is based on the Tier 2 EMEP/EEA methodology and implies multiplication of annual amount of products by the corresponding emission factor.

Emission factors are expressed as the quantity of emissions of pollutants per unit of production. All emission factors are taken from GB 2019 (primary aluminium production, pre-baked cell).

Information on inclusion/exclusion of the condensable component from PM10 and PM2.5 emission factors by NFR source category are provided in Appendix 9 of this Report.

Data on primary aluminium production were collected by a survey of aluminium manufacturer.

Activity data for the production of iron, steel, ferroalloys and primary aluminium are shown in table 5.3-1.

Table 5.3-1 Activity data for NFR 2.C.1, 2.C.2 and 2.C.3, represented by the relevant SNAP codes

NFR	2.C.1				2.C.2	2.C.3
Name	Electric furnace steel plant	Open hearth furnace steel plant	Blast furnace charging	Rolling mills	Ferroalloys production	Aluminium production
SNAP	040207	040205	040202	040208	040302	040301
Unit	t	t	t	t	t	t
1990	171138	253161	209308	575928	129955	74248
1991	119734	94165	25713	310104	124263	50931
1992	101944	NO	NO	226086	81630	NO
1993	74082	NO	NO	190097	36605	NO
1994	63355	NO	NO	159068	54337	NO
1995	45370	NO	NO	108862	26081	NO
1996	45754	NO	NO	101965	10559	NO
1997	69895	NO	NO	110997	24694	NO
1998	103204	NO	NO	163059	12615	NO
1999	75877	NO	NO	128562	14142	NO
2000	69641	NO	NO	110266	16112	NO
2001	56169	NO	NO	98372	701	NO
2002	32789	NO	NO	55252	220	NO
2003	40942	NO	NO	111530	724	NO
2004	86105	NO	NO	115471	NO	NO
2005	73640	NO	NO	116393	NO	NO
2006	80516	NO	NO	147189	NO	NO
2007	76252	NO	NO	144409	NO	NO
2008	138865	NO	NO	188307	NO	NO
2009	46264	NO	NO	79187	NO	NO
2010	103427	NO	NO	78472	NO	NO
2011	95907	NO	NO	82310	NO	NO
2012	1037	NO	NO	28060	NO	NO
2013	111009	NO	NO	42248	NO	NO
2014	146465	NO	NO	35851	NO	NO
2015	121533	NO	NO	24886	NO	NO
2016	NO	NO	NO	13084	NO	NO
2017	3856	NO	NO	13151	NO	NO
2018	135775	NO	NO	11157	NO	NO

Source: NIR 2020 (original source: CBS and survey requests to producers), scientific article "Sofilić et all"; Processing: Ekonerg Ltd

Recalculations and improvements

Iron and steel production (NFR 2.C.1, SNAP 040202, 400205, 040207 and 040208)

Recalculation of all emissions from steel production in EAFs was performed as a result of the Improvement project prepared with the aim of harmonization of the activity data with data used in the NIR. Changes in activity data relate to the period 2005-2008 and 2011-2017. Significant differences are observed in the period 2012-2017, while the differences in other years are smaller and are evidently related to the former rounding of decimals.

Ferroalloys production (NFR 2.C.2, SNAP 040300)

There was no recalculation or other improvement for this source category.

Aluminium production (NFR 2.C.3, SNAP 040100)

Emissions recalculations for 1990 and 1991 were performed due to the updating of emission factors. Up to now, Tier 1 EFs from the EMEP/EEA GB2013 have been used. In this inventory, Tier 2 EFs from the revised GB2019 have been included. This has affected emissions of SOx, TSP, PM, BC, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene and indeno[1,2,3-cd]pyrene, with excluding PCDD/F emissions from the inventory.

5.4. Other solvent and product use (NFR 2.D – 2.L)

Source category description

This chapter gives an overview of the following source categories under NFR 2.D - 2L Other solvent and product use: Domestic solvent use including fungicides (NFR 2.D.3.a), Road paving with asphalt (NFR 2.D.3.b), Asphalt roofing (NFR 2.D.3.c), Coating applications (NFR 2.D.3.d), Degreasing (NFR 2.D.3.e), Dry cleaning (NFR 2.D.3.f), Chemical products (NFR 2.D.3.g), Printing (NFR 2.D.3.h), Other solvent and product use (NFR 2.D.3.i, 2.G), Pulp and paper industry (NFR 2.H.1), Food and beverages industry (NFR 2.H.2), Other industrial processes (NFR 2.H.3), Wood processing (NFR 2.I), Production of POPs (NFR 2.J) and Consumption of POPs and heavy metals (NFR 2.K). Emissions from source category 2.L Other industrial processes including production, consumption, storage etc. of bulk products are included in other NFR 2.D-2.K.

Emission Calculation Improvement Project, led by the MEE, was conducted for the Chemical products subcategory. The project included the updating of emission factors and activity data according to the new GB2019, and including the activity of asphalt blowing in the emissions calculation.

Domestic solvent use including fungicides (NFR 2.D.3.a)

Domestic solvent use including fungicides covers emissions of NMVOCs arising from the domestic use of solvent-containing products. Many of these products are also used in industry and commerce. Croatian inventory stratified the following products/activities: Cosmetics and toiletries products, Car care products, DIY/buildings, Paint/varnish removers and solvents, DIY/buildings, Sealants, filling agents, Pesticides, and Domestic use of pharmaceutical products. Source of activity data are Annual Statistical Reports, Industrial production, Annual PRODCOM Results (CBS). Further distinction between aerosol and non-aerosol products is not available in national statistics. According to new the GB2019, Hg emission from fluorescent tubes is no longer included in this category.

Road paving with asphalt (NFR 2.D.3.b)

Asphalt for road paving is commonly referred to as bitumen, asphalt cement, asphalt concrete or road oil and is produced in petroleum refineries. The annual statistical weight of asphalt produced for road paving is used to calculate emissions of NMVOCs and PM from this source category (Annual Statistical Reports, Industrial production, Annual PRODCOM Results).

Asphalt roofing (NFR 2.D.3.c)

The asphalt roofing industry manufactures saturated felt, roofing and siding shingles, and roll roofing and sidings. Most of these products are used in roofing and other building applications. This source category covers emissions of NMVOC, CO and PM from all related facilities. National production of shingles is used as activity data (Annual Statistical Reports, Industrial production, Annual PRODCOM Results).

Coating applications (NFR 2.D.3.d)

Paints are used within the industrial and domestic sectors. Traditionally, the term paint has often been used to describe pigmented coating materials only, thus excluding clear coatings such as lacquers and varnishes. However, here the term paint is taken to include all materials applied as a continuous layer to a surface with the exception of glues and adhesives, which are covered by NFR source category 2.D.3.i, 2.G Other solvent and product use. Inks, which are coatings applied in a non-continuous manner to a surface in order to form an image, are excluded by the definition given above.

Application of coatings during the manufacture of a number of other industrial products is covered by NFR source category 2.D.3.g Chemical products: adhesive, magnetic tapes, films and photographs manufacturing (SNAP 060311); textile finishing (SNAP 060312); leather tanning (SNAP 060313).

The use of paint is a major source of NMVOC emissions. The use of paints is generally not considered relevant for emissions of particulate matter, heavy metals or persistent organic pollutants.

Degreasing (NFR 2.D.3.e)

Degreasing is a process of cleaning products from water-insoluble substances, such as grease, fats, oils, waxes, carbon deposits, fluxes and tars. In most cases, the process is applied to metal products, but also plastic, fiberglass, printed circuit boards and other products are treated by the same process. The metal-working industries are the major users of solvent degreasing. Industrial metal degreasing with organic solvents takes place in specially designed cleaning equipment. Emission limits required by the Solvents Emissions Directive 1999/13/EC can only be achieved by using hermetically-sealed cleaning equipment. This leads to a significant reduction of emissions and increased workplace safety. Metal degreasing takes place in either open-top or closed tanks. The open-top tanks, however, have been phased out in the European Union due to the Solvents Emissions Directive 1999/13/EC. Only small facilities, using not more than 1 or 2 tonnes of solvent per year (depending on the risk profile of the solvent) are still allowed to use open-top tanks. The most common organic solvents for vapour cleaning are: methylene chloride (MC), tetrachloroethylene (PER), trichloroethylene (TRI) and xylenes (XYL). Degreasing results in NMVOC emission.

Dry cleaning (NFR 2.D.3.f)

Dry cleaning refers to any process to remove contamination from furs, leather, down leathers, textiles or other objects made of fibres, using organic solvents. In general, dry cleaning process can be divided into following steps: cleaning in a solvent bath, drying with hot air and recovery of solvent, deodorisation (final drying) and regeneration of used solvent. Dry cleaning results in NMVOC emission.

Chemical products (NFR 2.D.3.g)

Source category Chemical products covers the emissions from the use of various chemical products in manufacturing or processing of chemical products. In Croatia, in the period since 1990, this source category includes many activities, such as: Polyester processing (SNAP 060301), Polyvinylchloride processing (SNAP 060302), Polyurethane processing (SNAP 060303), Polystyrene foam processing (SNAP 060304), Rubber processing (SNAP 060305), Pharmaceutical products manufacturing (SNAP 060306), Paints manufacturing (SNAP 060307), Inks manufacturing (SNAP 060308), Glues manufacturing (SNAP 060309) and Adhesive, magnetic tapes, films and photographs manufacturing (SNAP 060311). Almost all of these activities still exist in Croatia with the exception of rubber processing which was stopped during 2006, and polystyrene foam processing which was stopped during 2011. Leather tanning (SNAP 060313) is present in Croatia but ammonium salts are not used in any phase of this activity, thus there are no NH_3 emissions. Tyre production does not occur in Croatia.

Following the recommendation for the inventory improvement given by the ERT, the asphalt blowing activity (SNAP 060310), present in Croatia in the period 2003-2014, was included in this submission.

All activities in this category result in NMVOC emissions except for asphalt blowing, for which NMVOC, TSP, Cd, As, Cr, Ni, Se and PAH emissions are calculated.

Printing (NFR 2.D.3.h)

Printing includes NMVOC emissions arising from solvents used in printing industry. Printing involves the use of inks which may contain organic solvents. These inks can be diluted before use. Different inks have different portions of organic solvents and require dilution to different extents. Printing can also require the use of cleaning solvents and organic dampeners. Ink solvents, diluents, cleaners and dampeners may all make a significant contribution to emissions from industrial printing. Printing processes convert original text and pictures into an image on a carrier and the main process types are named according to how this image is carried.

Other solvent and product use (NFR 2.D.3.i, 2.G)

Other solvent and product use includes emissions of NMVOCs arising from the following activities that are present in Croatia: Oil extraction (SNAP 060404), Application of glues and adhesives (SNAP 060405), Wood preservation - Creosote preservation type (SNAP 060406), Wood preservation - Organic solvent-borne preservative (SNAP 060406), Car dewaxing (SNAP 060409), Use of shoes (SNAP 060603), Concrete additive (SNAP 060412-2), Cooling lubricant (SNAP 060412-3), Lubricant (SNAP 060412-4), Tobacco combustion (SNAP 060602) and Use of fireworks (SNAP 060601).

Glass wool and Mineral wool enduction (SNAP 060401 and 060402) as well as Underseal treatment and conservation of vehicles (SNAP 060407) are not present in Croatia, according to available information.

Official clarifications about activity data that show time series inconsistency cannot be obtained. Based on publically available information, it can be assumed why some of dips and jumps occurred within time series. For example, from 2002, there was an increase in use of adhesives in construction due to massive increase in construction sector in Croatia, which ended in sudden drop due to the recession in 2009. In wood preservation with creosote, there is a sudden drop in 2014 due to replacement of widely-used wooden power poles with concrete poles and replacement of wooden railway ties with concrete ones. Data for vehicle dewaxing were influenced by increased use of foil wrapping of vehicles. An increasing trend of use of fireworks (mainly use of prepared explosives, other than propellant powders) was noted from 2002 to 2005 with a peak in 2003. Reasons for other inconsistencies in time series are unknown.

Pulp and paper industry (NFR 2.H.1)

There are three types of processes for pulp and paper production that were existed and still exist in Croatia: Kraft (sulphate), acid sulphite and neutral sulphite semi-chemical process. Sulphate pulping was used until 1990 and acid sulphite pulping was used until 1994, while the neutral sulphite semi-chemical process still exists. Sulphate process results in emissions of NOx, CO, NMVOC, SO_2 and PM; acid sulphite process results in emissions of SO_2, NOx, NMVOC and PM, while neutral sulphite semi-chemical process results in NMVOC emissions.

Food and beverages industry (NFR 2.H.2)

Croatian Informative inventory reports are considering following activities in scope of NFR 2.H.2 Food and drink: production of wine (white and unspecific colour wine), spirits, beer, bread, coffee roasting, meat, fish etc. frying / curing, sugar production, animal feed, margarine and solid fats and final cakes, biscuits and breakfast cereals production. Emissions from food and beverages industry include NMVOC emissions from various processes in production chain.

Wood processing (NFR 2.I)

Wood processing activity includes the manufacture of plywood, reconstituted wood products and engineered wood products. This source category is only important for particulate matter emissions. The relevant activity statistic is the mass of wood products processed in Croatia.

Production of POPs (NFR 2.J)

According to GB2019, the production of POPs is not a key source category since the production processes are mostly highly controlled in order to manage health and environmental effects. In addition, no emission factors are available for the production of POPs.

Consumption of POPs and heavy metals (NFR 2.K)

NFR 2.K Consumption of POPs and heavy metals is considering the losses of PCBs and mercury (Hg) from electrical equipment. These substances are used in refrigerators, air conditioning equipment and electrical equipment. Electrical equipment is the largest source of PCBs emissions mainly from capacitors and transformers. The majority of capacitors used (70 %) are power capacitors and high frequency capacitors. Power capacitors are used in high and low voltage transmission lines or in high frequency transmission units. They can be used both as separate units and in the form of complex capacitor units or batteries. Mercury (Hg) emissions mainly come from the use of batteries, measuring and control instruments (including laboratory and hospital instruments), electrical equipment and light bodies (light bulbs). Other products (e.g. paints, pharmaceuticals, dental amalgams) may also be a source of Hg emissions but are unlikely to be very significant on a national level.

Methodology, emission factors and activity data

Domestic solvent use including fungicides (NFR 2.D.3.a)

The methodology for emission estimation is based on the Tier 2b EMEP/EEA 2019 methodology. Emission factors are expressed as the emission per annual production unit or per number of inhabitants, and are shown in Appendix 4. Activity data for NFR 2.D.3.a, represented by the relevant SNAP code are given in Table 5.4-1.

Table 5.4-1 Activity data for NFR code 2.D.3.a, represented by the relevant SNAP code

	Cosmetics and toiletries	House-hold products	Car care products	DIY/ buildings, Paint/ varnish removers & solvents	DIY/ buildings, Sealants, filling agents	Pharmaceutical products	Various products: pesticides
SNAP	060408-1	060408-2	060408-3	060408-4	060408-5	060411	060408-7
Unit	kg products	kg products	kg products	kg solvent	kg products	population	t products
1990	749437	11009000	7277000	7106000	9431000	4778000	13937
1991	810098	8458000	5003000	4072000	5471000	4513000	11578
1992	755473	6974000	5574000	2525000	3285000	4470000	4982
1993	771290	6917000	4701000	2259000	2959000	4641000	6647
1994	840915	4953149	4536000	2409000	4786000	4649000	10047
1995	668622	5378897	3609000	1815000	5821000	4669000	10901
1996	380755	4190651	4764000	1909000	6608000	4494000	9994
1997	380919	7007809	3692000	1716000	7912000	4572500	9194
1998	382291	6481108	2876000	1674000	9980000	4501000	7674
1999	426322	6045846	3044000	1544000	8409000	4554000	6081
2000	508522	5813441	2275000	1528000	7300000	4381000	7182
2001	497411	5956084	2505000	1474000	7383000	4305494	8570
2002	571345	7219129	3475000	1663000	9146000	4305384	7164
2003	625157	8590884	3009101	1661000	6225000	4305725	4799
2004	723313	8560240	2629826	1712000	8696000	4310861	6675
2005	483679	9004148	2764705	1693000	15084000	4312487	4423
2006	460002	9405593	1503195	1591000	12429000	4313530	4297
2007	578606	9957008	1324135	1430000	9255000	4311967	3993
2008	694125	8955890	2111528	1656000	13272000	4309796	3188
2009	581419	7663580	2136197	1405000	6968000	4302847	2372
2010	1281127	7584616	2961162	1182000	6804000	4289857	2445
2011	1544609	9098104	2616124	1112000	6686000	4280622	1923
2012	1370629	8984782	2977454	847000	5350000	4267558	1547
2013	696184	8713631	2557159	812000	4260000	4255689	939
2014	927176	8269223	2517049	711000	3529000	4238389	581
2015	498006	10871273	3850747	759000	3624000	4203604	528
2016	263372	8314330	4241600	764000	4033000	4174349	535
2017	194776	7689441	12017481	584000	4792000	4124531	462
2018	317124	7361617	16950005	739000	5102000	4087843	327

Source: CBS, Processing: Ekonerg Ltd

Road paving with asphalt (NFR 2.D.3.b)

Methodology for emission estimation is based on the Tier 1 EMEP/EEA 2019 methodology. The recommended Tier 1 emission factors from the GB2019 are used. Activity data stratified by different technologies that are possibly used in Croatia, required for Tier 2 approach are not available. Only the total national statistical data on the annual amount of asphalt produced for road paving are available. Additional research within this source category is not included in the current improvement plan.

Emission factors are expressed as the amount of emissions per annual production unit and are shown in Appendix 4. Activity data for NFR 2.D.3.b are presented in Table 5.4-2.

Information on inclusion/exclusion of the condensable component from PM_{10} and $PM_{2.5}$ emission factors by NFR source category are provided in Appendix 9 of this Report.

Asphalt roofing (NFR 2.D.3.c)

Methodology for emission estimation is based on the Tier 1 EMEP/EEA 2019 methodology. The recommended Tier 1 emission factors from the GB2019 are used. Emission factors are expressed as the amount of emission per annual production unit and are shown in Appendix 4. Activity data for NFR 2.D.3.c are presented in Table 5.4-2.

Information on inclusion/exclusion of the condensable component from PM_{10} and $PM_{2.5}$ emission factors by NFR source category are provided in Appendix 9 of this Report.

Coating applications (NFR 2.D.3.d)

The emission calculation is performed using Tier 1 EMEP/EEA 2019 methodology; multiplication of annual consumption of paint by the appropriate emission factor. It is assumed that all paint was used in diffuse sources. For the calculation, data from the Eurostat database (from the year 2001 onward) were used, together with annual statistical reports on industrial production (annual PRODCOM results) (1990-2000) and expert estimates for the amounts of paint based on GDP (Source: Eurostat: June 2017, Market Survey / Feb 2016, CHP survey / June 2017, SHARES2015 from Feb 2017, ECFIN: AMECO GDP June 2017, EEA / UNFCCC June 2017). The Eurostat data on the amounts of solvent-based paint (import, export and sold production) and amounts of water-based paint (import, export and sold production) were used. Total amount of paint used is presumed to be equal to imported amounts reduced by the exported amounts and increased by the produced amounts (i.e. sales, product realization). In the calculation, it is assumed that the total applied paint in Croatia is equal to consumption in decorative, industrial and other applications.

Emission factor is expressed as the amount of NMVOC emissions per total paint consumption and are shown in Appendix 4. Activity data for NFR 2.D.3.d are presented in Table 5.4-2.

Degreasing (NFR 2.D.3.e)

For the calculation of NMVOC emissions, the consumption of the most common organic solvents for degreasing was used (according to GB2019). Data on quantities of the most common organic solvents (import / export / production) for the years 2001 – onward, were taken from the Eurostat database. The calculation does not include the organic solvent trichlorethylene because it is assumed that this solvent is completely consumed within the activity NFR 2.D.3.f Dry cleaning. In addition to data from the Eurostat database (2001-onward), for the NMVOC emission calculation from this source for the period 1990-2000, the annual statistical reports on industrial production (annual PRODCOM results) and expert estimates for the quantities of degreasing products based on GDP were used.

NMVOC emission factor is the GB2019 Tier 2 EF (open-top degreaser), and it is expressed as the amount of NMVOC per annual unit of degreasing product. Emission factor is given in Appendix 4. Activity data for NFR 2.D.3.e are given in Table 5.4-2.

Dry cleaning (NFR 2.D.3.f)

Emission calculation for this activity includes methodology based on the amount of solvent used (import/export/production) for dry cleaning.

The EMEP/EEA GB2019 assumes that the most widespread solvent used in dry cleaning, accounting for about 90 % of the total consumption, is tetrachloroethene (also called tetrachloroethylene or perchloroethylene (PER)). Data for import / export / production are available from the Eurostat database. PER production data are available only in PRODCOM codes, where PER is linked to trichlorethylene, which is mostly used in metal degreasing processes (NFR 2.D.3.e). Given the above mentioned, the assumption that all PER (including the amount of trichlorethylene) is used only in dry cleaning sector is included in the calculation, thus minimizing the possibility of double counting. Since NMVOC EF for dry cleaning is shown in GB2019 as grams per kilogram of cleaned textiles, TERT has proposed using the following NMVOC emission calculation method: the second paragraph of Section 3.2.1. Dry Cleaning in GB explains that solvent emissions directly from the cleaning machine into the air represent little more than 40 % for a closed-circuit machine, which is most likely the main type of machines currently used for dry cleaning. Open-circuit equipment may be in use somewhere in small quantities, but it was basically removed from the use around the 1990s. According to the previous explanation, TERT has recommended that it should be assumed that the EF for dry cleaning can be 400 g of NMVOC/kg solvent. The same method is applied in the Estonian Inventory. In addition to data from the Eurostat database (2001-onward), for the NMVOC emission calculation from this source for the period 1990-2000, the annual statistical reports on industrial production (annual PRODCOM results) and expert estimates for the quantities of dry cleaning products based on GDP were used.

Emission factor is expressed as the amount of NMVOC emissions per annual amount of solvent used for dry cleaning, and it is shown in Appendix 4. Activity data for NFR 2.D.3.f are presented in Table 5.4-2.

Table 5.4-2 Activity data for NFR codes 2.D.3.b, 2.D.3.c, 2.D.3.d, 2.D.3.e and 2.D.3.f, represented by the relevant SNAP code

NFR	2.D.3.b	2.D.3.c	2.D.3.d	2.D.3.d	2.D.3.d	2.D.3.e	2.D.3.f
Name	Road paving with asphalt	Asphalt roofing	Decorative coating application	Industrial coating application	Other coating application	Degreasing	Dry cleaning
SNAP	040611	040610	060100	060100	060100	060201	060202
Unit	kt	kt	t	t	t	t	t
1990	200.4	24.5	28819.1	28819.1	28819.1	14792.6	428.4
1991	143.7	14.5	20840.0	20840.0	20840.0	6108.5	338.1
1992	35.6	14.3	14493.3	14493.3	14493.3	1839.8	298.4
1993	28.0	13.0	13355.3	13355.3	13355.3	1692.2	274.6
1994	254.3	13.6	13014.2	13014.2	13014.2	2782.4	295.5
1995	270.2	14.8	13863.7	13863.7	13863.7	27874.4	315.2
1996	338.8	19.7	15231.3	15231.3	15231.3	19951.5	335.5
1997	511.2	6.0	16263.9	16263.9	16263.9	2439.2	352.4
1998	500.7	9.9	16483.2	16483.2	16483.2	2436.2	358.8
1999	547.5	13.6	15941.8	15941.8	15941.8	2186.8	356.5
2000	491.3	23.4	15472.0	15472.0	15472.0	2614.7	368.9
2001	385.0	11.6	15480.4	15480.4	15480.4	2344.5	380.4
2002	741.3	9.5	16434.6	16434.6	16434.6	2488.0	390.8
2003	1139.5	24.7	17151.8	17151.8	17151.8	2506.8	403.3
2004	1350.3	24.9	18860.1	18860.1	18860.1	3269.9	288.5
2005	1212.1	43.8	19481.9	19481.9	19481.9	2944.0	261.0

NFR	2.D.3.b	2.D.3.c	2.D.3.d	2.D.3.d	2.D.3.d	2.D.3.e	2.D.3.f
Name	Road paving with asphalt	Asphalt roofing	Decorative coating application	Industrial coating application	Other coating application	Degreasing	Dry cleaning
SNAP	040611	040610	060100	060100	060100	060201	060202
Unit	kt	kt	t	t	t	t	t
2006	1118.1	72.7	21080.1	21080.1	21080.1	3423.1	230.8
2007	1108.3	46.8	18429.3	18429.3	18429.3	3911.5	224.2
2008	1338.7	25.3	21103.1	21103.1	21103.1	3778.9	176.7
2009	1107.7	23.5	16636.1	16636.1	16636.1	3370.3	143.6
2010	915.5	18.0	16047.4	16047.4	16047.4	3627.8	132.8
2011	973.4	16.6	16160.3	16160.3	16160.3	3097.3	132.1
2012	863.6	10.0	15173.5	15173.5	15173.5	2985.8	112.7
2013	670.0	16.5	14051.8	14051.8	14051.8	155.5	65.8
2014	780.6	13.1	14170.2	14170.2	14170.2	84.4	144.1
2015	763.9	38.5	13911.9	13911.9	13911.9	142.7	98.9
2016	749.7	17.3	16368.7	16368.7	16368.7	85.4	122.6
2017	814.1	27.6	12207.3	12207.3	12207.3	145.5	86.7
2018	855.7	15.9	16000.7	16000.7	16000.7	136.6	86.5

Source: CBS, EUROSTAT; Processing: Ekonerg Ltd

Chemical products (NFR 2.D.3.g)

For this category, an Emission Calculation Improvement Project, led by the Ministry of Environment and Energy, has been implemented. The project included the updating of emission factors and activity data according to the new GB2019, and including the activity of asphalt blowing in the emissions calculation.

For the activities: PVC processing, polyurethane processing, rubber processing, pharmaceutical products manufacturing, paints manufacturing, inks manufacturing and glues manufacturing, recommended emission factors from *CORINAIR Technical Annexes. Vol. 2 Default emission factors handbook (1994)* were used in previous calculations. For all of these activities, except for PVC processing, GB2019 proposes Tier 2 NMVOC emission factors. For PVC processing, only Tier 1 emission factor is available in GB, thus it was used in calculations. For polyester processing, activity data needed for Tier 2 approach were not available, thus Tier 1 NMVOC emission factor was used as well.

For asphalt blowing, recommended Tier 2 emission factors were used (EMEP/EEA GB2019, table 3-8).

For the rest of the activities included in this category – Polystyrene foam processing and Adhesive, magnetic tapes, films and photographs manufacturing, recommended Tier 2 EMEP/EEA emission factors have already been included in previous inventories.

Given the aforesaid, emissions calculation methodology for Chemical products source category is based on Tier 2 EMEP/EEA methodology for all activities, except for polyvinyl-chloride polyester and processing.

Activity data used in calculations are taken from annual statistical reports on industrial production (annual PRODCOM results) for all activities except for asphalt blowing (for which data obtained from refineries were used), and for pharmaceutical products manufacturing (for which data obtained from manufacturers were used).

As part of the Emissions Calculation Improvement Project, data on the amount of solvents used in the pharmaceutical products manufacturing were collected, since the previously used CORINAIR emission factor included population as activity data. All data received by the time of the inventory preparation are included in the emissions calculation. Data on solvents used are currently available from four manufacturers, for the period 2004-2018. For the years prior to that period, data are not available and they were estimated based on the average data values for the closest three years (2004-2006). Further investigation of this activity is ongoing and any information that will become available will be included in the inventory in one of the next submissions.

Emission factors are presented in Appendix 4. Activity data for various activities in the scope of NFR 2.D.3.g are presented in Table 5.4-3.

Table 5.4-3 Activity data for NFR code 2.D.3.g, represented by the relevant SNAP codes

NFR 2.D.3.g	Polyester processing	PVC processing	Polyurethane processing	Polystyrene foam processing	Rubber processing	Pharmaceutical products manufacturing
SNAP	060301	060302	060303	060304	060305	060306
Unit	kt	kt	kt	kt	kt	kt solvents
1990	6.0	49.7	3.8	7.8	5.7	34.2
1991	4.2	30.7	2.8	7.3	5.4	34.2
1992	3.5	20.0	1.7	6.7	2.4	34.2
1993	2.6	15.1	2.0	6.6	2.5	34.2
1994	2.5	5.5	2.5	9.3	2.3	34.2
1995	2.2	5.3	2.9	6.4	2.3	34.2
1996	3.4	5.3	1.8	7.6	1.3	34.2
1997	7.0	5.2	1.8	10.4	0.03	34.2
1998	8.3	4.2	1.8	9.9	0.02	34.2
1999	5.6	2.9	1.8	5.3	0.02	34.2
2000	12.8	1.5	1.9	3.6	0.02	34.2
2001	9.7	1.0	2.8	1.4	0.02	34.2
2002	14.7	8.4	5.6	NO	0.02	34.2
2003	9.7	8.4	2.9	NO	0.01	34.2
2004	10.9	10.1	2.5	1.0	0.01	34.5
2005	10.9	9.4	2.9	1.7	0.004	30.9
2006	14.1	8.0	2.4	11.0	0.004	37.2
2007	16.5	8.6	1.9	15.8	NO	45.6
2008	16.5	9.3	1.9	16.2	NO	46.6
2009	14.0	6.8	1.0	11.1	NO	41.6
2010	7.3	4.7	0.8	10.1	NO	1887.3
2011	7.1	3.8	0.6	0.6	NO	2313.9
2012	7.7	3.8	0.6	NO	NO	2946.0
2013	7.9	3.2	0.5	NO	NO	2099.1
2014	7.3	0.7	0.6	NO	NO	3620.2
2015	8.5	0.9	0.4	NO	NO	4468.9
2016	8.1	1.0	0.6	NO	NO	5599.7
2017	8.8	0.9	0.5	NO	NO	5754.4
2018	8.6	1.3	0.6	NO	NO	5740.2

Source: CBS (annual PRODCOM results), INA d.d., pharmaceuticals manufacturers, Processing: Ekonerg Ltd

Table 5.4-3, cont.

NFR 2.D.3.g	Paints manufacturing	Inks manufacturing	Glues manufacturing	Adhesive, magnetic tapes, films and photographs manufacturing	Asphalt blowing
SNAP	060307	060308	060309	060311	060310
Unit	kt	kt	kt	m^2	kt
1990	22.0	4.7	21.6	1009.0	NO
1991	13.8	3.6	13.4	776.0	NO
1992	9.5	1.4	7.1	469.0	NO

NFR 2.D.3.g	Paints manufacturing	Inks manufacturing	Glues manufacturing	Adhesive, magnetic tapes, films and photographs manufacturing	Asphalt blowing
SNAP	060307	060308	060309	060311	060310
Unit	kt	kt	kt	m^2	kt
1993	9.1	1.0	10.9	299.0	NO
1994	10.8	1.5	11.2	239.0	NO
1995	10.78	1.4	10.1	320.0	NO
1996	13.9	1.5	17.2	592.0	NO
1997	15.0	1.4	10.9	404.0	NO
1998	15.5	1.1	10.4	419.0	NO
1999	15.2	0.8	8.2	257.0	NO
2000	15.1	0.9	10.4	344.0	NO
2001	16.8	0.8	12.4	339.0	NO
2002	15.2	0.9	25.8	323.0	NO
2003	15.3	0.8	30.9	138.0	11.1
2004	15.0	0.9	46.1	27.0	90.0
2005	16.4	0.7	56.6	109.0	53.5
2006	17.3	0.7	71.3	108.0	91.1
2007	20.1	0.9	81.8	75.3	82.2
2008	19.7	0.9	77.7	93.3	94.4
2009	15.2	0.6	33.8	95.4	95.8
2010	16.4	0.3	35.5	95.2	57.6
2011	16.6	0.4	28.7	74.0	48.0
2012	14.3	0.3	28.8	41.0	29.3
2013	12.6	0.3	31.6	NO	39.2
2014	14.2	0.3	21.6	NO	2.9
2015	14.6	0.3	18.8	NO	NO
2016	17.4	0.3	19.0	NO	NO
2017	17.3	0.3	16.5	NO	NO
2018	16.0	0.4	23.3	NO	NO

Source: CBS (annual PRODCOM results), INA d.d., pharmaceuticals manufacturers, Processing: Ekonerg Ltd

As expected, after the implementation of the calculation improvement project, compared to the old methodology, emission was significantly reduced for the period prior to 2003, since the values of most of the emission factors were reduced. Emission increased significantly since 2004 due to the introduction of new activity and due to the increase in some of the production activities.

Printing (NFR 2.D.3.h)

Emission calculation includes methodology based on the amounts of ink used (imported, exported and produced) in the printing industry.

The calculation was performed by using Tier 1 EMEP/EEA 2019 methodology.

Data on the amounts of ink (import/export/production) were taken from the Eurostat database (from the year 2001 onward). In addition to Eurostat database, for the NMVOC emission calculation from this source for the period 1990-2000, the annual statistical reports on industrial production (annual PRODCOM results) and expert estimates for the quantities of ink for printing industry based on GDP were used.

The emission factor is expressed as the amount of NMVOC emissions per annual unit of ink used, and it is shown in Annex 4. Activity data for NFR code 2.D.3.h are represented in Table 5.4-4.

Other solvent and product use (NFR 2.D.3.i, 2.G)

The methodology for emission estimation is based on the Tier 2 of EMEP/EEA 2019 approach. Tier 2 emission factors used for all activities, except Application of glues and adhesives, are expressed as the amount of NMVOC emissions per annual consumption unit.

For the activity Application of glues and adhesives, in 2014, the project "Improvement of calculation of VOC emissions from the sector Domestic solvent use and other use of solvents" was prepared. The project, inter alia, encompassed inclusion of abatement technologies for NMVOC emissions, for which rates of penetration were modelled on IIASA data taken from the GAINS model for the Republic of Croatia. This was done for 1990, 2005, 2010 and 2030. For other years, data were estimated by linear interpolation. Abatement technologies included in calculations (taken from the GAINS model), include: activated carbon adsorption (ACA), emulsions (EMU), hot melts-100% solid (HOTM), incineration (INC) and no control (NOC). Accordingly, EFs were calculated for each year of the time series based on EMEP/EEA GB 2013 (for this category same as revised 2016 and 2019 GB), Tier 2 approach and inclusion of abatement technologies, with capacities controlled for each technology defined as follows:

	1990	*2005*	*2010*	*2030*
- *ACA*	0%	0%	2%	10%
- *EMU*	0%	50%	50%	55%
- *HOTM*	0%	7%	15%	20%
- *INC*	0%	10%	8%	5%
- *NOC*	100%	33%	25%	10%

All emission factors for source category 2.D.3.i, 2.G are shown in Appendix 4.

Information on inclusion/exclusion of the condensable component from PM_{10} and $PM_{2.5}$ emission factors by NFR source category are provided in Appendix 9 of this Report.

For this source category, basic activity statistics are stratified by activities and are separated to sub-categories 2.D.3.i Other solvent use and 2.G Other product use.

For activity under SNAP code 060404 Oil extractions, relevant activity statistics are the quantities of seed used in units of tonnes per year.

For activity under SNAP 060405 Application of glues and adhesives, relevant activity statistic are quantity of glues produced in units of tonnes per year for industry, DIY/buildings (construction) and domestic uses.

For activities under SNAP 060406 Wood preservation (Creosote preservation type and Organic solvent-borne preservative), the preservative consumption data is not available and the "quantity of wood preserved" (volume of wood impregnated with creosote (m^3/yr) and volume of wood impregnated with solvent borne preservative (m^3/yr) is combined with proposed assumptions in EMEP/EEA 2019.

For Car dewaxing (SNAP 060409), relevant activity data is annual number of motor vehicles (passenger and light cargo) imported by sea on Croatian territory. Data are available for the period 2000 - 2012, and for other years expert assessment was applied. Data are the result of processing the Uniform Customs declaration for the customs procedure of release goods into free circulation (import) by Croatian Ministry of Finance, Customs Administration.

For activity under SNAP 060601 Use of fireworks, relevant activity statistics are amounts of prepared explosives, other than propellant powders, and signalling flares.

For activity under SNAP 060602 Tobacco combustion, relevant activity statistics are the quantities of cigarettes and cigars used in units of tonnes per year combined with assumptions that one cigarette contains 1g of tobacco and one cigar contains 5g of tobacco.

For Use of shoes (SNAP 060603), relevant activity statistics is annual number of sold pairs of shoes.

For Concrete additive (SNAP 060604-1), relevant activity statistics is annual quantity of sold additives for construction activities.

Basic activity statistics data are taken from Annual Statistical Reports, Industrial production, Annual PRODCOM Results (CBS).

As source of activity data for Cooling lubricant (SNAP 060604-2) and Lubricant (SNAP 060604-3), national energy balance was used. Relevant activity data is non-energy use of various lubricants in energy sector, petrochemical industry, other industry, construction, transport and agriculture. Annual aggregated value on non-energy use of various lubricants was available for whole trend. Detail data by various type was available since 1999, and for years in trend from 1990 to 1998 the average factor by lubricant type was estimate. Types of lubricants are following: white spirit, oil and fats, paraffin and wax and other lubricants. Cooling lubricants (SNAP 060604-2) are assumed to be oils and fats and all other types of lubricant are assumed to be Lubricant (SNAP 060604-3).

Activity data for NFR 2.D.3.i and NFR 2.G are shown in Tables 5.4-4 and 5.4-5.

Table 5.4-4 Activity data for NFR codes 2.D.3.h, 2.D.3.i, 2G, represented by the relevant SNAP codes

NFR	2.D.3.h	2.D.3.i		2.G	
Name	Printing	Wood preservation with solvent borne preservative	Wood preservation with creosote	Tobacco combustion	Use of fireworks
SNAP	060403	060406b	060406a	060602	060601
Unit	kt	t	t	t	t
1990	6.53	31.69	334.83	12091	709
1991	5.09	11.77	124.32	11232	709
1992	2.63	25.50	269.43	12428	709
1993	2.17	21.40	226.08	11271	709
1994	2.67	51.41	508.73	4856	709
1995	2.71	50.68	362.50	11845	1214
1996	2.84	50.05	473.00	11327	1787
1997	2.95	43.21	409.63	11185	1766
1998	2.62	47.91	402.58	11965	1197
1999	2.33	33.54	434.43	13839	973
2000	2.50	34.33	243.73	13531	707
2001	2.47	37.54	234.65	17674	1659
2002	2.59	53.54	334.65	18350	8292
2003	2.95	60.63	1145.83	19070	11487
2004	3.33	53.11	1761.98	14256	6201
2005	3.61	32.86	1361.48	14634	2773
2006	4.09	18.54	971.35	14422	2088
2007	4.47	96.01	1451.90	14595	1471
2008	4.46	422.14	1337.15	15405	1024
2009	4.03	2058.15	1750.10	11335	456
2010	4.06	401.83	1819.20	13279	181
2011	4.20	448.51	1319.18	11665	156
2012	4.14	421.02	1712.98	11144	11
2013	4.79	572.80	2600.20	9598	1455
2014	4.71	518.98	364.18	8377	1036

NFR	2.D.3.h	2.D.3.i		2.G	
Name	Printing	Wood preservation with solvent borne preservative	Wood preservation with creosote	Tobacco combustion	Use of fireworks
SNAP	060403	060406b	060406a	060602	060601
Unit	kt	t	t	t	t
2015	4.69	675.70	617.23	8157	1000
2016	4.70	507.70	290.00	8162	1278
2017	4.71	1240.47	622.78	9097	1349
2018	4.65	1054.08	584.18	12042	1629

Source: CBS, EUROSTAT; Processing: Ekonerg Ltd

Table 5.4-5 Activity data for NFR code 2.D.3.i, 2.G, represented by the relevant SNAP code

NFR	2.D.3.i			2.G			
Name	Fat, edible and non-edible oil extraction	Use of adhesives	Vehicles dewaxing	Use of Shoes	Concrete additive	Cooling lubricant	Lubricant
SNAP	060404	060405	060409	060412-1	060412-2	060412-3	060412-4
Unit	t	t of glue	number of vehicles	1000 pairs of shoes	t	t	t
1990	121158	21591	751	26384	3109	130496	63304
1991	28401	13209	704	11977	1152	111631	54153
1992	72700	7079	657	8751	757	79388	38512
1993	42622	7479	438	13865	778	97300	47200
1994	72922	6280	503	8407	1081	108198	52487
1995	73551	7180	548	9408	934	105380	51120
1996	69991	8972	588	5766	964	113931	55269
1997	132847	10874	648	6715	1124	124705	60495
1998	157060	10379	687	5192	1102	93394	45306
1999	100509	8206	729	5159	1123	33500	15500
2000	25260	10355	768	2381	603	30000	14600
2001	24256	12385	673	2279	539	31100	20600
2002	155631	25851	58	3891	912	33600	24200
2003	151524	30873	7	4935	1583	29000	25100
2004	95505	46119	36	7130	1983	39400	19400
2005	123783	56573	152	5477	4724	35400	21700
2006	129269	71330	45	5776	6319	38100	19400
2007	98045	81768	70	5803	3872	45100	16400
2008	96740	77701	48	5443	2023	38900	17200
2009	76898	33849	25	5069	1722	37300	14800
2010	83669	35507	26	5276	2449	33200	11200
2011	86646	28722	10	4966	1668	33400	10300
2012	26214	28801	16	4486	1989	29700	10200
2013	34087	31622	5	4533	1394	28700	9700
2014	44358	21616	5	5148	522	29800	12200
2015	51005	18810	5	5010	500	32200	10900
2016	47170	18955	5	4989	827	34500	18400
2017	61879	16530	5	6086	1660	33900	16900
2018	66927	23291	5	6276	2165	34300	15600

Source: CBS, Croatian Ministry of Finance, Customs Administration, Energy balance; Processing: Ekonerg Ltd

Pulp and paper industry (NFR 2.H.1)

The methodology for emission estimation is based on the Tier 2 of EMEP/EEA 2019 methodology. For all activities in the source category 2.H.1, recommended Tier 2 emission factors are used according to the EMEP/EEA 2019. Emission factors are expressed as the amount of emissions per annual production unit and are shown in Appendix 4. Activity data for different SNAP codes within the NFR code 2.H.1 are represented in Table 5.4-6.

Information on inclusion/exclusion of the condensable component from PM_{10} and $PM_{2.5}$ emission factors by NFR source category are provided in Appendix 9 of this Report.

Activity data for different SNAP codes within the NFR code 2.H.1 are presented in Table 5.4-6.

Table 5.4-6 Activity data for NFR codes 2.H.1, 2.I and 2.K, represented by the relevant SNAP codes

NFR	2.H.1			2.I	2.K
Name	Paper pulp (Neutral Sulphite Semi-Chemical process)	Paper pulp (Acid sulphite process)	Paper pulp (Kraft process)	Wood processing	Consumption of POPs and heavy metals
SNAP	040604	040603	040602	040620	060508 (includes: 060502, 060504, 060507)
Unit	t	t	t	t	population
1990	94703	1623	14609	91422	4778000
1991	68778	1074	NO	60789	4513000
1992	62985	703	NO	74862	4470000
1993	74304	476	NO	69093	4641000
1994	92838	71	NO	63325	4649000
1995	78246	NO	NO	52779	4669000
1996	62933	NO	NO	53954	4494000
1997	69885	NO	NO	50541	4572500
1998	57552	NO	NO	52254	4501000
1999	71158	NO	NO	47461	4554000
2000	88607	NO	NO	50308	4381000
2001	77232	NO	NO	51038	4305494
2002	78247	NO	NO	54988	4305384
2003	52526	NO	NO	62789	4305725
2004	66065	NO	NO	68151	4310861
2005	55489	NO	NO	89565	4312487
2006	63331	NO	NO	110134	4313530
2007	49554	NO	NO	121040	4311967
2008	52122	NO	NO	123953	4309796
2009	36946	NO	NO	94985	4302847
2010	53340	NO	NO	93545	4289857
2011	61192	NO	NO	97483	4280622
2012	42966	NO	NO	102444	4267558
2013	40366	NO	NO	143088	4255689
2014	32648	NO	NO	134822	4238389
2015	31957	NO	NO	134552	4203604
2016	33596	NO	NO	87228	4174349
2017	38912	NO	NO	117871	4124531
2018	38767	NO	NO	113729	4087843

Source: CBS, Processing: Ekonerg Ltd

Food and beverages industry (NFR 2.H.2)

The methodology for emission estimation is based on the Tier 2 of EMEP/EEA 2019 methodology. For all activities in this category, Tier 2 default emission factors are used and they are based on various food and beverages products. Emission factors used for the preparation of the inventory are presented by NFR sectors and pollutants in Appendix 4. Activity data for different SNAP codes within the NFR code 2.H.2 are given in Table 5.4-7.

Table 5.4-7 Activity data for NFR code 2.H.2, represented by the relevant SNAP codes

NFR 2.H.2	Bread	Wine	Beer	Spirit	Cakes, biscuits, cereals	Margar-ine and solid fats	Animal feed	Sugar	Meat frying/ curing	Coffee roasting
SNAP	040605	040606	040607	040608	040615	040616	040617	040625	040626	040630
Unit	t	hl	hl	hl	t	t	t	t	t	t
1990	250489	129955	2800	1222	40848	24507	970853	20064	135315	12905
1991	205425	111499	2247	1125	32337	21000	755750	10016	104501	12591
1992	202327	109924	2720	6119	23525	17723	653431	94666	90577	8248
1993	185419	851302	2481	5517	21307	14687	650745	78847	86103	7296
1994	201668	858680	3156	3238	22371	13094	530053	11544	86112	8420
1995	172510	829480	3170	3106	23505	24507	519900	17534	86795	8003
1996	154330	793676	3291	4187	24146	16637	477753	19531	89773	8144
1997	154443	548426	3662	3582	26151	16170	476549	14138	84603	8643
1998	139070	626098	3759	3157	26507	15755	537653	13920	82321	8429
1999	124364	483515	3606	3267	25666	16124	496339	11396	79562	7639
2000	122585	612812	3993	3208	26320	20261	694835	56729	134297	7768
2001	123620	548667	3779	2537	26943	16414	530348	13069	84992	7955
2002	138063	600463	3638	2652	29454	22232	559542	17389	101742	11056
2003	136241	638412	3701	2475	36822	27378	583495	14656	101212	11181
2004	140597	631784	3606	2187	34988	30635	758976	21493	101972	10545
2005	136930	504248	3495	2816	36322	25427	534785	24538	106546	9697
2006	144683	534735	3688	2039	36313	31814	590284	32034	116218	13040
2007	202890	652852	3810	4958	39349	29600	643886	32832	115739	13549
2008	194473	508689	3879	5265	46395	4688	637284	31576	223998	12832
2009	191204	556945	3674	4882	47396	17284	602422	25595	133945	13934
2010	193074	463463	3438	5561	49494	16136	599633	26156	131874	13010
2011	192282	488750	3738	5130	49221	17542	654202	32932	141720	14203
2012	193307	441905	3625	4192	47762	16200	656880	29672	137243	12129
2013	157647	487803	3443	5350	47365	15010	654983	27384	130385	11667
2014	194812	452727	3416	4992	50662	13574	736066	33538	130027	11620
2015	190523	472699	3396	4460	49691	12839	517659	24882	125013	11927
2016	183009	484895	3365	4133	47555	12039	696173	33386	135622	14513
2017	185677	460889	3343	4387	48755	11615	675234	33194	143199	13497
2018	176738	500608	3468	4658	47806	11478	724469	12646	143043	13354

Source: CBS; Processing: Ekonerg Ltd

Wood processing (NFR 2.I)

The methodology for emission estimation is based on the Tier 1 of EMEP/EEA 2019 methodology. Proposed Tier 1 emission factors are used according to GB2019 and are presented in Appendix 4. Activity data are taken from the Annual Statistical Reports, Industrial production, Annual PRODCOM Results (CBS). Activity data for NFR code 2.I is presented in Table 5.4-6.

Consumption of POPs and heavy metals (NFR 2.K)

For PCBs and Hg emission calculation from sub-sector 2.K, Tier 1 default emission factors were used. Tier 1 emission factors are expressed as the quantity of pollutant by population in Croatia and are presented in Appendix 4. Annual national population statistics are used as relevant activity data for emission calculation (Table 5.4-6).

Recalculations and improvements

Domestic solvent use including fungicides (NFR 2.D.3.a)

An error in activity data entry for 2017 was corrected for the Car care products activity, which led to a change in NMVOC emission. Also, according to the new GB2019, Hg emission from fluorescent tubes is no longer included in this category.

Chemical products (NFR 2.D.3.g)

For this category, an Emission Calculation Improvement Project, led by the Ministry of Environment and Energy, has been implemented. The project included the updating of emission factors and activity data according to the new GB2019, and including the activity of asphalt blowing in the emissions calculation.

In accordance with the aforesaid, emissions recalculation was performed for the whole time series (for the years in which each of the activity was present), for all activities except polystyrene foam processing and adhesive, magnetic tapes, films and photographs manufacturing, which were not included in the improvement project. Apart from NMVOC emission recalculation, as a result of asphalt blowing being included in the inventory, emissions of TSP, Cd, As, Cr, Ni, Se, and PAH were included in this category.

For the rest of the categories, there were no recalculations or other improvements.

6. Agriculture (NFR 3)

This chapter gives an overview of the sector 3 Agriculture and contains information on methodologies, activity data, emission factors, recalculations used for the calculation of emission estimates and planned improvements. Under NFR sector 3, emissions of ammonia, particles (TSP, $PM_{2.5}$ and PM_{10}) HCB, NMVOC and NOx are reported.

This sector includes the following sub-sectors from which certain pollutant emissions in the Republic of Croatia are reported:

- 3.B Manure Management
  - 3.B.1.a Dairy cattle
  - 3.B.1.b Non-dairy cattle
  - 3.B.2 Sheep
  - 3.B.3 Swine
  - 3.B.4.d Goats
  - 3.B.4.e Horses
  - 3.B.4.f Mules and asses
  - 3.B.4.g.i Poultry
  - 3.B.4.g.i Laying hens
  - 3.B.4.g.ii Broilers
  - 3.B.4.g.iii Turkeys
  - 3.B.4.g.iv Other poultry
- 3.D Crop production and agricultural soils
  - 3.D.1.a Mineral N-fertilizers
  - 3.D.a.2.a Animal manure applied to soils
  - 3.D.a.2.b Sewage sludge applied to soils
  - 3.D.a.3 Urine and dung deposited by grazing animals
  - 3.D.c Farm-level agricultural operations including storage, handling and transport of agricultural products
  - 3.D.f Use of pesticides
- 3.F Field burning of agricultural residues

There are 5 main sources of activity data for emission calculation: the Central Bureau of Statistics (CBS), Croatian Agricultural Agency (CAA), Ministry for Environment and Energy, FAOSTAT and fertilizer companies. This yearly report includes major improvements for the Agriculture sector emission estimates as a result of inventory improvement projects.

This includes upgrade from Tier2 to Tier 3 methodology for swine and poultry NH_3 emission calculation in 3.B by implementing recognized abatement measures with known potentials 8 from „Guidance Document for Preventing and Abating Ammonia Emissions from Agricultural Sources“, ECE/EB.AIR/120.). Gathering required national data was done by analysing information in Environmental permits for farms (detailed information in the methodology chapter for 3.B source).

Furthermore, this is the first time emission estimates from 3.F source were included in the inventory. Emission from this source are currently considered to be overestimated, but need further investigation into AD before adjustments can be made.

Finally, cultivated crops calculation for NMVOC estimate was upgraded from Tier1 to Tier 2 methodology (using EMEP/EEA GB 2019).

6.1. Manure management (NFR 3.B)

Source category description

The manure management is source of emissions of NH_3, NO, NMVOC and PM. The NH_3, NO, NMVOC arise from the excreta of agricultural livestock deposited in and around buildings and collected as liquid slurry, solid manure or litter-based farmyard manure (FYM) and the last two are observed together as solid. Those emissions take place from buildings housing livestock and outdoor yard areas, from manure stores, following land spreading of manures and during grazing. The PM emissions arise mainly from feed, and also from bedding, animal skin or feathers, and take place from buildings housing livestock. There are five main sources of emissions from animal husbandry and manure management: livestock feeding (PM), livestock housing and holding areas (NH_3, PM, NMVOC), manure storage (NH_3, NO, NMVOC), field-applied manure (NH_3, NO, NMVOC) and manure deposited during grazing (NH_3, NO, NMVOC). Croatia is reported ammonia, NOx and PM emissions for animal husbandry, while NMVOC emission is not reported for now.

Listed below, are national specifics for manure management regarding key categories.

National specifics regarding swine:

Currently in Croatia, swine production is based on the using of high producing breeds (landrace type breeds or hybreed such as PIC, Topics etc.) in housing system based on slurry manure type. The type of production is similar to that in Western European countries (Netherlands, Denmark, and Germany), from where are animals and equipment imported. Local characteristics (climate condition in each part of Croatia) should be also taken into account. In the period 2000 - 2010 there were changes which resulted in intensifying of the pig production. The number of sows, especially sows kept outdoors in partial or full time grazing system decrease (to the proportion of < 5 %), as well the number of sows in litter based housing (about 40% in 2012 and 2013, compared to > 80 % in the period 1990 - 2000). Intensive fattening of pigs makes > 90 % and takes place in housing system based on slatted floor and liquid/slurry manure type, which is a significant change in comparison to 1990 in which it is estimated that was less than 50 %. Increasing the number of piglets produced per sow per year, increasing the daily gain and the higher meatiness of pigs (52% in 1990 to 58 % in 2012), result in higher nutritional demand of pigs to protein (N) in feed. It is estimated that fattening pigs intake about 20.0 kg of N by feed, from which about 13.5 kg or 70 % is excreted with excrements (feces and urine; IPCC, 2006; SN, 2012). For breeding sows N intake is estimated to 48.7 kg animal from which about 30.8 kg per animal per year is excreted with excrements. This amount of N is the basis for the TAN content in manure and ammonia emission, depending on the method of manure removal (4.5 kg N), storage (0.85 kg N per m2 per year) and the application of manure (> 15 % TAN). For grazing sows (outdoor production system) N loss is < 3.0 kg per animal (Misselbrook et al., 2000).

National specifics regarding Cattle dairy:

In the 1990s the milk production was based on keeping the double purpose dairy cows (milk and meat) in extensive production system. The average milk production amounted to 1,930.0 kg cow-1 year-1 in 1990 and 2307.0 kg in 2000 (CBS, 1990-2000). Because the average milk production per cow was relatively low during this time period, N excretion by manure was low due to the low nutritional demand of cow to protein (N) content in the feed. Increase in milk production per cow is closely associated with increase in DMI and the protein (N) content. Assuming that about 20% of N intake with feed is retained in the organism of the cow for milk synthesis and demands of their own tissues, the rest (80%) is excreted with faeces and urine and makes a pool for the emission of ammonia (IPCC, 2006). In the 1990s more than 80% of the dairy cows were in production system which was based on a combination of grazing (6 months) and housing (6 months) system or only housing system with the use of large amounts of litter (> 7.0 kg head day). Only about 20% of dairy cows were in the housing system based on liquid manure type. In the last 15 years significant changes in the structure of milk production could be observed. The number of cows was reduced, but the average production of milk per cow has significantly increased. In 2010 milk production per cow amounted to 4370 kg and for 2013 it is estimated to approach 5000 kg per cow per year. Above mentioned results in significantly greater demands to feed protein (N) intake and consequently a greater amount of N excreted with feces and urine as the basis for the emission of ammonia. In spite of this the nutritional protein demands risen more than twice and despite of higher efficiency of protein digestion increase the amount of N excreted in faeces and urine. Recently, milk production is based on a smaller number of specialized dairy farms in comparison to 15 years ago. The share of dairy cows kept in housing system based on liquid/slurry manure type (slatted floor or solid floor) increased. This is particularly evident after the adoption of the "Operative program for development of cattle production in Croatia" by the Croatian government that has resulted in building of new and reconstruction of existing farms dairy modelled on a farm in western European countries (Germany, Netherlands and Austria) that are based on the liquid manure. Milk production based on using of large amounts of litter and pasture as the favourable production systems from the point of ammonia emissions, are gradually reduced (currently their share is less than 30%) and are retained mainly on smaller farms with lower milk production per cow. In housing systems based on liquid manure, excrements are collected in lagoons (above ground level, open plan, solid floor) or in the pit storage (closed type, below the ground level, slatted floor). Housing system based on liquid manure and solid floor (the use of scrapers) as well the manure storage in lagoons is significantly less favourable from the point of ammonia emissions in comparison to previous using grazing system or housing system based on high amount of bedding material. Change from the grazing to the housing system has resulted in average increase of ammonia emission, while the move from the litter based to liquid/slurry based housing has resulted in additional increase of ammonia emission. In addition, the amount of ammonia which is lost during storage and during the application of manure should also be accounted for (Misselbrook et al., 2000).

National specifics regarding Cattle non-dairy:

The category of non-dairy cattle represents the ammonia emission from the beef and/or suckling cows and finishing cattle (calves, bulls, heifers). Beef cows make up 5% of the total number of cows in Croatia and are characterized by full time grazing with feed supplement during winter season and use of poor pasture in relation to crude protein content (N). The fattening of cattle takes place in housing with predominantly slurry based system (slatted) or more rarely with litter. Intensive fattening is based on using of high amounts of grains and maize silage, which brings about 45 kg N per animal per year of which 36 kg N per animal per year is excreted with the faeces and urine as a basis of TAN and the ammonia emissions from manure (SN, 2012). In the period 1990 - 2013 there were no significant changes in beef cattle production systems and manure management.

National specifics regarding Poultry:

Average annual N feed intake and in excretion is dependent on the type of poultry and their purpose (production of eggs, meat, and breeding flocks). The N intake in broilers is about 1.05 kg per animal per year, from which around 0.55 kg N is excreted with excrements as uric acid. In laying hens the amount of excreted N is about 0.75 kg animal per year, in ducks 0.76 kg animal per year and in turkey 1.71 kg animal per year (SN, 2012). The above mentioned is resulting with different emission of ammonia for different animal category. It should be noted that the production of poultry meat and eggs in Croatia in their characteristics are compatible with the same production in Western European countries (Netherlands, Germany, the same genetic basis of animal, housing and feeding, manure management).

Methodology, emission factors and activity data

For the calculation of NH_3 and NOx emissions from the NFR sector 3.B Animal husbandry and manure management, Tier 2 "mass-flow" methodology (EMEP/EEA GB2016) was used for all animal categories other than Swine and Poultry, for which Tier 3 method was used. A Tier 3 method was used to utilise the calculation procedure outlined under Tier 2, but with the inclusion of abatement measures.

National specifics described in the previous chapter were implemented within the Tier 2 methodology. Emission factors used for emission are presented in Appendix 4. Emission factor for a certain part of the poultry sub-category "Other poultry" (pheasants, quails, guinea fowls, ostriches, chickens other than laying hens) correspond to the emission factor for ducks, in accordance with the ERT recommendation.

National implemented proportions of livestock category housed on slurry and solid based systems and national specifics in manure management (nitrogen exchange rate (Nex), animal mass, N rate) were developed by the experts from the Faculty of Agriculture, University of Zagreb and are presented in Table 6.1-1 for the year 2017.

Tier 3 methodology for swine and poultry: To implement possible abatement measures, additional data on livestock building / management and methods of storage and application of manure was collected as part of an estimate calculation improvement project. This was done by analysing information in Environmental permits[30] for farms. In total, permits for 71 farms were analysed. Animals were sorted by applicable abatement measures. Abatement measures were taken from „Guidance Document for Preventing and Abating Ammonia Emissions from Agricultural Sources“, ECE/EB.AIR/120. Where the emission reduction potential of a measure was given in a form of a range, average value was selected. Reduction potentials are presented in table 6.1-2 and 6.1-3.

Table 6.1-1 Percentage (%) of animals on sillage feeding for selected years and year 2017

Animal category		Number of processed environmental permits (farms)	Percentage of the total animal number in Republic of Croatia	Percentage of animals with applicable abatement measures
Swine	Fattening pigs	25	26%	18%
	Sows	20	22%	19%
Poultry	Laying hens	10	68%	64%
	Broilers	17	39%	30%
	Turkeys	12	100%	28%

For sows and fattening pigs, reduction of emissions was calculated according to the reduction potentials for animal housing systems, manure storage techniques and manure application techniques. For laying hens, broilers and turkeys, emission reduction is only applicable for animal housing systems. Final emission abatement was obtained as a percentage of animals with applicable reduction methods / technologies in relation to the total number of animals in the Republic of Croatia.

Table 6.1-2 Reduction potentials used for determination of reduction factors for animal housing systems

Housing system	NH_3 emission abatement potential (%)
Fattening pigs	
Partially slatted floor with reduced pit	25%
Frequent manure removal	25%
Sows	
Partially slatted floor with reduced pit	35%
Frequent manure removal	25%
Laying hens	
Enriched cages, ventilated belts, 2 removals a week	55%
Enriched cages, ventilated belts, 3 removals a week	65%
Broilers	
Fan-ventilated house with fully littered floor with non-leaking drinking system	25%
Turkeys	
Fan ventilated house with fully littered floor and non-leaking drinking system	30%

Source: Guidance Document for Preventing and Abating Ammonia Emissions from Agricultural Sources“, ECE/EB.AIR/120.

[30] An environmental permit is issued for facilities carrying out the activities that may cause pollutant emissions into the soil, air, water and sea and the facilities that will carry out such activities after construction, or reconstruction and commissioning. Regulation on environmental permit Official Gazette 8/14, 5/18

Table 6.1-3 Reduction potentials used for determination of reduction factors for manure storage and manure application techniques

Manure storage technique	NH_3 emission abatement potential (%)
Tight lid, roof or tent structure	80%
Plastic sheeting (floating cover)	60%
Natural crust (floating cover)	40%
Plastic sheeting (floating cover)	40%
Manure application technique	**NH_3 emission abatement potential (%)**
Incorporation of surface applied slurry (within 4 h)	55%
Injecting slurry (closed slot) - deep injection (> 15cm)	85%
Incorporation of surface applied slurry (within 24 h)	30%

Source: Guidance Document for Preventing and Abating Ammonia Emissions from Agricultural Sources", ECE/EB.AIR/120.

Data for cattle farms were not provided by the deadline, therefore reduction techniques were not applicable to cattle.

Reduction potentials for NO_x were not estimated or applied due to missing default values or ranges of emissions reduction, so it is likely that NO_x emission have remained overestimated.

Analysis was conducted for each year from 1990 to 2018 and for each animal category separately, and are reported as a percentage reduction of emissions (6.1-4 – 6.1-8).

Table 6.1-4 Share of fattening pigs with reduction measures and percentage reduction of emissions

Year	Number of animals (total)	Animal housing system		Manure storage techniques		Manure application techniques	
		Number of animals in reduction	Emission reduction (%)	Number of animals in reduction	Emission reduction (%)	Number of animals in reduction	Emission reduction (%)
1990	1341000	20904	1.6%	24926	1.9%	35849	2.7%
1991	1387000	20904	1.5%	24926	1.8%	35849	2.6%
1992	1002000	20904	2.1%	24926	2.5%	35849	3.6%
1993	1069000	20904	2.0%	24926	2.3%	35849	3.4%
1994	1149000	20904	1.8%	24926	2.2%	35849	3.1%
1995	993000	20904	2.1%	24926	2.5%	35849	3.6%
1996	1016000	20904	2.1%	24926	2.5%	35849	3.5%
1997	991000	20904	2.1%	24926	2.5%	35849	3.6%
1998	980000	20904	2.1%	24926	2.5%	35849	3.7%
1999	1157000	20904	1.8%	24926	2.2%	35849	3.1%
2000	1048296	20904	2.0%	24926	2.4%	35849	3.4%
2001	1046721	20904	2.0%	24926	2.4%	35849	3.4%
2002	1096308	20904	1.9%	24926	2.3%	35849	3.3%
2003	1145756	20904	1.8%	24926	2.2%	35849	3.1%
2004	1259889	20904	1.7%	24926	2.0%	35849	2.8%
2005	1005609	20904	2.1%	24926	2.5%	35849	3.6%
2006	1289820	20904	1.6%	24926	1.9%	35849	2.8%

Year	Number of animals (total)	Animal housing system		Manure storage techniques		Manure application techniques	
		Number of animals in reduction	Emission reduction (%)	Number of animals in reduction	Emission reduction (%)	Number of animals in reduction	Emission reduction (%)
2007	1165708	20904	1.8%	24926	2.1%	35849	3.1%
2008	941819	28079	3.0%	51126	5.4%	43699	4.6%
2009	1082225	30954	2.9%	60326	5.6%	63631	5.9%
2010	1066618	36117	3.4%	86666	8.1%	63631	6.0%
2011	1104031	39367	3.6%	96485	8.7%	84497	7.7%
2012	1056381	39367	3.7%	96485	9.1%	84497	8.0%
2013	983007	39367	4.0%	96485	9.8%	84497	8.6%
2014	1036943	39367	3.8%	96485	9.3%	84497	8.1%
2015	1044762	39367	3.8%	96485	9.2%	84497	8.1%
2016	1040696	39367	3.8%	96485	9.3%	84497	8.1%
2017	992668	39367	4.0%	96485	9.7%	84497	8.5%
2018	924956	40642	4.4%	100010	10.8%	86027	9.3%

Processing: Ekonerg Ltd

Table 6.1-5 Share of sows with reduction measures and percentage reduction of emissions

Year	Number of animals (total)	Animal housing system		Manure storage techniques		Manure application techniques	
		Number of animals in reduction	Emission reduction (%)	Number of animals in reduction	Emission reduction (%	Number of animals in reduction	Emission reduction (%)
1990	232000	3401	1.5%	2934	1.3%	6236	2.7%
1991	234000	3401	1.5%	2934	1.3%	6236	2.7%
1992	180000	3401	1.9%	2934	1.6%	6236	3.5%
1993	193000	3401	1.8%	2934	1.5%	6236	3.2%
1994	198000	3401	1.7%	2934	1.5%	6236	3.1%
1995	182000	3401	1.9%	2934	1.6%	6236	3.4%
1996	181000	3401	1.9%	2934	1.6%	6236	3.4%
1997	185000	3401	1.8%	2934	1.6%	6236	3.4%
1998	186000	3401	1.8%	2934	1.6%	6236	3.4%
1999	205000	3401	1.7%	2934	1.4%	6236	3.0%
2000	185249	3401	1.8%	2934	1.6%	6236	3.4%
2001	187102	3401	1.8%	2934	1.6%	6236	3.3%
2002	190189	3401	1.8%	2934	1.5%	6236	3.3%
2003	200907	3401	1.7%	2934	1.5%	6236	3.1%
2004	229446	3401	1.5%	2934	1.3%	6236	2.7%
2005	199351	3401	1.7%	2934	1.5%	6236	3.1%
2006	198668	3401	1.7%	2934	1.5%	6236	3.1%
2007	182635	4241	2.3%	3854	2.1%	8276	4.5%
2008	162063	6613	4.1%	10034	6.2%	12761	7.9%
2009	167649	6613	3.9%	10034	6.0%	12761	7.6%
2010	163956	8993	5.5%	15474	9.4%	16331	10.0%
2011	129375	9693	7.5%	15474	12.0%	16331	12.6%

Year	Number of animals (total)	Animal housing system		Manure storage techniques		Manure application techniques	
		Number of animals in reduction	Emission reduction (%)	Number of animals in reduction	Emission reduction (%	Number of animals in reduction	Emission reduction (%)
2012	125966	9693	7.7%	15474	12.3%	16331	13.0%
2013	127643	9693	7.6%	15474	12.1%	16331	12.8%
2014	119277	9693	8.1%	15474	13.0%	16331	13.7%
2015	150377	9693	6.4%	15474	10.3%	16331	10.9%
2016	152593	9693	6.4%	15474	10.1%	16331	10.7%
2017	159761	9693	6.1%	15474	9.7%	16331	10.2%
2018	155506	9693	6.2%	15474	10.0%	16331	10.5%

Processing: Ekonerg Ltd

Table 6.1-6 Share of laying hens with reduction measures and percentage reduction of emissions

Year.	Number of animals (total)	Animal housing system	
		Number of animals in reduction	Emission reduction (%)
1990	7756000	714973	9.2%
1991	7671000	714973	9.3%
1992	6648000	714973	10.8%
1993	6321000	714973	11.3%
1994	6253000	714973	11.4%
1995	6503000	714973	11.0%
1996	6260000	714973	11.4%
1997	6089000	714973	11.7%
1998	5853000	714973	12.2%
1999	5851000	714973	12.2%
2000	5988000	714973	11.9%
2001	5709000	714973	12.5%
2002	5775000	714973	12.4%
2003	5610000	714973	12.7%
2004	6447000	714973	11.1%
2005	6056000	714973	11.8%
2006	5758000	714973	12.4%
2007	5529907	714973	12.9%
2008	5486401	714973	13.0%
2009	5673000	714973	12.6%
2010	4357905	714973	16.4%
2011	4078789	714973	17.5%
2012	3696170	801213	21.7%
2013	3979081	897482	22.6%
2014	3722447	929833	25.0%
2015	3017389	929833	30.8%
2016	3496860	982633	28.1%
2017	3843140	982633	25.6%

Year.	Number of animals (total)	Animal housing system	
		Number of animals in reduction	Emission reduction (%)
2018	2777952	982633	35.4%

Processing: Ekonerg Ltd

Table 6.1-7 Share of broilers with reduction measures and percentage reduction of emissions

Year	Number of animals (total)	Animal housing system	
		Number of animals in reduction	Emission reduction (%)
1990	4416916	43750	1.0%
1991	4264538	43750	1.0%
1992	3394171	43750	1.3%
1993	3279241	58750	1.8%
1994	3229137	58750	1.8%
1995	3105426	263000	8.5%
1996	2839151	263000	9.3%
1997	2826754	263000	9.3%
1998	2572101	360000	14.0%
1999	2673000	360000	13.5%
2000	3235000	417000	12.9%
2001	3352000	417000	12.4%
2002	3686000	586000	15.9%
2003	3936000	645000	16.4%
2004	2634000	645000	24.5%
2005	2520000	645000	25.6%
2006	2068000	645000	31.2%
2007	2097961	645000	30.7%
2008	2281879	645000	28.3%
2009	3111000	645000	20.7%
2010	3377605	645000	19.1%
2011	4420993	645000	14.6%
2012	4980156	645000	13.0%
2013	4524637	645000	14.3%
2014	5556971	645000	11.6%
2015	5974694	645000	10.8%
2016	5362104	654975	12.2%
2017	5838080	654975	11.2%
2018	7525121	654975	8.7%

Processing: Ekonerg Ltd

Table 6.1-8 Share of turkeys with reduction measures and percentage reduction of emissions

Year	Number of animals (total)	Animal housing system	
		Number of animals in reduction	Emission reduction (%)
1990	854870	0	0
1991	825378	0	0
1992	656923	0	0
1993	634679	0	0
1994	624982	0	0
1995	601038	0	0
1996	549502	0	0
1997	547103	0	0
1998	497816	0	0
1999	545000	0	0
2000	516000	0	0
2001	497000	0	0
2002	528000	0	0
2003	477000	40311	8.5%
2004	599000	40311	6.7%
2005	431000	40311	9.4%
2006	573000	40311	7.0%
2007	677474	40311	6.0%
2008	577486	40311	7.0%
2009	584000	40311	6.9%
2010	726301	40311	5.6%
2011	608666	40311	6.6%
2012	470701	40311	8.6%
2013	444116	40311	9.1%
2014	369446	44526	12.1%
2015	495034	44526	9.0%
2016	511844	44526	8.7%
2017	493072	44526	9.0%
2018	442028	44526	10.1%

Processing: Ekonerg Ltd

Table 6.1-9 Animal categories N rate, Nex and percentage of slurry % for the year 2018

Animal category	N rate	Nex	Slurry manure type (%)
Dairy cows (100501)	0.415	89.37	59.6
Other cattle (100502)	0.342	49.93	42
Sheep (100505)	0.88	8.03	82
Goats (100511)	1.28	16.35	82
Horses etc. (100506)	0.285	41.61	70
Fattening pigs (100953)	0.535	9.76	91.2
Sows (100504)	0.445	30.86	81
Layers (100507)	0.837	0.55	10
Broilers (100508)	1.1	0.4	2

Animal category	N rate	Nex	Slurry manure type (%)
Turkeys (100509)	0.74	1.62	3
Ducks (100509)	0.83	0.76	7
Geese (100509)	0.83	1.21	10

NMVOC methodology and EF used for emissions calculation was Tier 2 methodology (GB 2019), using the default Tier 2 EFs for NMVOCs (Table 3.9, Table 3.10, Table 3.11, Table 3.12, GB2019) for the whole time period.

Proportion of animals on silage feed was estimated by the experts from the Faculty of Agriculture, University of Zagreb, and are presented in Table 6.1-10.

Table 6.1-10 Percentage (%) of animal categories on sillage feeding for selected years and year 2018

Year	Dairy cows (SNAP 100901)	Other cattle (SNAP 100902)	Sheep & goats (SNAP 100905)
1990	20	10	0
2000	50	50	0.5
2010	70	65	0.5
2018	83	72	1

For PM, GB2016 Tier 1 methodology and default EF (Table 3.5, GB2016) were used for emissions calculation. Information on inclusion/exclusion of the condensable component from PM_{10} and $PM_{2.5}$ emission factors by NFR source category are provide in Appendix 9 of this Report.

Relevant activity data are the number of certain livestock categories in Croatia which were attained in more detail. The categories were defined according to typical examples provided in the Guidebook; thus including goats and mules/asses in the emission calculation. Camels, buffalo and fur animals were not included because the first two animal categories do not exist in Croatia while data on fur animals' number are not available. Since the total poultry number in Croatia includes some other animals such as pheasants, quails, guinea fowls, ostriches and chickens other than laying hens, in order to ensure the completeness of the calculation and the comparability with statistical data, they were attributed to the reported sub-category Other poultry. Therefore sub-category Other poultry includes ducks, geese, pheasants, quails, guinea fowls, ostriches and chickens other than laying hens.

The main data source is the Central Bureau of Statistics, Croatian Agricultural Agency (dairy cattle) and for some categories the FAOSTAT database. Data sources for each year and livestock category are presented in Table 6.1-11. Trend of animal number for each livestock category is presented in Tables 6.1-12 and 6.1-13.

Table 6.1-3 Sources for activity data for NFR code 4.B Animal husbandry and manure management

Livestock categories	CBS	FAO	CAA
Dairy cattle	1990-2018		2008-2018
Other cattle	1990-2018		
Sheep	1990-2018		
Goats	1990-1991; 1999-2018	1992-1998	
Horses	1990-1994		1995-2018
Mules/assess	1990-1991, 2018	1992-1994	1995-2017

Livestock categories	CBS	FAO	CAA
Swine	1990-2018		
Poultry	1990-2018		

Table 6.1-12 Activity data for NFR codes 3.B.1.a, 3.B.1.b, 3.B.2, 3.B.3, 3.B.4.d, 3.B.4.e and 3.B.4.f

NFR	3.B.1.a	3.B.1.b		3.B.2	3.B.4.d	3.B.4.e	3.B.4.f	3.B.3	
SNAP	100501	100502	100502	100505	100511	100506	100512	100503	100504
Name	Dairy cows	Other cows (mature)	Other cows (young)	Sheep	Goats	Horses	Mules/ asses	Breedin g pigs	Market pigs
Unit	animal	animal	animal	animal	animal	animal	Unit	animal	animal
1990	462718	47405	315804	751000	172000	39000	17000	232000	1341000
1991	443566	65873	268586	753000	133000	36000	13000	234000	1387000
1992	359863	29830	195326	539000	113809	26000	13440	180000	1002000
1993	347245	47269	209368	525000	105000	22000	12430	193000	1069000
1994	325809	28338	162736	444000	107685	21000	6640	198000	1149000
1995	316943	35873	149209	453000	107292	4685	1549	182000	993000
1996	293893	36373	141822	427000	105271	5274	1750	181000	1016000
1997	283652	33965	137815	453000	99544	5886	1902	185000	991000
1998	273516	38451	134112	427000	84403	6540	2077	186000	980000
1999	268438	29339	140920	488000	78000	7309	2255	205000	1157000
2000	262209	26933	137428	528675	79393	9611	2518	185249	1048296
2001	254096	28104	156223	539498	92943	10871	2780	187102	1046721
2002	247026	32285	137802	580016	96534	13570	3097	190189	1096308
2003	252211	29424	162685	586641	86087	15217	3033	200907	1145756
2004	226289	48078	191568	721578	126060	17057	3195	229446	1259889
2005	234966	38787	197272	796480	134483	17883	3146	199351	1005609
2006	232923	37300	212682	679839	102877	18885	3299	198668	1289820
2007	225407	32052	209618	645992	91902	18075	3415	182635	1165708
2008	212625	37799	203131	643384	83877	19687	3591	162063	941819
2009	212220	28284	206647	619044	76119	19958	3617	167649	1082225
2010	206537	23534	214243	629437	75215	20537	3722	163956	1066618
2011	184745	25683	236127	638608	70030	21836	3365	129375	1104031
2012	180555	26415	244547	679313	71978	22426	3363	125966	1056381
2013	168025	37467	236940	620000	69000	21256	3273	127643	983007
2014	159394	62289	218954	604866	60697	21144	2159	119277	1036943
2015	151502	52433	236157	607711	62057	21868	2468	150377	1044762
2016	146510	54357	243746	618896	75530	22775	2862	152593	1040696
2017	139443	55523	255791	636808	76771	23209	3270	159761	992668
2018	135851	28302	249972	636294	80064	23649	3705	155506	924956

Source: CBS, FAO, CAA; Processing: Ekonerg Ltd

Table 6.1-13 Activity data for NFR codes 3.B.4.g.i, 3.B.4.g.ii, 3.B.4.g.iii, and 3.B.4.g.iv

NFR	3.B.4.g.i	3.B.4.g.ii	3.B.4.g.iii	3.B.4.g.iv		
SNAP	100507	100508	100509a	100509z		
Name	Laying hens	Broilers	Turkeys	Ducks	Gees	Other poultry
Unit	animal	animal	animal	animal	animal	animal
1990	7756000	4416916	854870	345557	113147	3615510
1991	7671000	4264538	825378	333635	109243	3308206
1992	6648000	3394171	656923	265542	86948	2090416
1993	6321000	3279241	634679	256551	84003	2121525
1994	6253000	3229137	624982	252631	82720	2060530
1995	6503000	3105426	601038	242953	79551	1492032
1996	6260000	2839151	549502	222121	72730	1049497
1997	6089000	2826754	547103	221151	72412	1188581
1998	5853000	2572101	497816	201228	65889	768967

NFR	3.B.4.g.i	3.B.4.g.ii	3.B.4.g.iii	3.B.4.g.iv		
SNAP	100507	100508	100509a	100509z		
Name	Laying hens	Broilers	Turkeys	Ducks	Gees	Other poultry
Unit	animal	animal	animal	animal	animal	animal
1999	5851000	2673000	545000	219655	71923	1510422
2000	5988000	3235000	516000	227435	74470	1215096
2001	5709000	3352000	497000	237356	77718	1873926
2002	5775000	3686000	528000	235699	77176	1363126
2003	5610000	3936000	477000	237982	77923	1439095
2004	6447000	2634000	599000	226000	74000	1205000
2005	6056000	2520000	431000	175000	68000	1390000
2006	5758000	2068000	573000	219000	76000	1394000
2007	5529907	2097961	677474	191000	70000	1487000
2008	5486401	2281879	577486	184000	57000	1429000
2009	5673000	3111000	584000	186976	62203	1170187
2010	4357905	3377605	726301	200785	45972	760873
2011	4078789	4420993	608666	172387	39176	203421
2012	3696170	4980156	470701	210080	45994	757258
2013	3979081	4524637	444116	120215	26213	212428
2014	3722447	5556971	369446	96024	49011	523209
2015	3017389	5974694	495034	74476	21675	606517
2016	3496860	5362104	511844	91514	21009	373016
2017	3843140	5838080	493072	50848	13284	160976
2018	2777952	7525121	442028	55603	16089	596011

Source: CBS; Processing: Ekonerg Ltd

Recalculations and improvements

Recalculation of NH_3 and NOx emissions were performed for the entire period 1990-2017 (for fattening pigs, breeding pigs and poultry) due to an estimate improvement and change of methodology from Tier 1 to Tier 2. Recalculations of NH_3 and NOx emissions were performed for the entire period 1990-2017 for cattle categories due to the correction of AD used.

Planned improvement is collecting further data on used abatement measures for swine and poultry, collecting data on abatement for cattle categories and upgrading methodology to EMEP/EEA GB 2019.

6.2. Crop production and agricultural soils (NFR 3.D)

Source category description

Crop production and agricultural soils sector is a source of NH_3, NO, NMVOC and PM emission. There are four main sources of emissions from crop production and agricultural soils: fertiliser application (NH_3), soil microbial processes (NO), crop processes (NH_3 and NMVOC) and soil cultivation and crop harvesting (PM).

This chapter gives information for sub-sector Mineral N-fertilizers (NFR 3.D.1.a), Livestock manure applied to soils (NFR 3.D.a.2.a), Sewage sludge applied to soils (NFR 3.D.a.2.b), Livestock manure applied to soils category (NFR 3.D.a.3), Farm-level agricultural operations including storage, handling and transport of agricultural products (NFR 3.D.c), Cultivated crops (NFR 3.D.e).

Emissions for the source categories which are not estimated: NFR 3.D.a.2.c Other organic fertilizers (due to lack of AD), NFR 3.D.a.4 Crop residues applied to soils (no EF and methodology provided in GB2019), NFR 3.D.b Indirect emissions from managed soils (no EF and provided in GB2019), NFR 3.D.d Off-farm storage, handling and transport of bulk agricultural products (no EF and provided in GB2019).

Emissions of NMVOC regarding source category NFR 3.D.f Use of pesticides are presented in the scope of source category NFR 2.D.3.a Domestic solvent use including fungicides.

Mineral N-fertilizers (NFR 3.D.1.a)

Emissions of NH_3 and NOx resulting from the application of N fertilizers, including urea.

Livestock manure applied to soils (NFR 3.D.a.2.a)

Emissions of NH_3 and NOx due to manure applied to agricultural land. This source is presented separately starting with this report which is an improvement – in previous reports it was reported within the category 3.B. The emissions are calculated within the 3.B calculation, using mass-flow approach (see Chapter 6.1).

Sewage sludge applied to soils (NFR 3.D.a.2.b)

Emissions of NH_3 and NOx from usage of sewage sludge is - according to Croatian legislation -permitted only when it does not contain more heavy metals or organic matter than is allowed within the articles 5 and 6 of the „Guidance on sludge from waste water purification when that sludge is used in agriculture“ (*Pravilnik o gospodarenju muljem iz uređaja za pročišćavanje otpadnih voda kada se mulj koristi u poljoprivredi*, Official Gazette 38/08) and only when all potential pathogens are removed/destroyed. According to the aforementioned Guidance, the sludge is to be used in accordance with the crop needs and in such manner to keep the quality of water bodies at the required level.

Up to the year 2010 only the sludge from the waste water of food industry was used in agriculture, while from the year 2012 onwards the sludge from communal waste water purifiers was also used. For the year 2018, 11 sludge producers and 13 sludge users are reported.

Livestock manure applied to soils category (NFR 3.D.a.3)

Emissions of NH_3 and NOx due to manure applied to grazing land. The emissions are calculated within the 3.B calculation, using mass-flow approach (see Chapter 6.1).

Farm-level agricultural operations including storage, handling and transport of agricultural products (NFR 3.D.c)

Relates to the particle emissions from agricultural operations, using the data on utilized agricultural area (UAA).

Cultivated crops (NFR 3.D.e)

Relates to the NMVOC emissions from agricultural operations, using the data on cropland and grassland.

Use of pesticides (NFR 3.D.f)

Pesticide emissions originate mainly from their use in the agricultural and forest sectors. Other emission sources (e.g. the manufacturing of pesticides or emission of imported products) are not included in this source category.

In the EMEP/EEA Guidebook 2013, the following pesticides were included: Aldrin, Chlordane, DDT, Dieldrin, Endrin, Heptachlor, Hexachlorobenzene (HCB), Mirex, Toxaphene, pentachlorophenol and Lindane. The use of these pesticides as pure substances listed in the Aarhus Protocol on Persistent Organic Pollutants (POPs) and the Stockholm Convention has already been prohibited by most of the parties who have ratified the Protocol. In accordance with the POP Protocol art. 3, para 8, and art. 9, para. 1 (b) only substances (PAHs, Dioxins/furans, HCB and PCBs) listed in Annex III shall be reported.

Since the early 1990s, HCB has no longer been used as a pure substance. However, it can be present as an impurity or as a by-product in certain pesticides or chemicals. Some of this pesticides, e.g. Chlorthalonil (fungicide) and Picloram (herbicide) are still in use and their application is approved until 2017 or longer (see the EU database on pesticides). In 2014, more than 75% of the total pesticide sales (396 kt) in the EU 28 were fungicides and herbicides (see Eurostat database, pesticide sales). More than 24 million tonnes of fungicides and herbicides have been used worldwide. For this reason, pesticide applications are still a source of HCB emissions.

Emissions arise following the application of pesticides either from volatilization of pesticides deposited to leaf or soil prior to uptake by the crop or soil, or from 'spray drift' – the movement of fine droplets of pesticide spray away from the target application zone to areas downwind. For the calculation of emissions, only primary emissions of active input (e.g. evaporation during application, evaporation from the plant and soil surface after application) have to be taken into account. Further emission paths are neglected, due to the persistence and the high sorption behaviour of the respective pesticide or HCB on the organic soil substance.

In general, pesticides are characterized by their chemical structure and property of semi-volatility. The latter determines the emission behaviour. A Dutch study (MJPG, 1995) estimates that on average, 25% of all pesticide used is emitted to the air. However, the use of the most dangerous pesticides has been prohibited by international agreement (see 2.3.1 below). Only emissions related to pesticides use that are currently reported are those of The only emissions related to pesticide use that shall be currently reported are those of HCB, which is present as a contaminant. According to the Pesticide Leaching Model (PELMO 3.31; Ferrari et al, 2005), all the HCB present as a contaminant will be volatilised.

Methodology, emission factors and activity data

Mineral N-fertilizers (NFR 3.D.1.a)

For NH_3 emission calculation from the source category 3.D.1.a Mineral N fertilizers, Tier 2 GB2019 methodology was used and for NOx emission calculations Tier 1 GB2019 methodology was used. Emission factors used for NH_3 emission calculation from source category NFR 3.D.1.a Mineral N fertilizers are default Tier 2 factors attained from GB2019, Table 3.2. Entire agricultural land area in Croatia is in "Cool" climate zone, with a median temperature of 10-11°C according to the literature (*Zaninović, M. et al*). As for the normal/high pH ratios - 32% of the land is estimated to have pH below 7 (*Mesić, M. et al*).

Methodology also includes preparation of activity data that includes the calculation of the amount of nitrogen (N) in each of mineral fertilizers produced (accounting also for mineral fertilizers exported from and mineral fertilizers imported in Croatia). This calculation is performing on the basis of data obtained from all fertilizers producer in Croatia and amounts of a particular mineral fertilizer formulation and N content in each formulation. An assumption is made that all mineral fertilizers sold and imported in Croatia are actually applied to soil is used for emissions calculation.

This estimate is based on the amount of N in mineral fertiliser that is annually consumed in the Republic of Croatia and on the “Mineral fertiliser consumption, in tonnes of nitrogen” dataset obtained from the CBS.

- Data on the consumption of mineral fertilisers that are produced and applied in Croatia were obtained from companies that produces synthetic fertilizers for the time period 1992-1999, since CBS has no data on N applied from mineral fertilizers before the time period before 2000 (Table 5.5-1). Data on mineral fertilizers produced and applied in Croatia in 1990 and 1991 have been estimated by extrapolation method using the pattern from 1992 to 1999.
- “Mineral fertiliser consumption, NUTS 0, in tonnes of nutrient” CBS dataset is available starting from the year 2000, with peak consumption in 2008.

Relevant activity data for ammonia emission calculation is the mineral N-fertilizer consumed (applied). The consumed amount refers to the amount produced and sold for domestic use and also to the imported amounts. The activity data providers are producers of mineral fertilizers in Croatia. There are three mineral fertilizer producers in Croatia, among whom one produces a dominant share. The other two have started with production in the year 2006 and 2010, respectively. Preparation of activity data relates to calculation of the amount of nitrogen (N) in each of the mineral fertilizer type produced, excluding mineral fertilizers exported and including mineral fertilizers imported in Croatia. This calculation is performed using information on particular mineral fertilizer formulation and N content in each formulation obtained from fertilizers producer in Croatia. Regarding activity data received from the main fertilizer company, due to lack of data, the consumed amount was estimated by extrapolation method for the years 1990 and 1991 using the trend from the 1992 to 2006 time period.

Since official CBS data on N consumption (with no segregation for each fertilizer type) is available for the period from 2000 (and is also used as AD set for CRF tables), mineral fertilizer production dana on each fertilizer type was used as vector to distribute the CBS data. It is expected that CBS data will be available soon for the entire 1990-2000 time period.

Activity data for nitrogen (N) applied for each type of mineral fertilizer is shown in Table 6.2-1.

Table 6.2-1 Activity data for NFR code 3.D.1.a

NFR 3.D.1a	N (nitrogen) applied							
Name	Urea	Calcium ammonium nitrate	NPK	Ammonium nitrate	Urea ammonium nitrate	Ammonium sulfate	Ammonium sulfonitrate	TOTAL
Unit	kg N	kg N	kg N	kg N	kg N	kg N	kg N	kg N
1990	31376015	39030122	36285992	0	721273	0	0	0
1991	31957265	38643459	37441717	0	672217	0	0	0
1992	41093640	43521030	39921424	0	282405	0	0	0
1993	32705540	27743580	29856295	0	1053575	0	0	0
1994	29839280	36707850	29814546	0	549065	0	0	0
1995	29038880	35701020	28395908	0	279725	0	0	0
1996	32894140	34644780	30768659	0	81740	0	0	0

NFR 3.D.1a	N (nitrogen) applied							
Name	Urea	Calcium ammonium nitrate	NPK	Ammonium nitrate	Urea ammonium nitrate	Ammonium sulfate	Ammonium sulfonitrate	TOTAL
Unit	kg N	kg N	kg N	kg N	kg N	kg N	kg N	kg N
1997	42897760	43609050	35924213	0	920915	0	0	0
1998	27755940	38790630	28358872	0	341030	0	0	0
1999	31669160	34221420	39495688	0	235170	0	0	0
2000	38179584	39921706	39861836	0	41875	0	0	0
2001	57768696	37933147	32340662	0	300495	0	0	0
2002	50655639	38065664	31650881	0	96815	0	0	0
2003	42176472	31017324	33360685	0	5203219	1863300	0	0
2004	45109237	32069375	33625948	0	5126147	1647293	0	0
2005	41939650	36264840	36438674	0	4983133	1682703	0	0
2006	41555040	40021849	37732772	0	3024324	1540316	0	0
2007	46486607	39451328	40122830	0	3574246	813389	0	0
2008	65532821	55416207	47907534	0	467684	827953	0	0
2009	33343767	30669628	26144086	0	15769	619850	0	0
2010	45043935	38246014	25485034	0	23187	547131	0	0
2011	56381522	38898515	29057189	0	19372	658501	0	0
2012	52977787	31041560	22209100	0	0	655953	0	0
2013	32923601	28558977	16160081	0	0	276940	0	0
2014	27880685	28878928	16627034	0	0	293602	0	0
2015	35233951	32046047	19745358	0	8341	345630	41252	7121
2016	31518361	26429010	12965009	0	542053	328108	189915	347543
2017	40251540	31397799	25147230	0	248205	350025	234633	782570
2018	49232412	32678534	15837330	0	0	635677	594076	441971

Source: CBS; Processing: Ekonerg Ltd

Livestock manure applied to soils (NFR 3.D.a.2.a)

Methodology used for NH_3 emissions is GB2019, Tier 2 – NH_3 emissions were calculated within the NFR 3.B category ("mass-flow" approach) using the same AD set.

For NOx emissions, GB2016 Tier 1 methodology was used (no Tier 2 methodology is available in GB2016). Applied N was calculated in the 3.B „mass-flow" approach (sum of $m_{applic\_slurry\_N}$ and $m_{applic\_solid\_N}$).

NH_3 emissions were calculated for all animal categories. NOx emissions for swine and poultry (3.B.3, 3.B.4.g.i, 3.B.4.g.ii, 3.B.4.g.iii and .3B.4.g.iv) were calculated and reported here, while NOx emissions for other (predominantly pasture animals) are reported in 3.D.a.3. Livestock manure applied to soils category in accordance with the GB2016 methodology.

Sewage sludge applied to soils (NFR 3.D.a.2.b)

NH_3 and NOx emissions from source 3.D.a.2.b Sewage sludge applied to soil were reported for the first time in 2018 submission, IIR 1990 – 2017. Following the revision, TERT recommended (HR-3Da2b-2018-0001) to modify the default Tier1 methodology and change the used AD from population numbers to readily available "applied N from sewage sludge" (CRF data), and to change EF to 0.04 kg NO_2 (2016 EMEP/EEA Guidebook, Annex 2) and 0.13 kg NH_3 (2016 EMEP/EEA Guidebook, Annex 1). These changes were implemented in this report. AD on this source was provided from the Croatian Agency for Environment and Nature and is available from 2005 onwards while for the period 1990-2004 currently there is no data available.

Table 6.2-2 Activity data for NFR code 3.D.a.2.b

NFR 3Da2b	Applied N (kg/y)
1990	NE
1991	NE
1992	NE
1993	NE
1994	NE
1995	NE
1996	NE
1997	NE
1998	NE
1999	NE
2000	NE
2001	NE
2002	NE
2003	NE
2004	NE
2005	330
2006	660
2007	770
2008	1760
2009	17859
2010	16886
2011	26574
2012	37196
2013	60968
2014	35756
2015	51397
2016	60501
2017	50191
2018	66571

Source: Ministry of Environment and Energy; Processing: Ekonerg Ltd.

Urine and dung deposited by grazing animals (NFR 3.D.a.3)

Methodology used for NH_3 emissions is GB2019, Tier 2 – NH_3 emissions were calculated within the 3.B category ("mass-flow" approach).

For NOx emissions, GB2019 Tier 1 methodology was used (no Tier 2 methodology is available in GB2019). Applied N was calculated in the 3.B „mass-flow" approach (m_{graz_N}).

NH_3 and NOx emissions were calculated and reported for 3.B.1.a, 3.b.1.b, 3.B.2, 3.B.4.d, 3.B.4.e, 3.B.4.f animal categories , while NOx emissions for swine and poultry are reported within the NFR 3.D.a.2.a source, in accordance with GB2019 methodology.

Farm-level agricultural operations including storage, handling and transport of agricultural products (NFR 3.D.c)

Currently the calculation for PM is performed using Tier 1 methodology, where $E_{pollutant} = AR_{area} \times EF_{pollutant}$, using default EF for PMs (0.06 for PM_{10} and $PM_{2.5}$ and 1.56 kg/ha for TSP, GB2019, Table 3.1). Information on inclusion/exclusion of the condensable component from

PM_{10} and $PM_{2.5}$ emission factors by NFR source category are provide in Appendix 9 of this Report.

Activity data (AR_{area}) used for PM emission calculations is the total utilized agricultural area (UAA), data provided by Croatian Bureau of Statistics. AD for the period 1990 – 2018 is presented in table 6.2-3.

Table 6.2-3 Activity data for NFR code 3.D.c

NFR 3.D.c	Total utilized agricultural area (UAA)
Unit	ha
1990	3059733
1991	3048915
1992	2120536
1993	2153750
1994	2179271
1995	2178453
1996	2576871
1997	2658509
1998	2791681
1999	2754371
2000	1168705
2001	1177999
2002	1181138
2003	1195734
2004	1176161
2005	1210790
2006	1230183
2007	1201756
2008	1289091
2009	1299582
2010	1333835
2011	1326083
2012	1330973
2013	1568881
2014	1508885
2015	1537629
2016	1546019
2017	1496663
2018	1485645

Source: CBS

Cultivated crops (NFR 3.D.e)

The calculation for NMVOC estimates was performed using Tier 2 methodology according to the EMEP/EEA GB 2019. Emissions were estimated for all of the relevant crop types for which EFs are available in the 2019 EMEP/EEA Guidebook (wheat, rye and rape, Table 3.3, GB 2019). For the remaining cropland area an average of the highest and lowest EF (wheat and rape) was applied (0.83 kg NMVOC/ha)[31].

Croatia has cold climate condition (*Zaninović, M. et al*). Therefore, the emission factor for pasture (grass 15°C) of 0.41 kg NMVOC/ha/yr following the GB 2019, Table 3.3, has been taken. Emissions are currently calculated with the following formula:

[31] Recommended approach as preseneted in the NEC Review 2017 (EC 2017) for Austria

$$E_{NMVOC\_cl\_gl} = \Sigma A_{cl,gl} * EF_{cl,gl}$$

where:

$E_{NMVOC\_cl,gl}$ = annual NMVOC emission flux from cropland and grassland areas (kg NMVOC)

$A_{cl,gl}$ = annual cropland area, annual grassland area (ha)

$EF_{cl,gl}$=EF of wheat, rye, rape and average EF (wheat and rape) for cropland and grass (15°C) for grassland (kg NMVOC/ha

Table 6.2-4 Activity data for NFR code 3.D.e

NFR 3.D.e	grassland - CLC	cropland - CBS (wheat + rye + rape)	wheat	rye	rape
	ha	ha	ha	ha	ha
1990	1210347	1625174	318955	3053	12647
1991	1212461	1621604	324460	2974	9004
1992	1214576	1618085	168865	2252	11743
1993	1216690	1614431	211845	2453	13010
1994	1218804	1610876	198381	2963	13889
1995	1220919	1607291	227044	1930	10982
1996	1223033	1603647	200852	2043	7651
1997	1225147	1600173	208377	1959	5356
1998	1227261	1596661	241734	2146	8949
1999	1229376	1593006	169280	2446	16234
2000	1231490	1589574	182333	2738	12886
2001	1225385	1588961	184274	2981	10319
2002	1219279	1588309	179153	3244	13041
2003	1213174	1587618	157175	2960	15524
2004	1207068	1587000	162634	2869	14282
2005	1200963	1585550	146253	1848	20149
2006	1194857	1582845	175551	2008	8413
2007	1194142	1578565	175045	1731	13069
2008	1193427	1576599	156536	1367	22372
2009	1192711	1572213	180376	998	28723
2010	1191996	1567213	168507	1035	16339
2011	1191281	1560817	149797	871	17536
2012	1190565	1555494	186949	846	9893
2013	1189850	1547977	204506	1019	17972
2014	1189135	1539132	156139	1373	23122
2015	1188420	1532451	140986	1093	21977
2016	1187704	1530516	168029	1285	36778
2017	1186989	1526059	116151	774	48616
2018	1186989	1526059	135708	774	55032

Sources: CBS, NIR

Activity data used for NMVOC emission calculations is the agricultural area under wheat, rye and rape, data provided by Croatian Bureau of Statistics. For the grassland, dana was taken from the land use area calculation in the Land use, Land Use Change and Forestry (LULUCF) sector. Further details are given in Croatia's National Inventory Report 2018, chapter 6.3.3.

Use of pesticides (NFR 3.D.f)

HCB emission was calculated by using Tier 1 methodology (GB 2019) by summing the amount of each pesticide applied and the concentration of HCB in that pesticide (i.e. its impurity factor):

$$E_{pest} = \Sigma\ (m_{pest\_i}\ x\ IF_i)$$

where:

E_{pest} = total emission of HCB (in mg a^{-1}, unit conversion reported in kg),

m_{pest_i} = mass of individual pesticide *i* applied (kg a^{-1}),

IF_i= impurity factor of HCB in the *i*th pesticide (mg kg^{-1})

Impurities derived from the manufacturing process and/or product storage are present in all pesticide active ingredients. Impurities can have an adverse impact on human health, the environment or both. Maximum impurity standards (here used as an impurity factor, IF) are listed for specific active constituents. One of the listed substances is HCB. Before pesticide regulations were implemented, HCB impurity levels in many active substances were quite high but producers were obliged to reduce the impurity levels dramatically. Today, the amounts of impurities are clearly below the legally defined impurity levels but national standards for HCB impurity can differ between countries and depend on the year of implementation. Emission factors for emission calculation are given in the table 6.2-5.

Table 6.2-5 Tier 1 emission factors for source category 3.D.f Use of pesticides

Active substances	1990 mg/kg	1995 mg/kg	2000 mg/kg	2005 mg/kg	2010 mg/kg	2015 mg/kg	Banned in EU since	EU Directives or Regulations
Atrazine	2,50	1	1	Use stopped	Use stopped	Use stopped	End 2003	No 2004/248/EC
Clopyralid	not used in EU	not used in EU	not used in EU	not used in EU	2.50	2.50		Reg. (EU) No 2019/168, 06/64/EC, No 540/2011, No 678/2014
Chlorothalonil	300	300	40	10	40	40		2005/53/EC, Reg. (EU) 2018/1262, Reg. (EU) No 540/2011, Reg.(EU) 2017/1511, Reg. (EU) No 533/2013
Chlorthal-dimethyl	1000	1000	40	40	Use stopped	Use stopped	End 2010	2009/715/EC ******
Endosulfan	0.1	0.1	0.1	0.1	Use stopped	Use stopped	End 2005	05/864/EC, No 1107/2009
Lindane	100	50	50	50	Use stopped	Use stopped	End 2007	1107/2009, 850/2004, 2000/801/EG
Quintozene	500	500	500	Use stopped	Use stopped	Use stopped	End 2000	No 2000/816/EC
Picloram	50	50	50	50	50	50		No 540/2011, 2010/39/EU, Reg. (EU) No 2018/1796

Active substances	1990 mg/kg	1995 mg/kg	2000 mg/kg	2005 mg/kg	2010 mg/kg	2015 mg/kg	Banned in EU since	EU Directives or Regulations
Propazine	1	1	1	Use stopped	Use stopped	Use stopped		No 2002/2076
Simazine	1	1	1	Use stopped	Use stopped	Use stopped	End 2004	No 2004/247/EC
Pentachlorophenol (PCP)	50	50	50	Use stopped	Use stopped	Use stopped	End 2002	No 2002/2076

Source: GB 2019

Sources of activity data are Central Bureau of Statistics (CBS) and Ministry of Agriculture. The annual sales of relevant active substance (in kilograms) is used to conclude the quantity that is applied, using the assumption that during the year, all the pesticides sold to farmers, ranchers, foresters, etc. are applied.

As a result of the study it was concluded that the following pesticides: Propazine, Pentchlorophenol, Quintozene, Chlorthaldimethyl and Endosulfan were not / are not in use in the Republic of Croatia and will be marked with notation key „NO“ in the Inventory. Annual quantities of pesticide active substance sold in the Republic of Croatia are shown in table 6.2-6.

Only the quantities produced were available for Lindane, and it was assumed in the HCB emission calculation that the amount of Lindane produced was equal to the amount of active substance produced, and that it was equal to the amount of active substance sold. Use of Lindane in Croatia was banned in 2002.

Only the quantities of sold Atrazine were available for the period 1990 – 1993. Consequently, quantities of the active substance of atrazine sold for the period 1990 – 1993 were estimated using a mean value of 88% for the proportions of the active substance of atrazine sold in the sold quantity of atrazine in the period 1994 – 2003. Share of active substance of atrazine sold in sold amount of atrazine in the period 1994 – 2003 ranged from 76 - 97%. Use of Atrazine in Croatia was banned in 2004.

There was no production or sales of Simazine in the period 1990 – 1991. Only the quantities of sold Simazine were available for the period 1992 – 1993. Consequently, the quantities of the active substance of simazine sold for the 1992 – 1993 period were estimated using a mean value of 55% for the proportions of sold active substance of other triazine-based herbicides and sold active substance in the sold quantity of other triazine-based herbicides in the period 1994 – 2007. Share of sold active substance of other triazine-based herbicides in the sold amount of other triazine-based herbicides in the 1994 – 2007 period ranged from 45 – 71%. Use of Simazine in Croatia was banned in 1994.

For Picloram and Chlorthalonil, only available data were the data on annual sales of active substance since the year 2013. For the historical trend from 1990 to 2012, the quantity of active substance sold in 2013 was taken into calculation and it was applied for all years in 1990 – 2012 period.

Data on annual sales of active substance since 2013 were available for Propazine. Propazine has only been in use in the EU since 2010. For the period 2010 – 2012 the quantity of active substance sold in 2013 was taken into calculation and applied for all years in the period 2010 – 2012.

Table 6.2-6 Annual sales of active substance in kilograms for the pesticides in Croatia

Annual sales of active substance (kg)						
Year	Lindane	Atrazine	Simazine	Picloram	Chlorthalonil	Clopyralid
1990	11700	635752	NO	82.7	13,515.22	NO
1991	12663	356727	NO	82.7	13,515.22	NO
1992	13625	935968	21984	82.7	13,515.22	NO
1993	16243	912127	13740	82.7	13,515.22	NO
1994	14633	1253000	use stopped	82.7	13,515.22	NO
1995	15488	1334000		82.7	13,515.22	NO
1996	12800	818000		82.7	13,515.22	NO
1997	4300	606000		82.7	13,515.22	NO
1998	7000	732000		82.7	13,515.22	NO
1999	6500	168000		82.7	13,515.22	NO
2000	9800	695000		82.7	13,515.22	NO
2001	4200	1024000		82.7	13,515.22	NO
2002	use stopped	544000		82.7	13,515.22	NO
2003		138245		82.7	13,515.22	NO
2004		use stopped		82.7	13,515.22	NO
2005				82.7	13,515.22	NO
2006				82.7	13,515.22	NO
2007				82.7	13,515.22	NO
2008				82.7	13,515.22	NO
2009				82.7	13,515.22	NO
2010				82.7	13,515.22	2,784.54
2011				82.7	13,515.22	2,784.54
2012				82.7	13,515.22	2,784.54
2013				82.7	13,515.22	2,784.54
2014				101.1	8,603.01	3,086.57
2015				101.9	3,066.80	2,174.11
2016				84.2	4,078.80	2,597.73
2017				87.7	4,187.62	3,096.47
2018				105.8	6,406.20	2,085.05

Sources: CBS, Ministry of Agriculture

Recalculations and improvements

Inorganic N fertilizers (including urea) (NFR 3.D.1.a)

Emissions estimates for NH_3 and NOx were recalculated for the 2000-2017. The whole time period was recalculated due to update of AD.

Animal manure applied to soils (NFR 3.D.a.2.a)

Recalculations of NH_3 emissions were performed for the entire period 1990-2017 (for fattening pigs, breeding pigs and poultry) due to the improvement of 3B methodology from Tier 2 to Tier 3.

Urine and dung deposited by grazing animals (NFR 3.D.a.3)

Recalculations of NH_3 and NOx emissions were performed for the entire period 1990-2017 due to the correction of AD for cattle.

Cultivated crops (NFR 3.D.e)

The emission estimate for NMVOC was recalculated due the improvement from Tier 1 to Tier 2 methodology .

6.3. Field burning of agricultural residues (NFR 3.F)

Source category description

Field burning of agricultural residues is a minor source of several pollutants. The practice of burning crop residues is used as a quick and favourable method for clearing the land from crop residues that enables further and undisturbed land tillage. Field burning can also improve the fight against diseases and pests of certain crops. This activity is prohibited by the EU legislation.

This category does not include activities of burning crop residues after their use for another purpose, for example, straw used for protection of agricultural products during storage at the farms. This activities should be included in the sector NFR 5.C.2 Waste.

Field burning of agricultural residues results in emission of a number of pollutants into the atmosphere including ammonia (NH_3), nitrogen oxides (NO_x), non-methane volatile organic compounds (NMVOC), sulfur dioxide (SO_2), carbon monoxide (CO) and particles (PM), including black carbon (BC). Burning of agricultural residues also results in emission of heavy metals and dioxins .

Methodology, emission factors and activity data

Tier 1 methodology is based on estimates for amounts of agricultural residues and the application of a default emission factors for each pollutant, and this level of calculation will be used for emission calculation in the Republic of Croatia.

Tier 1 methodology uses the general equation for calculation of emissions from field burning of agricultural residues:

$$E_{\text{pollutant}} = AR_{\text{residue\_burnt}} \cdot EF_{\text{pollutant}}$$

where:

$E_{\text{pollutant}}$ – emission (E) of pollutant (kg);

$AR_{\text{residue\_burnt}}$ – activity rate (AR), mass of residue burnt (kg dry matter);

$EF_{\text{pollutant}}$ – emission factor (EF) for pollutant (kg kg^{-1} dry matter).

This equation is applied at the national level, using annual national total amount of residue burned. Value of the activity rate ($AR_{\text{residue\_burnt}}$) is the product of the land area on which the crops whose residues are burnt were grown (A), mass of the fuel available for combustion, in tonnes per hectare (M_b) and combustion factor (C_f). Default values are given in the 2006 IPPC Guidelines, Vol. 4, Chapter 2, Table 2.6.

Emission factors for calculation of emissions caused by field burning of agricultural residues are given in Annex 4.

Activity data should include estimates of land areas for each type, which are then used to estimate residues that are commonly burned, the fraction of residue burned and the dry matter content of residue. The mass of crop residue burned can be calculated from the following equation:

$$AR_{residue\_burnt} = A \cdot Y \cdot s \cdot d \cdot p_{\mathrm{b}} \cdot C_{\mathrm{f}}$$

where:

- A – area of land on which crops are grown whose residues are burned (ha);
- Y – average crop yield (kg ha^{-1})
- s – ratio between the mass of crop residues and the average crop yield
- d – dry matter content of the yield;
- p_b – proportion of residues that are burned (not used elsewhere);
- C_f – combustion factor (proportion of the fuel present at the time of the fire that is actually burned).

The most important data to collect for calculation of emissions are the actual amounts of crop produced (by type) with residues that are commonly burned. Considering that such data are missing, and in the absence of better data, the values given below are used.

Default values of the ratio of residue mass to crop yield (s) are given in Table 6.3-1. To ensure consistency with the IPCC Guidelines 2006 (Chapter 2.4), and with the assumption that the dry matter content in yield (d) is 0.85, for crops other than wheat, maize and rice, values for wheat should be used.

Data on the harvested area (Table 6.3-2) and yield (Table 6.3-3) of the most important crops are obtained from the CBS (Croatian Bureau of Statistics) for all years in data set. Value for the proportion of residues that are burned (p_b) is set at the conservative 0.5 (50%), since there is currently no data on actually burned area of agricultural residues.

Table 6.3-1. Default values for estimating the amount of residues burned

CROP	Ratio of residue mass to crop yield (s)	Average crop yield (Y), kg ha^{-1} fresh weight	Combustion factor (C_f)
Wheat	1.3	3.6	0.9
Barley	1.2		
Maize	1.0	11.8	0.8
Oats	1.3		
Rye	1.6		
Rice	1.4	4.6	0.8
Peas	1.5		
Beans	2.1		
Soybeans	2.1		

Source: IPCC, 2000., EMEP/EEA GB 2019

Table 6.3-2. Data on the harvested area of the most important crops

Harvested area	Wheat	Barley	Maize	Oats	Rye	Peas	Beans	Soybeans
1990	318955	51565	77016	25495	3053	3402	8132	27260

Harvested area	Wheat	Barley	Maize	Oats	Rye	Peas	Beans	Soybeans
1991	324460	51643	78510	23425	2974	3174	8921	22840
1992	168865	32873	60758	17582	2252	2597	5980	26220
1993	211845	36605	64754	17204	2453	2738	6514	21424
1994	198381	36225	66356	18493	2963	2899	6958	20435
1995	227044	32518	66458	15763	1930	2915	6733	15018
1996	200852	31034	65537	16290	2043	2787	6975	16423
1997	208377	33759	63189	18142	1959	3041	7521	16030
1998	241734	42737	64931	21669	2146	562	5946	34015
1999	169280	44517	66374	24124	2446	660	6581	46336
2000	182333	55511	17237	26042	2738	555	7470	47484
2001	184274	61267	17435	26103	2981	778	7149	41621
2002	179153	61165	17222	24484	3244	872	7104	47897
2003	157175	65001	16919	25300	2960	889	6826	49860
2004	162634	67538	16043	23457	2869	813	6137	36979
2005	146253	50341	18903	21185	1848	447	6477	48211
2006	175551	59159	16759	24914	2008	326	6367	62810
2007	175045	59000	17355	27967	1731	374	4451	46506
2008	156536	65536	15000	19873	1367	351	2147	35789
2009	180376	59584	14000	20901	998	372	1947	44292
2010	168507	52524	10950	19280	1035	221	1276	56456
2011	149797	48318	10881	25344	871	252	1232	58896
2012	186949	56905	10232	28514	846	139	788	54109
2013	204506	53796	10234	21656	1019	154	1097	47156
2014	156139	46160	10310	21146	1373	219	1483	47104
2015	140986	43700	10047	23462	1093	94	1475	88867
2016	168029	56483	9866	26572	1285	71	1574	78614
2017	116151	53950	9833	23139	774	71	1539	85133
2018	135708	50988	9272	15885	774	147	1403	77087

Source: CBS

Table 6.3-3 Data on yield of the most important crops

Yield (kg ha^{-1})	Wheat	Barley	Maize	Oats	Rye	Peas	Beans	Soybeans
1990	5.02	3.81	3.88	2.44	5.19	0.29	2.27	2.03
1991	4.61	3.60	4.89	2.30	4.73	0.31	2.46	2.47
1992	3.90	3.25	3.67	2.57	2.69	0.31	2.67	1.76
1993	4.19	3.43	4.48	2.39	2.56	0.12	2.70	2.31
1994	3.78	2.98	4.55	2.29	2.41	0.14	2.96	2.16
1995	3.86	3.18	4.90	2.43	2.62	0.29	3.24	2.29
1996	3.69	2.84	5.23	2.43	2.70	0.22	2.90	2.19
1997	4.00	3.21	5.88	2.58	2.56	0.19	2.73	2.46
1998	4.22	3.36	5.25	2.59	2.58	1.33	3.53	2.28
1999	3.30	2.81	5.56	2.36	2.55	1.25	3.39	2.50
2000	4.75	3.24	4.07	2.37	2.64	1.65	0.36	1.38
2001	4.40	3.13	5.67	2.74	3.62	2.48	0.62	2.21
2002	4.59	3.38	6.38	3.03	2.84	2.39	0.73	2.70
2003	3.22	2.46	4.20	2.10	2.02	1.30	0.73	1.66
2004	4.93	3.52	6.31	3.13	3.13	2.29	0.73	2.65
2005	4.11	3.23	6.92	2.34	2.56	2.00	0.93	2.48
2006	4.58	3.64	6.53	2.67	2.73	2.19	0.64	2.77
2007	4.64	3.82	4.94	2.01	2.52	1.79	0.56	1.95
2008	5.48	4.26	7.98	3.29	2.98	2.48	1.52	3.01
2009	5.19	4.09	7.35	2.98	2.87	2.57	1.26	2.60
2010	4.04	3.28	6.97	2.50	2.42	1.54	1.29	2.72
2011	5.22	4.01	5.68	3.05	3.39	2.76	0.86	2.50
2012	5.35	4.14	4.34	3.32	2.87	2.91	0.60	1.79

Yield (kg ha^{-1})	Wheat	Barley	Maize	Oats	Rye	Peas	Beans	Soybeans
2013	4.88	3.74	6.50	2.78	2.90	1.23	1.35	2.36
2014	4.16	3.80	8.10	2.67	2.04	2.64	0.90	2.79
2015	5.38	4.43	6.47	3.06	3.07	2.06	0.78	2.21
2016	5.71	4.66	8.55	3.03	3.62	3.46	0.93	3.10
2017	5.87	4.83	6.31	2.95	3.32	2.00	0.87	2.44
2018	5.44	4.46	9.12	2.82	3.32	2.14	1.24	3.18

Source: CBS

Recalculations and improvements

This is the first time emissions from 3.F source were estimated in the inventory.

As the current emission estimate is probably overestimated due to using p_b value of 0.5, long term planned improvement is getting a better national estimate for the value.

7. Waste (NFR 5)

Croatia reports for the following source categories of the sector NFR 5 Waste:

- 5.A Biological treatment of waste - solid waste disposal on land
- 5.B.1 Biological treatment of waste - composting
- 5.C Waste Incineration
  - 5.C.1.b.i Industrial waste incineration
  - 5.C.1.b.iii Clinical waste incineration
  - 5.C.1.b.v Cremation
- 5.D Wastewater Handling
  - 5.D.1 Domestic wastewater handling
  - 5.D.1 Industrial wastewater handling
- 5.E Other Waste
  - SNAP code 091009 Car fire
  - SNAP code 091010 Detached house fire
  - SNAP code 091011 Undetached house fire
  - SNAP code 091012 Apartment building fire
  - SNAP code 091013 Industrial building fire

Source category description

The source category NFR 5.A includes emissions of NMVOC and PMs; 5.B.1 includes emission of NH_3; 5.C includes emissions of NOx, NMVOC, SO_2, PMs, heavy metals, PCDD/PCDF, PAHs, HCB and PCBs; 5.D includes emissions of NMVOC and NH_3; 5.E includes emissions of PMs, heavy metals and PCDD/PCDF.

Implementation and establishment of the integral waste management system in Croatia are ensured by applying and fulfilling the objectives defined by the Sustainable Waste Management Act [32] and Waste Management Plan[33]. The main act regulating waste management issues in the Republic of Croatia is the Sustainable Waste Management Act. There are a number of ordinances that have been adopted according to Sustainable Waste Management Act, some of them regulating certain waste management operations, some regulating management of specific waste types. Waste Framework Directive[34] is transposed in the area of waste management into the Croatian legislation by the Sustainable Waste Management Act which is adopted in 2013. The following waste hierarchy shall apply as a priority order in waste prevention and management legislation and policy: (a) prevention; (b) preparing for re-use; (c) recycling; (d)

32 Sustainable Waste Management Act (OG 94/2013, 73/2017, 14/2019, 98/2019)
33 Waste Management Plan of the Republic of Croatia for the period 2017 - 2022 (OG 3/2017)
34 Waste Framework Directive 2008/98/EC

other recovery, e.g. energy recovery; and (e) disposal. Avoiding and reducing of waste generation has the highest priority and results in reduction of quantity and adversity of produced waste which enters into the next phase. Reuse/recovery of produced waste has the purpose to use material and energy potentials of waste, in the framework of technical, ecological and economic possibilities. Disposal of remaining inert waste at the managed controlled landfills has the lowest rank in the waste management hierarchy. According to the Waste Management Plan the backbone of the system will be recycling centres with sorting of waste. Waste management system in Croatia will be organized as integral unit of all subjects at the national, regional and local level.

Methodology, emission factors and activity data

In general the EMEP/EEA methodology, multiplying activity data for each sub category with an emission factor, is applied. A CS methodology was developed to estimate a NMVOC emission factor from 5.A, for all years in reporting period.

Emission factors are expressed as the quantity of pollutant emission per unit of waste treated. Used emission factors are from GB2019 and GB2009 (for emission factors not estimated in GB2019, for NFR 5.C.1.b.i) as well CS NMVOC emission factors for 5.A. The source of emission factors used for emission calculation is noted in each of sub-sector under NFR code 5. Emission factors used for the preparation of the IIR 2020, presented by NFR sectors and pollutants, are given in Appendix 4.

Generally four sources of information concerning activity and emission data for the source category waste have been used:

- Activity data as reported annually by facilities in legally required forms under the Croatian Environmental Emission Register and Waste Management Information System (MEE);
- National statistical reports at national level from the Croatian CBS (the Annual Statistical Reports and Releases, Census1981, Census 1991, Census 2001 and Census 2011);
- Plant specific activity data collected by direct contacts with facility (e.g. facilities for cremation, industrial combustion facility);
- Ministry of Interior.

7.1. Biological treatment of waste – solid waste disposal on land (NFR 5.A)

Source category description

This source is only a minor source of air pollutant emissions, greenhouse gas CH_4 is the major pollutant. Small quantities of NMVOC, PM_{10}, $PM_{2.5}$, TSP, NH_3 and CO may be emitted. Croatia reports emissions of NMVOC and PMs from solid waste disposal.

Following information, which are relevant for IIR, are taken from GHG emissions report (NIR). As a result of the in-country review 2018, inventory problem in terms of missing estimate was defined for 5.A Solid waste disposal. According to the recommendation by Expert review team (ERT) as well requirements of the 2006 IPCC Guidelines, Croatia included the CH_4 emissions for category 5.A Solid waste disposal from municipal solid waste (MSW), industrial solid waste and sludge disposed at landfills for the entire time series. In previous NIR reports, only CH_4 emissions from MSW were included in the inventory for the entire time series. In the NIR 2019 report, along with data on MSW, the inventory includes data on industrial waste and sludge disposed at landfills to improve the accuracy and completeness of the inventory.

Detailed explanations of the data sources and methods of assessment the data for emission estimates are contained in the NIR 2019.

Data source for disposed waste amounts is MEE. Data collection system for waste is based on the Sustainable Waste Management Act and by-laws and enforcement regulations. All detail regarding data collection is in detail described in Croatian NIR, according to IPCC methodology. The MEE is collecting and processing waste data, among other the data reported to the Environmental Pollution Register; data on waste management permits and certificates, and data for Waste Management Information System. By the Ordinance on the Environmental Pollution Register (OG 87/2015), adopted according to Environment Protection Act, the MEE is collecting data on the quantities and types of waste produced, collected, recovered or disposed. Data on quantities are available for each waste code (based on European LoW- List of Waste) and NACE activity. Four forms are available for data delivery (for waste producer, waste collector of municipal waste, waste collector of industrial waste and operator of waste treatment facility). Waste data are reported by operators electronically, using internet based application, on annual basis. Validation and verification of data is done first by county offices (with appropriate support from the environment protection inspectors), and then by the MEE that is cooperating with competent offices in counties and with companies collecting MSW or operating landfills, in order to strengthen data quality. Data is checked for completeness, correctness and consistency in time-series. In cases that collected or disposed waste is not reported, quantities are determined on the basis of previous year report or calculation on the basis of average MSW production per capita. Quality of municipal data is gradually improving as scales are installed at landfills, but still large amount of municipal waste is not being weighted, which usually lead to overestimation of collected and disposed quantities.

Main source for activity data on MSW is Environmental Pollution Register database and Waste Management Information System database, operated by MEE. Total annual MSW disposed to landfills for the period 1990-1998 has been evaluated from available relevant data compiled into Report; Fundurulja, D., Mužinić, M. (2000) *Estimation of the Quantities of Municipal Solid Waste in the Republic of Croatia in the period 1990 – 1998 and 1998 – 2010*, Zagreb, in the framework of the preparation the documents for the 1st NC[35]. Insufficient data for the quantity of disposed MSW in 1999 were evaluated by interpolation method. Data for the quantity of disposed MSW in 2000 were obtained from *Environment Report (2012)*, Croatian Environment Agency. Data for the quantity of disposed MSW in 2005 were obtained from *Waste Management Plan in the Republic of Croatia for 2007 - 2015* (OG *85/2007, 126/2010, 31/2011, 46/2015*). Taking into account the pattern over 2000 and 2005, quantity of disposed MSW for the period 2001 to 2004 were assessed by interpolation method. Data on the quantity of disposed MSW for the period 2006 - 2018 were obtained from the Environmental Pollution Register and Waste Management Information System. Due to low quality of data for the period 2006 - 2009 provided by operators of landfills, the data were taken from the reports of companies collecting the MSW (reporting destination of MSW). Data on the quantity of generated and disposed MSW for the period 2010 - 2018 were obtained from the Environmental Pollution Register - reports delivered by the operators of active landfills. Data on the quantity of disposed

[35] The First National Communication of the Republic of Croatia to the United Nations Framework Convention on Climate Change (UNFCCC), Republic of Croatia, Ministry of Environmental Protection and Physical Planning, 2001

biodegradable MSW for the period 2010 - 2018 were obtained from the Waste Management Information System - reports on landfills and waste disposal.

Data on the quantity of disposed industrial waste for the period 1990 - 2009 are not available and were estimated by linear extrapolation method. Historical data were extrapolated based on average for the period 2010 - 2016. Data for the first year in the time series (1955) were calculated using the ratio of the total amount of disposed MSW in 1955 and the average of disposed MSW for the period 2010 - 2016. Data on the quantity of generated and disposed industrial waste for the period 2010 - 2018 were obtained from the Environmental Pollution Register - reports delivered by the operators of active landfills. Data on the quantity of disposed biodegradable industrial waste for the period 2010 - 2018 were obtained from the Waste Management Information System - reports on landfills and waste disposal.

Data on the quantity of disposed sludge from wastewater treatment for the period 1990 - 2009 are not available and were estimated using the average for the period 2010 - 2016. Data on the quantity of disposed sludge for the period 2010 - 2018 were obtained from the Waste Management Information System - reports on landfills and waste disposal. Linear extrapolation method was not used due to high discrepancy of the data for the period 2010 - 2016. Average value 2010 - 2016 was used to construct the time series - back in time was done by overlapping data for 1990 - 2012 with average 2010 - 2016.

Waste Management Information System contains various data on landfills, such as implementation of technical measures (e.g. fence, scale, flares…) or environment protection measures (e.g. degassing, compacting, aligning, monitoring etc.). Database also contains data on the status of remediation of landfills (in preparation/ongoing/finished) and status of operation (active/closed). Active landfills for municipal waste are obligated by legislation to deliver this data to MEE in prescribed form (Form on landfills and landfilling of waste), as for the rest (closed landfills and landfills for the industrial waste) the data forms are periodically sent to landfill operators by MEE or the update is done upon receiving the information on individual landfill from other sources. Data on remediation status is requested by MEE once a year from the Environment Protection and Energy Efficiency Fund which is co-financing remediation of almost all of official landfills.

Methodology, emission factors and activity data

According to the recommendation by TERT during review in 2019, a technical correction were performed for NMVOC emissions from 5.A. CS methodology was developed to estimate a NMVOC EF for all years in reporting period, based on the CH_4 emissions estimated in the framework of the NIR report. CH_4 emission ratio per ton of disposed waste was used, converted into a volume of CH_4 per tonne of disposed waste (using the molecular volume of CH_4) and then into a volume of biogas per tonne of disposed waste (applying the fraction of CH_4 in biogas F = 50%) and then the fraction of NMVOC in biogas (5.65 g/m^3 of landfill gas), presented in the note at the bottom of Table 3-1, Chapter 5.A of the EMEP/EEA GB2019, was applied. The NMVOC emission factor is presented in Appendix 4.

The Tier 1 EMEP/EEA methodology from GB2019 is used for emissions calculation of $PM_{2,5}$, PM_{10} and TSP. Tier 2 is not available for this source. Recommended Tier 1 emission factors from GB2019 that expressed as the amount of pollutant per amount of landfilled waste are used (emission factors is presented in Appendix 4).

Information on inclusion/exclusion of the condensable component from PM_{10} and $PM_{2.5}$ emission factors by NFR source category are provided in Appendix 9 of this Report.

Relevant activity data is an annual amount of landfilled waste. The activity data is presented in Table 7.1-1. Solid waste disposal trend during the reporting period depends on the multiple factors. For the period 1990 - 2009, there was increasing of disposed waste due to increasing of waste generation, mainly caused by increasing of living standard. After 2009 there is a decrease in quantities registered, caused primary by economic crisis but also other factors regarding to effects of measures undertaken to avoid/reduce and recycle waste. In the period 2010 - 2018, there is a fluctuating trend of landfilled waste, which is affected by measures to avoid/reduce and recycle waste and remediation of illegal landfills. Since 2016, the quantities of landfilled waste have been reduced slightly.

As the calculated CH_4 emissions in the NIR report, which are estimated using the kinetic model (IPCC FOD model), are used to calculate NMVOC emissions, the NMVOC emissions have been increased throughout the reporting period, which only slowed down after 2016. Regarding the application of the Tier 1 EMEP/ EEA methodology for $PM_{2,5}$, PM_{10} and TSP, emissions have been decreased since 2010, when the quantities of landfilled waste started to decrease.

Further, a number of new legislation acts have been adopted with the purpose to increase separate collection, recycling and recovery of different waste types. National schemes based on „extended producer responsibility“ have been introduced for collection and recovery of different waste categories.

All these activities influence emissions of pollutants from solid waste disposal on land.

Table 7.1-1 Activity data for NFR codes 5.A, 5.B.1, 5.C.1.b.i, 5.C.1.b.iii, 5.C.1.b.v, 5.D.1 and 5.D.2, represented by the relevant SNAP codes

NFR	5.A	5.B.1	5.C.1.b.i	5.C.1.b.iii	5.C.1.b.v	5.D.2	5.D.2	5.D.1
SNAP	090401	091005	090202	090207	090901	091002	091001	091007
Name	Solid waste disposal on land	Composting	Industrial waste incineration	Clinical waste incineration	Cremation	Residential/commercial wastewater	Industrial wastewater	Domestic wastewater - Latrines
Unit	kt	kt	kt	kt	corps	1000 m³	1000 m³	popul.
1990	1050.436	NE	0.250	0.140	1464	NO	104000	433305
1991	1061.948	NE	0.250	0.140	1786	NO	94488	431084
1992	1078.940	NE	0.250	0.140	2287	NO	46785	428862
1993	1111.838	NE	0.250	0.140	2760	NO	87343	428862
1994	1148.735	NE	0.250	0.140	3037	NO	34419	426640
1995	1210.797	NE	0.250	0.140	3109	54353	33758	422196
1996	1264.429	NE	0.250	0.140	3385	58009	93836	419974
1997	1327.111	NE	1.031	0.140	3476	61661	41857	417752
1998	1395.683	NE	2.168	0.140	3312	87796	30985	415531
1999	1461.113	NE	2.580	0.140	3201	88785	28924	413309
2000	1426.158	NE	3.652	0.142	3080	86579	22208	411087
2001	1497.490	NE	3.967	0.156	2972	83533	21337	408865
2002	1570.222	NE	2.206	0.158	3254	81196	21883	406643
2003	1642.954	NE	0.400	0.163	3392	84283	28408	404421
2004	1714.686	NE	0.120	0.173	3404	160277	22468	402199
2005	1787.497	NE	0.005	0.176	3633	132280	15984	399978
2006	1952.135	NE	0.350	0.188	3593	140906	19758	397756
2007	2116.773	15.230	0.285	0.205	3962	140228	14118	395534
2008	2240.286	14.860	0.316	0.165	3911	192033	16507	393312
2009	2290.490	12.490	IE	0.185	4060	206042	17445	391090
2010	1998.998	13.480	IE	0.054	4314	205709	26679	388868
2011	2033.592	14.020	IE	0.057	4344	209150	7205	386646
2012	1951.002	25.960	IE	0.093	4478	259135	11536	384425
2013	1992.832	41.091	IE	0.048	4601	295264	12574	382203

NFR	5.A	5.B.1	5.C.1.b.i	5.C.1.b.iii	5.C.1.b.v	5.D.2	5.D.2	5.D.1
SNAP	090401	091005	090202	090207	090901	091002	091001	091007
Name	Solid waste disposal on land	Composting	Industrial waste incineration	Clinical waste incineration	Cremation	Residential/commercial wastewater	Industrial wastewater	Domestic wastewater - Latrines
Unit	kt	kt	kt	kt	corps	1000 m^3	1000 m^3	popul.
2014	1830.499	39.723	IE	0.051	4803	268002	13301	379981
2015	1918.659	74.877	IE	0.052	5373	256690	12943	377759
2016	1769.572	37.488	IE	0.056	5128	275162	11901	375537
2017	1683.640	42.444	IE	NO	5496	264034	15117	373315
2018	1601.602	47.594	IE	NO	6440	281243	17260	371093

Source: 5.A, 5.B.1 and 5.C - MEE, 5.D - CBS, Processing: Ekonerg Ltd

Recalculation and improvements

According to the recommendation by TERT during review in 2019, a technical correction were performed for NMVOC emissions. In order to improve the accuracy of the estimate, a CS methodology was developed to estimate a NMVOC EF for all years in reporting period, based on the CH_4 emissions estimated in the framework of the NIR report. Accordingly, recalculation was performed for the period 1990 - 2017.

7.2. Biological treatment of waste – composting (NFR 5.B.1)

Source category description

According to GB2019, NH_3 emission resulting from composting are included in this category (Technologies – Compost production, SNAP 091005). NH_3 emission from composting of municipal and industrial solid waste, sludge and other organic waste are included in emission estimates for the period 2007 – 2018. Data on different types of waste (wet weight) have been used for NH_3 emission calculation for the period 2007 – 2018. Emissions for previous period (1990 – 2006) are not estimated because activity data are not available. The notation key “NE” (not estimated) is used for the period 1990 – 2006. It is necessary to collect accurate data for NH_3 emission calculations for the entire reporting period and to include them in the inventory to be complete.

The official source of activity data for waste composting is MEE that is collecting and processing waste data, among other data reported to the Environmental Pollution Register and Waste Management Information System. By the Ordinance on the Environmental Pollution Register (OG 87/2015), adopted according to Environment Protection Act, the MEE is collecting data on the quantities and types of waste produced, collected, recovered or disposed. The MEE coordinates activities relating to data quality assurance and control.

Methodology, emission factors and activity data

The Tier 2 EMEP/EEA methodology and recommended Tier 2 emission factor from GB2019 are used for NH_3 emission calculation from composting. The NH_3 emission factor is presented in Appendix 4.

Relevant activity data is the annual quantity of composted municipal and industrial solid waste, sludge and other organic waste. The activity data is presented in Table 7.1-1.

A fluctuating trend for composting waste during the period 2007 - 2018 was due to multiple factors, which depend primarily on the separate collection of biodegradable waste, as well as the treatment of biodegradable waste in biogas facilities for the production of biogas used for energy generation. All these activities influence emissions of pollutants from composting of solid waste.

Recalculation and improvements

Data on different types of waste on a wet weight basis (that used in the NIR report) have been included in the inventory in relation to previous inventory that used data on different types of waste based on dry matter. The recalculation was made for the period 2007 - 2017.

Future improvements are related primarily to aggregation of accurate data for NH_3 emission calculations for the entire reporting period, which is included in the Annual Data Collection Plan. This primarily refers for the pre-2007 years, for which activity data need to be investigated. When the competent authority provides all necessary information and data, it will be included in the inventory.

7.3. Biological treatment of waste – anaerobic digestion at biogas facilities (NFR 5.B.2)

Emissions from anaerobic digestion of organic waste at biogas facilities (NFR 5.B.2) are included in the Energy sector (1.A.1 and 1.A.4), due to energy recovery. The notation key „IE“ (included elsewhere) has been used for the period in which the activity existed (2009 – 2018).

Potential NH_3 emissions from pre- and post-storage as well as possible leakage during solid-liquid separation are not included in the inventory. This issue should be investigated for the entire activity period and included in the inventory.

7.4. Waste incineration (NFR 5.C.1)

Source category description

Waste incineration (NFR 5.C.1) includes emission of pollutants from industrial waste incineration (NFR 5.C.1.b.i), clinical waste incineration (NFR 5.C.1.b.iii) and cremation (NFR 5.C.1.b.v), without energy recovery. There is no municipal waste incineration (NFR 5.C.1.a), neither incineration of sludge from wastewater treatment (NFR 5.C.1.b.iv) in Croatia, and notation key “NO” (not occurring) for that source activities are reported. Also, there is no incineration of carcasses in Croatia.

Emissions that occur as a result of waste incineration with energy recovery are presented in the Energy Sector 1.A.

Industrial waste incineration (NFR 5.C.1.b.i)

The official source of activity data for industrial waste incineration is MEE that collects data from emission point sources in the Environmental Pollution Register database. According to the Article 21 of Ordinance on the Environmental Pollution Register (OG 87/2015), the completed forms should be submitted for the previous calendar year not later than March 31 of the current year. The competent authority (administrative department of the county and the City of Zagreb) ensures the checking of data submitted in terms of their completeness, consistency and credibility. The MEE coordinates activities relating to data quality assurance and control.

In the period from 1997 to 2002, an incineration of hazardous waste was existed in Croatia and those emissions are reported in the scope of source category NFR 5.C.1.b.i Industrial waste incineration. For the source category NFR 5.C.1.b.ii Hazardous waste incineration the notation key "IE" is used. Croatia uses EWC codes for waste classification that is part of the Regulation on categories, types and classification of waste with a Waste Catalogue and List of hazardous waste (OG 50/2005 and 39/2009) and Ordinance on Waste Catalogue (OG 90/2015).

Clinical waste incineration (NFR 5.C.1.b.iii)

The official source of activity data for clinical waste incineration is MEE that collects data from emission point sources in the Environmental Pollution Register database. According to the Article 21 of Ordinance on the Environmental Pollution Register (OG 87/2015), the completed forms should be submitted for the previous calendar year not later than March 31 of the current year.

In the period from 1990 to 2016, an incineration of clinical waste was existed in Croatia and those emissions are reported in the scope of source category NFR 5.C.1.b.iii. There was no incineration of clinical waste without energy recovery in 2017 and 2018.

Incineration plants for clinical waste in Croatia were not modern facilities. The longest-running plant had started with the incineration of clinical waste in 1986, using gas furnaces and no information on installed abatement technologies are available for this facility. The other two facilities were within the hospitals. One facility that operated from 1988 to 2011 had only installed a system of flue gas purification by a wet process. For the second facility that operated from 2001 to 2012 there are no available information on installed abatement technologies. Batch incineration without agitation was used in all facilities.

Cremation (NFR 5.C.1.b.v)

The official source of activity data for cremation is MEE that collects data from a crematorium in Croatia, located in the city of Zagreb.

Methodology, emission factors and activity data

Industrial waste incineration (NFR 5.C.1.b.i)

The Tier 1 EMEP/EEA methodology and recommended Tier 1 emission factors from GB2019 (and GB2009 for emission factors not estimated in GB2019) are used for emissions calculation. Emission factors are presented in Appendix 4.

Information on inclusion/exclusion of the condensable component from PM_{10} and $PM_{2.5}$ emission factors by NFR source category are provided in Appendix 9 of this Report.

Relevant activity data is the annual quantity of incinerated industrial waste. The activity data is presented in Table 7.1-1.

Data for the period 1990 -2007 were obtained in direct contact with facilities for industrial and hazardous waste incineration. For years 2007 and 2008, plant specific emission factors were used. These are based on direct emission reported in EPR database. Data for the period 2009 - 2018 on the total amount of incinerated waste by operation D10 (Waste incineration on land) and operation R1 (Waste usage as a fuel or other means to generate energy) have been based on validated PL-OPKO forms - Registration form for entities carrying out the municipal and/or industrial waste recovery/disposal. Regarding previously mentioned, since 2009 there is no more facility operating without energy recovery, so from 2009 all emissions regarding Industrial waste incineration are reported in the scope of energy sector. From 2009 for source category Industrial waste incineration (NFR 5.C.1.b.i) the notation key "IE" is reported.

Clinical waste incineration (NFR 5.C.1.b.iii)

The Tier 1 EMEP/EEA methodology and recommended Tier 1 emission factors from GB2019 are used for emissions calculation. Emission factors are presented in Appendix 4.

Information on inclusion/exclusion of the condensable component from PM_{10} and $PM_{2.5}$ emission factors by NFR source category are provided in Appendix 9 of this Report.

Relevant activity data for clinical waste incineration is the annual quantity of incinerated clinical waste. The activity data is presented in Table 7.1-1.

The trend of incineration of clinical waste during the period 1990 - 1999 is steady, while in the period 2000 - 2009 the quantity of incinerated clinical waste has been increased. From 2010, there is decrease in incinerated quantities of clinical waste, with a fluctuating trend. This is the result of incineration of clinical waste with energy recovery, which is presented in the Energy sector. All these activities influence emissions of pollutants from incineration of clinical waste.

Cremation (NFR 5.C.1.b.v)

The Tier 1 EMEP/EEA methodology and recommended Tier 1 emission factors from GB2019 are used for emissions calculation. Emission factors are presented in Appendix 4.

Information on inclusion/exclusion of the condensable component from PM_{10} and $PM_{2.5}$ emission factors by NFR source category are provided in Appendix 9 of this Report.

Relevant activity data for cremation is the number of incinerated corpses. The activity data is presented in Table 7.1-1.

During the reporting period (1990 - 2018) there is a fluctuating, mainly the growing trend of cremated bodies.

Recalculation and improvements

Industrial waste incineration (NFR 5.C.1.b.i)

Clinical waste incineration (NFR 5.C.1.b.iii)

Cremation (NFR 5.C.1.b.v)

There was no recalculation and other improvement for these source categories.

7.5. Open burning of waste (NFR 5.C.2)

Open burning of waste (NFR 5.C.2) is prohibited by law in Croatia. The notation key „NO“ (not occurring) has been used for the entire reporting period (1990 - 2018). This operation is not allowed in Croatia, therefore no data collection procedures in this segment are prescribed in legislation. MEE has no information on such occurrences, nor the information on possible or estimated quantities of open-burned waste.

Although this activity is prohibited by law in Croatia, the Annual Data Collection Plan includes activity data need to be investigated for the entire reporting period.

7.6. Wastewater handling (NFR 5.D)

Source category description

Activities considered within this source category are Domestic wastewater handling (NFR 5.D.1) and Industrial wastewater handling (NFR 5.D.2).

Domestic wastewater handling (NFR 5.D.1)

In the scope of this source category, Croatia is reporting emissions from latrines. A latrine is a simple “dry” toilet built outside the house, usually in a backyard without water flushing. A storage tank under the latrine can be a hole dug in the ground, or a concrete reservoir. Capacity of the tank can vary between 1 m^3 and 2 m^3. The time of storage can vary between a few months and “forever”. Latrines are source of NH_3 emissions in Croatia.

Industrial wastewater handling (NFR 5.D.2)

In the scope of this source category, Croatia is reporting emissions from wastewater treatment in industry and wastewater treatment in residential/commercial sectors. Processing wastewater is most commonly used aerobic biological treatment. Biological treatment plants have minor influence on the emissions of pollutants. NMVOC emissions are reporting in this source category.

Methodology, emission factors and activity data

Domestic wastewater handling (NFR 5.D.1)

The Tier 2 EMEP/EEA methodology and recommended Tier 2 emission factor from GB2019 are used for NH_3 emission calculation. The NH_3 emission factor is presented in Appendix 4.

The relevant activity data is the number of residents who use latrines. The source of activity data is Croatian Bureau of Statistics - Census 1981, Census 1991, Census 2001 and Census 2011. Activity data that is the number of population in the housing units without toilets was collected for years: 1981, 1991, 2001 and 2011. Data for other years in the period 1990 - 2018 are assessed according to these statistical data with extrapolation method. The activity data is presented in Table 7.1-1.

During the reporting period (1990 - 2018) there is a decreasing trend in the number of inhabitants using latrines, caused by increasing of living standard i.e. increase in the number of inhabitants connected to public drainage systems.

Industrial wastewater handling (NFR 5.D.2)

The Tier 2 EMEP/EEA methodology and recommended Tier 2 emission factor from GB2019 are used for NMVOC emission calculation. The NMVOC emission factor is presented in Appendix 4.

The relevant activity data is the annual amount of total wastewater treated in industry and residential/commercial sectors.

The source of activity data for wastewater from industry is Croatian Bureau of Statistics – First Release; Utilization of Waters and Protection of Waters from Pollution in Industry; Discharge of Treated Waste Water, according to NKD 2007. Unavailable data for 1997 was estimated with interpolation method. Data for other years in the period 1990 – 2018 are available from statistical reports and releases. The activity data is presented in Table 7.1-1.

During the reporting period (1990 - 2018) there is a fluctuating trend in the quantity of wastewater treated in industry. The quantities of wastewater treated in industry were higher in the period up to 2010. After 2010 amounts are reduced, while maintaining the fluctuating trend, which is influenced by the volume of industrial production.

The source of activity data for wastewater from residential/commercial sectors is Croatian Bureau of Statistics – First Release; Public Sewage System; Source, Treatment and Discharge of Waste Waters. Unavailable data for 1997 was estimated with interpolation method. Data for other years in the period 1990 – 2018 are available from statistical reports and releases. The activity data is presented in Table 7.1-1.

During the reporting period (1990 - 2018) there is an increasing trend of the quantity of wastewater treated in residential/commercial sectors, which is the result of construction and improving the public sewerage system.

Recalculation and improvements

Domestic wastewater handling (NFR 5.D.1)

Industrial wastewater handling (NFR 5.D.2)

According to the recommendation by TERT during review in 2019, allocation of wastewater from residential/commercial sectors from category 5.D.1 to category 5.D.2 as well wastewater from latrines from category 5.D.3 to category 5.D.1 has been performed, as defined in the EMEP/EEA GB2019.

In addition, correction of AD for residential/commercial wastewater for 2017 has been performed.

Accordingly, recalculations of NH_3 emissions for 5.D.1 and NMVOC emissions for 5.D.2 were performed for the period 1990. – 2017.

7.7. Other waste (NFR 5.E)

Source category description

The source category Other waste (NFR 5.E) in Croatia covers the emissions from the activities car fires and house fires. Car and house fires include mostly unwanted fires in cars and various types of houses. Types of fires in house that are covered are: detached house fire, undetached house fire, apartment building fire and industrial building fire.

Methodology, emission factors and activity data

The Tier 2 EMEP/EEA methodology and recommended Tier 2 emissions factor from GB2019 are used for emissions calculation. Emission factors are presented in Appendix 4.

Information on inclusion/exclusion of the condensable component from PM_{10} and $PM_{2.5}$ emission factors by NFR source category are provided in Appendix 9 of this Report.

Both the activity data and the emission factors are stratified according to the different activity. For car and house fires, the relevant activity statistics are the standard statistics on number of fires per year, collected by MIA. The activity data is presented in Table 7.7-1.

Table 7.7-1 Activity data for NFR code 5.E, represented by the relevant SNAP codes

NFR	5.E				
Name	Car fire	Detached house fire	Undetached house fire	Apartment building fire	Industrial building fire
SNAP	091009	091010	091011	091012	091013
Unit	fire	fire	fire	fire	fire
1990	306	1655	185	73	742
1991	278	1119	164	68	554
1992	294	2127	155	86	844
1993	291	1095	154	54	687
1994	383	1406	174	69	708
1995	484	1698	214	69	907
1996	487	1726	211	57	860
1997	474	1552	219	55	1030
1998	559	1645	187	54	1042
1999	576	1759	204	35	873
2000	639	1735	141	60	1031
2001	565	1616	150	47	999
2002	544	1527	130	48	922
2003	604	1723	152	60	1141
2004	562	1425	120	67	1011
2005	537	1444	146	37	1189
2006	542	1438	141	39	1189
2007	486	1357	141	33	1256
2008	484	1326	190	32	1061
2009	461	1239	134	41	1076
2010	415	1200	148	28	851
2011	415	1280	172	31	1116
2012	379	1261	132	24	1016
2013	353	1157	149	31	845
2014	314	767	89	19	626
2015	433	845	98	21	690
2016	439	854	99	22	697
2017	488	926	108	23	756

NFR	5.E				
Name	Car fire	Detached house fire	Undetached house fire	Apartment building fire	Industrial building fire
SNAP	091009	091010	091011	091012	091013
Unit	fire	fire	fire	fire	fire
2018	487	782	91	20	639

Source: MIA, Processing: Ekonerg Ltd

During the reporting period (1990 - 2018) there is a fluctuating trend of car fires and house fires. In 2018, the number of house fires decreased by 13 - 16% compared to 2017 (depending on the type of house), while the number of car fires remained almost the same.

Recalculation and improvements

There was no recalculation and other improvement in this report.

8. Natural sources (NFR 11)

8.1. Forest fires (NFR 11.B)

Source category description

Forest fires (NFR 11.B) are classified as natural source of emissions although they may be caused by the intentional or unintentional human activity. These emissions are reported as memo items and are not included in the national total of pollutant emissions.

Methodology, emission factors and activity data

For emission calculation from forest fires source category Tier 1 methodology and emission factors recommended by the GB2019 were applied. Croatia estimates the emission of SO_2, NOx, NMVOC, CO and NH_3 from this source category.

The emission of other pollutants (TSP, PM_{10}, $PM_{2.5}$, BC) will be calculated at the moment when the specific activity data kg wood burned proposed recommended by the GB2019 will be available.

Available activity data is area of forest burnt. The overview of activity data used for emission calculation from forest fire are presented in table 8.1-1.

Table 8.1-1 Activity data of the sector 11.B – Forest fires

NFR 11.B	Area of forest burnt
Unit	ha
1990	3805
1991	3805
1992	964
1993	8196
1994	3723
1995	633
1996	2550
1997	4025
1998	7660
1999	483
2000	14030
2001	3503
2002	1798
2003	8270
2004	355
2005	629
2006	2981
2007	12628
2008	3449
2009	2789
2010	1944
2011	3277
2012	5668
2013	1999
2014	191
2015	6064
2016	6733

NFR 11.B	Area of forest burnt
Unit	ha
2017	41174
2018	1033

Data source: CBS, St.Y.

Recalculation and improvements

The recalculation of SO_2, NOx, NMHOS, CO and NH_3 emissions for 2017 has been carried out to revise the activity statistics data.

9. Recalculations and improvements

This chapter gives an overview of all recalculations and other changes included into this report within the chapters from 3 to 9. Also, reasons for performed recalculations and other changes is given as well the result of performed recalculations within the meaning of decrease or increase of pollutant emission.

9.1. Recalculations and other changes

Energy sector

Public Electricity and Heat Production (NFR 1.A.1.a)

As part of the Inventory Improvement Project, surveys were conducted which showed that all measured mass concentrations on the CEM system are used for the emission calculation. The conclusion of the surveys did not affect inventory emissions.

Manufacturing of Solid Fuels and Other Energy Industries (NFR 1.A.1.c)

In sector 1.A.1.c, emission factors from previous Guidelines were used for the emission calculation. The emission factors from 2019 EEA / EMEP Guidelines for all pollutants and for the whole period from 1990 to 2017 are included in IIR 2019. The change in FE from GB 2016 to GB 2019 occurred only in particles.

Manufacturing industries and construction (NFR 1.A.2)

Emissions from the NFR 1.A.2 Industry and Construction Sector in the 1990-2000 period were presented at an aggregated / sectoral level. For this year submission, improvement of inventory for 1.A.2 was implemented and emissions for the period from1990-2000 are calculated and reported by each industry type (iron and steel, non-ferrous metals, chemical, paper, food, building materials, petrochemical and construction industries) with using GB2019.

Non-road mobile sources and machinery: Industry (NFR 1.A.2.g.vii)

Recalculation was performed for the period 1990 – 1995 due to correction of activity data for gasoline consumption.

Road transport (NFR 1.A.3.b)

The reason for the small differences in emissions is the new vehicle categorization, which is more detailed in the COPERT 5 model than in the COPERT 4 in all types of subcategories. The most important changes by categories are:

- Passenger cars: in the COPERT 5 model a category of small vehicles with a cylinder size of less than 0.8 litters was added while in COPERT 4 these vehicles were part of the 0-1.4 lit category. The EURO 6 2017-2019 standard for vehicles manufactured in the period 2017-2019 and the Passenger cars that use both LPG and CNG as fuel are distributed in the COPERT 5 model by cylinder capacity, which was not the case in COPERT 4. In COPERT 4 those vehicles were summed in one category.

- Light commercial vehicles: The EURO 6 2017-2019 standard for vehicles manufactured in the period 2017-2019 have been added for all vehicle categories. Light commercial vehicles in the COPERT 5 database can be subdivided into three sub-categories (N1-I, N1-II and N1-II), but the Croatian Vehicle Database does not have such data, so all light commercial vehicles are categorized as N1-I.
- Heavy Duty Trucks: The distribution of vehicles in COPERT 5 is identical to the COPERT 4 distribution. Although the model has not changed in this part, significant progress has been made in the Inventory. Until now, an auxiliary table has been used to switch total number of HDV from weight class <3.5 t, 3.5-7.5 t, 7.5-16 t, 16-32 t, >32 t, to the required categories for COPERT model (Rigid<7.5 t, 7,5-12 t, 12-14 t, 14-20 t, 20-26 t, 26-28t, 28-32 t, >32t, Articulated 14-20 t, 20-28 t, 28-34 t, 34-40 t, 40-50 t, 50-60 t). When changing to COPERT 5, model for sorting Croatian vehicle database was changed too in a way that actual registered weight class is used to match COPERT 5 categories. So now, in COPERT model, HDV vehicles are in the appropriate categories as registered in the Croatian vehicle database. This recalculation is made for whole period from 1990-2018.
- L category: Quad & ATVs as well as Micro-car categories are added in COPERT 5. Croatian model for sorting vehicles was changed so these vehicles can be exported and entered in COPERT 5.
- National gas vapour pressure values are entered in accordance with the legal regulations of the Republic of Croatia instead of using the values recommended by the COPERT 5 model.

Navigation (shipping) (NFR 1.A.3.d)

All relevant emissions for the period from 1994 to 2017 were recalculated due to correction of activity data on fuel consumption for 1.A.3.d.i(i) International navigation (bunkers).

Commercial/Institutional (NFR 1.A.4.a)

Updating of emission factors according to GB2019 and recalculation of particulate matter (PM, TSP and BC) for liquid fuels and biomass for the whole observed period. Recalculation resulted in an increase in PM, TSP and BC emissions due to an increase in the recommended FEs for liquid fuels and biomass.

Residential (NFR 1.A.4.b.i)

The new model for biomass in small residential combustion has led to significant changes in the emissions of those pollutants whose emissions depend on combustion technology (NOx, NMVOC, NH_3, CO, particles, dioxins / furans, PAHs and PCBs). This resulted in a reduction of NOx emission and an increase in the emissions of other mentioned pollutants in the period 1990-2017. The new model did not affect the emissions of heavy metals, SO_2 and HCB.

Updating of emission factors according to GB2019 and recalculation of particulate matter (PM, TSP and BC) for pellet stoves and boilers burning wood pellets for the whole observed period. Recalculation resulted in an increase in PM, TSP and BC emissions due to an increase in the recommended FEs.

Natural gas - Exploration, production, transport (NFR 1.B.2.b)

For the activity – natural gas transmission (1.B.2.b.ii; SNAP 050600), an emission calculation improvement project, led by the MEE, was carried out, in the scope of which new data were collected. In accordance with the aforesaid, NMVOC emission was recalculated for the whole time series in this source category.

Venting and flaring (NFR 1.B.2.c)

Emission was recalculated for the whole time series for the activity of flaring in oil refinery, due to updated (Tier 2) emission factors from the new GB2019. This has impacted the values of emissions of NOx, CO, Pb, Cd, Hg, As, Cr, Cu, Ni and Zn, with inclusion of Se emission factor in calculation for this activity.

Industrial processes and product use sector

Cement production (NFR 2.A.1)

Recalculation was performed for the period 1990-1994, due to transition to Tier 1 approach for one plant. Croatia has recently revised this sub-sector using what is considered to be the most accurate currently available and verifiable data. Production at this factory stopped more than 25 years ago, mainly due to war activities, making it unlikely to collect or verify more detailed activity data needed for a higher tier approach. Therefore, it was concluded that there was no realistic possibility of improving the emission calculation under the circumstances.

Ammonia (NFR 2.B.1, SNAP 040403)

Recalculation was made for NH_3 emission for 1999, due to a correction of error in EF input for this year.

Iron and steel production (NFR 2.C.1, SNAP 040202, 400205, 040207 and 040208)

For this category, an Emission Calculation Improvement Project, led by the Ministry of Environment and Energy, has been implemented. The recalculation of all emissions from steel production in EAFs was performed in order to harmonize the activity data with the NIR. Changes in activity data relate to the period 2005-2008 and 2011-2017. Significant differences are observed in the period 2012-2017, while the differences in other years are smaller and are evidently related to the former rounding of decimals.

Aluminium production (NFR 2.C.3, SNAP 040100)

Emissions recalculations for 1990 and 1991 were performed due to the updating of emission factors. Up to now, Tier 1 EFs from the EMEP/EEA GB2013 have been used. In this inventory, Tier 2 EFs from the revised GB2019 have been included. This has affected emissions of SOx, TSP, PM, BC, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene and indeno[1,2,3-cd]pyrene, with excluding PCDD/F emissions from the inventory.

Domestic solvent use including fungicides (NFR 2.D.3.a)

An error in activity data entry for 2017 was corrected for the Car care products activity, which led to a change in NMVOC emission. Also, according to the new GB2019, Hg emission from fluorescent tubes is no longer included in this category.

Chemical products (NFR 2.D.3.g)

For this category, an Emission Calculation Improvement Project, led by the Ministry of Environment and Energy, has been implemented. The project included updating of emission factors and activity data according to the new GB2019, and including the activity of asphalt blowing in the emissions calculation. In accordance with the aforesaid, emissions recalculation was performed for the whole time series (for the years in which each of the activity was present), for all activities except polystyrene foam processing and adhesive, magnetic tapes, films and photographs manufacturing, which were not included in the improvement project. Apart from NMVOC emission recalculation, as a result of asphalt blowing being included in the inventory, emissions of TSP, Cd, As, Cr, Ni, Se, and PAH were included in this category.

Agriculture sector

Manure Management (NFR 3.B)

Recalculation of emissions were performed for the entire period 1990-2017 (for fattening pigs, breeding pigs and poultry) due to an estimate improvement and change of methodology from Tier 1 to Tier 2. Recalculations of NH_3 and NOx emissions were performed for the entire period 1990-2017 for cattle categories due to the correction of activity data used.

Inorganic N fertilizers (NFR 3.D.1.a)

Emissions estimates for NH_3 and NOx were recalculated for the 2000-2017. The whole time period was recalculated due to update of AD.

Animal manure applied to soils (NFR 3.D.a.2.a)

Recalculations of NH_3 emissions were performed for the entire period 1990-2017 (for fattening pigs, breeding pigs and poultry) due to the improvement of methodology from Tier 2 to Tier 3.

Urine and dung deposited by grazing animals (NFR 3.D.a.3)

Recalculations of NH_3 and NOx emissions were performed for the entire period 1990-2017 due to the correction of AD for cattle.

Cultivated crops (NFR 3.D.e)

The emission estimate for NMVOC was recalculated due the improvement from Tier 1 to Tier 2 methodology.

Use of pesticides (NFR 3.D.f)

This is the first time emissions from 3.D.f source were estimated in the inventory.

Field burning of agricultural residues (NFR 3.F)

This is the first time emissions from 3.F source were estimated in the inventory.

Waste sector

Biological treatment of waste – solid waste disposal on land (NFR 5.A)

According to the recommendation by TERT during review in 2019, a technical correction were performed for NMVOC emissions. In order to improve the accuracy of the estimate, a CS methodology was developed to estimate a NMVOC EF for all years in reporting period, based on the CH_4 emissions estimated in the framework of the NIR report. Accordingly, recalculation was performed for the period 1990 - 2017.

Biological treatment of waste – composting (NFR 5.B.1)

Data on different types of waste on a wet weight basis (that used in the NIR report) have been included in the inventory in relation to previous inventory that used data on different types of waste based on dry matter. The recalculation was made for the period 2007 - 2017.

Wastewater handling (NFR 5.D)

Domestic wastewater handling (NFR 5.D.1) and Industrial wastewater handling (NFR 5.D.2)

According to the recommendation by TERT during review in 2019, allocation of wastewater from residential/commercial sectors from category 5.D.1 to category 5.D.2 as well wastewater from latrines from category 5.D.3 to category 5.D.1 has been performed, as defined in the EMEP/EEA GB2019.

In addition, correction of AD for residential/commercial wastewater for 2017 has been performed.

Accordingly, recalculation of NH_3 emissions for 5.D.1 and NMVOC emissions for 5.D.2 were performed for the period 1990. – 2017.

Natural sources (NFR 11)

Forest fires (NFR 11.B)

The recalculation of SO_2, NOx, NMHOS, CO and NH_3 emissions for 2017 has been carried out to revise the activity statistics data.

9.2. Planned improvements

Energy sector

Public electricity and Heat production (NFR 1.A.1.a)

As long term goal Croatia will take certain steps to justify the use of direct emissions for large point sources in the inventory.

Stationary combustion in manufacturing industries and construction (NFR 1.A.2)

On short term basis it is planned to divide total consumption of fuel to appropriate branches for the whole period from 1990 to 2000.

For NOx emission calculation Croatia uses methodology disaggregated by fuel types (gas oil, fuel oil, natural gas, etc.) but not disaggregated by technology. As long term goal Croatia will estimate NOx emission by technology type.

Aviation (civil) (NFR 1.A.3.a)

For the harmonization of the calculation methodology with the GB2019 for the aviation, it is necessary to estimate the representative aircraft. For that it is necessary to collect more detailed data on aircrafts and their movements in all airports in Croatia, i.e. annual number of take-off and landing by type of aircraft and at airports and average flight length by type of airplane for domestic aviation and international air traffic. In respect of international air traffic by category of flights shorter than 1,000 nm and for flights of more than 1,000 nm (km or nm airline).

Industrial processes and product use sector

Glass production (NFR 2.A.3)

Currently, both glass which is nationally produced and glass which is imported and then processed in Croatia, is being included in calculations as nationally produced glass products, due to unavailability of disaggregated statistical data. Revision of applied method for emission calculation in line with specific national circumstances should be made to avoid overestimation of emissions for this category. At the moment, this matter is categorised as a long term plan for improvement, provided the required financial resources are made available.

Construction and demolition (NFR 2.A.5.b)

The plan is to recalculate emissions for the entire reporting period for this category after collecting the required activity data according to Tier 1 EMEP/EEA GB2019 methodology. Several inquiries have been addressed to relevant entities so far, but some of the information provided is not structured at the required level and it will evidently be necessary to carry out significant estimates of missing data and/or to adapt the emission calculation methodology to the data available. Given that for this year's inventory the emissions calculation improvements were focused on several other categories, recalculation of emissions from this activity is currently planned for one of the next submissions.

Coating applications (NFR 2.D.3.d)

The plan is to recalculate the trend (entire reporting period) for this category after further investigation of available data which would enable transition to Tier 2 EMEP/EEA GB2019 methodology. Since trend analysis should be carried out, the recalculations will be included in one of the next submissions, provided the required financial resources are made available.

Chemical products (NFR 2.D.3.g)

As part of the Emissions Calculation Improvement Project, data on the amount of solvents used in the pharmaceutical products manufacturing were collected. All data received by the time of inventory preparation are included in the emissions calculation. Data on solvents used are currently available only from four manufacturers, for the period 2004-2018. Further investigation of this activity is ongoing and any information that will become available will be included in the inventory in one of the next submissions.

Printing (NFR 2.D.3.h)

The plan is to recalculate the trend (entire reporting period) for this category after further investigation of available data which would enable transition to Tier 2 EMEP/EEA GB2019 methodology. Since trend analysis should be carried out, the recalculations will be included in one of the next submissions, provided the required financial resources are made available.

Agriculture sector

Manure management (NFR 3.B)

The plan is also to improve emission calculation of NH_3 (Nex and other parameters used in the emission estimates are taken from the „Improvement of NH_3, CH_4 and N_2O emission calculation from manure management and development of national factors“, developed by the experts from the Faculty of Agriculture, 2015). Factors and parameters in question will undergo a revision during a new project that is planned due to issues raised by the ERT in the NIR In-country review in. As a part of this revised project, updated national emission factors and parameters are expected, as well as incorporation of existing abatement measures for cattle farms. Also, planned improvement is upgrading methodology to EMEP/EEA GB 2019.

The above mentioned improvement will be carried out in one of the following submissions.

Other organic fertilizers applied to soils (including composts) (3.D.a.2.c)

It is necessary to check on availability of AD on other organic fertilizers. This improvement will be made in one of the upcoming reports.

Field burning of agricultural residues (NFR 3.F)

This is the first time emissions from 3.F source were estimated in the inventory. As the current emission estimate is probably overestimated due to using p_b value of 0.5, long term planned improvement is getting a better national estimate for the value.

Waste sector

Biological treatment of waste - composting (NFR 5.B.1)

Future improvements are related primarily to aggregation of accurate data for NH_3 emission calculations for the entire reporting period, which is included in the Annual Data Collection Plan. This primarily refers for the pre-2007 years, for which activity data need to be investigated. When the competent authority provides all necessary information and data, it will be included in the inventory.

Biological treatment of waste - anaerobic digestion at biogas facilities (5.B.2)

Potential NH_3 emissions from pre- and post-storage as well as possible leakage during solid-liquid separation are not included in the inventory. This issue should be investigated for the entire activity period and included in the inventory.

Open burning of waste (NFR 5.C.2)

Although this activity is prohibited by law in Croatia, the Annual Data Collection Plan includes activity data need to be investigated for the entire reporting period.

10. Projections

The text in subdivisions is taken from the “Report on implementation of policies and measures that reduce greenhouse gas emissions by sources and enhance removals by sinks” and “Report on projections of greenhouse gas emissions” submitted by the Republic of Croatia to the UNFCCC and EC and supplemented with information on emission projections for air pollutants.

“Report on implementation of policies and measures that reduce greenhouse gas emissions by sources and enhance removals by sinks” and “Report on projections of greenhouse gas emissions” (hereinafter: Reports) are an integral part of the national system for monitoring the implementation of policies and measures for GHGs emission reductions and emission projections of GHGs related to the fulfilment of commitments under the United Nations Framework Convention on Climate Change (hereinafter: the UNFCCC) and the Kyoto Protocol. The Republic of Croatia is required to report to the European Commission on monitoring the implementation of these policies and measures and emission projections, based on the EU legislation. The legal basis for preparation of the Report in the national legislation is primarily in Article 75 Paragraph 3 of the Air Protection Act (OG 130/11, 47/14, 61/17).

The emission projections of air pollutants is fully coordinated with the emission projections of greenhouse gases in the Republic of Croatia. In the preparation of emission projections of GHGs and of air pollutants, the stakeholders have realized the importance and need for mutual understanding. As a follow-up, all activity data required to prepare emission projections of air pollutants are based on identical initial assumptions and parameters as for the preparation of GHGs emission projections.

10.1. Methodology

Methodology for estimating projections is prescribed in chapter 8 Projections, Part A: general guidance chapters EMEP / EEA guidebook - 2016 (hereinafter: GB2016). Two groups of scenarios were considered: scenario with existing measures (WM) and scenario with additional measures (WAM).

Scenario with existing measures (WM): projection includes policies and measures currently implement and adopted:

- Implemented policies and measures: legislation in force, or one or more voluntary agreements have been established or financial resources have been allocated or human resources have been mobilized.
- The adopted policies and measures: an official government decision has been made and there is a clear commitment to proceed with implementation.

Scenario with additional measures (WAM): encompasses planned policies and measures

- Planned policies and measures: options under discussion and having a realistic chance of being adopted and implemented in future.

To understand the meaning of the states following terms:

- Planned policies / measures are those that have not yet been formally laid down in the legislation;
- Adopted policies / measures are those that have been agreed and stipulated in the legislation,

- Implementation of policies / measures when action taken or is being taken to undertake activities that are often carried out over several years.

Emission projections are the function of (future) activity data combined with an emission factor. On a range of datasets including projections of economic growth (Gross domestic product (GDP)), industrial growth, population growth, changes in land use patterns, and transportation demand. Future emission factors reflect technological advances, environmental regulations, improvement in operating conditions and rates of penetration of new technologies and/or controls and any other expected changes.

For estimating projection the Tier 2 model from GB2016 is applied which includes sector-specific projections of activity data and, where appropriate, the inclusion of future emission factors depending on the sector (and pollutants) when measures are included in the concerned industry. In this sense, the application of the Tier 2 model included the stratification of defined source categories on the sub-activities and thus, it is possible to include the penetration of new technologies in emission factor. The stratification allows for over the years to include measures intended only for that particular activity in an appropriate volume (capacity controlled) for each year of the projection.

Emission projections of air pollutants originate from the official national data set for all sectors: The Republic of Croatia 2018 Informative Inventory Report (1990-2016) (IIR 2018). This means that sectoral sets of activity data and sets of pollutant emission factors are updated in accordance with the official submission in 2018 and included as a starting point for the production of emission projections.

The model used for projection is the LEAP (The Long-Range Energy Alternatives Planning System). LEAP is a software tool used to analyse energy policies and assess ways to mitigate climate change. It represents an integrated modelling tool designed to create energy balances and planning the development of particular energy sectors and energy as a whole, making it suitable for monitoring energy consumption, production and exploitation of raw materials in all sectors of the economy and its advantage is that it can be used for analysis and emission projections of air pollutants at local, regional and national level. The model and methodology used in the design of projections are also described by sectors, below the chapters.

The with measures and with additional measures scenarios included policies and measures for reduction of emissions from sources and increase greenhouse gases sinks. In order to determine the contribution of each individual policy and measure for emissions reduction, the reduction potential was determined. In cases where the emission reduction potential of individual policies and measures cannot be expressed separately, reports are aggregated with other potential policies and measures.

Projections cover the period until 2035, with five-year steps.

The observation time horizon until 2035 can be divided into three periods: 1) First commitment period of the Kyoto Protocol from 2008 to 2012, which has ended; 2) Second commitment period from 2013 to 2020; and 3) Third period after 2020. The second commitment period until 2020 is characterized by the regulation of the transfer of the EU acquis, mostly the climate and energy package adopted in 2009. After 2020, the trend should be towards the established long-term goals defined by the EU document Roadmap for moving to a competitive low-carbon economy in 2050 (the aim of the European Union to reduce greenhouse gas emissions by 85 % - 95 % until 2050).

Republic of Croatia is in the process of adopting of the Low-Carbon Development Strategy of the Republic of Croatia for the period until 2030 with a view to 2050 where a range of possible measures and scenarios for achieving this objective will be closely considered in it. The current legal framework and policies and measures as well as guidelines and recommended parameters of the European Commission from 14th June 2016 which comply with EU baseline scenario 2016 were taken into account while preparing the scenarios.

Energy (stationary combustion)

The overview of the strategical and planning framework for reduction of emissions in the energy sector is shown in the Figure 10.1-1.

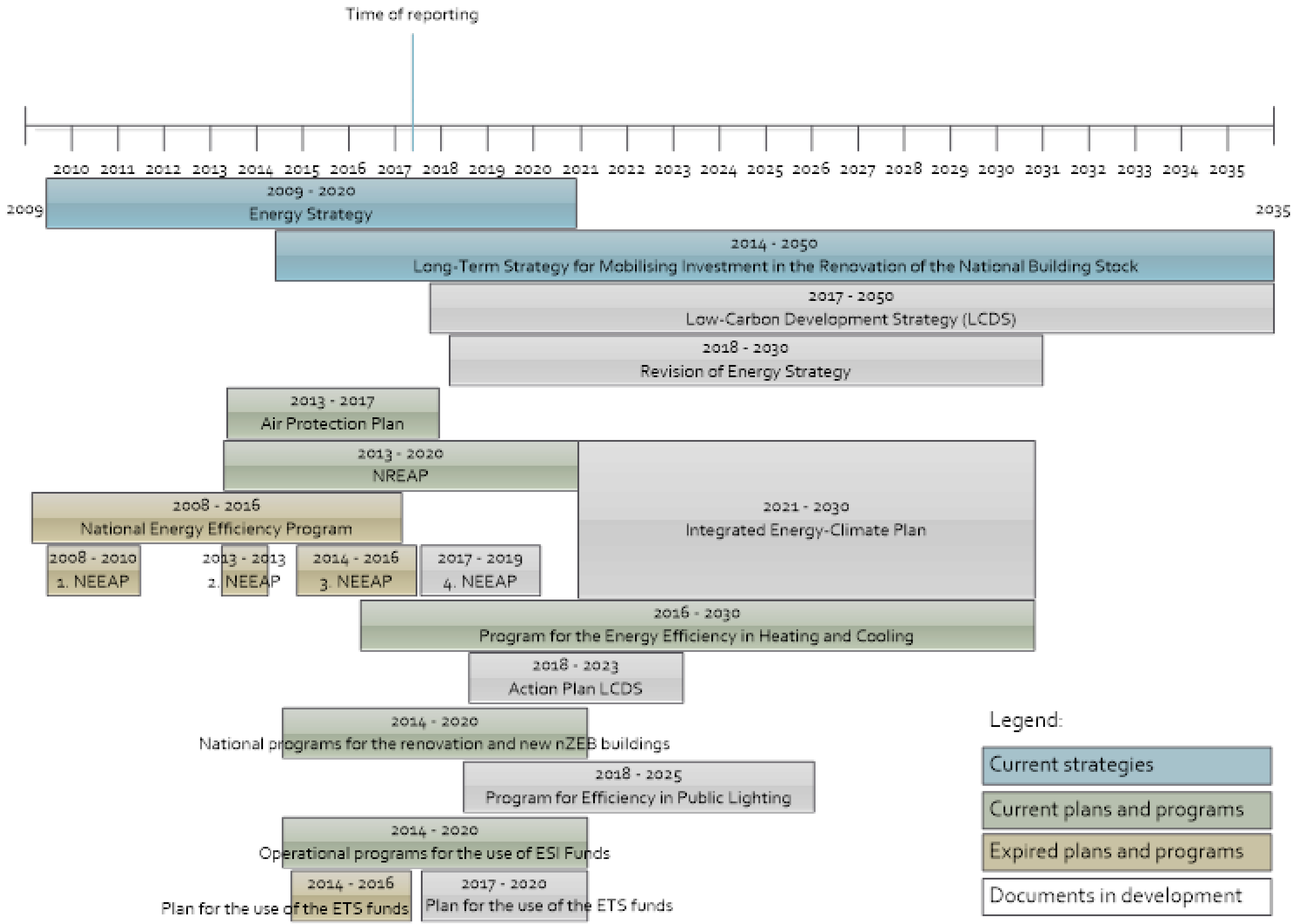

Figure 10.1-1 Overview of the strategical and planning framework for reduction of GHG emissions in the energy sector

The important currently actual strategies and plans include:

- Energy Strategy (OG 130/09),
- Long-Term Strategy for Mobilising Investment in the Renovation of the National Building Stock (OG 74/14),
- Plan for protection of air, ozone layer and climate change mitigation in the Republic of Croatia for the period from 2013 to 2017 (OG 139/13),
- National Renewable Energy Action Plan (ME, 2013),
- Program for the Energy Efficiency in Heating and Cooling (ME, 2016),
- set of national programs and plans for the renovation of existing buildings and increase of nearly-zero energy buildings (described later) and
- set of national Operational programs for the use of EU Funds[36].

Planning periods of some of the existing plans have expired, but very important policy documents are either available in draft versions or in the process of development, among them are:

- Low-Carbon Development strategy until 2030 with a view to 2050,
- Revision of the Energy Strategy,
- 4th National Energy Efficiency Action Plan for the Period 2017-2019,
- Action Plan for the Implementation of the Low-Carbon Development Strategy for the First 5-year Period,
- Program for the Energy Efficiency in Public Lighting until 2025,
- Integrated Energy-Climate Plan for the Period 2021-2030 as well as
- new Plan for the use of Funds from the Sale of Emission Allowances in the EU ETS for the Period 2017-2020.

The measures included in projection of energy sector are taken from the listed documents, but also from the other national or EU legislation if applicable for the reduction of GHG emissions and/or air pollutants emissions.

The projections of GHG emissions and air pollutant emissions in the energy sector are based on assumptions, objectives, measures and guidelines provided by the draft of the Low-Carbon Development Strategy of the Republic of Croatia until 2030 with a view to 2050.

The Strategy provided projections of the final energy consumption and gross final energy consumption until 2030, with a view of 2050, for the reference scenario and two scenarios with additional measures. The Strategy was based on the assumption of macroeconomic indicators as defined by The Recommended parameters of the EC for 2017 [19].

The with measures scenario represents a group effect of measures that are under implementation or adopted with enforcement of existing instruments and measures arising from the transfer of the EU acquis. The detail list and description of measures included is listed in the separated Report on Policy and Measures. The with measures scenario is equivalent of the Reference scenario of the Low-Carbon Development Strategy of the Republic of Croatia until 2030 with a view to 2050.

The with additional measures scenario is based on the application of the planned policy and measures, as listed in the Report on Policy and Measures. It is equivalent of the Low-Carbon

[36] http://www.strukturnifondovi.hr/

Scenario 1 (NU1) from the Low-Carbon Development Strategy of the Republic of Croatia until 2030 with a view to 2050. For some of the goals from the Strategy the instruments are not yet defined but it is expected that they will be defined by the Action plan for Strategy implementation.

Energy (mobile combustion)

In total final energy consumption, the transport sector accounts for approximately 33% [25.], the largest share of energy consumption is in the road transport with almost 90%.

The with measures scenario represents a group effect of measures that are under implementation and adopted with enforcement of existing instruments and measures arising from the transfer of the EU acquis. The detail list and description of measures included are listed in the separated Report on Policy and Measures. The with measures scenario is equivalent of the Reference scenario of the Low-Carbon Development Strategy of the Republic of Croatia until 2030 with a view to 2050.

The with additional measures scenario is based on the application of the planned measures as listed in the Report on Policy and Measures. It is equivalent of the Low-Carbon Scenario 1 (NU1) from the Low-Carbon Development Strategy of the Republic of Croatia until 2030 with a view to 2050. For some of the goals from the Strategy the instruments are not yet defined but it is expected that they will be defined by the Action plan for Strategy implementation.

Industrial Processes and Product Use

The Industrial Strategy of the Republic of Croatia 2014 – 2020 defines objectives of industrial development and key indicators of the Croatian industry in the period 2014 – 2020. According to the “realistic scenario”, by the year 2020 achieving the level of physical volume of industrial production on the level of 2008 is expected, when it reached the highest level of economic activity in Croatia.

The projections of emissions of greenhouse gases and pollutants in the sector Industrial processes and product use are based on assumptions, objectives and measures provided by the draft of the Low-Carbon Development Strategy of the Republic of Croatia until 2030 with a view to 2050.

The with measures scenario assumes that production in Industrial processes and product use sector will reach planned, maximum values until 2035, which will affect the increase in emissions. It is equivalent of the Reference scenario (NUR) provided by the draft of the Low-Carbon Development Strategy of the Republic of Croatia until 2030 with a view to 2050.

The with additional measures scenario includes implementation of cost- effective measures to reduce emissions of greenhouse gases and pollutants from energy consumption by industry branch and process emissions in the production of cement, glass and nitric acid and the reduction of emissions of volatile organic compounds, controlled substances and fluorinated greenhouse gases. The scenario comprises process emissions. Emissions from fuel combustion are included in the Energy sector.

The with additional measures scenario is equivalent of the Low-Carbon Scenario 1 (NU1) provided by the draft of the Low-Carbon Development Strategy of the Republic of Croatia until 2030 with a view to 2050. It is based on the application of the planned measures as listed in the Report on Policy and Measures.

Process measures for reducing emissions of greenhouse gases and pollutants from Industrial processes and product use sector include:

- reduction of clinker factor in cement production;
- increase of recycled glass in the glass production;
- reduction of N_2O emission in nitric acid production (catalytic decomposition);
- reducing emissions of volatile organic compounds in Product Use sector;
- handling of substances that deplete the ozone layer and fluorinated greenhouse gases;
- technical and organizational measures for collection, reuse, recovery and destruction of controlled substances and fluorinated greenhouse gases;
- capacity building and strengthening knowledge of authorized repairers;
- leakage detection of controlled substances and fluorinated greenhouse gases.

Agriculture

In the period until 2035, a recovery of agricultural production and increase of the number of animals is expected.

Both scenarios: with measures and with additional measures assume that there will be an increase in agricultural production (restoration of the livestock fund in the period from 2015 to 2020 and continued population increase until 2035, with the of crop production based on indicative trends in the period from 2000 to 2009) and sustainable consumption of fertilizer (on the level of the 2007-2014 period average).

Policies and measures included in the development of the with measures scenario:

- executing the Rural Development Programme for the period 2014-2020, including changing the system of cattle farming (manure removal system and genetic improvement) and diet (increasing digestibility, improving the quality of voluminous forage, improving grazing systems, use of additives in animal feed)

Scenario with additional measures assumes implementation of additional measures:

- change in diet of cattle and pigs and animal feed quality,
- changes in animals waste management systems, including aerobic decomposition of manure and biogas production
- improvements in synthetic fertilizer application methods,
- hydromeliorative field interventions,
- introduction of new cultivars, varieties and cultures.

Waste

For the purpose of effective implementation of the measures included in the Waste sector, along with the already adopted sectoral legislation that is harmonized with EU legislation, it is necessary to adopt a more significant number of by-lows.

The projections of emissions of greenhouse gases and pollutants in the Waste sector are based on assumptions, objectives and measures provided by the draft of the Low-Carbon Development Strategy of the Republic of Croatia until 2030 with a view to 2050.

The with measures scenario includes projections of emissions of greenhouse gases and pollutants from solid waste disposal, biological treatment (composting) of solid waste, incineration of waste and wastewater treatment and discharge. It is equivalent of the Reference scenario (NUR) provided by the draft of the Low-Carbon Development Strategy of the Republic of Croatia until 2030 with a view to 2050.

The with measures scenarios assume a continuous increase of waste quantities in the period until 2035 as a result of higher living standards, despite the effects of measures undertaken to avoid/reduce and recycle waste. The implementation of measures is prescribed by the sectoral legislation.

The with additional measures scenario includes projections of emissions of greenhouse gases and pollutants from solid waste disposal and biological treatment (composting) of solid waste since the remaining activities are not provided for measures to reduce emissions of greenhouse gases and pollutants. The scenario includes a more intensive application of measures defined by sectoral strategic documents, in relation to the with measures scenario. In the period until 2035, reduction of emissions of greenhouse gases and pollutants in waste management could be achieved by implementing the measures that are defined by the waste management priority order. The scenario assumes implementation of measures defined by the Sustainable Waste Management Act (OG 94/13, 73/17, 14/19) and Waste Management Plan of the Republic of Croatia for the period 2017 – 2022 (OG 3/17).

The with additional measures scenario is equivalent of the Low-Carbon Scenario 1 (NU1) provided by the draft of the Low-Carbon Development Strategy of the Republic of Croatia until 2030 with a view to 2050. It is based on the application of the planned measures as listed in the Report on Policy and Measures.

Measures for reducing emissions of greenhouse gases and pollutants from Waste sector include:

- preventing the generation and reducing the amount of municipal waste;
- increasing the amount of separately collected and recycled municipal waste;
- methane flaring;
- reducing the amount of disposed biodegradable municipal waste;
- use of biogas for electricity and heat generation.

10.2. Parameters

For the preparation of the Report on GHG Emission Projections for 2017, and also for pollutant emission projections, parameters and data sources for the parameters used in the following table by sectors were used.

Table 10.2-1 Parameters and their sources used to produce projections by sectors

Sector	Data type	Data source
General parameters	GDP – yearly growth rate Population Coal price Crude oil price Natural gas price	European Commission recommendations
Energy	Fuel consumption Electricity generation Electricity imports Final energy demand	National energy balance Draft of Low-Carbon Development Strategy of the Republic of Croatia until 2030 with a view to 2050
Transport	Number of passenger kilometres Number of tonne-kilometres	ODYSSEE database

Sector	Data type	Data source
	Energy demand in transport sector	Draft of Low-Carbon Development Strategy of the Republic of Croatia until 2030 with a view to 2050
Industry	Production index	Sectorial studies (cement, glass and nitric acid production) National Bureau of Statistics
	Use of solvents	Inventory Report of air pollutants on the Croatian territory under the Convention on Long-range Transboundary Air Pollution (CLRTAP)
Agriculture	Number and type of livestock	National Bureau of Statistics Croatian Agricultural Agency Faculty of Agriculture FAOSTAT database
	Plant production	National Bureau of Statistics Statistical reports on plant production FAOSTAT database
Waste	The amount of generated municipal waste The amount of municipal waste disposed of at landfill The organic fraction of municipal solid waste	Sustainable Waste Management Act Waste Management Plan of the Republic of Croatia for the period 2017 – 2022

10.3. Sectoral methodologies

Energy (stationary and mobile combustion)

In preparing the projections, a software package LEAP (Long-range Energy Alternatives Planning System) [37] was used, in which was created a model of the energy sector in Croatia. For the needs of detailed modelling of the development and optimization of the power sector, more advanced model were used, whose outputs were the inputs for the energy model in LEAP. Output data are structured in accordance with the structure of inventory of the United Nations Framework Convention on Climate Change. It is the engineering simulation model in which are the scenarios simulated and certain processes and decisions optimized in regard to the assumptions and limitations. The model is detailed to the level of individual production units, present and future.

Projections were made until 2035, with a single step every year. The model is of 'bottom-up' type, because it starts from the sectoral data and individual emission sources in the power sector and calculates GHG emissions projections of GHGs and air pollutants.

Assumptions used in the preparation of projections are shown in table below.

Table 10.3-1 Assumptions for projections – Energy (stationary and mobile combustion)

ENERGY (STATIONARY AND MOBILE COMBUSTION)	
Projections of GHG emissions for this report are taken from the draft of the Low-Carbon Development Strategy of Croatia until 2030 with a view to 2050. Below is a more detailed description of the methodology used.	
Final energy demand	Final energy demand is projected in different sectors - industry, transport, services, households and agriculture, fisheries and forestry. The bases for projections of

[37] More information available at http://www.energycommunity.org/default.asp?action=47

ENERGY (STATIONARY AND MOBILE COMBUSTION)	
	activities are macroeconomic parameters and guidelines provided by the EC to Member States to harmonize the key parameters. For the projections of energy intensities, a development of technology and changing of lifestyles was taken into account. The scenarios 'with existing measures' and 'with additional measures' modelled the impacts of each measure. The analyses were performed by sub-sectors: industry - by industry and type of fuel used, transport – by type of transport (road, air, marine and rail) and types of means of transport (cars, buses, motorcycles, light and heavy vans) and by type of technology and fuel used services – by branches (tourism, trade, education, health), climatic zone (coastal or continental Croatia), purpose (heating, water heating, cooking, cooling, electrical appliances and lighting), type of fuel used, heating demand is modelled on the level of useful and final energy households – by climatic zone (coastal or continental Croatia), purpose (heating, water heating, cooking, cooling, electrical appliances and lighting) and by type of fuel, heating demand is modelled on the level of useful and final energy agriculture, fisheries and forestry - by type of fuel
	Demographic trends - assumes a scenario of average fertility and average migration, in accordance with the guidelines of the EC.
With measures scenario	
	In the period until 2020, energy efficiency improvements are in line with the existing measures listed in the National Action Plan for Energy Efficiency for the Period 2017-2019 (listed in the Report on Policy and Measures), while for the post-2020 period, there are no yet implemented measures, so only assessed market improvements are integrated: market driven improvements of energy efficiency and fuel switches in industrial sector; renovation of 0,5% surface are of the buildings annually to the standard as listed in the Technical regulation on rational use of energy in buildings (OG 97/14) ; all new buildings built according to the same Regulation; it is assumed that all emissions from the new vehicles will be in line with the Regulation EU no. 333/2014 for the personal vehicles, i.e. average emissions of new vehicles will be below 95 g CO2/km and Regulation EU no. 510/2011 to reduce the average emissions of light duty vehicles below 174 g CO2/km after 2017 and below 147 gCO2/km after 2020; it assumed that there will be stagnation in the use of rail and inland waterways transport; – it is assumed that 6% of the vehicles will be electric vehicles in 2050 (based on the EU Reference scenario 2016).
With additional measures scenario	
	Continued support to energy efficiency after 2020, with the following key assumptions: renovation of 2% of the buildings annually to the nearly-zero energy standard (include the use of renewable sources); support for the development of the share of electric vehicles to 25% of the personal vehicles in 2050; intermodal shift with the goal to shift 7% of the transport of passengers and goods to rails until 2030 and 20% until 2050; improvements of energy efficiency in industry together with fuel switch towards the use of renewable energy and electricity.
Energy transformations and resources	The power system was analysed by the simulation of market development with the software for the hourly optimization of operation and development of the power system. The price of the emission allowances in the EU ETS was assumed as in the EU Reference scenario 2016. The simulation of the operation of the refineries was done to satisfy the domestic demand as possible with the existing capacities, which mean reducing production in 'with existing measures' and 'with additional measures' scenarios.
With measures scenario	
	Assumptions:

ENERGY (STATIONARY AND MOBILE COMBUSTION)	
	Until 2020, installed capacities of renewable energy sources power plants are as defined by the National Action Plan for Renewable Energy Sources by 2020 and Tariff system for renewable energy and efficient cogeneration (OG 133/2013, 151/2013, 20/2014, 107/2014 i 100/2015); for the post-2020 period the simulation of the market development with the software for the hourly optimization of operation and development of the power system was done. The price of the emission allowances in the EU ETS was assumed as in the EU Reference scenario 2016. The analysis showed that renewable energy sources will be competent to certain extent without the need of the public support for the solar PV system and wind. no new coal power plants; no net imports of electricity after 2030.
With additional measures scenario	
	Assumptions include continuous development of renewable energy policy even after 2020: the simulation of the market development with the software for the hourly optimization of operation and development of the power system was done. The price of the emission allowances in the EU ETS was assumed as in the EU Reference scenario 2016. Due to lower demand for energy compared to the ‘with existing measures’ due to the energy efficiency improvements, the costs to achieve higher shares of renewable energy are lower. no new coal power plants; no net imports of electricity after 2030.

Source: Report on projections of greenhouse gas emissions, Ekonerg Ltd.

Industrial Processes and Product Use

In preparing the projections, the engineering simulation model derived in tabular calculation interface was used. The model is structured in accordance with the table structure of the inventory of United Nations Framework Convention on Climate Change (UNFCCC) and Convention on Long-range Transboundary Air Pollution (CLRTAP).

The model is detailed for LPC to the level of individual production units, the present and future ones while for the other source categories is on level of NFR categories.

Projections are made until 2035, in steps of five years. The model is of 'bottom-up' type, because it starts from the sectoral data and individual emission sources.

Assumptions used in the preparation of projections are shown in table below.

Table 10.3-2 Assumptions for projections – Industrial Processes and Product Use

INDUSTRIAL PROCESES AND PRODUCT USE	
	The projections were carried out based on the expected development of certain industries, which includes the production goals by 2035. Emission projections start from the situation and projections of macroeconomic parameters in 2015 (The 2015 Ageing Report) - the projected dynamics of the annual growth rate of gross domestic product and gross value added and the decline of population, as well the results of sectoral analysis and studies (cement, ammonia, nitric acid, sulphuric acid and mineral fertilizers production).
With measures scenario	
	Assumptions: no installation of additional capacity; production will reach the maximum value by 2035; The Industrial Strategy of the Republic of Croatia 2014 – 2020 defines objectives of industrial development and key indicators of the Croatian industry in the period 2014 – 2020. According to the “realistic scenario”, by the year 2020 achieving the level of physical volume of

INDUSTRIAL PROCESES AND PRODUCT USE	
	industrial production on the level of 2008 is expected, when it reached the highest level of economic activity in Croatia; process emissions from economic activities included in the sector Industrial processes and product use were estimated on the basis of detailed sectoral projections of production of cement, ammonia, nitric acid, sulphuric acid and mineral fertilizers and the projected macroeconomic indicators of gross value added by other industrial branches, annual increase rate in gross domestic product and decline of population. The scenario includes the implementation of measures defined in the strategic and sectoral planning documents included in the business policy of cement, ammonia, nitric acid, sulphuric acid and mineral fertilizers manufacturers, conditioned by market demands, laws and regulations and the requirements of the application of best available techniques in the production process.
With additional measures scenario	
	Assumptions: the application of cost- effective measures to reduce emissions of greenhouse gases and pollutants in the production of cement, glass and nitric acid and the reduction of emissions of volatile organic compounds, controlled substances and fluorinated greenhouse gases; there are no additional measures for the air pollutants emission reductions.
According to good practice	
	Assumptions: the projections were made for activity data and emission factors; activity data – applying grade of 1, 2 and 3 methods (projections of macroeconomic parameters, effects of policies and measures, sectoral analysis and studies); emission factors – applying grade of 1 and 2 methods (projections based on average values for the previous five-year period, effects of policies and measures, sectoral analysis and studies).

Source: Report on projections of greenhouse gas emissions, Ekonerg Ltd.

Agriculture

In preparing the projections, a model derived in tabular Calculation interface was used. The model is structured in accordance with the table structure of the inventory of United Nations Framework Convention on Climate Change. It is the engineering simulation model.

The model is detailed to the level of individual sources, the present and future ones.

Projections are made by 2020, indicative until 2035, in steps of five years. The model is of 'bottom-up' type, because it starts from the sectoral data and individual emission sources.

Assumptions used in the preparation of projections are shown in table below.

Table 10.3-3 Assumptions for projections - Agriculture

AGRICULTURE	
	The projections were carried out based on the expected future state of key parameters. In order to determine the key parameters for projections (number and types of livestock, crop production), the extrapolation of historical input data was used and expert assessment that includes historical data and sectoral strategic and development documents.
	Assumptions: uncertainties due to the lack of adequate and reliable statistics and economic indicators.

Source: Report on projections of greenhouse gas emissions, Ekonerg Ltd.

Waste

In preparing the projections, the engineering simulation model derived in tabular calculation interface was used. The model is structured in accordance with the table structure of the inventory of United Nations Framework Convention on Climate Change (UNFCCC) and Convention on Long-range Transboundary Air Pollution (CLRTAP).

The model is detailed to the level of individual sources, the present and future ones.

Projections are made until 2035, in steps of five years. The model is of 'bottom-up' type, because it starts from the sectoral data and individual emission sources.

Assumptions used in the preparation of projections are shown in table below.

Table 10.3-4 Assumptions for projections – Waste

WASTE	
	The projections were carried out on the basis of expected development and future state of parameters relating to the amount of generated solid waste, amount of waste disposed at landfills, the organic fraction of municipal solid waste . Emission projections start from the situation and projections of macroeconomic parameters in 2015 (The 2015 Ageing Report) - the projected dynamics of the annual growth rate of gross domestic product and gross value added and the decline of population, which includes the goals by 2035.
With measures scenario	
	Assumptions: Includes projections of emissions of greenhouse gases and pollutants from solid waste disposal, biological treatment (composting) of solid waste, incineration of waste and wastewater treatment and discharge: solid waste disposal on land - continuous increase of generated and disposed waste quantities in the period until 2035 as a result of higher living standards, despite the effects of measures undertaken to avoid/reduce and recycle waste (the objectives are defined by sectoral strategic documents); composting - continuous increase in the amount of solid waste that is being processed by composting; incineration of waste - continuous increase in the quantity of incinerated clinical waste as well decrease in the number of cremated bodies; wastewater treatment and discharge – continuous increase in the quantity of wastewater treated in industry sectors and decrease in the quantity of wastewater treated in residential/commercial sectors, decrease the number of population with individual system of drainage (septic tank) and the number of residents in households without sanitary facilities; other waste - slight continuous increase in the number of fires in almost all categories. Emissions of greenhouse gases and pollutants that are included in the Waste sector (according to the IPCC and EMEP/EEA methodology) were estimated on the basis of sectoral analysis and projected macroeconomic indicators on the annual increase in gross domestic product, gross value aded and decline of population. The scenario includes the implementation of measures defined in the strategic and planning sectoral documents – Sustainable Waste Management Act and Waste Management Plan of the Republic of Croatia for the period 2017 – 2022.
With additional measures scenario	
	Assumptions: Includes projections for solid waste disposal on land and biological treatment (composting) of solid waste: solid waste disposal on land - decrease of generated and disposed solid waste due to application of the measures defined by strategic documents harmonized with EU legislation. Quantitative targets for the amount and composition of solid waste and other parameters in the models for estimating emissions from landfills, which are not defined by the strategic documents, are estimated by expert judgment; composting - assumes a continuous increase in the amount of solid waste that is being processed by composting due to the application of measures defined by strategic documents

WASTE	
	harmonized with EU legislation (depends on the reduction of the amount of disposed biodegradable waste). The with additional measures scenario includes a more intensive application of measures defined by sectoral legislation, in relation to the with measures scenario, with the implementation of binding targets in accordance with EU legislation.
According to good practice	
	Assumptions: the projections were made for activity data, emission factors and parameters of the models; applying grade of 1, 2 and 3 methods (projections of macroeconomic parameters, effects of policies and measures, sectoral analysis and studies, expert judgement).

Source: Report on projections of greenhouse gas emissions, Ekonerg Ltd.

10.4. Results

Results of emission projections for NOx, SO_2, NMVOCs, NH_3, and $PM_{2.5}$ are presented in Figures 10.4-1 to 10.4-5. Each of the graphic figures gives an overview by individual pollutant of the historical emission trend (1990 - 2018) according to this year submission, applied scenarios, compliance with emission quotas and reduction commitments from 2020 to 2029, and reduction commitments from 2030 according to the NEC Regulation.

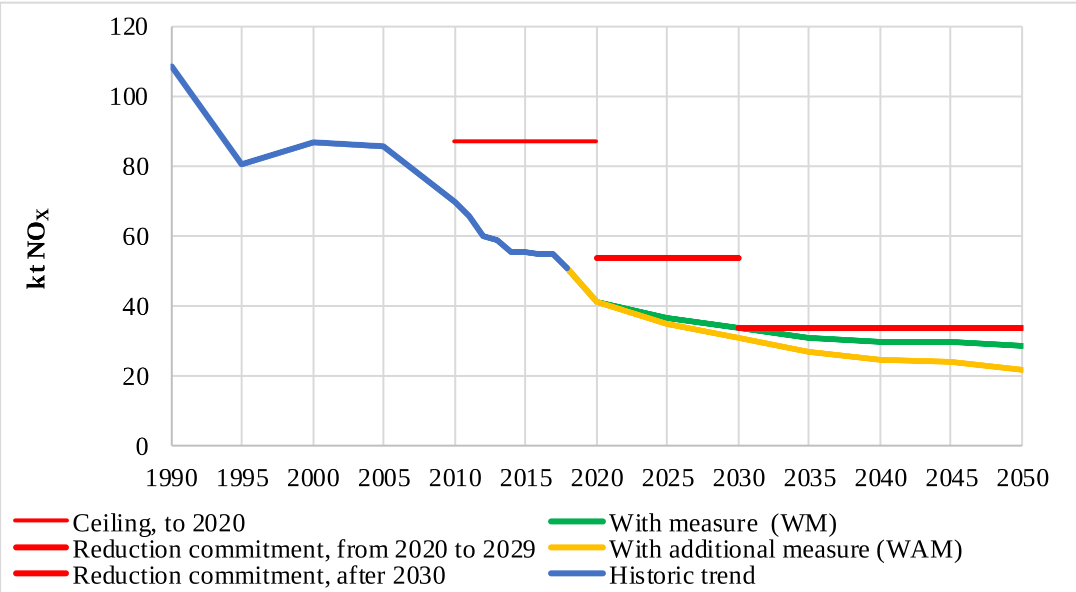

Figure 10.4-1 Trend and projections of NOx emissions

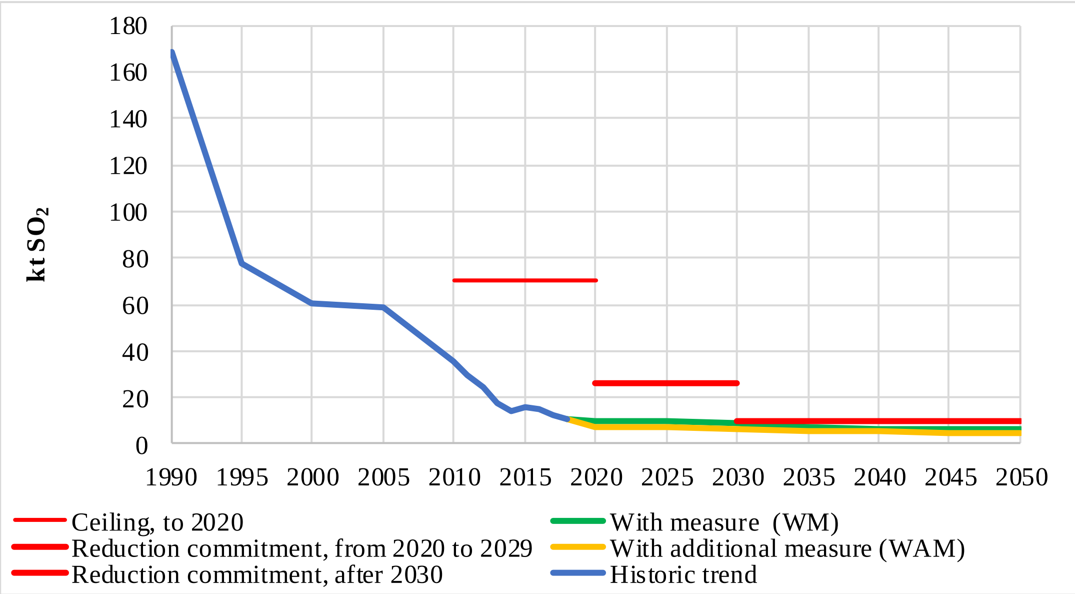

Figure 10.4-2 Trend and projections of SO_2 emissions

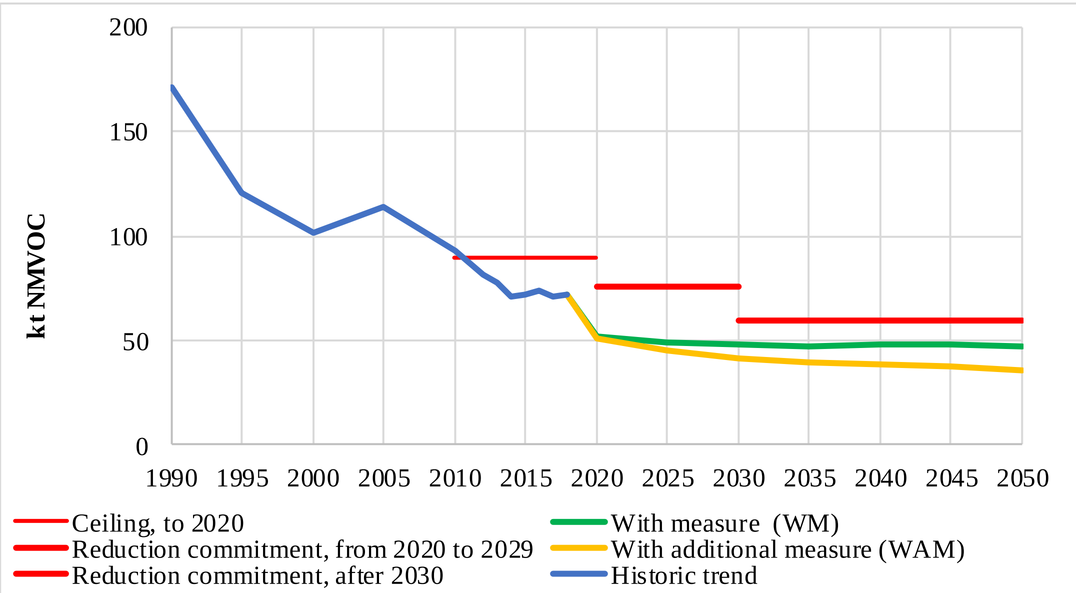

Figure 10.4-3 Trend and projections of NMVOC emissions

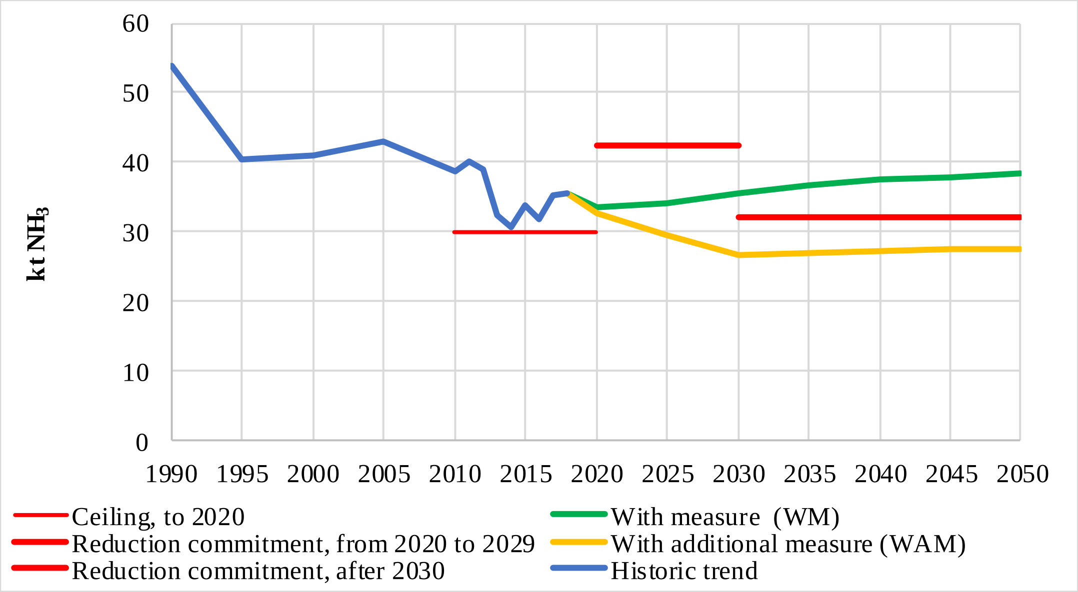

Figure 10.4-4 Trend and projections of NH_3 emissions

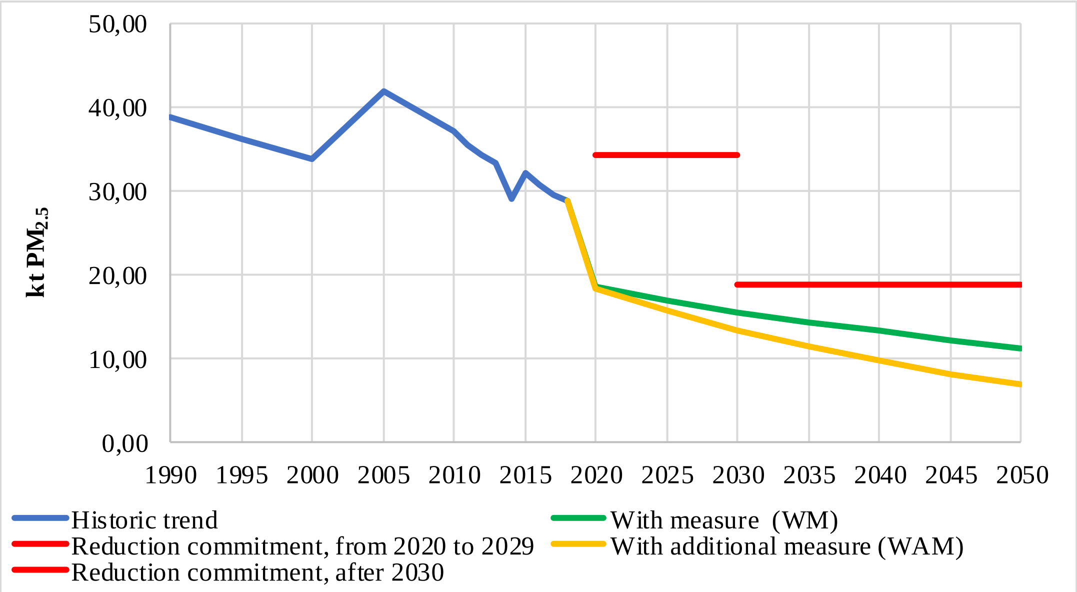

Figure 10.4-5 Trend and projections of $PM_{2.5}$ emissions

10.5. Sensitivity

This section analyses the sensitivity of projections to several selected sizes, which largely determine uncertainty. The selected sizes are analysed below are:

- GDP growth,
- influence of change in temperature on heating and cooling energy demand (heating and cooling requirements, Other impacts on energy),
- hydrology in the production of hydroelectric power,
- input parameters in the power sector,

- development of agriculture.

GDP growth

The increase of GDP is assumed by 2050 in all analysed scenarios in average of 1.66% by 2050 which makes a nominal increase of 78% compared to 2010.

In an optimistic macroeconomic scenario, Croatian economy is expected to grow at an average annual rate of 2.15% by 2050 (demographic projection remains the same as in the main scenario). The resulting increase in real GDP per capita by 2050 is about 138% in comparison with 2012. A faster closure of the development gap than the EU average can be expected. Therefore, Croatia reaches 91% of the EU average development level by 2050 in an optimistic scenario. However, according to the pessimistic macroeconomic scenario, an average annual growth rate of 0.8% and a cumulative rise in real GDP per capita of only 44% is expected by 2050. The assumption is that growth would be slower than the growth of the total EU, thus real per capita income in Croatia could drop to 55% in comparison to current EU average level of about 60%.

The optimistic scenario of economic growth expects the emission to be about 7.1% higher in 2030 and about 18.1% by 2050 compared to the presented scenarios, assuming the same carbon intensity of the economy. However, the implementation of emission reduction measures will reduce and cut the link between GDP and emissions in the long term. Thus, the GDP growth can also contribute to emissions reduction when it comes to investments in low carbon technology, industry and services.

The pessimistic scenario has an average GDP growth of 0.97% by 2050, so greenhouse gas emissions would be lower than the average scenario. However, the problem of financing the transition could occur in this scenario, thus any additional financing for the implementation of the measures may be questionable.

Influence of change in temperature on heating and cooling energy demand

Change in temperature will affect the decrease in heating energy demand, but on the other side, it will increase the cooling energy demand. The goal of climate policy is to keep the global temperature rise within 2°C. The temperature increase has been determined in Croatia since the measurements have been carried out. An increase of about 1°C is assumed by 2050.

Heating requirements - The indoor temperature in buildings is mainly 20°C but the temperature of the heated rooms is usually maintained at the level up to 24°C. In addition to these assumptions, the reduction in heat required for heating could be between 7.7 and 11.3% in the continental part of Croatia and between 12.7 and 24.2% in the coastal part of Croatia.

Cooling requirements - Unlike heating requirements, there is no such dependence between the need for comfortable cooling and the outdoor air temperature, since in the influence of heat gains due to solar radiation is dominant in this case. At the moment it is not possible to estimate the influence of external temperature change on cooling requirements due to data availability. The only possible estimation suggests that the impact will be less expressed comparing to heating requirements.

Other impacts on energy - Changes in temperature, precipitation and wind energy will affect the production of renewable energy sources. These impacts need to be quantified and embedded in operational planning, especially at the regional and local level where large variations are possible.

Hydrology in the production of hydroelectric power

Generation from large hydropower plants varies from 4 TWh to 8 TWh, depending on hydrology. This represents 20% or 40% of the total electricity generation in Croatia. Emissions from the electroenergy sector can vary considerably based on the cycles of dry and humid years that can last for several years.

The lack of generation from hydropower plants is supplemented by increased production from thermal power plants or by increased imports. In the case of extreme drought, the increase in emission could occur in 2030 in the scenario with additional measures in amount of 4.2% of the total emissions in Croatia respectively.

Input parameters in the power sector

Along with the sensitivity analysis of the hydrology, the sensitivity analysis was performed also for the other parameters in the power sector. The analysis showed:

- in WEM scenario:
    - import of up to 30% of electricity, instead of zero net imports (except imports from the nuclear power plant Krško), would lead to reduction of domestic emissions by 2,1% in 2030;
    - constant price of EUA at 15 EUR/EUA, instead of growth of prices of allowances as in EU Reference scenario 2016, would lead to increase in total emissions by 2,1% in 2030;
- in WAM scenario:
    - import of up to 30% of electricity, instead of zero net imports (except imports from the nuclear power plant Krško), would lead to reduction of domestic emissions by 2,6% in 2030;
    - import of up to 30% of electricity, instead of zero net imports (except imports from the nuclear power plant Krško), but in combination with the 30% lower natural gas prices (compared to EU Reference scenario 2016) would lead to reduction of domestic emissions by 1,5% in 2030.

The overview of analysis is shown in the following figure.

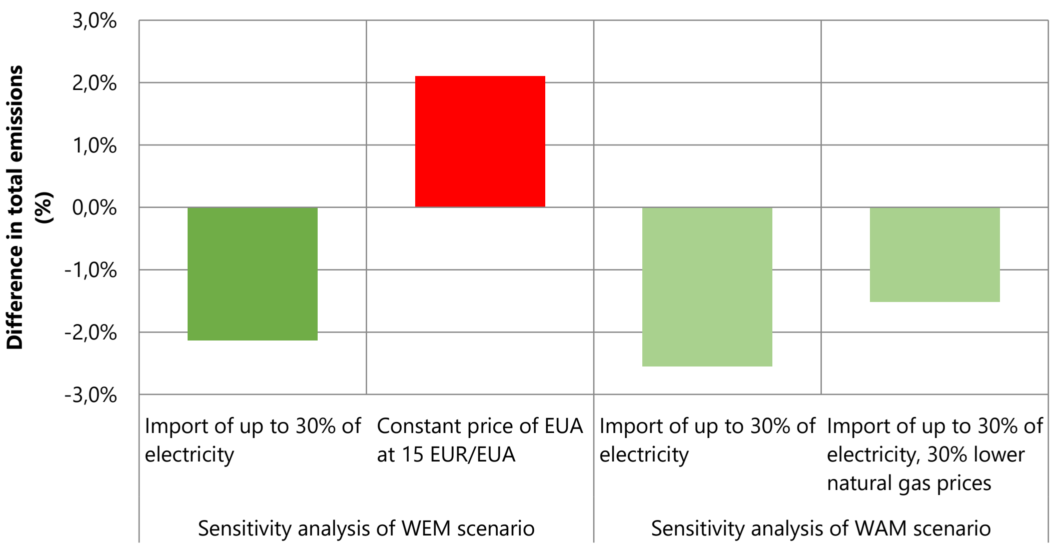

Figure 10.5-1 Sensitivity analysis of total emissions for some of the input parameters in power sector

Development of agriculture

The characteristics of agriculture in Croatia are extremely small estates; the average family farm has only 2 ha. According to the 2003 Agriculture Census, only 20% of the processed land is in private ownership with an average of 159 ha. The similar situation is in the field of cattle breeding. Thus, for example, 96% of all diary producers own only 15 cows while 90% of pork production is handled by 200,000 small farms where 170,000 farms have less than 10 pigs. Such fragmentation and predominantly old populations prevent faster development. Agriculture will change slowly thus Croatia will have a big challenge in emissions.

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12. IIR Appendices

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APPENDIX 3: NFR and correspond SNAP codes

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12.1. Appendix 1. QA/QC activities

Table A1-1 QA/QC activities

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

Activity	QC checks / reviews		QC others (Correction)	
	Expert name	Period / deadline	QA / QC manager / other person	Deadline
Check *Tier 2* method for emissions calculation by using *Tier 1*	Mirela Poljanac	December	Vladimir Jelavić	December
FILLING ANNEXES TABLES (Annex_I_Emissions_reporting_template, Annex_IV_Projections_reporting_template, Annex_VI_LPS_emissions_template)				
Check pollutants emission totals by pollutants and by sectors	Mirela Poljanac	beginning February	Nina Zovko/ Vladimir Jelavić	week before the 15th February
Check NFR national totals	Mirela Poljanac	beginning February	Nina Zovko/ Vladimir Jelavić	week before the 15th February
Check for major changes compared to previous year	Mirela Poljanac	beginning February	Nina Zovko/ Vladimir Jelavić	week before the 15th February
Check totals in NFR codes with totals in SNAP codes	Mirela Poljanac	beginning February	Nina Zovko/ Vladimir Jelavić	week before the 15th February
Check longitude, latitude and height class of LPSs	Mirela Poljanac	beginning February	Mirela Poljanac	week before the 15th February
Automate work due to avoid errors by linking working Excels	Mirela	beginning February	Mirela Poljanac	week before the 15th February
PREPARING IIR (INFORMATIVE INVENTORY REPORT)				
Check the values in the text and excel tables	Mirela Poljanac	10. February to 14th March	Nina Zovko / Vladimir Jelavić	the 14th March
Check out the Figures	Mirela Poljanac	10. February to 14th March	Nina Zovko / Vladimir Jelavić	the 14th March
ARCHIVING				
Production of *"hard"* copies of the database	Mirela Poljanac	from April -…	-	-
Archiving Excel Table	Mirela Poljanac	from April -…	-	-
Archiving of data sources	Mirela Poljanac	from April -…	-	-
Archiving of all manuals	Mirela Poljanac	from April -…	-	-
Archiving IIR	Mirela Poljanac	from April -…	-	-

12.2. Appendix 2. Description of SNAP97 sectors

SNAP 01: Combustion in energy transformation industry

This sector covers emissions from boilers, gas turbines and stationary engines as point sources and emission from combustion plants as area sources where the fossil fuel is combusted for the purpose of electricity generation and thermal production. This sector also includes emissions from combustion processes within a refinery for the heating of crude and petroleum products without contact between flame and products (crude oil transformation into derivates such as benzene, diesel, gas oil, kerosene, etc.), emissions from solid fuel transformation plants and combustion during oil / gas extraction and coal mining. Production of electricity and thermal energy for own consumption is also included. Dominant emissions from sector 01 are the following: SO_2, NO_x, TSP and heavy metals (arsenic, cadmium, chrome, mercury, zinc and nickel).

SNAP 02: Non-industrial combustion plants

Sector 02 includes all stationary energy plants with the exception of combustion in manufacturing industry (sector 03) and energy transformation industry (sector 01). Mainly, this sector includes emissions from small and medium combustion plants for thermal energy production like, commercial and institutional plants, residential plants and plants in agriculture, forestry and aquaculture. Production of electricity and thermal energy for own consumption is also included. Dominant emissions from sector 02 are the following: SO_2, NO_x, NMVOC, CO, TSP, particulate matter, heavy metals (cadmium, zinc and mercury) and persistent organic pollutants (PAHs, DIOX).

SNAP 03: Combustion in manufacturing industry

Emission because of production process (sector 04) and emission due to fuel combustion in manufacturing industry (sector 03) must be distinguished. The sector Combustion in manufacturing industry covers emissions released from: electricity generation and thermal energy production for manufacturing processes, combustion in order to generate thermal energy for processes without contact and non-energy fuel consumption. Non-energy fuel consumption comprises natural gas consumption for fertilizers, ethane, paraffin and wax production in chemical industry, bitumen production in construction industry and oil and fat production in different areas of application. Dominant emissions from sector 03 are the following: SO_2, NO_X, CO, TSP, particulate matter and heavy metals (arsenic, cadmium, chrome, mercury, zinc and nickel).

SNAP 04: Production processes

Sector 04 includes emissions which are the result of different production processes. These are the processes in petroleum industries, iron and steel industries, non-ferrous metal industries, inorganic and organic chemical industries, wood, paper pulp, food, drink, cement, glass and other industries, etc. The dominant emissions from sector 04 are: NO_X, NMVOC, NH_3, CO, TSP, particulate matter and heavy metals (cadmium, arsenic, chrome, selenium and zinc).

SNAP 05: Extraction and distribution of fossil fuel and geothermal energy

The extraction and first treatment of solid, oil and gas fuel results in non-methane volatile organic compounds emissions (NMVOC) and it is a dominant emission from sector 05. The largest NMVOCs emissions are the fugitive emissions from gas stations and emissions that occur during loading of gaseous and liquid fossil fuel from on-shore and offshore facilities. During the gaseous fossil fuel extraction and first treatment, emissions of mercury (Hg) occur. Those emissions can be of considerable amount if the mercury concentration in gaseous fossil fuel is high and if no additional measures for emission reduction are implemented. This sector also includes emissions from geothermal energy extraction. The SNAP code 05 is a key source of NMVOC emissions.

SNAP 06: Solvent and other product use

All activities, in which organic solvents are used and are emitted, are included in sector 06. Solvent use is a major contributor to NMVOC emissions. These emissions come from paint application, degreasing, dry cleaning and electronics, production or processing of chemical products and other use of solvents and related activities. The SNAP code 06 is also a key source of PCBs emission.

SNAP 07: Road transport

This sector includes emissions from all types of vehicles (passenger cars, light and heavy duty vehicles, buses, mopeds and motorcycles), emissions from gasoline evaporation from vehicles and also emissions from automobile tyre and brake wear. For emission calculation in road transport COPERT 4 (v11.3) software, developed for the purposes of European Environmental Agency, was used. Road transport is the key source of heavy metals emissions (lead, chrome, zinc and copper), NO_x, NMVOC, CO, and TSP, and particulate matter.

SNAP 08: Other mobile source and machinery

Emissions from sector 08 include emissions from off-road machinery. In other words, emissions from railways, inland waterways, maritime activities, air traffic. Furthermore, the emissions from agriculture, forestry, industry, household, gardening and other off-road mobile machinery are calculated. Emissions from international air traffic and waterways are excluded. Dominant emissions from this sector are: NO_x and $PM_{2.5}$.

SNAP 09: Waste treatment and disposal

Sector 09 includes emissions which are the result of biological treatment of waste - solid waste disposal on land, waste incineration (waste thermal treatment and cremation), wastewater handling and other activities such as car fires and house fires.

The dominant emissions from sector 09 are NMVOC and NH_3.

If the waste is used as fuel for energy and thermal generation, the emissions that occur must be included in one of the stationary sectors (sectors 01, 02 and 03).

SNAP 10: Agriculture

The sector agriculture includes emissions that occur from application of nitrogen (N)-containing fertilizers and pesticides on agricultural land and also emissions from manure management, regarding organic compounds (emissions from animal excreta). The dominant emission from sector 10 is emission of ammonia (NH_3). Production and use of HCH (Lindane) has been permanently prohibited since July 2001. Therefore, the emission of Lindane no longer occurs on the territory of the Republic of Croatia.

SNAP 11: Other sources and sinks

Sector 11 is the only sector that includes non-anthropogenic emissions (caused by nature). This sector includes emissions from non-managed and managed deciduous and coniferous forests and forests soils, natural grassland and other vegetation, marshes and waters (rivers and lakes), volcanoes, lightning, changes in forest and other woody biomass stocks, etc. In Croatia only SNAP code 110300 Forest and other vegetation fires is considering within sector 11. The SNAP 11 is not the key source of emissions.

12.3. Appendix 3. NFR and correspond SNAP codes

Table A3-1 NFR and correspond SNAP codes

NFR Code	Long name	SNAP code
1 A	Energy – fuel combustion	
1 A 1	Energy industry	01 00 00
1 A 1 a	Public Electricity and Heat Production	01 01 and 01 02
1 A 1 b	Petroleum refining	01 03 00
1 A 1 c	Manufacture of Solid Fuel and Other Energy Industries	01 05 00
1 A 2	Manufacturing Industries and Construction	01 00 00
1 A 2 a	Stationary Combustion in Manufacturing Industries and Construction: Iron and Steel	-
1 A 2 b	Stationary Combustion in Manufacturing Industries and Construction: Non-ferrous Metals	-
1 A 2 c	Stationary Combustion in Manufacturing Industries and Construction: Chemicals	-
1 A 2 d	Stationary Combustion in Manufacturing Industries and Construction: Pulp, Paper and Print	-
1 A 2 e	Stationary Combustion in Manufacturing Industries and Construction: Food Processing, Beverages and Tobacco	-
1 A 2 f	Stationary Combustion in Manufacturing Industries and Construction: Non- metallic minerals	03 01 and 03 03
1 A 2 g vii	Mobile Combustion in Manufacturing Industries and Construction	08 08 01
1 A 3	Transport	
1 A 3 a ii (i)	Civil Aviation (Domestic, LTO)	08 05 01
1 A 3 a i (i)	International Aviation (LTO)	08 85 02
1 A 3 b i	Road Transport:, Passenger cars	07 07 01
1 A 3 b ii	Road Transport:, Light duty vehicles	07 07 02
1 A 3 b iii	Road Transport:, Heavy duty vehicles	07 07 03
1 A 3 b iv	Road Transport:, Mopeds & Motorcycles	07 07 04 and 07 07 05
1 A 3 b v	Road Transport:, Gasoline evaporation	07 07 06
1 A 3 b vi	Road Transport:, Automobile tyre and brake wear	07 07 07
1 A 3 b vii	Road Transport:, Automobile road abrasion	07 07 08
1 A 3 c	Railways	08 02
1 A 3 d i (ii)	International inland waterways	-
1 A 3 d ii	National Navigation (Shipping)	08 03 and 08 04
1 A 3 e	Pipeline compressors	-
1 A 4	Other sectors	
1 A 4 a i	Commercial / Institutional: Stationary	02 01 00
1 A 4 a ii	Commercial / Institutional: Mobile	
1 A 4 b i	Residential: Stationary plants	02 02 00
1 A 4 b ii	Residential: Household and gardening (mobile)	08 09 01
1 A 4 c i	Agriculture/Forestry/Fishing: Stationary	02 03 00
1 A 4 c ii	Agriculture/Forestry/Fishing: Off-road Vehicles and Other Machinery	08 06 and 08 07
1 A 5	Other (including Military)	
1 A 5 a	Other, Stationary (including Military)	-
1 A 5 b	Other, Mobile (Including military, land based and recreational boats)	-
1 B	Fugitive emission from Fuel	
1 B 1	Fugitive emission from Solid Fuel	
1 B 1 a	Coal Mining and Handling	-
1 B 1 b	Solid fuel transformation	-
1 B 1 c	Other fugitive emissions from solid fuel	-
1 B 2	Fugitive emission from oil and natural gas	
1 B 2 a i	Exploration Production, Transport	
1 B 2 a iv	Refining / Storage	04 01

NFR Code	Long name	SNAP code
1 B 2 a v	Distribution of oil products	05 04 and 05 05
1 B 2 a vi	Geothermal energy extraction	-
1 B 2 b	Natural gas	05 03 and 05 06
1 B 2 c	Venting and flaring	09 02 03 and 09 02 06
2 A	Mineral Products	
2 A 1	Cement Production	04 06 12
2 A 2	Lime Production	04 06 14
2 D 3 c	Asphalt Roofing	04 04 10
2 D 3 b	Road Paving with Asphalt	04 04 11
2 A 5 a	Quarrying and mining of minerals other than coal	04 06 23
2 A 5 b	Construction and demolition	04 06 24
2 A 3	Other Mineral products	04 06 13
2 B	Chemical industry	
2 B 1	Ammonia Production	04 04 03
2 B 2	Nitric Acid Production	04 04 02
2 B 10 a	Other chemical industry	04 04, 04 05
2 C	Metal production	
2 C 1	Iron and Steel Production	04 02
2 C 2	Ferroalloys Production	04 03 02
2 C 3	Aluminium Production	04 03 01
2 C 5 a	Copper Production	-
2 C 5 b	Lead Production	-
2 C 5 c	Nickel Production	-
2 C 5 d	Zinc Production	-
2 C 5 e	Other metal production	-
2 C 5 f	Storage, handling and transport of metal products	-
2 D 3 a	Domestic solvent use including fungicides	06 04 08
2 D 3 d	Coating application	06 01 00
2 D 3 e	Metal degreasing	06 02 01
2 D 3 f	Dry cleaning	06 02 02
2 D 3 g	Chemical products	06 03
2 D 3 h	Printing	06 04 03
2 H 1	Pulp and Paper	04 06 02, 04 06 03 and 04 06 04
2 H 2	Food and Drink	04 06 05, 04 06 06 and 04 06 08
2 I	Wood processing	-
2 K	Consumption of POPs and Heavy Metals (e.g. electrical and scientific equipment)	06 05 08
2 D 3 i, 2 G	Other	
3 B	Manure management	
3 B 1 a	Cattle Dairy	10 05 01
3 B 1 b	Cattle Non-Dairy	10 05 02
3 B 2	Sheep	10 05 05
3 B 4 d	Goats	-
3 B 4 e	Horses	10 05 06
3 B 4 f	Mules and Asses	-
3 B 3	Swine	10 05 03 and 10 05 04
3 B 4 g i	Laying Hens	10 05 07
3 B 4 g ii	Broilers	10 05 08
3 B 4 g iii	Turkeys	10 05 09a
3 B 4 g iv	Other Poultry	10 05 09z
3 D 1	Direct Soil Emission	
3 D 1 a	Inorganic N-fertilizers	10 01
3 D f	Use of pesticide	
3 F	FIELD BURNING OF AGRICULTURAL WASTES	-
3 G	Agriculture OTHER	10 06

NFR Code	Long name	SNAP code
5 A	SOLID WASTE DISPOSAL ON LAND	09 04 01
5 C	Waste incineration	
5 C 1 b iii	Clinical Waste Incineration	09 02 07
5 C 1 b i	Industrial Waste Incineration	09 02 02
5 C 1 d	Cremation	09 02 01
5 C e	Small Scale Waste Burning	-
5 D 1	Domestic wastewater handling	09 10 01
5 D 2	Industrial wastewater handling	09 10 02
5 D 3	Other wastewater handling (latrines)	09 10 07
Memo Items	NOT TO BE INCLUDED IN NATIONAL TOTALS	
1 A 3 a ii (ii)	Civil Aviation (Domestic, Cruise)	-
1 A 3 a i (ii)	International Aviation (Cruise)	-
1 A 3 d i (i)	International maritime Navigation	08 04 04
11 B	Forest fires	11 03

12.4. Appendix 4. Emission factors – 2018

Table A4-1 Emission factors for the year 2018 – export from CollectER database

Tech_ID	Naziv tehnologije	Kategorija	Polutant	Faktor emisije	Jedinica
1	Plomin	1.A.1.a	NMVOC	3	g/GJ
3	Residual fuel oil	1.A.1.a	As	24.88	mg/GJ
3	Residual fuel oil	1.A.1.a	Cr	62.2	mg/GJ
3	Residual fuel oil	1.A.1.a	Cu	24.88	mg/GJ
3	Residual fuel oil	1.A.1.a	Se	1.24	mg/GJ
3	Residual fuel oil	1.A.1.a	Zn	24.88	mg/GJ
3	Residual fuel oil	1.A.1.a	DIOX	2.5	ng/GJ
3	Residual fuel oil	1.A.1.a	Benzo(b)	505.1	µg/GJ
3	Residual fuel oil	1.A.1.a	Benzo(k)	99.03	µg/GJ
3	Residual fuel oil	1.A.1.a	Benzo(a)	116.45	µg/GJ
3	Residual fuel oil	1.A.1.a	Indeno	188.36	µg/GJ
3	Residual fuel oil	1.A.1.a	NH3	0.01	g/GJ
3	Residual fuel oil	1.A.1.a	NMVOC	3	g/GJ
6	Natural gas	1.A.1.a	DIOX	0.5	ng/GJ
6	Natural gas	1.A.1.a	NH3	0.15	g/GJ
6	Natural gas	1.A.1.a	NMVOC	4	g/GJ
1	Plomin	1.A.1.a	NH3	0.31	g/GJ
1	Plomin	1.A.1.a	As	2.13	mg/GJ
1	Plomin	1.A.1.a	Cr	1.55	mg/GJ
1	Plomin	1.A.1.a	Cu	3.99	mg/GJ
1	Plomin	1.A.1.a	Se	0.27	mg/GJ
1	Plomin	1.A.1.a	Zn	9.88	mg/GJ
1	Plomin	1.A.1.a	Benzo(b)	0.28	µg/GJ
1	Plomin	1.A.1.a	Benzo(k)	0.28	µg/GJ
1	Plomin	1.A.1.a	Benzo(a)	0.14	µg/GJ
1	Plomin	1.A.1.a	Indeno	0.27	µg/GJ
1	Plomin	1.A.1.a	DIOX	10	ng/GJ
14	Gas oil	1.A.1.a	As	1.17	mg/GJ
14	Gas oil	1.A.1.a	Cr	0.47	mg/GJ
14	Gas oil	1.A.1.a	Cu	1.17	mg/GJ
14	Gas oil	1.A.1.a	Se	0.023	mg/GJ
14	Gas oil	1.A.1.a	Zn	2.34	mg/GJ
14	Gas oil	1.A.1.a	DIOX	1.5	ng/GJ
14	Gas oil	1.A.1.a	Benzo(b)	475.3	µg/GJ
14	Gas oil	1.A.1.a	Benzo(k)	93.19	µg/GJ
14	Gas oil	1.A.1.a	Benzo(a)	109.58	µg/GJ
14	Gas oil	1.A.1.a	Indeno	177.24	µg/GJ
14	Gas oil	1.A.1.a	NH3	0.01	g/GJ
14	Gas oil	1.A.1.a	NMVOC	3	g/GJ
7024	TE-TO Zg 2018	1.A.1.a	Cd	0	kg
98	Bread (white bread)	2.D.2	NMVOC	2	kg/t
103	Mineral Industry, Asfalt Roofing	2.A.5	NMVOC	130	g/t
103	Mineral Industry, Asfalt Roofing	2.A.5	CO	9.5	g/t

Tech_ID	Naziv tehnologije	Kategorija	Polutant	Faktor emisije	Jedinica
103	Mineral Industry, Asfalt Roofing	2.A.5	TSP	1600	g/t
104	Mineral Production, Road Paving with Asphalt	2.A.6	NMVOC	16	g/t
104	Mineral Production, Road Paving with Asphalt	2.A.6	TSP	14000	g/t
104	Mineral Production, Road Paving with Asphalt	2.A.6	PM25	400	g/t
104	Mineral Production, Road Paving with Asphalt	2.A.6	PM10	3000	g/t
108	2.A.7.d_glass production	2.A.7.1	As	0.19	g/t
108	2.A.7.d_glass production	2.A.7.1	Cd	0.13	g/t
108	2.A.7.d_glass production	2.A.7.1	Cr	0.23	g/t
108	2.A.7.d_glass production	2.A.7.1	Cu	0.007	g/t
108	2.A.7.d_glass production	2.A.7.1	Hg	0.003	g/t
108	2.A.7.d_glass production	2.A.7.1	Ni	0.49	g/t
108	2.A.7.d_glass production	2.A.7.1	Pb	1.7	g/t
108	2.A.7.d_glass production	2.A.7.1	Se	0.8	g/t
108	2.A.7.d_glass production	2.A.7.1	Zn	0.37	g/t
108	2.A.7.d_glass production	2.A.7.1	TSP	300	g/t
108	2.A.7.d_glass production	2.A.7.1	PM25	240	g/t
108	2.A.7.d_glass production	2.A.7.1	PM10	270	g/t
120	Polyester processing	3.C	NMVOC	10	kg/t
4842	2.D.3.i Fat, edible and non-edible oil extraction	3.D.3	NMVOC	1.57	kg/t
196	Incineration of industrial waste	6.C.b	As	0.016	g/t
196	Incineration of industrial waste	6.C.b	Cd	0.1	g/t
196	Incineration of industrial waste	6.C.b	Cr	0.3	g/t
196	Incineration of industrial waste	6.C.b	Cu	3	g/t
196	Incineration of industrial waste	6.C.b	Hg	0.056	g/t
196	Incineration of industrial waste	6.C.b	Ni	0.14	g/t
196	Incineration of industrial waste	6.C.b	Pb	1.3	g/t
196	Incineration of industrial waste	6.C.b	Zn	2.1	g/t
196	Incineration of industrial waste	6.C.b	HCB	0.002	g/t
196	Incineration of industrial waste	6.C.b	DIOX	350	µg/t
196	Incineration of industrial waste	6.C.b	PAH	0.02	g/t
196	Incineration of industrial waste	6.C.b	SO2	0.047	kg/t
196	Incineration of industrial waste	6.C.b	NOX	0.87	kg/t
196	Incineration of industrial waste	6.C.b	NMVOC	7.4	kg/t
196	Incineration of industrial waste	6.C.b	CO	0.07	kg/t
196	Incineration of industrial waste	6.C.b	TSP	0.01	kg/t
196	Incineration of industrial waste	6.C.b	PM25	0.004	kg/t
196	Incineration of industrial waste	6.C.b	PM10	0.007	kg/t
198	1.B.2.c.2_Venting and flaring (gas)	1.B.2.c.2	NOX	1.4	kg/t
198	1.B.2.c.2_Venting and flaring (gas)	1.B.2.c.2	NMVOC	1.8	kg/t
198	1.B.2.c.2_Venting and flaring (gas)	1.B.2.c.2	CO	6.3	kg/t
4842	2.D.3.i Fat, edible and non-edible oil extraction	3.D.3	TSP	1.1	kg/t

Tech_ID	Naziv tehnologije	Kategorija	Polutant	Faktor emisije	Jedinica
4842	2.D.3.i Fat, edible and non-edible oil extraction	3.D.3	PM25	0.6	kg/t
4842	2.D.3.i Fat, edible and non-edible oil extraction	3.D.3	PM10	0.9	kg/t
4843	2.D.3.i Creosote preservative type	3.D.3	NMVOC	105	kg/t
4843	2.D.3.i Creosote preservative type	3.D.3	Benzo(a)	1.05	g/t
4843	2.D.3.i Creosote preservative type	3.D.3	Benzo(b)	0.53	g/t
4843	2.D.3.i Creosote preservative type	3.D.3	Benzo(k)	0.53	g/t
4843	2.D.3.i Creosote preservative type	3.D.3	Indeno	0.53	g/t
4844	2.D.3.i Organic solventborne preservative	3.D.3	NMVOC	945	kg/t
4846	2.G Tabacco combustion	3.D.3	Ni	2.7	g/t
4846	2.G Tabacco combustion	3.D.3	Cd	5.4	g/t
4846	2.G Tabacco combustion	3.D.3	Zn	2.7	g/t
4846	2.G Tabacco combustion	3.D.3	Benzo(b)	0.045	g/t
6431	Degreasing - Vapour cleaning	3.B.1	NMVOC	710	caput
3700	1.A.2.a_203A	1.A.2.c	As	24.88	mg/GJ
3700	1.A.2.a_203A	1.A.2.c	Cd	24.88	mg/GJ
3700	1.A.2.a_203A	1.A.2.c	Cr	62.2	mg/GJ
3700	1.A.2.a_203A	1.A.2.c	Cu	24.88	mg/GJ
3700	1.A.2.a_203A	1.A.2.c	Hg	0	mg/GJ
3700	1.A.2.a_203A	1.A.2.c	Ni	870.86	mg/GJ
3700	1.A.2.a_203A	1.A.2.c	Pb	32.35	mg/GJ
3700	1.A.2.a_203A	1.A.2.c	Se	1.24	mg/GJ
3700	1.A.2.a_203A	1.A.2.c	Zn	24.88	mg/GJ
3700	1.A.2.a_203A	1.A.2.c	DIOX	2.5	ng/GJ
3700	1.A.2.a_203A	1.A.2.c	Benzo(b)	45.04	µg/GJ
3700	1.A.2.a_203A	1.A.2.c	Benzo(k)	70.17	µg/GJ
3700	1.A.2.a_203A	1.A.2.c	Benzo(a)	85.34	µg/GJ
3700	1.A.2.a_203A	1.A.2.c	Indeno	170.19	µg/GJ
3700	1.A.2.a_203A	1.A.2.c	NMVOC	3	g/GJ
3701	1.A.2.a_301A	1.A.2.c	Hg	0.61	mg/GJ
3701	1.A.2.a_301A	1.A.2.c	DIOX	0.03	ng/GJ
3701	1.A.2.a_301A	1.A.2.c	NMVOC	7	g/GJ
3813	2.D.1_Paper pulp: Neutral Sulphite Semi-Chemical process	2.D.1	NMVOC	0.05	kg/t
3815	White wine	2.D.2	NMVOC	0.035	hl product
3816	Wine (unspecified color)	2.D.2	NMVOC	0.08	hl product
3817	2.D.2_Beer	2.D.2	NMVOC	35	g/hl product
3818	2.D.2_Spirits	2.D.2	NMVOC	15000	g/hl product
3824	1.B.2.a.1_201A	1.B.2.a.1	NMVOC	0.095	kg/t
3826	Imported oil	1.B.2.a.5	NMVOC	0.3	kg/t
3827	Total crude oil	1.B.2.a.5	NMVOC	0.02	kg/t
3836	3.C_PVC process.	3.C	NMVOC	10	kg/t
6430	Printing industry	3.D.1	NMVOC	500	t

Tech_ID	Naziv tehnologije	Kategorija	Polutant	Faktor emisije	Jedinica
3840	3.C_Rubber manufac.	3.C	NMVOC	8	kg/t
3841	3.C_Pharmaceuticals products manufac.	3.C	NMVOC	300	g/kg solvent
3842	3.C_Paints manufac.	3.C	NMVOC	11	kg/t
3843	3.C_Inks manufac.	3.C	NMVOC	11	kg/t
3844	3.C_Glues manufac.	3.C	NMVOC	11	kg/t
4428	Rolling mills - hot	2.C.1.5	NMVOC	7	g/t
4428	Rolling mills - hot	2.C.1.5	TSP	9	g/t
4430	Mineral Industry, Quaring and mining of minerals other than coal	2.A.7.a	TSP	102	g/t
4430	Mineral Industry, Quaring and mining of minerals other than coal	2.A.7.a	PM25	5	g/t
4430	Mineral Industry, Quaring and mining of minerals other than coal	2.A.7.a	PM10	50	g/t
4432	Mineral Industry, Construction and demolition	2.A.7.b	TSP	0.162	kg/m2
4432	Mineral Industry, Construction and demolition	2.A.7.b	PM25	0.00812	kg/m2
4432	Mineral Industry, Construction and demolition	2.A.7.b	PM10	0.0812	kg/m2
4436	Ammonium phosphate production	2.B.5.a	TSP	300	g/t
4436	Ammonium phosphate production	2.B.5.a	PM25	180	g/t
4436	Ammonium phosphate production	2.B.5.a	PM10	240	g/t
4448	Forest Fires	11.A	SO2	20	kg/ha
4448	Forest Fires	11.A	NOX	100	kg/ha
4448	Forest Fires	11.A	NH3	20	kg/ha
4448	Forest Fires	11.A	NMVOC	300	kg/ha
4448	Forest Fires	11.A	CO	3000	kg/ha
4449	Consumption of POPs and HMs	2.F.8	Hg	0.01	g/caput
4449	Consumption of POPs and HMs	2.F.8	PCBs	0.1	g/caput
4470	Latrines	6.B.2	NH3	1.6	kg/inhabitant
4471	Waste water treatment in industry	6.B.1	NMVOC	15	g/1000m3
4472	Waste water treatment in residental / commercial sector	6.B.1	NMVOC	15	g/1000m3
4487	Rolling mills - cold	2.C.1.5	TSP	96	g/t
4488	Meat, fish etc. frying / curing	2.D.2	NMVOC	0.3	kg/t
4489	Sugar	2.D.2	NMVOC	10	kg/t
4490	Margarine and solid cooking fats	2.D.2	NMVOC	10	kg/t
4492	Animal feed	2.D.2	NMVOC	1	kg/t
4493	Coffee roasting	2.D.2	NMVOC	0.55	kg/t
4494	Cakes, biscuits and breakfast cereals	2.D.2	NMVOC	1	kg/t
4500	040620_wood processing	2.D.3	TSP	1	kg/t

Tech_ID	Naziv tehnologije	Kategorija	Polutant	Faktor emisije	Jedinica
4502	Catalytic reforming units	1.B.2.a.4	SO2	4	g/m3
4502	Catalytic reforming units	1.B.2.a.4	CO	42	g/m3
4503	Catalytic Cracking unit regenerators-Partial burn without CO boiler	1.B.2.a.4	As	0.014	g/m3
4503	Catalytic Cracking unit regenerators-Partial burn without CO boiler	1.B.2.a.4	Cd	0.063	g/m3
4503	Catalytic Cracking unit regenerators-Partial burn without CO boiler	1.B.2.a.4	Cu	0.14	g/m3
4503	Catalytic Cracking unit regenerators-Partial burn without CO boiler	1.B.2.a.4	Hg	0.07	g/m3
4503	Catalytic Cracking unit regenerators-Partial burn without CO boiler	1.B.2.a.4	Ni	0.61	g/m3
4503	Catalytic Cracking unit regenerators-Partial burn without CO boiler	1.B.2.a.4	Pb	0.32	g/m3
4503	Catalytic Cracking unit regenerators-Partial burn without CO boiler	1.B.2.a.4	Zn	0.12	g/m3
4503	Catalytic Cracking unit regenerators-Partial burn without CO boiler	1.B.2.a.4	SO2	1.4	kg/m3
4503	Catalytic Cracking unit regenerators-Partial burn without CO boiler	1.B.2.a.4	NOX	0.2	kg/m3
4503	Catalytic Cracking unit regenerators-Partial burn without CO boiler	1.B.2.a.4	NH3	0.16	kg/m3
4503	Catalytic Cracking unit regenerators-Partial burn without CO boiler	1.B.2.a.4	NMVOC	0.63	kg/m3
4503	Catalytic Cracking unit regenerators-Partial burn without CO boiler	1.B.2.a.4	CO	39	kg/m3
4503	Catalytic Cracking unit regenerators-Partial burn without CO boiler	1.B.2.a.4	PM10	0.55	kg/m3
4504	Sulphur recovery plants	1.B.2.a.4	SO2	140	kg/t product
4505	Fluid coking units	1.B.2.a.4	As	2.2	g/m3
4505	Fluid coking units	1.B.2.a.4	Cu	0.015	g/m3
4505	Fluid coking units	1.B.2.a.4	Hg	0.03	g/m3
4505	Fluid coking units	1.B.2.a.4	Ni	0.57	g/m3
4505	Fluid coking units	1.B.2.a.4	Pb	0.045	g/m3
4505	Fluid coking units	1.B.2.a.4	Zn	0.045	g/m3
4505	Fluid coking units	1.B.2.a.4	NMVOC	0.046	kg/m3
4505	Fluid coking units	1.B.2.a.4	PM10	0.77	kg/m3
4506	Diffuse NMVOC emissions	1.B.2.a.4	NMVOC	0.2	kg/t crude
4507	Petroleum refining	1.A.1.b	As	0.343	mg/GJ
4507	Petroleum refining	1.A.1.b	Cd	0.712	mg/GJ
4507	Petroleum refining	1.A.1.b	Cr	2.74	mg/GJ

Tech_ID	Naziv tehnologije	Kategorija	Polutant	Faktor emisije	Jedinica
4507	Petroleum refining	1.A.1.b	Cu	2.22	mg/GJ
4507	Petroleum refining	1.A.1.b	Hg	0.086	mg/GJ
4507	Petroleum refining	1.A.1.b	Ni	3.6	mg/GJ
4507	Petroleum refining	1.A.1.b	Pb	1.79	mg/GJ
4507	Petroleum refining	1.A.1.b	Benzo(b)	1.14	µg/GJ
4507	Petroleum refining	1.A.1.b	Benzo(k)	0.631	µg/GJ
4507	Petroleum refining	1.A.1.b	Benzo(a)	0.669	µg/GJ
4507	Petroleum refining	1.A.1.b	Indeno	0.631	µg/GJ
4507	Petroleum refining	1.A.1.b	SO2	0.281	g/GJ
4507	Petroleum refining	1.A.1.b	NOX	63	g/GJ
4507	Petroleum refining	1.A.1.b	NMVOC	2.58	g/GJ
4507	Petroleum refining	1.A.1.b	CO	12.1	g/GJ
4507	Petroleum refining	1.A.1.b	TSP	0.89	g/GJ
4507	Petroleum refining	1.A.1.b	PM25	0.89	g/GJ
4507	Petroleum refining	1.A.1.b	PM10	0.89	g/GJ
4647	Decorative coating application	3.A.1	NMVOC	150	g/kg product
4649	Industrial coating application	3.A.2	NMVOC	400	g/kg product
4650	Other coating application	3.A.3	NMVOC	200	g/kg product
4651	Polystirene; in primary forms	2.B.5.a	NMVOC	120	g/t
4651	Polystirene; in primary forms	2.B.5.a	TSP	4	g/t
4652	Expended polystiren foam	2.B.5.a	NMVOC	3.2	kg/t
4652	Expended polystiren foam	2.B.5.a	TSP	30	g/t
4653	2.B.5.a_Polyethylene Low Density	2.B.5.a	NMVOC	2.4	kg/t
4653	2.B.5.a_Polyethylene Low Density	2.B.5.a	TSP	31	g/t
4797	Expandible PS	3.C	NMVOC	60	kg/t
4503	Catalytic Cracking unit regenerators-Partial burn without CO boiler	1.B.2.a.4	TSP	0.7	kg/m3
4505	Fluid coking units	1.B.2.a.4	TSP	1.5	kg/m3
6	Natural gas	1.A.1.a	Benzo(a)	0.6	µg/GJ
6	Natural gas	1.A.1.a	Benzo(b)	0.8	µg/GJ
6	Natural gas	1.A.1.a	Benzo(k)	0.8	µg/GJ
6	Natural gas	1.A.1.a	Indeno	0.8	µg/GJ
4833	coke oven coke from browe coal	1.A.2.f.1	As	4	mg/GJ
4833	coke oven coke from browe coal	1.A.2.f.1	Cd	1.8	mg/GJ
4833	coke oven coke from browe coal	1.A.2.f.1	Cr	13.5	mg/GJ
4833	coke oven coke from browe coal	1.A.2.f.1	Cu	17.5	mg/GJ
4833	coke oven coke from browe coal	1.A.2.f.1	Hg	7.9	mg/GJ
4833	coke oven coke from browe coal	1.A.2.f.1	Ni	13	mg/GJ
4833	coke oven coke from browe coal	1.A.2.f.1	Pb	134	mg/GJ
4833	coke oven coke from browe coal	1.A.2.f.1	Se	1.8	mg/GJ

Tech_ID	Naziv tehnologije	Kategorija	Polutant	Faktor emisije	Jedinica
4833	coke oven coke from browe coal	1.A.2.f.1	Zn	200	mg/GJ
4833	coke oven coke from browe coal	1.A.2.f.1	DIOX	203	ng/GJ
4833	coke oven coke from browe coal	1.A.2.f.1	HCB	0.62	µg/GJ
4833	coke oven coke from browe coal	1.A.2.f.1	PCBs	170	µg/GJ
4833	coke oven coke from browe coal	1.A.2.f.1	Benzo(a)	45.5	µg/GJ
4833	coke oven coke from browe coal	1.A.2.f.1	Benzo(b)	58.9	µg/GJ
4833	coke oven coke from browe coal	1.A.2.f.1	Benzo(k)	23.7	µg/GJ
4833	coke oven coke from browe coal	1.A.2.f.1	Indeno	18.5	µg/GJ
4834	natural gas	1.A.2.f.1	As	0.09	mg/GJ
4834	natural gas	1.A.2.f.1	Cd	0.5	mg/GJ
4834	natural gas	1.A.2.f.1	Cr	0.7	mg/GJ
4834	natural gas	1.A.2.f.1	Cu	0.4	mg/GJ
4834	natural gas	1.A.2.f.1	Hg	0.2	mg/GJ
4834	natural gas	1.A.2.f.1	Ni	1	mg/GJ
4834	natural gas	1.A.2.f.1	Pb	0.2	mg/GJ
4834	natural gas	1.A.2.f.1	Se	0.01	mg/GJ
4834	natural gas	1.A.2.f.1	Zn	14	mg/GJ
4834	natural gas	1.A.2.f.1	DIOX	2	ng/GJ
4834	natural gas	1.A.2.f.1	Benzo(a)	0.6	µg/GJ
4834	natural gas	1.A.2.f.1	Benzo(b)	0.8	µg/GJ
4834	natural gas	1.A.2.f.1	Benzo(k)	0.8	µg/GJ
4834	natural gas	1.A.2.f.1	Indeno	0.8	µg/GJ
4836	CPS I, II, III_2011	1.B.2.b.1	Hg	0.041	kg
4837	Detached house fire	6.D	As	1.35	g/fire
4837	Detached house fire	6.D	Cd	0.85	g/fire
4837	Detached house fire	6.D	Cr	1.29	g/fire
4837	Detached house fire	6.D	Cu	2.99	g/fire
4837	Detached house fire	6.D	Hg	0.85	g/fire
4837	Detached house fire	6.D	Pb	0.42	g/fire
4837	Detached house fire	6.D	DIOX	1.44	mg/fire
4837	Detached house fire	6.D	TSP	143.82	kg/fire
4837	Detached house fire	6.D	PM25	143.82	kg/fire
4837	Detached house fire	6.D	PM10	143.82	kg/fire
4838	Undetached house fire	6.D	As	0.58	g/fire
4838	Undetached house fire	6.D	Cd	0.36	g/fire
4838	Undetached house fire	6.D	Cr	0.55	g/fire
4838	Undetached house fire	6.D	Cu	1.28	g/fire
4838	Undetached house fire	6.D	Hg	0.36	g/fire
4838	Undetached house fire	6.D	Pb	0.18	g/fire
4838	Undetached house fire	6.D	DIOX	0.62	mg/fire
4838	Undetached house fire	6.D	TSP	61.62	kg/fire
4838	Undetached house fire	6.D	PM25	61.62	kg/fire

Tech_ID	Naziv tehnologije	Kategorija	Polutant	Faktor emisije	Jedinica
4838	Undetached house fire	6.D	PM10	61.62	kg/fire
4839	Apartment building fire	6.D	As	0.41	g/fire
4839	Apartment building fire	6.D	Cd	0.26	g/fire
4839	Apartment building fire	6.D	Cr	0.39	g/fire
4839	Apartment building fire	6.D	Cu	0.91	g/fire
4839	Apartment building fire	6.D	Hg	0.26	g/fire
4839	Apartment building fire	6.D	Pb	0.13	g/fire
4839	Apartment building fire	6.D	DIOX	0.44	mg/fire
4839	Apartment building fire	6.D	TSP	43.78	kg/fire
4839	Apartment building fire	6.D	PM25	43.78	kg/fire
4839	Apartment building fire	6.D	PM10	43.78	kg/fire
4840	Industrial building fire	6.D	As	0.25	g/fire
4840	Industrial building fire	6.D	Cd	0.16	g/fire
4840	Industrial building fire	6.D	Cr	0.24	g/fire
4840	Industrial building fire	6.D	Cu	0.57	g/fire
4840	Industrial building fire	6.D	Hg	0.16	g/fire
4840	Industrial building fire	6.D	Pb	0.08	g/fire
4840	Industrial building fire	6.D	DIOX	0.27	mg/fire
4840	Industrial building fire	6.D	TSP	27.23	kg/fire
4840	Industrial building fire	6.D	PM25	27.23	kg/fire
4840	Industrial building fire	6.D	PM10	27.23	kg/fire
4841	Car fire	6.D	DIOX	0.048	mg/fire
4841	Car fire	6.D	TSP	2.3	kg/fire
4841	Car fire	6.D	PM25	2.3	kg/fire
4841	Car fire	6.D	PM10	2.3	kg/fire
4846	2.G Tabacco combustion	3.D.3	NMVOC	4.84	kg/t
4846	2.G Tabacco combustion	3.D.3	TSP	27	kg/t
4846	2.G Tabacco combustion	3.D.3	PM25	27	kg/t
4846	2.G Tabacco combustion	3.D.3	PM10	27	kg/t
4846	2.G Tabacco combustion	3.D.3	NOX	1.8	kg/t
4846	2.G Tabacco combustion	3.D.3	CO	55.1	kg/t
4846	2.G Tabacco combustion	3.D.3	Cu	5.4	g/t
4846	2.G Tabacco combustion	3.D.3	DIOX	0.1	µg/t
4846	2.G Tabacco combustion	3.D.3	Benzo(k)	0.045	g/t
4846	2.G Tabacco combustion	3.D.3	Benzo(a)	0.111	g/t
4948	derived gas - gas oil (ELLU)	1.A.2.f.1	As	0.09	mg/GJ
4948	derived gas - gas oil (ELLU)	1.A.2.f.1	Cd	0.5	mg/GJ
4948	derived gas - gas oil (ELLU)	1.A.2.f.1	Cr	0.7	mg/GJ
4948	derived gas - gas oil (ELLU)	1.A.2.f.1	Cu	0.4	mg/GJ
4948	derived gas - gas oil (ELLU)	1.A.2.f.1	Hg	0.2	mg/GJ
4948	derived gas - gas oil (ELLU)	1.A.2.f.1	Ni	1	mg/GJ
4948	derived gas - gas oil (ELLU)	1.A.2.f.1	Pb	0.2	mg/GJ
4948	derived gas - gas oil (ELLU)	1.A.2.f.1	Se	0.01	mg/GJ
4948	derived gas - gas oil (ELLU)	1.A.2.f.1	Zn	14	mg/GJ
4948	derived gas - gas oil (ELLU)	1.A.2.f.1	DIOX	2	ng/GJ
4948	derived gas - gas oil (ELLU)	1.A.2.f.1	Benzo(a)	0.6	µg/GJ
4948	derived gas - gas oil (ELLU)	1.A.2.f.1	Benzo(b)	0.8	µg/GJ
4948	derived gas - gas oil (ELLU)	1.A.2.f.1	Benzo(k)	0.8	µg/GJ

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4948	derived gas - gas oil (ELLU)	1.A.2.f.1	Indeno	0.8	µg/GJ
5361	5.C.1.b.v Cremation	6.C.d	Hg	1.49	g/caput
5361	5.C.1.b.v Cremation	6.C.d	SO2	0.113	kg/caput
5361	5.C.1.b.v Cremation	6.C.d	NOX	0.825	kg/caput
5361	5.C.1.b.v Cremation	6.C.d	CO	0.14	kg/caput
5361	5.C.1.b.v Cremation	6.C.d	TSP	38.56	kg/caput
5361	5.C.1.b.v Cremation	6.C.d	PM25	34.7	kg/caput
5361	5.C.1.b.v Cremation	6.C.d	PM10	34.7	kg/caput
5361	5.C.1.b.v Cremation	6.C.d	NMVOC	0.013	kg/caput
5361	5.C.1.b.v Cremation	6.C.d	Pb	30.03	mg/caput
5361	5.C.1.b.v Cremation	6.C.d	Cd	5.03	mg/caput
5361	5.C.1.b.v Cremation	6.C.d	As	13.61	mg/caput
5361	5.C.1.b.v Cremation	6.C.d	Cr	13.56	mg/caput
5361	5.C.1.b.v Cremation	6.C.d	Cu	12.43	mg/caput
5361	5.C.1.b.v Cremation	6.C.d	Ni	17.33	mg/caput
5361	5.C.1.b.v Cremation	6.C.d	Se	19.78	mg/caput
5361	5.C.1.b.v Cremation	6.C.d	Zn	160.12	mg/caput
5361	5.C.1.b.v Cremation	6.C.d	PCBs	0.41	mg/caput
5361	5.C.1.b.v Cremation	6.C.d	DIOX	0.027	µg/caput
5361	5.C.1.b.v Cremation	6.C.d	HCB	0.15	mg/caput
5361	5.C.1.b.v Cremation	6.C.d	Benzo(a)	13.2	µg/caput
5361	5.C.1.b.v Cremation	6.C.d	Benzo(b)	7.21	µg/caput
5361	5.C.1.b.v Cremation	6.C.d	Benzo(k)	6.44	µg/caput
5361	5.C.1.b.v Cremation	6.C.d	Indeno	6.99	µg/caput
5362	5.C.1.b.iii Clinical waste incineration	6.C.a	As	0.2	g/t
5362	5.C.1.b.iii Clinical waste incineration	6.C.a	Cd	8	g/t
5362	5.C.1.b.iii Clinical waste incineration	6.C.a	Cr	2	g/t
5362	5.C.1.b.iii Clinical waste incineration	6.C.a	Cu	98	g/t
5362	5.C.1.b.iii Clinical waste incineration	6.C.a	Hg	43	g/t
5362	5.C.1.b.iii Clinical waste incineration	6.C.a	Ni	2	g/t
5362	5.C.1.b.iii Clinical waste incineration	6.C.a	Pb	62	g/t
5362	5.C.1.b.iii Clinical waste incineration	6.C.a	DIOX	40	mg/t
5362	5.C.1.b.iii Clinical waste incineration	6.C.a	PCBs	0.02	g/t
5362	5.C.1.b.iii Clinical waste incineration	6.C.a	SO2	0.54	kg/t
5362	5.C.1.b.iii Clinical waste incineration	6.C.a	NOX	2.3	kg/t
5362	5.C.1.b.iii Clinical waste incineration	6.C.a	CO	0.19	kg/t
5362	5.C.1.b.iii Clinical waste incineration	6.C.a	TSP	17	kg/t
5362	5.C.1.b.iii Clinical waste incineration	6.C.a	HCB	0.1	g/t

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5362	5.C.1.b.iii Clinical waste incineration	6.C.a	PAH	0.04	mg/t
5362	5.C.1.b.iii Clinical waste incineration	6.C.a	BC	0.391	kg/t
5362	5.C.1.b.iii Clinical waste incineration	6.C.a	NMVOC	0.7	kg/t
5427	Petroleum coke	1.A.1.b	Zn	49.3	mg/GJ
5427	Petroleum coke	1.A.1.b	DIOX	2.5	ng/GJ
6808	High-efficiency stoves	1.A.4.b.1	Pb	27	mg/GJ
6808	High-efficiency stoves	1.A.4.b.1	Se	0.5	mg/GJ
5154	Open fireplaces	1.A.4.b.1	Pb	27	mg/GJ
5154	Open fireplaces	1.A.4.b.1	Se	0.5	mg/GJ
5154	Open fireplaces	1.A.4.b.1	Zn	512	mg/GJ
5154	Open fireplaces	1.A.4.b.1	DIOX	800	ng/GJ
5154	Open fireplaces	1.A.4.b.1	Benzo(b)	111	µg/GJ
5154	Open fireplaces	1.A.4.b.1	Benzo(k)	42	µg/GJ
5154	Open fireplaces	1.A.4.b.1	Benzo(a)	121	µg/GJ
5154	Open fireplaces	1.A.4.b.1	Indeno	71	µg/GJ
5154	Open fireplaces	1.A.4.b.1	SO2	11	g/GJ
5154	Open fireplaces	1.A.4.b.1	NOX	50	g/GJ
5154	Open fireplaces	1.A.4.b.1	NH3	74	g/GJ
5154	Open fireplaces	1.A.4.b.1	NMVOC	600	g/GJ
5154	Open fireplaces	1.A.4.b.1	CO	4000	g/GJ
5154	Open fireplaces	1.A.4.b.1	TSP	880	g/GJ
5154	Open fireplaces	1.A.4.b.1	PM25	820	g/GJ
5154	Open fireplaces	1.A.4.b.1	PM10	840	g/GJ
5154	Open fireplaces	1.A.4.b.1	BC	57.4	g/GJ
5154	Open fireplaces	1.A.4.b.1	PCBs	0.06	µg/GJ
5154	Open fireplaces	1.A.4.b.1	HCB	5	µg/GJ
5155	Single house boilers <50kWth	1.A.4.b.1	Pb	27	mg/GJ
5155	Single house boilers <50kWth	1.A.4.b.1	Se	0.5	mg/GJ
5155	Single house boilers <50kWth	1.A.4.b.1	Zn	512	mg/GJ
5155	Single house boilers <50kWth	1.A.4.b.1	DIOX	550	ng/GJ
5155	Single house boilers <50kWth	1.A.4.b.1	Benzo(b)	111	µg/GJ
5155	Single house boilers <50kWth	1.A.4.b.1	Benzo(k)	42	µg/GJ
5155	Single house boilers <50kWth	1.A.4.b.1	Benzo(a)	121	µg/GJ
5155	Single house boilers <50kWth	1.A.4.b.1	Indeno	71	µg/GJ
5155	Single house boilers <50kWth	1.A.4.b.1	SO2	11	g/GJ
5155	Single house boilers <50kWth	1.A.4.b.1	NOX	80	g/GJ
5155	Single house boilers <50kWth	1.A.4.b.1	NH3	74	g/GJ
5155	Single house boilers <50kWth	1.A.4.b.1	NMVOC	350	g/GJ
5155	Single house boilers <50kWth	1.A.4.b.1	CO	4000	g/GJ
5155	Single house boilers <50kWth	1.A.4.b.1	TSP	500	g/GJ
5155	Single house boilers <50kWth	1.A.4.b.1	PM25	470	g/GJ
5155	Single house boilers <50kWth	1.A.4.b.1	PM10	480	g/GJ
5155	Single house boilers <50kWth	1.A.4.b.1	BC	75.2	g/GJ
5155	Single house boilers <50kWth	1.A.4.b.1	PCBs	0.06	µg/GJ
5155	Single house boilers <50kWth	1.A.4.b.1	HCB	5	µg/GJ
5155	Single house boilers <50kWth	1.A.4.b.1	As	0.19	mg/GJ

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5155	Single house boilers <50kWth	1.A.4.b.1	Cd	13	mg/GJ
5155	Single house boilers <50kWth	1.A.4.b.1	Cr	23	mg/GJ
5155	Single house boilers <50kWth	1.A.4.b.1	Cu	6	mg/GJ
5155	Single house boilers <50kWth	1.A.4.b.1	Hg	0.56	mg/GJ
5155	Single house boilers <50kWth	1.A.4.b.1	Ni	2	mg/GJ
5156	Domestic stoves	1.A.4.b.1	Pb	27	mg/GJ
5156	Domestic stoves	1.A.4.b.1	Se	0.5	mg/GJ
5156	Domestic stoves	1.A.4.b.1	Zn	512	mg/GJ
5156	Domestic stoves	1.A.4.b.1	DIOX	800	ng/GJ
5156	Domestic stoves	1.A.4.b.1	Benzo(b)	111	µg/GJ
5156	Domestic stoves	1.A.4.b.1	Benzo(k)	42	µg/GJ
5156	Domestic stoves	1.A.4.b.1	Benzo(a)	121	µg/GJ
5156	Domestic stoves	1.A.4.b.1	Indeno	71	µg/GJ
5156	Domestic stoves	1.A.4.b.1	SO2	11	g/GJ
5156	Domestic stoves	1.A.4.b.1	NOX	50	g/GJ
5156	Domestic stoves	1.A.4.b.1	NH3	70	g/GJ
5156	Domestic stoves	1.A.4.b.1	NMVOC	600	g/GJ
5156	Domestic stoves	1.A.4.b.1	CO	4000	g/GJ
5156	Domestic stoves	1.A.4.b.1	TSP	800	g/GJ
5156	Domestic stoves	1.A.4.b.1	PM25	740	g/GJ
5156	Domestic stoves	1.A.4.b.1	PM10	760	g/GJ
5156	Domestic stoves	1.A.4.b.1	BC	74	g/GJ
5156	Domestic stoves	1.A.4.b.1	PCBs	0.06	µg/GJ
5128	2.A.2	2.A.2	TSP	400	g/t
5128	2.A.2	2.A.2	PM25	30	g/t
5128	2.A.2	2.A.2	PM10	200	g/t
5154	Open fireplaces	1.A.4.b.1	As	0.19	mg/GJ
5154	Open fireplaces	1.A.4.b.1	Cd	13	mg/GJ
5154	Open fireplaces	1.A.4.b.1	Cr	23	mg/GJ
5154	Open fireplaces	1.A.4.b.1	Cu	6	mg/GJ
5154	Open fireplaces	1.A.4.b.1	Hg	0.56	mg/GJ
5154	Open fireplaces	1.A.4.b.1	Ni	2	mg/GJ
5156	Domestic stoves	1.A.4.b.1	HCB	5	µg/GJ
5156	Domestic stoves	1.A.4.b.1	As	0.19	mg/GJ
5156	Domestic stoves	1.A.4.b.1	Cd	13	mg/GJ
5156	Domestic stoves	1.A.4.b.1	Cr	23	mg/GJ
5156	Domestic stoves	1.A.4.b.1	Cu	6	mg/GJ
5156	Domestic stoves	1.A.4.b.1	Hg	0.56	mg/GJ
5156	Domestic stoves	1.A.4.b.1	Ni	2	mg/GJ
5157	Gaseous fuels	1.A.4.b.1	Pb	0.0015	mg/GJ
5157	Gaseous fuels	1.A.4.b.1	Se	0.011	mg/GJ
5157	Gaseous fuels	1.A.4.b.1	Zn	0.0015	mg/GJ
5157	Gaseous fuels	1.A.4.b.1	DIOX	1.5	ng/GJ
5157	Gaseous fuels	1.A.4.b.1	Benzo(b)	0.84	µg/GJ
5157	Gaseous fuels	1.A.4.b.1	Benzo(k)	0.84	µg/GJ
5157	Gaseous fuels	1.A.4.b.1	Benzo(a)	0.56	µg/GJ
5157	Gaseous fuels	1.A.4.b.1	Indeno	0.84	µg/GJ
5157	Gaseous fuels	1.A.4.b.1	SO2	0.3	g/GJ

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5157	Gaseous fuels	1.A.4.b.1	NOX	51	g/GJ
5157	Gaseous fuels	1.A.4.b.1	NMVOC	1.9	g/GJ
5157	Gaseous fuels	1.A.4.b.1	CO	26	g/GJ
5157	Gaseous fuels	1.A.4.b.1	TSP	1.2	g/GJ
5157	Gaseous fuels	1.A.4.b.1	PM25	1.2	g/GJ
5157	Gaseous fuels	1.A.4.b.1	PM10	1.2	g/GJ
5157	Gaseous fuels	1.A.4.b.1	BC	0.06	g/GJ
5157	Gaseous fuels	1.A.4.b.1	As	0.12	mg/GJ
5157	Gaseous fuels	1.A.4.b.1	Cd	0.00025	mg/GJ
5157	Gaseous fuels	1.A.4.b.1	Cr	0.00076	mg/GJ
5157	Gaseous fuels	1.A.4.b.1	Cu	7.60E-05	mg/GJ
5157	Gaseous fuels	1.A.4.b.1	Hg	0.68	mg/GJ
5157	Gaseous fuels	1.A.4.b.1	Ni	0.00051	mg/GJ
5231	BC - Lignit_STOVES	1.A.4.b.1	Pb	100	mg/GJ
5231	BC - Lignit_STOVES	1.A.4.b.1	Se	2	mg/GJ
5231	BC - Lignit_STOVES	1.A.4.b.1	Zn	200	mg/GJ
5231	BC - Lignit_STOVES	1.A.4.b.1	DIOX	1000	ng/GJ
5231	BC - Lignit_STOVES	1.A.4.b.1	Benzo(b)	400	µg/GJ
5231	BC - Lignit_STOVES	1.A.4.b.1	Benzo(k)	150	µg/GJ
5231	BC - Lignit_STOVES	1.A.4.b.1	Benzo(a)	250	µg/GJ
5231	BC - Lignit_STOVES	1.A.4.b.1	Indeno	120	µg/GJ
5231	BC - Lignit_STOVES	1.A.4.b.1	SO2	2469.14	g/GJ
5231	BC - Lignit_STOVES	1.A.4.b.1	NOX	100	g/GJ
5231	BC - Lignit_STOVES	1.A.4.b.1	NH3	0.3	g/GJ
5231	BC - Lignit_STOVES	1.A.4.b.1	NMVOC	600	g/GJ
5231	BC - Lignit_STOVES	1.A.4.b.1	CO	5000	g/GJ
5231	BC - Lignit_STOVES	1.A.4.b.1	TSP	500	g/GJ
5231	BC - Lignit_STOVES	1.A.4.b.1	PM25	450	g/GJ
5231	BC - Lignit_STOVES	1.A.4.b.1	PM10	450	g/GJ
5231	BC - Lignit_STOVES	1.A.4.b.1	BC	28.8	g/GJ
5231	BC - Lignit_STOVES	1.A.4.b.1	PCBs	170	µg/GJ
5231	BC - Lignit_STOVES	1.A.4.b.1	HCB	0.62	µg/GJ
5231	BC - Lignit_STOVES	1.A.4.b.1	As	1.5	mg/GJ
5231	BC - Lignit_STOVES	1.A.4.b.1	Cd	1	mg/GJ
5231	BC - Lignit_STOVES	1.A.4.b.1	Cr	10	mg/GJ
5231	BC - Lignit_STOVES	1.A.4.b.1	Cu	20	mg/GJ
5231	BC - Lignit_STOVES	1.A.4.b.1	Hg	5	mg/GJ
5231	BC - Lignit_STOVES	1.A.4.b.1	Ni	10	mg/GJ
5235	BC - Lignit_SHB	1.A.4.b.1	Pb	200	mg/GJ
5235	BC - Lignit_SHB	1.A.4.b.1	Se	2	mg/GJ
5235	BC - Lignit_SHB	1.A.4.b.1	Zn	300	mg/GJ
5240	Gaseous fuels	1.A.2.f.1	Pb	0.011	mg/GJ
5240	Gaseous fuels	1.A.2.a	Pb	0.011	mg/GJ
5240	Gaseous fuels	1.A.2.b	Pb	0.011	mg/GJ
5240	Gaseous fuels	1.A.2.c	Pb	0.011	mg/GJ
5240	Gaseous fuels	1.A.2.d	Pb	0.011	mg/GJ
5240	Gaseous fuels	1.A.2.e	Pb	0.011	mg/GJ
5240	Gaseous fuels	1.A.2.f.1	Se	0.058	mg/GJ

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5240	Gaseous fuels	1.A.2.a	Se	0.058	mg/GJ
5240	Gaseous fuels	1.A.2.b	Se	0.058	mg/GJ
5240	Gaseous fuels	1.A.2.c	Se	0.058	mg/GJ
5240	Gaseous fuels	1.A.2.d	Se	0.058	mg/GJ
5240	Gaseous fuels	1.A.2.e	Se	0.058	mg/GJ
5240	Gaseous fuels	1.A.2.f.1	Zn	0.73	mg/GJ
5240	Gaseous fuels	1.A.2.a	Zn	0.73	mg/GJ
5240	Gaseous fuels	1.A.2.b	Zn	0.73	mg/GJ
5240	Gaseous fuels	1.A.2.c	Zn	0.73	mg/GJ
5240	Gaseous fuels	1.A.2.d	Zn	0.73	mg/GJ
5240	Gaseous fuels	1.A.2.e	Zn	0.73	mg/GJ
5240	Gaseous fuels	1.A.2.f.1	DIOX	0.52	ng/GJ
5240	Gaseous fuels	1.A.2.a	DIOX	0.52	ng/GJ
5240	Gaseous fuels	1.A.2.b	DIOX	0.52	ng/GJ
5240	Gaseous fuels	1.A.2.c	DIOX	0.52	ng/GJ
5240	Gaseous fuels	1.A.2.d	DIOX	0.52	ng/GJ
5240	Gaseous fuels	1.A.2.e	DIOX	0.52	ng/GJ
5240	Gaseous fuels	1.A.2.f.1	Benzo(b)	2.9	µg/GJ
5240	Gaseous fuels	1.A.2.a	Benzo(b)	2.9	µg/GJ
5240	Gaseous fuels	1.A.2.b	Benzo(b)	2.9	µg/GJ
5240	Gaseous fuels	1.A.2.c	Benzo(b)	2.9	µg/GJ
5240	Gaseous fuels	1.A.2.d	Benzo(b)	2.9	µg/GJ
5240	Gaseous fuels	1.A.2.e	Benzo(b)	2.9	µg/GJ
5240	Gaseous fuels	1.A.2.f.1	Benzo(k)	1.1	µg/GJ
5240	Gaseous fuels	1.A.2.a	Benzo(k)	1.1	µg/GJ
5240	Gaseous fuels	1.A.2.b	Benzo(k)	1.1	µg/GJ
5240	Gaseous fuels	1.A.2.c	Benzo(k)	1.1	µg/GJ
5240	Gaseous fuels	1.A.2.d	Benzo(k)	1.1	µg/GJ
5240	Gaseous fuels	1.A.2.e	Benzo(k)	1.1	µg/GJ
5235	BC - Lignit_SHB	1.A.4.b.1	DIOX	500	ng/GJ
5235	BC - Lignit_SHB	1.A.4.b.1	Benzo(b)	250	µg/GJ
5235	BC - Lignit_SHB	1.A.4.b.1	Benzo(k)	100	µg/GJ
5235	BC - Lignit_SHB	1.A.4.b.1	Benzo(a)	270	µg/GJ
5235	BC - Lignit_SHB	1.A.4.b.1	Indeno	90	µg/GJ
5235	BC - Lignit_SHB	1.A.4.b.1	SO2	2469.14	g/GJ
5235	BC - Lignit_SHB	1.A.4.b.1	NOX	158	g/GJ
5235	BC - Lignit_SHB	1.A.4.b.1	NH3	0.3	g/GJ
5235	BC - Lignit_SHB	1.A.4.b.1	NMVOC	174	g/GJ
5235	BC - Lignit_SHB	1.A.4.b.1	CO	4787	g/GJ
5235	BC - Lignit_SHB	1.A.4.b.1	TSP	261	g/GJ
5235	BC - Lignit_SHB	1.A.4.b.1	PM25	201	g/GJ
5235	BC - Lignit_SHB	1.A.4.b.1	PM10	225	g/GJ
5235	BC - Lignit_SHB	1.A.4.b.1	BC	12.864	g/GJ
5235	BC - Lignit_SHB	1.A.4.b.1	PCBs	170	µg/GJ
5235	BC - Lignit_SHB	1.A.4.b.1	HCB	0.62	µg/GJ
5235	BC - Lignit_SHB	1.A.4.b.1	As	5	mg/GJ
5235	BC - Lignit_SHB	1.A.4.b.1	Cd	4	mg/GJ
5235	BC - Lignit_SHB	1.A.4.b.1	Cr	15	mg/GJ

Tech_ID	Naziv tehnologije	Kategorija	Polutant	Faktor emisije	Jedinica
5235	BC - Lignit_SHB	1.A.4.b.1	Cu	30	mg/GJ
5235	BC - Lignit_SHB	1.A.4.b.1	Hg	6	mg/GJ
5235	BC - Lignit_SHB	1.A.4.b.1	Ni	20	mg/GJ
5236	BC - Sub-bituminous_SHB	1.A.4.b.1	Pb	200	mg/GJ
5236	BC - Sub-bituminous_SHB	1.A.4.b.1	Se	2	mg/GJ
5236	BC - Sub-bituminous_SHB	1.A.4.b.1	Zn	300	mg/GJ
5236	BC - Sub-bituminous_SHB	1.A.4.b.1	DIOX	500	ng/GJ
5236	BC - Sub-bituminous_SHB	1.A.4.b.1	Benzo(b)	250	µg/GJ
5236	BC - Sub-bituminous_SHB	1.A.4.b.1	Benzo(k)	100	µg/GJ
5236	BC - Sub-bituminous_SHB	1.A.4.b.1	Benzo(a)	270	µg/GJ
5236	BC - Sub-bituminous_SHB	1.A.4.b.1	Indeno	90	µg/GJ
5236	BC - Sub-bituminous_SHB	1.A.4.b.1	SO2	1648.35	g/GJ
5236	BC - Sub-bituminous_SHB	1.A.4.b.1	NOX	158	g/GJ
5236	BC - Sub-bituminous_SHB	1.A.4.b.1	NH3	0.3	g/GJ
5236	BC - Sub-bituminous_SHB	1.A.4.b.1	NMVOC	174	g/GJ
5236	BC - Sub-bituminous_SHB	1.A.4.b.1	CO	4787	g/GJ
5236	BC - Sub-bituminous_SHB	1.A.4.b.1	TSP	261	g/GJ
5236	BC - Sub-bituminous_SHB	1.A.4.b.1	PM25	201	g/GJ
5236	BC - Sub-bituminous_SHB	1.A.4.b.1	PM10	225	g/GJ
5236	BC - Sub-bituminous_SHB	1.A.4.b.1	BC	12.864	g/GJ
5236	BC - Sub-bituminous_SHB	1.A.4.b.1	PCBs	170	µg/GJ
5236	BC - Sub-bituminous_SHB	1.A.4.b.1	HCB	0.62	µg/GJ
5236	BC - Sub-bituminous_SHB	1.A.4.b.1	As	5	mg/GJ
5236	BC - Sub-bituminous_SHB	1.A.4.b.1	Cd	4	mg/GJ
5236	BC - Sub-bituminous_SHB	1.A.4.b.1	Cr	15	mg/GJ
5236	BC - Sub-bituminous_SHB	1.A.4.b.1	Cu	30	mg/GJ
5236	BC - Sub-bituminous_SHB	1.A.4.b.1	Hg	6	mg/GJ
5236	BC - Sub-bituminous_SHB	1.A.4.b.1	Ni	20	mg/GJ
5237	BC - Sub-bituminous_STOVES	1.A.4.b.1	Pb	100	mg/GJ
5237	BC - Sub-bituminous_STOVES	1.A.4.b.1	Se	2	mg/GJ
5237	BC - Sub-bituminous_STOVES	1.A.4.b.1	Zn	200	mg/GJ
5237	BC - Sub-bituminous_STOVES	1.A.4.b.1	DIOX	1000	ng/GJ
5237	BC - Sub-bituminous_STOVES	1.A.4.b.1	Benzo(b)	400	µg/GJ
5237	BC - Sub-bituminous_STOVES	1.A.4.b.1	Benzo(k)	150	µg/GJ
5237	BC - Sub-bituminous_STOVES	1.A.4.b.1	Benzo(a)	250	µg/GJ
5237	BC - Sub-bituminous_STOVES	1.A.4.b.1	Indeno	120	µg/GJ
5237	BC - Sub-bituminous_STOVES	1.A.4.b.1	SO2	1648.35	g/GJ
5237	BC - Sub-bituminous_STOVES	1.A.4.b.1	NOX	100	g/GJ
5237	BC - Sub-bituminous_STOVES	1.A.4.b.1	NH3	0.3	g/GJ
5237	BC - Sub-bituminous_STOVES	1.A.4.b.1	NMVOC	600	g/GJ
5237	BC - Sub-bituminous_STOVES	1.A.4.b.1	CO	5000	g/GJ
5237	BC - Sub-bituminous_STOVES	1.A.4.b.1	TSP	500	g/GJ
5237	BC - Sub-bituminous_STOVES	1.A.4.b.1	PM25	450	g/GJ
5237	BC - Sub-bituminous_STOVES	1.A.4.b.1	PM10	450	g/GJ
5237	BC - Sub-bituminous_STOVES	1.A.4.b.1	BC	28.8	g/GJ
5237	BC - Sub-bituminous_STOVES	1.A.4.b.1	PCBs	170	µg/GJ
5237	BC - Sub-bituminous_STOVES	1.A.4.b.1	HCB	0.62	µg/GJ
5237	BC - Sub-bituminous_STOVES	1.A.4.b.1	As	1.5	mg/GJ

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5237	BC - Sub-bituminous_STOVES	1.A.4.b.1	Cd	1	mg/GJ
5237	BC - Sub-bituminous_STOVES	1.A.4.b.1	Cr	10	mg/GJ
5237	BC - Sub-bituminous_STOVES	1.A.4.b.1	Cu	20	mg/GJ
5237	BC - Sub-bituminous_STOVES	1.A.4.b.1	Hg	5	mg/GJ
5237	BC - Sub-bituminous_STOVES	1.A.4.b.1	Ni	10	mg/GJ
5240	Gaseous fuels	1.A.2.f.1	Benzo(a)	0.72	µg/GJ
5240	Gaseous fuels	1.A.2.a	Benzo(a)	0.72	µg/GJ
5240	Gaseous fuels	1.A.2.b	Benzo(a)	0.72	µg/GJ
5240	Gaseous fuels	1.A.2.c	Benzo(a)	0.72	µg/GJ
5240	Gaseous fuels	1.A.2.d	Benzo(a)	0.72	µg/GJ
5240	Gaseous fuels	1.A.2.e	Benzo(a)	0.72	µg/GJ
5240	Gaseous fuels	1.A.2.f.1	Indeno	1.08	µg/GJ
5240	Gaseous fuels	1.A.2.a	Indeno	1.08	µg/GJ
5240	Gaseous fuels	1.A.2.b	Indeno	1.08	µg/GJ
5240	Gaseous fuels	1.A.2.c	Indeno	1.08	µg/GJ
5240	Gaseous fuels	1.A.2.d	Indeno	1.08	µg/GJ
5240	Gaseous fuels	1.A.2.e	Indeno	1.08	µg/GJ
5240	Gaseous fuels	1.A.2.f.1	SO2	0.67	g/GJ
5240	Gaseous fuels	1.A.2.a	SO2	0.67	g/GJ
5240	Gaseous fuels	1.A.2.b	SO2	0.67	g/GJ
5240	Gaseous fuels	1.A.2.c	SO2	0.67	g/GJ
5240	Gaseous fuels	1.A.2.d	SO2	0.67	g/GJ
5240	Gaseous fuels	1.A.2.e	SO2	0.67	g/GJ
5240	Gaseous fuels	1.A.2.f.1	NOX	74	g/GJ
5240	Gaseous fuels	1.A.2.a	NOX	74	g/GJ
5240	Gaseous fuels	1.A.2.b	NOX	74	g/GJ
5240	Gaseous fuels	1.A.2.c	NOX	74	g/GJ
5240	Gaseous fuels	1.A.2.d	NOX	74	g/GJ
5240	Gaseous fuels	1.A.2.e	NOX	74	g/GJ
5240	Gaseous fuels	1.A.2.f.1	NMVOC	23	g/GJ
5240	Gaseous fuels	1.A.2.a	NMVOC	23	g/GJ
5240	Gaseous fuels	1.A.2.b	NMVOC	23	g/GJ
5240	Gaseous fuels	1.A.2.c	NMVOC	23	g/GJ
5240	Gaseous fuels	1.A.2.d	NMVOC	23	g/GJ
5240	Gaseous fuels	1.A.2.e	NMVOC	23	g/GJ
5240	Gaseous fuels	1.A.2.f.1	CO	29	g/GJ
5240	Gaseous fuels	1.A.2.a	CO	29	g/GJ
5240	Gaseous fuels	1.A.2.b	CO	29	g/GJ
5240	Gaseous fuels	1.A.2.c	CO	29	g/GJ
5240	Gaseous fuels	1.A.2.d	CO	29	g/GJ
5240	Gaseous fuels	1.A.2.e	CO	29	g/GJ
5240	Gaseous fuels	1.A.2.f.1	TSP	0.78	g/GJ
5240	Gaseous fuels	1.A.2.a	TSP	0.78	g/GJ
5240	Gaseous fuels	1.A.2.b	TSP	0.78	g/GJ
5240	Gaseous fuels	1.A.2.c	TSP	0.78	g/GJ
5240	Gaseous fuels	1.A.2.d	TSP	0.78	g/GJ
5240	Gaseous fuels	1.A.2.e	TSP	0.78	g/GJ
5240	Gaseous fuels	1.A.2.f.1	PM25	0.78	g/GJ

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5240	Gaseous fuels	1.A.2.a	PM25	0.78	g/GJ
5240	Gaseous fuels	1.A.2.b	PM25	0.78	g/GJ
5240	Gaseous fuels	1.A.2.c	PM25	0.78	g/GJ
5240	Gaseous fuels	1.A.2.d	PM25	0.78	g/GJ
5240	Gaseous fuels	1.A.2.e	PM25	0.78	g/GJ
5240	Gaseous fuels	1.A.2.f.1	PM10	0.78	g/GJ
5240	Gaseous fuels	1.A.2.a	PM10	0.78	g/GJ
5240	Gaseous fuels	1.A.2.b	PM10	0.78	g/GJ
5240	Gaseous fuels	1.A.2.c	PM10	0.78	g/GJ
5240	Gaseous fuels	1.A.2.d	PM10	0.78	g/GJ
5240	Gaseous fuels	1.A.2.e	PM10	0.78	g/GJ
5240	Gaseous fuels	1.A.2.f.1	BC	0.0312	g/GJ
5240	Gaseous fuels	1.A.2.a	BC	0.0312	g/GJ
5240	Gaseous fuels	1.A.2.b	BC	0.0312	g/GJ
5240	Gaseous fuels	1.A.2.c	BC	0.0312	g/GJ
5240	Gaseous fuels	1.A.2.d	BC	0.0312	g/GJ
5240	Gaseous fuels	1.A.2.e	BC	0.0312	g/GJ
5240	Gaseous fuels	1.A.2.f.1	As	0.1	mg/GJ
5240	Gaseous fuels	1.A.2.a	As	0.1	mg/GJ
5240	Gaseous fuels	1.A.2.b	As	0.1	mg/GJ
5240	Gaseous fuels	1.A.2.c	As	0.1	mg/GJ
5240	Gaseous fuels	1.A.2.d	As	0.1	mg/GJ
5240	Gaseous fuels	1.A.2.e	As	0.1	mg/GJ
5240	Gaseous fuels	1.A.2.f.1	Cd	0.0009	mg/GJ
5240	Gaseous fuels	1.A.2.a	Cd	0.0009	mg/GJ
5240	Gaseous fuels	1.A.2.b	Cd	0.0009	mg/GJ
5240	Gaseous fuels	1.A.2.c	Cd	0.0009	mg/GJ
5240	Gaseous fuels	1.A.2.d	Cd	0.0009	mg/GJ
5240	Gaseous fuels	1.A.2.e	Cd	0.0009	mg/GJ
5240	Gaseous fuels	1.A.2.f.1	Cr	0.013	mg/GJ
5240	Gaseous fuels	1.A.2.a	Cr	0.013	mg/GJ
5240	Gaseous fuels	1.A.2.b	Cr	0.013	mg/GJ
5240	Gaseous fuels	1.A.2.c	Cr	0.013	mg/GJ
5240	Gaseous fuels	1.A.2.d	Cr	0.013	mg/GJ
5240	Gaseous fuels	1.A.2.e	Cr	0.013	mg/GJ
5240	Gaseous fuels	1.A.2.f.1	Cu	0.0026	mg/GJ
5240	Gaseous fuels	1.A.2.a	Cu	0.0026	mg/GJ
5240	Gaseous fuels	1.A.2.b	Cu	0.0026	mg/GJ
5240	Gaseous fuels	1.A.2.c	Cu	0.0026	mg/GJ
5240	Gaseous fuels	1.A.2.d	Cu	0.0026	mg/GJ
5240	Gaseous fuels	1.A.2.e	Cu	0.0026	mg/GJ
5240	Gaseous fuels	1.A.2.f.1	Hg	0.54	mg/GJ
5240	Gaseous fuels	1.A.2.a	Hg	0.54	mg/GJ
5240	Gaseous fuels	1.A.2.b	Hg	0.54	mg/GJ
5240	Gaseous fuels	1.A.2.c	Hg	0.54	mg/GJ
5240	Gaseous fuels	1.A.2.d	Hg	0.54	mg/GJ
5240	Gaseous fuels	1.A.2.e	Hg	0.54	mg/GJ
5240	Gaseous fuels	1.A.2.f.1	Ni	0.013	mg/GJ

Tech_ID	Naziv tehnologije	Kategorija	Polutant	Faktor emisije	Jedinica
5240	Gaseous fuels	1.A.2.a	Ni	0.013	mg/GJ
5240	Gaseous fuels	1.A.2.b	Ni	0.013	mg/GJ
5240	Gaseous fuels	1.A.2.c	Ni	0.013	mg/GJ
5240	Gaseous fuels	1.A.2.d	Ni	0.013	mg/GJ
5240	Gaseous fuels	1.A.2.e	Ni	0.013	mg/GJ
5287	Biomass	1.A.2.f.1	PM25	140	g/GJ
5287	Biomass	1.A.2.a	PM25	140	g/GJ
5287	Biomass	1.A.2.b	PM25	140	g/GJ
5287	Biomass	1.A.2.c	PM25	140	g/GJ
5287	Biomass	1.A.2.d	PM25	140	g/GJ
5287	Biomass	1.A.2.e	PM25	140	g/GJ
5287	Biomass	1.A.2.f.1	PM10	143	g/GJ
5287	Biomass	1.A.2.a	PM10	143	g/GJ
5287	Biomass	1.A.2.b	PM10	143	g/GJ
5287	Biomass	1.A.2.c	PM10	143	g/GJ
5287	Biomass	1.A.2.d	PM10	143	g/GJ
5287	Biomass	1.A.2.e	PM10	143	g/GJ
5287	Biomass	1.A.2.f.1	BC	39.2	g/GJ
5287	Biomass	1.A.2.a	BC	39.2	g/GJ
5287	Biomass	1.A.2.b	BC	39.2	g/GJ
5287	Biomass	1.A.2.c	BC	39.2	g/GJ
5287	Biomass	1.A.2.d	BC	39.2	g/GJ
5287	Biomass	1.A.2.e	BC	39.2	g/GJ
5287	Biomass	1.A.2.f.1	PCBs	0.06	µg/GJ
5287	Biomass	1.A.2.a	PCBs	0.06	µg/GJ
5287	Biomass	1.A.2.b	PCBs	0.06	µg/GJ
5287	Biomass	1.A.2.c	PCBs	0.06	µg/GJ
5287	Biomass	1.A.2.d	PCBs	0.06	µg/GJ
5287	Biomass	1.A.2.e	PCBs	0.06	µg/GJ
5287	Biomass	1.A.2.f.1	HCB	5	µg/GJ
5287	Biomass	1.A.2.a	HCB	5	µg/GJ
5287	Biomass	1.A.2.b	HCB	5	µg/GJ
5287	Biomass	1.A.2.c	HCB	5	µg/GJ
5287	Biomass	1.A.2.d	HCB	5	µg/GJ
5287	Biomass	1.A.2.e	HCB	5	µg/GJ
5287	Biomass	1.A.2.f.1	As	0.19	mg/GJ
5287	Biomass	1.A.2.a	As	0.19	mg/GJ
5287	Biomass	1.A.2.b	As	0.19	mg/GJ
5287	Biomass	1.A.2.c	As	0.19	mg/GJ
5287	Biomass	1.A.2.d	As	0.19	mg/GJ
5287	Biomass	1.A.2.e	As	0.19	mg/GJ
5287	Biomass	1.A.2.f.1	Cd	13	mg/GJ
5287	Biomass	1.A.2.a	Cd	13	mg/GJ
5287	Biomass	1.A.2.b	Cd	13	mg/GJ
5287	Biomass	1.A.2.c	Cd	13	mg/GJ
5287	Biomass	1.A.2.d	Cd	13	mg/GJ
5287	Biomass	1.A.2.e	Cd	13	mg/GJ
5287	Biomass	1.A.2.f.1	Cr	23	mg/GJ

Tech_ID	Naziv tehnologije	Kategorija	Polutant	Faktor emisije	Jedinica
5287	Biomass	1.A.2.a	Cr	23	mg/GJ
5287	Biomass	1.A.2.b	Cr	23	mg/GJ
5287	Biomass	1.A.2.c	Cr	23	mg/GJ
5287	Biomass	1.A.2.d	Cr	23	mg/GJ
5287	Biomass	1.A.2.e	Cr	23	mg/GJ
5287	Biomass	1.A.2.f.1	Cu	6	mg/GJ
5287	Biomass	1.A.2.a	Cu	6	mg/GJ
5287	Biomass	1.A.2.b	Cu	6	mg/GJ
5287	Biomass	1.A.2.c	Cu	6	mg/GJ
5287	Biomass	1.A.2.d	Cu	6	mg/GJ
5287	Biomass	1.A.2.e	Cu	6	mg/GJ
5287	Biomass	1.A.2.f.1	Hg	0.56	mg/GJ
5287	Biomass	1.A.2.a	Hg	0.56	mg/GJ
5287	Biomass	1.A.2.b	Hg	0.56	mg/GJ
5287	Biomass	1.A.2.c	Hg	0.56	mg/GJ
5287	Biomass	1.A.2.d	Hg	0.56	mg/GJ
5287	Biomass	1.A.2.e	Hg	0.56	mg/GJ
5287	Biomass	1.A.2.f.1	Ni	2	mg/GJ
5287	Biomass	1.A.2.a	Ni	2	mg/GJ
5287	Biomass	1.A.2.b	Ni	2	mg/GJ
5287	Biomass	1.A.2.c	Ni	2	mg/GJ
5287	Biomass	1.A.2.d	Ni	2	mg/GJ
5287	Biomass	1.A.2.e	Ni	2	mg/GJ
5288	Solid fuels (coals)	1.A.2.f.1	PM25	108	g/GJ
5288	Solid fuels (coals)	1.A.2.a	PM25	108	g/GJ
5288	Solid fuels (coals)	1.A.2.e	PM25	108	g/GJ
5288	Solid fuels (coals)	1.A.2.c	PM25	108	g/GJ
5288	Solid fuels (coals)	1.A.2.f.1	PM10	117	g/GJ
5288	Solid fuels (coals)	1.A.2.a	PM10	117	g/GJ
5288	Solid fuels (coals)	1.A.2.e	PM10	117	g/GJ
5288	Solid fuels (coals)	1.A.2.c	PM10	117	g/GJ
5288	Solid fuels (coals)	1.A.2.f.1	BC	6.912	g/GJ
5288	Solid fuels (coals)	1.A.2.a	BC	6.912	g/GJ
5288	Solid fuels (coals)	1.A.2.e	BC	6.912	g/GJ
5288	Solid fuels (coals)	1.A.2.c	BC	6.912	g/GJ
5288	Solid fuels (coals)	1.A.2.f.1	PCBs	170	µg/GJ
5288	Solid fuels (coals)	1.A.2.a	PCBs	170	µg/GJ
5288	Solid fuels (coals)	1.A.2.e	PCBs	170	µg/GJ
5288	Solid fuels (coals)	1.A.2.c	PCBs	170	µg/GJ
5288	Solid fuels (coals)	1.A.2.f.1	HCB	0.62	µg/GJ
5288	Solid fuels (coals)	1.A.2.a	HCB	0.62	µg/GJ
5288	Solid fuels (coals)	1.A.2.e	HCB	0.62	µg/GJ
5288	Solid fuels (coals)	1.A.2.c	HCB	0.62	µg/GJ
5288	Solid fuels (coals)	1.A.2.f.1	As	4	mg/GJ
5288	Solid fuels (coals)	1.A.2.a	As	4	mg/GJ
5288	Solid fuels (coals)	1.A.2.e	As	4	mg/GJ
5288	Solid fuels (coals)	1.A.2.c	As	4	mg/GJ
5288	Solid fuels (coals)	1.A.2.f.1	Cd	1.8	mg/GJ

Tech_ID	Naziv tehnologije	Kategorija	Polutant	Faktor emisije	Jedinica
5288	Solid fuels (coals)	1.A.2.a	Cd	1.8	mg/GJ
5288	Solid fuels (coals)	1.A.2.e	Cd	1.8	mg/GJ
5288	Solid fuels (coals)	1.A.2.c	Cd	1.8	mg/GJ
5288	Solid fuels (coals)	1.A.2.f.1	Cr	13.5	mg/GJ
5288	Solid fuels (coals)	1.A.2.a	Cr	13.5	mg/GJ
5288	Solid fuels (coals)	1.A.2.e	Cr	13.5	mg/GJ
5288	Solid fuels (coals)	1.A.2.c	Cr	13.5	mg/GJ
5288	Solid fuels (coals)	1.A.2.f.1	Cu	17.5	mg/GJ
5288	Solid fuels (coals)	1.A.2.a	Cu	17.5	mg/GJ
5288	Solid fuels (coals)	1.A.2.e	Cu	17.5	mg/GJ
5288	Solid fuels (coals)	1.A.2.c	Cu	17.5	mg/GJ
5288	Solid fuels (coals)	1.A.2.f.1	Hg	0.56	mg/GJ
5288	Solid fuels (coals)	1.A.2.a	Hg	0.56	mg/GJ
5288	Solid fuels (coals)	1.A.2.e	Hg	0.56	mg/GJ
5288	Solid fuels (coals)	1.A.2.c	Hg	0.56	mg/GJ
5288	Solid fuels (coals)	1.A.2.f.1	Ni	13	mg/GJ
5288	Solid fuels (coals)	1.A.2.a	Ni	13	mg/GJ
5288	Solid fuels (coals)	1.A.2.e	Ni	13	mg/GJ
5288	Solid fuels (coals)	1.A.2.c	Ni	13	mg/GJ
5288	Solid fuels (coals)	1.A.2.f.1	Pb	27	mg/GJ
5288	Solid fuels (coals)	1.A.2.a	Pb	27	mg/GJ
5288	Solid fuels (coals)	1.A.2.e	Pb	27	mg/GJ
5288	Solid fuels (coals)	1.A.2.c	Pb	27	mg/GJ
5288	Solid fuels (coals)	1.A.2.f.1	Se	1.8	mg/GJ
5288	Solid fuels (coals)	1.A.2.a	Se	1.8	mg/GJ
5288	Solid fuels (coals)	1.A.2.e	Se	1.8	mg/GJ
5288	Solid fuels (coals)	1.A.2.c	Se	1.8	mg/GJ
5288	Solid fuels (coals)	1.A.2.f.1	Zn	200	mg/GJ
5288	Solid fuels (coals)	1.A.2.a	Zn	200	mg/GJ
5288	Solid fuels (coals)	1.A.2.e	Zn	200	mg/GJ
5288	Solid fuels (coals)	1.A.2.c	Zn	200	mg/GJ
5288	Solid fuels (coals)	1.A.2.f.1	DIOX	203	ng/GJ
5288	Solid fuels (coals)	1.A.2.a	DIOX	203	ng/GJ
5288	Solid fuels (coals)	1.A.2.e	DIOX	203	ng/GJ
5288	Solid fuels (coals)	1.A.2.c	DIOX	203	ng/GJ
5288	Solid fuels (coals)	1.A.2.f.1	Benzo(b)	58.9	µg/GJ
5288	Solid fuels (coals)	1.A.2.a	Benzo(b)	58.9	µg/GJ
5288	Solid fuels (coals)	1.A.2.e	Benzo(b)	58.9	µg/GJ
5288	Solid fuels (coals)	1.A.2.c	Benzo(b)	58.9	µg/GJ
5288	Solid fuels (coals)	1.A.2.f.1	Benzo(k)	23.7	µg/GJ
5288	Solid fuels (coals)	1.A.2.a	Benzo(k)	23.7	µg/GJ
5288	Solid fuels (coals)	1.A.2.e	Benzo(k)	23.7	µg/GJ
5288	Solid fuels (coals)	1.A.2.c	Benzo(k)	23.7	µg/GJ
5288	Solid fuels (coals)	1.A.2.f.1	Benzo(a)	45.5	µg/GJ
5288	Solid fuels (coals)	1.A.2.a	Benzo(a)	45.5	µg/GJ
5288	Solid fuels (coals)	1.A.2.e	Benzo(a)	45.5	µg/GJ
5288	Solid fuels (coals)	1.A.2.c	Benzo(a)	45.5	µg/GJ
5288	Solid fuels (coals)	1.A.2.f.1	Indeno	18.5	µg/GJ

Tech_ID	Naziv tehnologije	Kategorija	Polutant	Faktor emisije	Jedinica
5288	Solid fuels (coals)	1.A.2.a	Indeno	18.5	µg/GJ
5288	Solid fuels (coals)	1.A.2.e	Indeno	18.5	µg/GJ
5288	Solid fuels (coals)	1.A.2.c	Indeno	18.5	µg/GJ
5288	Solid fuels (coals)	1.A.2.f.1	SO2	900	g/GJ
5288	Solid fuels (coals)	1.A.2.a	SO2	900	g/GJ
5288	Solid fuels (coals)	1.A.2.e	SO2	900	g/GJ
5288	Solid fuels (coals)	1.A.2.c	SO2	900	g/GJ
5288	Solid fuels (coals)	1.A.2.f.1	NOX	173	g/GJ
5288	Solid fuels (coals)	1.A.2.a	NOX	173	g/GJ
5288	Solid fuels (coals)	1.A.2.e	NOX	173	g/GJ
5288	Solid fuels (coals)	1.A.2.c	NOX	173	g/GJ
5288	Solid fuels (coals)	1.A.2.f.1	NMVOC	88.8	g/GJ
5288	Solid fuels (coals)	1.A.2.a	NMVOC	88.8	g/GJ
5288	Solid fuels (coals)	1.A.2.e	NMVOC	88.8	g/GJ
5288	Solid fuels (coals)	1.A.2.c	NMVOC	88.8	g/GJ
5288	Solid fuels (coals)	1.A.2.f.1	CO	931	g/GJ
5288	Solid fuels (coals)	1.A.2.a	CO	931	g/GJ
5288	Solid fuels (coals)	1.A.2.e	CO	931	g/GJ
5288	Solid fuels (coals)	1.A.2.c	CO	931	g/GJ
5288	Solid fuels (coals)	1.A.2.f.1	TSP	124	g/GJ
5288	Solid fuels (coals)	1.A.2.a	TSP	124	g/GJ
5288	Solid fuels (coals)	1.A.2.e	TSP	124	g/GJ
5288	Solid fuels (coals)	1.A.2.c	TSP	124	g/GJ
5289	Petroleum coke	1.A.2.f.1	Pb	0.08	mg/GJ
5289	Petroleum coke	1.A.2.a	Pb	0.08	mg/GJ
5289	Petroleum coke	1.A.2.c	Pb	0.08	mg/GJ
5289	Petroleum coke	1.A.2.f.1	Se	0.11	mg/GJ
5289	Petroleum coke	1.A.2.a	Se	0.11	mg/GJ
5289	Petroleum coke	1.A.2.c	Se	0.11	mg/GJ
5289	Petroleum coke	1.A.2.f.1	Zn	29	mg/GJ
5289	Petroleum coke	1.A.2.a	Zn	29	mg/GJ
5289	Petroleum coke	1.A.2.c	Zn	29	mg/GJ
5289	Petroleum coke	1.A.2.f.1	DIOX	1.4	ng/GJ
5289	Petroleum coke	1.A.2.a	DIOX	1.4	ng/GJ
5289	Petroleum coke	1.A.2.c	DIOX	1.4	ng/GJ
5289	Petroleum coke	1.A.2.f.1	Benzo(b)	15	µg/GJ
5289	Petroleum coke	1.A.2.a	Benzo(b)	15	µg/GJ
5289	Petroleum coke	1.A.2.c	Benzo(b)	15	µg/GJ
5289	Petroleum coke	1.A.2.f.1	Benzo(k)	1.7	µg/GJ
5289	Petroleum coke	1.A.2.a	Benzo(k)	1.7	µg/GJ
5289	Petroleum coke	1.A.2.c	Benzo(k)	1.7	µg/GJ
5289	Petroleum coke	1.A.2.f.1	Benzo(a)	1.9	µg/GJ
5289	Petroleum coke	1.A.2.a	Benzo(a)	1.9	µg/GJ
5289	Petroleum coke	1.A.2.c	Benzo(a)	1.9	µg/GJ
5289	Petroleum coke	1.A.2.f.1	Indeno	1.5	µg/GJ
5289	Petroleum coke	1.A.2.a	Indeno	1.5	µg/GJ
5289	Petroleum coke	1.A.2.c	Indeno	1.5	µg/GJ
5289	Petroleum coke	1.A.2.f.1	SO2	47	g/GJ

Tech_ID	Naziv tehnologije	Kategorija	Polutant	Faktor emisije	Jedinica
5289	Petroleum coke	1.A.2.a	SO2	47	g/GJ
5289	Petroleum coke	1.A.2.c	SO2	47	g/GJ
5289	Petroleum coke	1.A.2.f.1	NOX	513	g/GJ
5289	Petroleum coke	1.A.2.a	NOX	513	g/GJ
5289	Petroleum coke	1.A.2.c	NOX	513	g/GJ
5289	Petroleum coke	1.A.2.f.1	NMVOC	25	g/GJ
5289	Petroleum coke	1.A.2.a	NMVOC	25	g/GJ
5289	Petroleum coke	1.A.2.c	NMVOC	25	g/GJ
5289	Petroleum coke	1.A.2.f.1	CO	66	g/GJ
5289	Petroleum coke	1.A.2.a	CO	66	g/GJ
5289	Petroleum coke	1.A.2.c	CO	66	g/GJ
5289	Petroleum coke	1.A.2.f.1	TSP	20	g/GJ
5289	Petroleum coke	1.A.2.a	TSP	20	g/GJ
5289	Petroleum coke	1.A.2.c	TSP	20	g/GJ
5289	Petroleum coke	1.A.2.f.1	PM25	20	g/GJ
5289	Petroleum coke	1.A.2.a	PM25	20	g/GJ
5289	Petroleum coke	1.A.2.c	PM25	20	g/GJ
5289	Petroleum coke	1.A.2.f.1	PM10	20	g/GJ
5289	Petroleum coke	1.A.2.a	PM10	20	g/GJ
5289	Petroleum coke	1.A.2.c	PM10	20	g/GJ
5289	Petroleum coke	1.A.2.f.1	BC	11.2	g/GJ
5289	Petroleum coke	1.A.2.a	BC	11.2	g/GJ
5289	Petroleum coke	1.A.2.c	BC	11.2	g/GJ
5289	Petroleum coke	1.A.2.f.1	As	0.03	mg/GJ
5289	Petroleum coke	1.A.2.a	As	0.03	mg/GJ
5289	Petroleum coke	1.A.2.c	As	0.03	mg/GJ
5289	Petroleum coke	1.A.2.f.1	Cd	0.006	mg/GJ
5289	Petroleum coke	1.A.2.a	Cd	0.006	mg/GJ
5289	Petroleum coke	1.A.2.c	Cd	0.006	mg/GJ
5289	Petroleum coke	1.A.2.f.1	Cr	0.2	mg/GJ
5289	Petroleum coke	1.A.2.a	Cr	0.2	mg/GJ
5289	Petroleum coke	1.A.2.c	Cr	0.2	mg/GJ
5289	Petroleum coke	1.A.2.f.1	Cu	0.22	mg/GJ
5289	Petroleum coke	1.A.2.a	Cu	0.22	mg/GJ
5289	Petroleum coke	1.A.2.c	Cu	0.22	mg/GJ
5289	Petroleum coke	1.A.2.f.1	Hg	0.12	mg/GJ
5289	Petroleum coke	1.A.2.a	Hg	0.12	mg/GJ
5289	Petroleum coke	1.A.2.c	Hg	0.12	mg/GJ
5289	Petroleum coke	1.A.2.f.1	Ni	0.008	mg/GJ
5289	Petroleum coke	1.A.2.a	Ni	0.008	mg/GJ
5289	Petroleum coke	1.A.2.c	Ni	0.008	mg/GJ
5290	sub-bituminous coal	1.A.4.a.1	Pb	134	mg/GJ
5290	sub-bituminous coal	1.A.4.a.1	Se	1.8	mg/GJ
5290	sub-bituminous coal	1.A.4.a.1	Zn	200	mg/GJ
5290	sub-bituminous coal	1.A.4.a.1	DIOX	203	ng/GJ
5290	sub-bituminous coal	1.A.4.a.1	Benzo(b)	58.9	µg/GJ
5290	sub-bituminous coal	1.A.4.a.1	Benzo(k)	23.7	µg/GJ
5290	sub-bituminous coal	1.A.4.a.1	Benzo(a)	45.5	µg/GJ

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5290	sub-bituminous coal	1.A.4.a.1	Indeno	18.5	µg/GJ
5290	sub-bituminous coal	1.A.4.a.1	SO2	2469.14	g/GJ
5287	Biomass	1.A.2.f.1	Pb	27	mg/GJ
5287	Biomass	1.A.2.a	Pb	27	mg/GJ
5287	Biomass	1.A.2.b	Pb	27	mg/GJ
5287	Biomass	1.A.2.c	Pb	27	mg/GJ
5287	Biomass	1.A.2.d	Pb	27	mg/GJ
5287	Biomass	1.A.2.e	Pb	27	mg/GJ
5287	Biomass	1.A.2.f.1	Se	0.5	mg/GJ
5287	Biomass	1.A.2.a	Se	0.5	mg/GJ
5287	Biomass	1.A.2.b	Se	0.5	mg/GJ
5287	Biomass	1.A.2.c	Se	0.5	mg/GJ
5287	Biomass	1.A.2.d	Se	0.5	mg/GJ
5287	Biomass	1.A.2.e	Se	0.5	mg/GJ
5287	Biomass	1.A.2.f.1	Zn	512	mg/GJ
5287	Biomass	1.A.2.a	Zn	512	mg/GJ
5287	Biomass	1.A.2.b	Zn	512	mg/GJ
5287	Biomass	1.A.2.c	Zn	512	mg/GJ
5287	Biomass	1.A.2.d	Zn	512	mg/GJ
5287	Biomass	1.A.2.e	Zn	512	mg/GJ
5287	Biomass	1.A.2.f.1	DIOX	100	ng/GJ
5287	Biomass	1.A.2.a	DIOX	100	ng/GJ
5287	Biomass	1.A.2.b	DIOX	100	ng/GJ
5287	Biomass	1.A.2.c	DIOX	100	ng/GJ
5287	Biomass	1.A.2.d	DIOX	100	ng/GJ
5287	Biomass	1.A.2.e	DIOX	100	ng/GJ
5287	Biomass	1.A.2.f.1	Benzo(b)	16	µg/GJ
5287	Biomass	1.A.2.a	Benzo(b)	16	µg/GJ
5287	Biomass	1.A.2.b	Benzo(b)	16	µg/GJ
5287	Biomass	1.A.2.c	Benzo(b)	16	µg/GJ
5287	Biomass	1.A.2.d	Benzo(b)	16	µg/GJ
5287	Biomass	1.A.2.e	Benzo(b)	16	µg/GJ
5287	Biomass	1.A.2.f.1	Benzo(k)	5	µg/GJ
5287	Biomass	1.A.2.a	Benzo(k)	5	µg/GJ
5287	Biomass	1.A.2.b	Benzo(k)	5	µg/GJ
5287	Biomass	1.A.2.c	Benzo(k)	5	µg/GJ
5287	Biomass	1.A.2.d	Benzo(k)	5	µg/GJ
5287	Biomass	1.A.2.e	Benzo(k)	5	µg/GJ
5287	Biomass	1.A.2.f.1	Benzo(a)	10	µg/GJ
5287	Biomass	1.A.2.a	Benzo(a)	10	µg/GJ
5287	Biomass	1.A.2.b	Benzo(a)	10	µg/GJ
5287	Biomass	1.A.2.c	Benzo(a)	10	µg/GJ
5287	Biomass	1.A.2.d	Benzo(a)	10	µg/GJ
5287	Biomass	1.A.2.e	Benzo(a)	10	µg/GJ
5287	Biomass	1.A.2.f.1	Indeno	4	µg/GJ
5287	Biomass	1.A.2.a	Indeno	4	µg/GJ
5287	Biomass	1.A.2.b	Indeno	4	µg/GJ
5287	Biomass	1.A.2.c	Indeno	4	µg/GJ

Tech_ID	Naziv tehnologije	Kategorija	Polutant	Faktor emisije	Jedinica
5287	Biomass	1.A.2.d	Indeno	4	µg/GJ
5287	Biomass	1.A.2.e	Indeno	4	µg/GJ
5287	Biomass	1.A.2.f.1	SO2	11	g/GJ
5287	Biomass	1.A.2.a	SO2	11	g/GJ
5287	Biomass	1.A.2.b	SO2	11	g/GJ
5287	Biomass	1.A.2.c	SO2	11	g/GJ
5287	Biomass	1.A.2.d	SO2	11	g/GJ
5287	Biomass	1.A.2.e	SO2	11	g/GJ
5287	Biomass	1.A.2.f.1	NOX	91	g/GJ
5287	Biomass	1.A.2.a	NOX	91	g/GJ
5287	Biomass	1.A.2.b	NOX	91	g/GJ
5287	Biomass	1.A.2.c	NOX	91	g/GJ
5287	Biomass	1.A.2.d	NOX	91	g/GJ
5287	Biomass	1.A.2.e	NOX	91	g/GJ
5287	Biomass	1.A.2.f.1	NH3	37	g/GJ
5287	Biomass	1.A.2.a	NH3	37	g/GJ
5287	Biomass	1.A.2.b	NH3	37	g/GJ
5287	Biomass	1.A.2.c	NH3	37	g/GJ
5287	Biomass	1.A.2.d	NH3	37	g/GJ
5287	Biomass	1.A.2.e	NH3	37	g/GJ
5287	Biomass	1.A.2.f.1	NMVOC	300	g/GJ
5287	Biomass	1.A.2.a	NMVOC	300	g/GJ
5287	Biomass	1.A.2.b	NMVOC	300	g/GJ
5287	Biomass	1.A.2.c	NMVOC	300	g/GJ
5287	Biomass	1.A.2.d	NMVOC	300	g/GJ
5287	Biomass	1.A.2.e	NMVOC	300	g/GJ
5287	Biomass	1.A.2.f.1	CO	570	g/GJ
5287	Biomass	1.A.2.a	CO	570	g/GJ
5287	Biomass	1.A.2.b	CO	570	g/GJ
5287	Biomass	1.A.2.c	CO	570	g/GJ
5287	Biomass	1.A.2.d	CO	570	g/GJ
5287	Biomass	1.A.2.e	CO	570	g/GJ
5287	Biomass	1.A.2.f.1	TSP	150	g/GJ
5287	Biomass	1.A.2.a	TSP	150	g/GJ
5287	Biomass	1.A.2.b	TSP	150	g/GJ
5287	Biomass	1.A.2.c	TSP	150	g/GJ
5287	Biomass	1.A.2.d	TSP	150	g/GJ
5287	Biomass	1.A.2.e	TSP	150	g/GJ
5290	sub-bituminous coal	1.A.4.a.1	NOX	173	g/GJ
5290	sub-bituminous coal	1.A.4.a.1	NH3	0.3	g/GJ
5290	sub-bituminous coal	1.A.4.a.1	NMVOC	88.8	g/GJ
5290	sub-bituminous coal	1.A.4.a.1	CO	931	g/GJ
5290	sub-bituminous coal	1.A.4.a.1	TSP	124	g/GJ
5290	sub-bituminous coal	1.A.4.a.1	PM25	108	g/GJ
5290	sub-bituminous coal	1.A.4.a.1	PM10	117	g/GJ
5290	sub-bituminous coal	1.A.4.a.1	BC	6.912	g/GJ
5290	sub-bituminous coal	1.A.4.a.1	PCBs	170	µg/GJ
5290	sub-bituminous coal	1.A.4.a.1	HCB	0.62	µg/GJ

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5290	sub-bituminous coal	1.A.4.a.1	As	4	mg/GJ
5290	sub-bituminous coal	1.A.4.a.1	Cd	1.8	mg/GJ
5290	sub-bituminous coal	1.A.4.a.1	Cr	13.5	mg/GJ
5290	sub-bituminous coal	1.A.4.a.1	Cu	17.5	mg/GJ
5290	sub-bituminous coal	1.A.4.a.1	Hg	7.9	mg/GJ
5290	sub-bituminous coal	1.A.4.a.1	Ni	13	mg/GJ
5291	lignit	1.A.4.a.1	Pb	134	mg/GJ
5291	lignit	1.A.4.a.1	Se	1.8	mg/GJ
5291	lignit	1.A.4.a.1	Zn	200	mg/GJ
5291	lignit	1.A.4.a.1	DIOX	203	ng/GJ
5291	lignit	1.A.4.a.1	Benzo(b)	58.9	µg/GJ
5291	lignit	1.A.4.a.1	Benzo(k)	23.7	µg/GJ
5291	lignit	1.A.4.a.1	Benzo(a)	45.5	µg/GJ
5291	lignit	1.A.4.a.1	Indeno	18.5	µg/GJ
5291	lignit	1.A.4.a.1	SO2	1648.35	g/GJ
5291	lignit	1.A.4.a.1	NOX	173	g/GJ
5291	lignit	1.A.4.a.1	NH3	0.3	g/GJ
5291	lignit	1.A.4.a.1	NMVOC	88.8	g/GJ
5291	lignit	1.A.4.a.1	CO	931	g/GJ
5291	lignit	1.A.4.a.1	TSP	124	g/GJ
5291	lignit	1.A.4.a.1	PM25	108	g/GJ
5291	lignit	1.A.4.a.1	PM10	117	g/GJ
5291	lignit	1.A.4.a.1	BC	6.912	g/GJ
5291	lignit	1.A.4.a.1	PCBs	170	µg/GJ
5291	lignit	1.A.4.a.1	HCB	0.62	µg/GJ
5291	lignit	1.A.4.a.1	As	4	mg/GJ
5291	lignit	1.A.4.a.1	Cd	1.8	mg/GJ
5291	lignit	1.A.4.a.1	Cr	13.5	mg/GJ
5291	lignit	1.A.4.a.1	Cu	17.5	mg/GJ
5291	lignit	1.A.4.a.1	Hg	7.9	mg/GJ
5291	lignit	1.A.4.a.1	Ni	13	mg/GJ
5294	gaseous fuel	1.A.1.c	Pb	0.011	mg/GJ
5294	gaseous fuel	1.A.4.a.1	Pb	0.011	mg/GJ
5294	gaseous fuel	1.A.4.a.1	Pb	0.011	mg/GJ
5294	gaseous fuel	1.A.4.c.1	Pb	0.011	mg/GJ
5294	gaseous fuel	1.A.4.c.1	Pb	0.011	mg/GJ
5294	gaseous fuel	1.A.4.a.1	Pb	0.011	mg/GJ
5294	gaseous fuel	1.A.1.a	Pb	0.011	mg/GJ
5294	gaseous fuel	1.A.4.a.1	Pb	0.011	mg/GJ
5294	gaseous fuel	1.A.4.a.1	Se	0.058	mg/GJ
5294	gaseous fuel	1.A.4.a.1	Se	0.058	mg/GJ
5294	gaseous fuel	1.A.4.c.1	Se	0.058	mg/GJ
5294	gaseous fuel	1.A.4.c.1	Se	0.058	mg/GJ
5294	gaseous fuel	1.A.4.a.1	Se	0.058	mg/GJ
5294	gaseous fuel	1.A.1.a	Se	0.058	mg/GJ
5294	gaseous fuel	1.A.4.a.1	Se	0.058	mg/GJ
5294	gaseous fuel	1.A.1.c	Se	0.058	mg/GJ
5294	gaseous fuel	1.A.4.a.1	Zn	0.73	mg/GJ

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5294	gaseous fuel	1.A.4.a.1	Zn	0.73	mg/GJ
5294	gaseous fuel	1.A.4.c.1	Zn	0.73	mg/GJ
5294	gaseous fuel	1.A.4.c.1	Zn	0.73	mg/GJ
5294	gaseous fuel	1.A.4.a.1	Zn	0.73	mg/GJ
5294	gaseous fuel	1.A.1.a	Zn	0.73	mg/GJ
5294	gaseous fuel	1.A.4.a.1	Zn	0.73	mg/GJ
5294	gaseous fuel	1.A.1.c	Zn	0.73	mg/GJ
5294	gaseous fuel	1.A.1.c	DIOX	0.52	ng/GJ
5294	gaseous fuel	1.A.4.a.1	DIOX	0.52	ng/GJ
5294	gaseous fuel	1.A.4.a.1	DIOX	0.52	ng/GJ
5294	gaseous fuel	1.A.4.c.1	DIOX	0.52	ng/GJ
5294	gaseous fuel	1.A.4.c.1	DIOX	0.52	ng/GJ
5294	gaseous fuel	1.A.4.a.1	DIOX	0.52	ng/GJ
5294	gaseous fuel	1.A.1.a	DIOX	0.52	ng/GJ
5294	gaseous fuel	1.A.4.a.1	DIOX	0.52	ng/GJ
5294	gaseous fuel	1.A.1.c	Benzo(b)	2.9	µg/GJ
5294	gaseous fuel	1.A.4.a.1	Benzo(b)	2.9	µg/GJ
5294	gaseous fuel	1.A.4.a.1	Benzo(b)	2.9	µg/GJ
5294	gaseous fuel	1.A.4.c.1	Benzo(b)	2.9	µg/GJ
5294	gaseous fuel	1.A.4.c.1	Benzo(b)	2.9	µg/GJ
5294	gaseous fuel	1.A.4.a.1	Benzo(b)	2.9	µg/GJ
5294	gaseous fuel	1.A.1.a	Benzo(b)	2.9	µg/GJ
5294	gaseous fuel	1.A.4.a.1	Benzo(b)	2.9	µg/GJ
5294	gaseous fuel	1.A.1.c	Benzo(k)	1.1	µg/GJ
5294	gaseous fuel	1.A.4.a.1	Benzo(k)	1.1	µg/GJ
5294	gaseous fuel	1.A.4.a.1	Benzo(k)	1.1	µg/GJ
5294	gaseous fuel	1.A.4.c.1	Benzo(k)	1.1	µg/GJ
5294	gaseous fuel	1.A.4.c.1	Benzo(k)	1.1	µg/GJ
5294	gaseous fuel	1.A.4.a.1	Benzo(k)	1.1	µg/GJ
5294	gaseous fuel	1.A.1.a	Benzo(k)	1.1	µg/GJ
5294	gaseous fuel	1.A.4.a.1	Benzo(k)	1.1	µg/GJ
5294	gaseous fuel	1.A.1.c	Benzo(a)	0.72	µg/GJ
5294	gaseous fuel	1.A.4.a.1	Benzo(a)	0.72	µg/GJ
5294	gaseous fuel	1.A.4.a.1	Benzo(a)	0.72	µg/GJ
5294	gaseous fuel	1.A.4.c.1	Benzo(a)	0.72	µg/GJ
5294	gaseous fuel	1.A.4.c.1	Benzo(a)	0.72	µg/GJ
5294	gaseous fuel	1.A.4.a.1	Benzo(a)	0.72	µg/GJ
5294	gaseous fuel	1.A.1.a	Benzo(a)	0.72	µg/GJ
5294	gaseous fuel	1.A.4.a.1	Benzo(a)	0.72	µg/GJ
5294	gaseous fuel	1.A.1.c	Indeno	1.08	µg/GJ
5294	gaseous fuel	1.A.4.a.1	Indeno	1.08	µg/GJ
5294	gaseous fuel	1.A.4.a.1	Indeno	1.08	µg/GJ
5294	gaseous fuel	1.A.4.c.1	Indeno	1.08	µg/GJ
5294	gaseous fuel	1.A.4.c.1	Indeno	1.08	µg/GJ
5294	gaseous fuel	1.A.4.a.1	Indeno	1.08	µg/GJ
5294	gaseous fuel	1.A.1.a	Indeno	1.08	µg/GJ
5294	gaseous fuel	1.A.4.a.1	Indeno	1.08	µg/GJ
5294	gaseous fuel	1.A.4.a.1	SO2	0.67	g/GJ

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5294	gaseous fuel	1.A.4.a.1	SO2	0.67	g/GJ
5294	gaseous fuel	1.A.4.c.1	SO2	0.67	g/GJ
5294	gaseous fuel	1.A.4.c.1	SO2	0.67	g/GJ
5294	gaseous fuel	1.A.4.a.1	SO2	0.67	g/GJ
5294	gaseous fuel	1.A.1.a	SO2	0.67	g/GJ
5294	gaseous fuel	1.A.4.a.1	SO2	0.67	g/GJ
5294	gaseous fuel	1.A.1.c	SO2	0.67	g/GJ
5294	gaseous fuel	1.A.1.a	SO2	0.67	g/GJ
5294	gaseous fuel	1.A.4.a.1	NOX	74	g/GJ
5294	gaseous fuel	1.A.4.a.1	NOX	74	g/GJ
5294	gaseous fuel	1.A.4.c.1	NOX	74	g/GJ
5294	gaseous fuel	1.A.4.c.1	NOX	74	g/GJ
5294	gaseous fuel	1.A.4.a.1	NOX	74	g/GJ
5294	gaseous fuel	1.A.1.a	NOX	74	g/GJ
5294	gaseous fuel	1.A.4.a.1	NOX	74	g/GJ
5294	gaseous fuel	1.A.1.c	NOX	74	g/GJ
5294	gaseous fuel	1.A.1.a	NOX	74	g/GJ
5294	gaseous fuel	1.A.4.a.1	NMVOC	23	g/GJ
5294	gaseous fuel	1.A.4.a.1	NMVOC	23	g/GJ
5294	gaseous fuel	1.A.4.c.1	NMVOC	23	g/GJ
5294	gaseous fuel	1.A.4.c.1	NMVOC	23	g/GJ
5294	gaseous fuel	1.A.4.a.1	NMVOC	23	g/GJ
5294	gaseous fuel	1.A.1.a	NMVOC	23	g/GJ
5294	gaseous fuel	1.A.4.a.1	NMVOC	23	g/GJ
5294	gaseous fuel	1.A.1.c	NMVOC	23	g/GJ
5294	gaseous fuel	1.A.1.a	NMVOC	23	g/GJ
5294	gaseous fuel	1.A.4.a.1	CO	29	g/GJ
5294	gaseous fuel	1.A.4.a.1	CO	29	g/GJ
5294	gaseous fuel	1.A.4.c.1	CO	29	g/GJ
5294	gaseous fuel	1.A.4.c.1	CO	29	g/GJ
5294	gaseous fuel	1.A.4.a.1	CO	29	g/GJ
5294	gaseous fuel	1.A.1.a	CO	29	g/GJ
5294	gaseous fuel	1.A.4.a.1	CO	29	g/GJ
5294	gaseous fuel	1.A.1.c	CO	29	g/GJ
5294	gaseous fuel	1.A.1.a	CO	29	g/GJ
5294	gaseous fuel	1.A.4.a.1	TSP	0.78	g/GJ
5294	gaseous fuel	1.A.4.a.1	TSP	0.78	g/GJ
5294	gaseous fuel	1.A.4.c.1	TSP	0.78	g/GJ
5294	gaseous fuel	1.A.4.c.1	TSP	0.78	g/GJ
5294	gaseous fuel	1.A.4.a.1	TSP	0.78	g/GJ
5294	gaseous fuel	1.A.1.a	TSP	0.78	g/GJ
5294	gaseous fuel	1.A.4.a.1	TSP	0.78	g/GJ
5294	gaseous fuel	1.A.1.c	TSP	0.78	g/GJ
5294	gaseous fuel	1.A.1.a	TSP	0.78	g/GJ
5294	gaseous fuel	1.A.4.a.1	PM25	0.78	g/GJ
5294	gaseous fuel	1.A.4.a.1	PM25	0.78	g/GJ
5294	gaseous fuel	1.A.4.c.1	PM25	0.78	g/GJ
5294	gaseous fuel	1.A.4.c.1	PM25	0.78	g/GJ

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5294	gaseous fuel	1.A.4.a.1	PM25	0.78	g/GJ
5294	gaseous fuel	1.A.1.a	PM25	0.78	g/GJ
5294	gaseous fuel	1.A.4.a.1	PM25	0.78	g/GJ
5294	gaseous fuel	1.A.1.c	PM25	0.78	g/GJ
5294	gaseous fuel	1.A.1.a	PM25	0.78	g/GJ
5294	gaseous fuel	1.A.4.a.1	PM10	0.78	g/GJ
5294	gaseous fuel	1.A.4.a.1	PM10	0.78	g/GJ
5294	gaseous fuel	1.A.4.c.1	PM10	0.78	g/GJ
5294	gaseous fuel	1.A.4.c.1	PM10	0.78	g/GJ
5294	gaseous fuel	1.A.4.a.1	PM10	0.78	g/GJ
5294	gaseous fuel	1.A.1.a	PM10	0.78	g/GJ
5294	gaseous fuel	1.A.4.a.1	PM10	0.78	g/GJ
5294	gaseous fuel	1.A.1.c	PM10	0.78	g/GJ
5294	gaseous fuel	1.A.1.a	PM10	0.78	g/GJ
5294	gaseous fuel	1.A.4.a.1	BC	0.0312	g/GJ
5294	gaseous fuel	1.A.4.a.1	BC	0.0312	g/GJ
5294	gaseous fuel	1.A.4.c.1	BC	0.0312	g/GJ
5294	gaseous fuel	1.A.4.c.1	BC	0.0312	g/GJ
5294	gaseous fuel	1.A.4.a.1	BC	0.0312	g/GJ
5294	gaseous fuel	1.A.1.a	BC	0.0312	g/GJ
5294	gaseous fuel	1.A.4.a.1	BC	0.0312	g/GJ
5294	gaseous fuel	1.A.1.c	BC	0.0312	g/GJ
5294	gaseous fuel	1.A.1.a	BC	0.0312	g/GJ
5294	gaseous fuel	1.A.1.c	As	0.1	mg/GJ
5294	gaseous fuel	1.A.4.a.1	As	0.1	mg/GJ
5294	gaseous fuel	1.A.4.a.1	As	0.1	mg/GJ
5294	gaseous fuel	1.A.4.c.1	As	0.1	mg/GJ
5294	gaseous fuel	1.A.4.c.1	As	0.1	mg/GJ
5294	gaseous fuel	1.A.4.a.1	As	0.1	mg/GJ
5294	gaseous fuel	1.A.1.a	As	0.1	mg/GJ
5294	gaseous fuel	1.A.4.a.1	As	0.1	mg/GJ
5294	gaseous fuel	1.A.1.c	Cd	0.0009	mg/GJ
5294	gaseous fuel	1.A.4.a.1	Cd	0.0009	mg/GJ
5294	gaseous fuel	1.A.4.a.1	Cd	0.0009	mg/GJ
5294	gaseous fuel	1.A.4.c.1	Cd	0.0009	mg/GJ
5294	gaseous fuel	1.A.4.c.1	Cd	0.0009	mg/GJ
5294	gaseous fuel	1.A.4.a.1	Cd	0.0009	mg/GJ
5294	gaseous fuel	1.A.1.a	Cd	0.0009	mg/GJ
5294	gaseous fuel	1.A.4.a.1	Cd	0.0009	mg/GJ
5294	gaseous fuel	1.A.1.c	Cr	0.013	mg/GJ
5294	gaseous fuel	1.A.4.a.1	Cr	0.013	mg/GJ
5294	gaseous fuel	1.A.4.a.1	Cr	0.013	mg/GJ
5294	gaseous fuel	1.A.4.c.1	Cr	0.013	mg/GJ
5294	gaseous fuel	1.A.4.c.1	Cr	0.013	mg/GJ
5294	gaseous fuel	1.A.4.a.1	Cr	0.013	mg/GJ
5294	gaseous fuel	1.A.1.a	Cr	0.013	mg/GJ
5294	gaseous fuel	1.A.4.a.1	Cr	0.013	mg/GJ
5294	gaseous fuel	1.A.1.c	Cu	0.0026	mg/GJ

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5294	gaseous fuel	1.A.4.a.1	Cu	0.0026	mg/GJ
5294	gaseous fuel	1.A.4.a.1	Cu	0.0026	mg/GJ
5294	gaseous fuel	1.A.4.c.1	Cu	0.0026	mg/GJ
5294	gaseous fuel	1.A.4.c.1	Cu	0.0026	mg/GJ
5294	gaseous fuel	1.A.4.a.1	Cu	0.0026	mg/GJ
5294	gaseous fuel	1.A.1.a	Cu	0.0026	mg/GJ
5294	gaseous fuel	1.A.4.a.1	Cu	0.0026	mg/GJ
5294	gaseous fuel	1.A.1.c	Hg	0.1	mg/GJ
5294	gaseous fuel	1.A.4.a.1	Hg	0.1	mg/GJ
5294	gaseous fuel	1.A.4.a.1	Hg	0.1	mg/GJ
5294	gaseous fuel	1.A.4.c.1	Hg	0.1	mg/GJ
5294	gaseous fuel	1.A.4.c.1	Hg	0.1	mg/GJ
5294	gaseous fuel	1.A.4.a.1	Hg	0.1	mg/GJ
5294	gaseous fuel	1.A.1.a	Hg	0.1	mg/GJ
5294	gaseous fuel	1.A.4.a.1	Hg	0.1	mg/GJ
5294	gaseous fuel	1.A.1.a	Hg	0.1	mg/GJ
5294	gaseous fuel	1.A.1.c	Ni	0.013	mg/GJ
5294	gaseous fuel	1.A.4.a.1	Ni	0.013	mg/GJ
5294	gaseous fuel	1.A.4.a.1	Ni	0.013	mg/GJ
5294	gaseous fuel	1.A.4.c.1	Ni	0.013	mg/GJ
5294	gaseous fuel	1.A.4.c.1	Ni	0.013	mg/GJ
5294	gaseous fuel	1.A.4.a.1	Ni	0.013	mg/GJ
5294	gaseous fuel	1.A.4.a.1	Ni	0.013	mg/GJ
5294	gaseous fuel	1.A.1.a	Ni	0.013	mg/GJ
5295	biomass	1.A.4.a.1	Pb	27	mg/GJ
5295	biomass	1.A.4.a.1	Se	0.5	mg/GJ
5295	biomass	1.A.4.a.1	Zn	512	mg/GJ
5295	biomass	1.A.4.a.1	DIOX	100	ng/GJ
5295	biomass	1.A.4.a.1	Benzo(b)	16	µg/GJ
5295	biomass	1.A.4.a.1	Benzo(k)	5	µg/GJ
5295	biomass	1.A.4.a.1	Benzo(a)	10	µg/GJ
5295	biomass	1.A.4.a.1	Indeno	4	µg/GJ
5295	biomass	1.A.4.a.1	SO2	11	g/GJ
5295	biomass	1.A.4.a.1	NOX	91	g/GJ
5295	biomass	1.A.4.a.1	NH3	37	g/GJ
5295	biomass	1.A.4.a.1	NMVOC	300	g/GJ
5295	biomass	1.A.4.a.1	CO	570	g/GJ
5295	biomass	1.A.4.a.1	TSP	150	g/GJ
5295	biomass	1.A.4.a.1	PM25	140	g/GJ
5295	biomass	1.A.4.a.1	PM10	143	g/GJ
5295	biomass	1.A.4.a.1	BC	39.2	g/GJ
5295	biomass	1.A.4.a.1	PCBs	0.06	µg/GJ
5295	biomass	1.A.4.a.1	HCB	5	µg/GJ
5295	biomass	1.A.4.a.1	As	0.19	mg/GJ
5295	biomass	1.A.4.a.1	Cd	13	mg/GJ
5295	biomass	1.A.4.a.1	Cr	23	mg/GJ
5295	biomass	1.A.4.a.1	Cu	6	mg/GJ
5295	biomass	1.A.4.a.1	Hg	0.56	mg/GJ

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5295	biomass	1.A.4.a.1	Ni	2	mg/GJ
5294	gaseous fuel	1.A.1.c	NH3	0.15	g/GJ
5294	gaseous fuel	1.A.4.a.1	NH3	0.15	g/GJ
5294	gaseous fuel	1.A.4.a.1	NH3	0.15	g/GJ
5294	gaseous fuel	1.A.4.c.1	NH3	0.15	g/GJ
5294	gaseous fuel	1.A.4.c.1	NH3	0.15	g/GJ
5294	gaseous fuel	1.A.4.a.1	NH3	0.15	g/GJ
5294	gaseous fuel	1.A.1.a	NH3	0.15	g/GJ
5294	gaseous fuel	1.A.4.a.1	NH3	0.15	g/GJ
5294	gaseous fuel	1.A.1.a	NH3	0.15	g/GJ
5347	Household products	3.D.2	NMVOC	16	xxx
5348	Car care product	3.D.2	NMVOC	180	xxx
5349	DIY/buildings, Paint/varnish removers and solvents	3.D.2	NMVOC	950	g/kg solvent
5350	DIY/buildings, Sealants, filling agents	3.D.2	NMVOC	45	g/kg product
5352	Cosmetics and toiletries	3.D.2	NMVOC	127	g/kg product
5353	Pharmaceutical products	3.D.2	NMVOC	48	g/caput
4846	2.G Tabacco combustion	3.D.3	BC	12.15	kg/t
4846	2.G Tabacco combustion	3.D.3	NH3	4.15	kg/t
4846	2.G Tabacco combustion	3.D.3	Indeno	0.045	g/t
5354	2.G Use of shoes	3.D.3	NMVOC	60	g/pair
5355	Various_Pesticide use incl. fungicides	3.D.2	NMVOC	150	kg/t
5356	Car dewaxing	3.D.3	NMVOC	1	kg/vehicle
5358	2.G Other: Concrete aditive	3.D.3	NMVOC	915	g/t
5359	2.G Other: Cooling lubricant	3.D.3	NMVOC	1000	g/t
5360	2.G Other: Lubricant	3.D.3	NMVOC	28000	g/t
5372	CALUCEM_abated FE	2.A.1	TSP	18.2	g/t
5372	CALUCEM_abated FE	2.A.1	PM25	78	g/t
5372	CALUCEM_abated FE	2.A.1	PM10	154.44	g/t
5372	CALUCEM_abated FE	2.A.1	BC	3.9	g/t
5410	N from fertilizers use	4.D.1.a	NOX	0.026	kg/kg fertilizer
5411	KAN	4.D.1.a	NH3	0.017145714	kg/kg fertilizer
5412	Urea Amonij nitrat	4.D.1.a	NH3	0.195645714	kg/kg fertilizer
5413	Urea	4.D.1.a	NH3	0.195645714	kg/kg fertilizer
5414	Amonij nitrat	4.D.1.a	NH3	0.032251429	kg/kg fertilizer
5415	NPK	4.D.1.a	NH3	0.094568571	kg/kg fertilizer
5128	2.A.2	2.A.2	BC	0.138	g/t
4503	Catalytic Cracking unit regenerators-Partial burn without CO boiler	1.B.2.a.4	PM25	0.24	kg/m3
4503	Catalytic Cracking unit regenerators-Partial burn without CO boiler	1.B.2.a.4	BC	0.000312	kg/m3

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4503	Catalytic Cracking unit regenerators-Partial burn without CO boiler	1.B.2.a.4	Se	0.014	g/m3
4503	Catalytic Cracking unit regenerators-Partial burn without CO boiler	1.B.2.a.4	DIOX	0.019	µg/m3
4505	Fluid coking units	1.B.2.a.4	PM25	0.33	kg/m3
4505	Fluid coking units	1.B.2.a.4	Se	0.03	g/m3
4503	Catalytic Cracking unit regenerators-Partial burn without CO boiler	1.B.2.a.4	Cr	0.33	g/m3
4503	Catalytic Cracking unit regenerators-Partial burn without CO boiler	1.B.2.a.4	Benzo(b)	1.2	mg/m3
4503	Catalytic Cracking unit regenerators-Partial burn without CO boiler	1.B.2.a.4	Benzo(k)	0.82	mg/m3
4503	Catalytic Cracking unit regenerators-Partial burn without CO boiler	1.B.2.a.4	Benzo(a)	0.71	mg/m3
4503	Catalytic Cracking unit regenerators-Partial burn without CO boiler	1.B.2.a.4	Indeno	0.62	mg/m3
4436	Ammonium phosphate production	2.B.5.a	BC	9	g/t product
5422	Formaldehid	2.B.5.a	NMVOC	7	kg/t
5422	Formaldehid	2.B.5.a	CO	12	kg/t
5425	Steelmaking, Electric Arc Furnace Steel Plant (EAF)	2.C.1.1	As	0.015	g/t
5425	Steelmaking, Electric Arc Furnace Steel Plant (EAF)	2.C.1.1	Cd	0.2	g/t
5425	Steelmaking, Electric Arc Furnace Steel Plant (EAF)	2.C.1.1	Cr	0.1	g/t
5425	Steelmaking, Electric Arc Furnace Steel Plant (EAF)	2.C.1.1	Cu	0.02	g/t
5425	Steelmaking, Electric Arc Furnace Steel Plant (EAF)	2.C.1.1	Hg	0.05	g/t
5425	Steelmaking, Electric Arc Furnace Steel Plant (EAF)	2.C.1.1	Ni	0.7	g/t
5425	Steelmaking, Electric Arc Furnace Steel Plant (EAF)	2.C.1.1	Pb	2.6	g/t
5425	Steelmaking, Electric Arc Furnace Steel Plant (EAF)	2.C.1.1	Zn	3.6	g/t
5425	Steelmaking, Electric Arc Furnace Steel Plant (EAF)	2.C.1.1	DIOX	3	µg/t
5425	Steelmaking, Electric Arc Furnace Steel Plant (EAF)	2.C.1.1	PAH	0.48	g/t
5425	Steelmaking, Electric Arc Furnace Steel Plant (EAF)	2.C.1.1	PCBs	2.5	mg/t
5425	Steelmaking, Electric Arc Furnace Steel Plant (EAF)	2.C.1.1	SO2	60	g/t
5425	Steelmaking, Electric Arc Furnace Steel Plant (EAF)	2.C.1.1	NOX	130	g/t
5425	Steelmaking, Electric Arc Furnace Steel Plant (EAF)	2.C.1.1	NMVOC	46	g/t

Tech_ID	Naziv tehnologije	Kategorija	Polutant	Faktor emisije	Jedinica
5425	Steelmaking, Electric Arc Furnace Steel Plant (EAF)	2.C.1.1	CO	1.7	kg/t
5425	Steelmaking, Electric Arc Furnace Steel Plant (EAF)	2.C.1.1	TSP	30	g/t
5425	Steelmaking, Electric Arc Furnace Steel Plant (EAF)	2.C.1.1	PM25	21	g/t
5425	Steelmaking, Electric Arc Furnace Steel Plant (EAF)	2.C.1.1	PM10	24	g/t
5425	Steelmaking, Electric Arc Furnace Steel Plant (EAF)	2.C.1.1	BC	0.0756	g/t
4507	Petroleum refining	1.A.1.b	BC	0.1638	g/GJ
5427	Petroleum coke	1.A.1.b	As	3.98	mg/GJ
5427	Petroleum coke	1.A.1.b	Cd	1.2	mg/GJ
5427	Petroleum coke	1.A.1.b	Cr	14.8	mg/GJ
5427	Petroleum coke	1.A.1.b	Cu	11.9	mg/GJ
5427	Petroleum coke	1.A.1.b	Hg	0.3	mg/GJ
5427	Petroleum coke	1.A.1.b	Ni	1030	mg/GJ
5427	Petroleum coke	1.A.1.b	Pb	4.6	mg/GJ
5427	Petroleum coke	1.A.1.b	Benzo(b)	3.7	µg/GJ
5427	Petroleum coke	1.A.1.b	Benzo(k)	0.2	µg/GJ
5427	Petroleum coke	1.A.1.b	Benzo(a)	0.6	µg/GJ
5427	Petroleum coke	1.A.1.b	Indeno	1.3	µg/GJ
5427	Petroleum coke	1.A.1.b	SO2	485	g/GJ
5427	Petroleum coke	1.A.1.b	NOX	142	g/GJ
5427	Petroleum coke	1.A.1.b	NMVOC	2.3	g/GJ
5427	Petroleum coke	1.A.1.b	CO	15	g/GJ
5427	Petroleum coke	1.A.1.b	TSP	20	g/GJ
5427	Petroleum coke	1.A.1.b	PM25	9	g/GJ
5427	Petroleum coke	1.A.1.b	PM10	15	g/GJ
5427	Petroleum coke	1.A.1.b	BC	0.504	g/GJ
5427	Petroleum coke	1.A.1.b	Se	2.1	mg/GJ
6808	High-efficiency stoves	1.A.4.b.1	Zn	512	mg/GJ
6808	High-efficiency stoves	1.A.4.b.1	DIOX	250	ng/GJ
6808	High-efficiency stoves	1.A.4.b.1	Benzo(b)	111	µg/GJ
6808	High-efficiency stoves	1.A.4.b.1	Benzo(k)	42	µg/GJ
6808	High-efficiency stoves	1.A.4.b.1	Benzo(a)	121	µg/GJ
4507	Petroleum refining	1.A.1.b	Se	0.42	mg/GJ
4507	Petroleum refining	1.A.1.b	Zn	25.5	mg/GJ
5452	Natural gas	1.A.1.b	As	0.12	mg/GJ
5452	Natural gas	1.A.1.b	Cd	0.00025	mg/GJ
5452	Natural gas	1.A.1.b	Cr	0.00076	mg/GJ
5452	Natural gas	1.A.1.b	Cu	7.60E-05	mg/GJ
5452	Natural gas	1.A.1.b	Hg	0.1	mg/GJ
5452	Natural gas	1.A.1.b	Ni	0.00051	mg/GJ
5452	Natural gas	1.A.1.b	Pb	0.0015	mg/GJ
5452	Natural gas	1.A.1.b	Benzo(b)	0.84	µg/GJ
5452	Natural gas	1.A.1.b	Benzo(k)	0.84	µg/GJ
5452	Natural gas	1.A.1.b	Benzo(a)	0.56	µg/GJ
5452	Natural gas	1.A.1.b	Indeno	0.84	µg/GJ

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5452	Natural gas	1.A.1.b	SO2	0.281	g/GJ
5452	Natural gas	1.A.1.b	NOX	89	g/GJ
5452	Natural gas	1.A.1.b	NMVOC	2.6	g/GJ
5452	Natural gas	1.A.1.b	CO	39	g/GJ
5452	Natural gas	1.A.1.b	TSP	0.89	g/GJ
5452	Natural gas	1.A.1.b	PM25	0.89	g/GJ
5452	Natural gas	1.A.1.b	PM10	0.89	g/GJ
5452	Natural gas	1.A.1.b	DIOX	0.5	ng/GJ
5452	Natural gas	1.A.1.b	Se	0.0112	mg/GJ
5452	Natural gas	1.A.1.b	Zn	0.0015	mg/GJ
5452	Natural gas	1.A.1.b	BC	0.077	g/GJ
5454	HOLCIM_abated FE	2.A.1	TSP	18.2	g/t
5454	HOLCIM_abated FE	2.A.1	PM25	78	g/t
5454	HOLCIM_abated FE	2.A.1	PM10	154.44	g/t
5454	HOLCIM_abated FE	2.A.1	BC	3.9	g/t
5455	NAŠICECEMENT_sve godine	2.A.1	TSP	18.2	g/t
5455	NAŠICECEMENT_sve godine	2.A.1	PM25	78	g/t
5455	NAŠICECEMENT_sve godine	2.A.1	PM10	154.44	g/t
5455	NAŠICECEMENT_sve godine	2.A.1	BC	3.9	g/t
5456	CEMEX_sve godine	2.A.1	TSP	18.2	g/t
5456	CEMEX_sve godine	2.A.1	PM25	78	g/t
5456	CEMEX_sve godine	2.A.1	PM10	154.44	g/t
5456	CEMEX_sve godine	2.A.1	BC	3.9	g/t
6441	Horses,mules and asses - housing	4.D.1.b	NH3	2.075130345	kg/animal
6441	Horses,mules and asses - housing	4.D.1.b	NH3	2.075130345	kg/animal
6442	Sewage sludge applied to soil - faktor za stvarni mulj	4.D.4	NH3	0.13	kg/kg product
6442	Sewage sludge applied to soil - faktor za stvarni mulj	4.D.4	NOX	0.04	kg/kg product
6443	Mules and asses grazing	4.D.2.c	NH3	5.37795	kg/animal
6443	Mules and asses grazing	4.D.2.c	NOX	2.771828571	kg/animal
6460	Sheep- grazing	4.D.2.c	NH3	0.3946635	kg/animal
6808	High-efficiency stoves	1.A.4.b.1	Indeno	71	µg/GJ
6808	High-efficiency stoves	1.A.4.b.1	SO2	11	g/GJ
6587	Geese	4.D.1.b	NH3	0.136842542	kg/animal
6959	1.A.3.a_kerosene_LTO2_2018	1.A.3.a.1.1	Cu	0.22	mg/GJ
6959	1.A.3.a_kerosene_LTO2_2018	1.A.3.a.1.1	Ni	0.008	mg/GJ
6959	1.A.3.a_kerosene_LTO2_2018	1.A.3.a.1.1	Pb	0.08	mg/GJ
6959	1.A.3.a_kerosene_LTO2_2018	1.A.3.a.1.1	Se	0.11	mg/GJ
6959	1.A.3.a_kerosene_LTO2_2018	1.A.3.a.1.1	Zn	29	mg/GJ
6959	1.A.3.a_kerosene_LTO2_2018	1.A.3.a.1.1	Benzo(b)	15	µg/GJ
6959	1.A.3.a_kerosene_LTO2_2018	1.A.3.a.1.1	BC	0.93	g/GJ
6959	1.A.3.a_kerosene_LTO2_2018	1.A.3.a.1.1	Benzo(a)	1.9	µg/GJ
6959	1.A.3.a_kerosene_LTO2_2018	1.A.3.a.1.1	SO2	10.99217704	g/GJ
6959	1.A.3.a_kerosene_LTO2_2018	1.A.3.a.1.1	NOX	228.86	g/GJ
6959	1.A.3.a_kerosene_LTO2_2018	1.A.3.a.1.1	NMVOC	13.79	g/GJ
6959	1.A.3.a_kerosene_LTO2_2018	1.A.3.a.1.1	CO	325.36	g/GJ

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6959	1.A.3.a_kerosene_LTO2_2018	1.A.3.a.1.1	TSP	1.93	g/GJ
6960	1.A.3.a_gasoline_2018	1.A.3.a.2.1	Cu	60.555	mg/GJ
6960	1.A.3.a_gasoline_2018	1.A.3.a.2.1	Ni	0.77	mg/GJ
6960	1.A.3.a_gasoline_2018	1.A.3.a.2.1	Pb	6140.899	mg/GJ
6960	1.A.3.a_gasoline_2018	1.A.3.a.2.1	Se	0.072	mg/GJ
6960	1.A.3.a_gasoline_2018	1.A.3.a.2.1	Zn	71.602	mg/GJ
6960	1.A.3.a_gasoline_2018	1.A.3.a.2.1	Benzo(b)	226.509	µg/GJ
6960	1.A.3.a_gasoline_2018	1.A.3.a.2.1	Benzo(a)	137.657	µg/GJ
6960	1.A.3.a_gasoline_2018	1.A.3.a.2.1	SO2	0.151708789	g/GJ
6960	1.A.3.a_gasoline_2018	1.A.3.a.2.1	NOX	89.706	g/GJ
6960	1.A.3.a_gasoline_2018	1.A.3.a.2.1	NH3	7.04	g/GJ
6960	1.A.3.a_gasoline_2018	1.A.3.a.2.1	NMVOC	426.105	g/GJ
6960	1.A.3.a_gasoline_2018	1.A.3.a.2.1	CO	26911.864	g/GJ
6960	1.A.3.a_gasoline_2018	1.A.3.a.2.1	TSP	6.099	g/GJ
6960	1.A.3.a_gasoline_2018	1.A.3.a.2.1	PM25	3.626	g/GJ
6960	1.A.3.a_gasoline_2018	1.A.3.a.2.1	PM10	6.099	g/GJ
6960	1.A.3.a_gasoline_2018	1.A.3.a.2.1	Benzo(k)	92.881	µg/GJ
6960	1.A.3.a_gasoline_2018	1.A.3.a.2.1	Indeno	261.54	µg/GJ
6960	1.A.3.a_gasoline_2018	1.A.3.a.2.1	DIOX	0.006	ng/GJ
6960	1.A.3.a_gasoline_2018	1.A.3.a.2.1	Cd	0.276	mg/GJ
6960	1.A.3.a_gasoline_2018	1.A.3.a.2.1	Cr	3.008	mg/GJ
6960	1.A.3.a_gasoline_2018	1.A.3.a.2.1	BC	0.544	g/GJ
6961	1.A.3.a_kerosene_cruise1_2018	1.A.3.a.2.2	As	0.03	mg/GJ
6961	1.A.3.a_kerosene_cruise1_2018	1.A.3.a.2.2	Cd	0.006	mg/GJ
6961	1.A.3.a_kerosene_cruise1_2018	1.A.3.a.2.2	Cr	0.2	mg/GJ
6961	1.A.3.a_kerosene_cruise1_2018	1.A.3.a.2.2	Cu	0.22	mg/GJ
6961	1.A.3.a_kerosene_cruise1_2018	1.A.3.a.2.2	Ni	0.008	mg/GJ
6961	1.A.3.a_kerosene_cruise1_2018	1.A.3.a.2.2	Pb	0.08	mg/GJ
6961	1.A.3.a_kerosene_cruise1_2018	1.A.3.a.2.2	Se	0.11	mg/GJ
6961	1.A.3.a_kerosene_cruise1_2018	1.A.3.a.2.2	Zn	29	mg/GJ
6961	1.A.3.a_kerosene_cruise1_2018	1.A.3.a.2.2	BC	2.18	g/GJ
6961	1.A.3.a_kerosene_cruise1_2018	1.A.3.a.2.2	Benzo(b)	15	µg/GJ
6961	1.A.3.a_kerosene_cruise1_2018	1.A.3.a.2.2	Benzo(a)	1.9	µg/GJ
6961	1.A.3.a_kerosene_cruise1_2018	1.A.3.a.2.2	SO2	10.99217704	g/GJ
6961	1.A.3.a_kerosene_cruise1_2018	1.A.3.a.2.2	NOX	234.3	g/GJ
6961	1.A.3.a_kerosene_cruise1_2018	1.A.3.a.2.2	NMVOC	2.27	g/GJ
5825	Pellete stoves and boilers	1.A.4.b.1	Pb	27	mg/GJ
5825	Pellete stoves and boilers	1.A.4.b.1	Se	0.5	mg/GJ
5825	Pellete stoves and boilers	1.A.4.b.1	Zn	512	mg/GJ
5825	Pellete stoves and boilers	1.A.4.b.1	DIOX	100	ng/GJ
5825	Pellete stoves and boilers	1.A.4.b.1	Benzo(b)	16	µg/GJ
5825	Pellete stoves and boilers	1.A.4.b.1	Benzo(k)	5	µg/GJ
5825	Pellete stoves and boilers	1.A.4.b.1	Benzo(a)	10	µg/GJ
5825	Pellete stoves and boilers	1.A.4.b.1	Indeno	4	µg/GJ
5825	Pellete stoves and boilers	1.A.4.b.1	SO2	11	g/GJ
5825	Pellete stoves and boilers	1.A.4.b.1	NOX	80	g/GJ
5825	Pellete stoves and boilers	1.A.4.b.1	NH3	12	g/GJ
5825	Pellete stoves and boilers	1.A.4.b.1	NMVOC	10	g/GJ

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5825	Pellete stoves and boilers	1.A.4.b.1	CO	300	g/GJ
5825	Pellete stoves and boilers	1.A.4.b.1	TSP	62	g/GJ
5825	Pellete stoves and boilers	1.A.4.b.1	PM25	60	g/GJ
5825	Pellete stoves and boilers	1.A.4.b.1	PM10	60	g/GJ
5825	Pellete stoves and boilers	1.A.4.b.1	BC	9	g/GJ
5825	Pellete stoves and boilers	1.A.4.b.1	PCBs	0.01	µg/GJ
5825	Pellete stoves and boilers	1.A.4.b.1	HCB	5	µg/GJ
5825	Pellete stoves and boilers	1.A.4.b.1	As	0.19	mg/GJ
5825	Pellete stoves and boilers	1.A.4.b.1	Cd	13	mg/GJ
5825	Pellete stoves and boilers	1.A.4.b.1	Cr	23	mg/GJ
5825	Pellete stoves and boilers	1.A.4.b.1	Cu	6	mg/GJ
5825	Pellete stoves and boilers	1.A.4.b.1	Hg	0.56	mg/GJ
5825	Pellete stoves and boilers	1.A.4.b.1	Ni	2	mg/GJ
1	Plomin	1.A.1.a	PCBs	170	µg/GJ
1	Plomin	1.A.1.a	PCBs	170	µg/GJ
1	Plomin	1.A.1.a	HCB	0.62	µg/GJ
5878	Advanced/ecolabelled stoves and boilers	1.A.4.b.1	Pb	27	mg/GJ
5878	Advanced/ecolabelled stoves and boilers	1.A.4.b.1	Se	0.5	mg/GJ
5878	Advanced/ecolabelled stoves and boilers	1.A.4.b.1	Zn	512	mg/GJ
5878	Advanced/ecolabelled stoves and boilers	1.A.4.b.1	DIOX	100	ng/GJ
5878	Advanced/ecolabelled stoves and boilers	1.A.4.b.1	Benzo(b)	16	µg/GJ
5878	Advanced/ecolabelled stoves and boilers	1.A.4.b.1	Benzo(k)	5	µg/GJ
5878	Advanced/ecolabelled stoves and boilers	1.A.4.b.1	Benzo(a)	10	µg/GJ
5878	Advanced/ecolabelled stoves and boilers	1.A.4.b.1	Indeno	4	µg/GJ
5878	Advanced/ecolabelled stoves and boilers	1.A.4.b.1	SO2	11	g/GJ
5878	Advanced/ecolabelled stoves and boilers	1.A.4.b.1	NOX	95	g/GJ
5878	Advanced/ecolabelled stoves and boilers	1.A.4.b.1	NH3	37	g/GJ
5878	Advanced/ecolabelled stoves and boilers	1.A.4.b.1	NMVOC	250	g/GJ
5878	Advanced/ecolabelled stoves and boilers	1.A.4.b.1	CO	2000	g/GJ
5878	Advanced/ecolabelled stoves and boilers	1.A.4.b.1	TSP	100	g/GJ
5878	Advanced/ecolabelled stoves and boilers	1.A.4.b.1	PM25	93	g/GJ
5878	Advanced/ecolabelled stoves and boilers	1.A.4.b.1	PM10	95	g/GJ
5878	Advanced/ecolabelled stoves and boilers	1.A.4.b.1	BC	26.04	g/GJ
5878	Advanced/ecolabelled stoves and boilers	1.A.4.b.1	PCBs	0.007	µg/GJ
5878	Advanced/ecolabelled stoves and boilers	1.A.4.b.1	HCB	5	µg/GJ

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5878	Advanced/ecolabelled stoves and boilers	1.A.4.b.1	As	0.19	mg/GJ
5878	Advanced/ecolabelled stoves and boilers	1.A.4.b.1	Cd	13	mg/GJ
5878	Advanced/ecolabelled stoves and boilers	1.A.4.b.1	Cr	23	mg/GJ
5878	Advanced/ecolabelled stoves and boilers	1.A.4.b.1	Cu	6	mg/GJ
5878	Advanced/ecolabelled stoves and boilers	1.A.4.b.1	Hg	0.56	mg/GJ
5878	Advanced/ecolabelled stoves and boilers	1.A.4.b.1	Ni	2	mg/GJ
103	Mineral Industry, Asfalt Roofing	2.A.5	BC	0.0104	g/t
103	Mineral Industry, Asfalt Roofing	2.A.5	PM25	80	g/t
103	Mineral Industry, Asfalt Roofing	2.A.5	PM10	400	g/t
104	Mineral Production, Road Paving with Asphalt	2.A.6	BC	22.8	g/t
108	2.A.7.d_glass production	2.A.7.1	BC	0.1488	g/t
4653	2.B.5.a_Polyethylene Low Density	2.B.5.a	PM10	24.8	g/t
4653	2.B.5.a_Polyethylene Low Density	2.B.5.a	PM25	18.6	g/t
4653	2.B.5.a_Polyethylene Low Density	2.B.5.a	BC	0.335	g/t
4651	Polystirene; in primary forms	2.B.5.a	PM10	3.2	g/t
4651	Polystirene; in primary forms	2.B.5.a	PM25	2.4	g/t
4651	Polystirene; in primary forms	2.B.5.a	BC	0.324	g/t
4652	Expended polystiren foam	2.B.5.a	PM10	24	g/t
4652	Expended polystiren foam	2.B.5.a	PM25	18	g/t
4652	Expended polystiren foam	2.B.5.a	BC	0.324	g/t
6808	High-efficiency stoves	1.A.4.b.1	NOX	80	g/GJ
5974	1.A.1.b_GF_LPG	1.A.1.b	As	0.12	mg/GJ
5974	1.A.1.b_GF_LPG	1.A.1.b	Cd	0.00025	mg/GJ
5974	1.A.1.b_GF_LPG	1.A.1.b	Cr	0.00076	mg/GJ
5974	1.A.1.b_GF_LPG	1.A.1.b	Cu	7.60E-05	mg/GJ
5974	1.A.1.b_GF_LPG	1.A.1.b	Hg	0.1	mg/GJ
5974	1.A.1.b_GF_LPG	1.A.1.b	Ni	0.00051	mg/GJ
5974	1.A.1.b_GF_LPG	1.A.1.b	Pb	0.0015	mg/GJ
5974	1.A.1.b_GF_LPG	1.A.1.b	Benzo(b)	0.84	µg/GJ
5974	1.A.1.b_GF_LPG	1.A.1.b	Benzo(k)	0.84	µg/GJ
5974	1.A.1.b_GF_LPG	1.A.1.b	Benzo(a)	0.56	µg/GJ
5974	1.A.1.b_GF_LPG	1.A.1.b	Indeno	0.84	µg/GJ
5974	1.A.1.b_GF_LPG	1.A.1.b	SO2	0.281	g/GJ
5974	1.A.1.b_GF_LPG	1.A.1.b	NOX	89	g/GJ
5974	1.A.1.b_GF_LPG	1.A.1.b	NMVOC	2.6	g/GJ
5974	1.A.1.b_GF_LPG	1.A.1.b	CO	39	g/GJ
5974	1.A.1.b_GF_LPG	1.A.1.b	TSP	0.89	g/GJ
5974	1.A.1.b_GF_LPG	1.A.1.b	PM25	0.89	g/GJ
5974	1.A.1.b_GF_LPG	1.A.1.b	PM10	0.89	g/GJ

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5974	1.A.1.b_GF_LPG	1.A.1.b	Se	0.0112	mg/GJ
5974	1.A.1.b_GF_LPG	1.A.1.b	Zn	0.0015	mg/GJ
5974	1.A.1.b_GF_LPG	1.A.1.b	BC	0.02225	g/GJ
5974	1.A.1.b_GF_LPG	1.A.1.b	DIOX	0.5	ng/GJ
5975	1.B.2.b.1	1.B.2.b.1	NMVOC	0.1	kg/1000 m3
5977	ships using bunker fuel oil	1.A.3.d.1	As	16.92	mg/GJ
5977	ships using bunker fuel oil	1.A.3.d.1	Hg	0.5	mg/GJ
5977	ships using bunker fuel oil	1.A.3.d.1	Pb	4.48	mg/GJ
5977	ships using bunker fuel oil	1.A.3.d.1	HCB	3.48	µg/GJ
5977	ships using bunker fuel oil	1.A.3.d.1	PCBs	14.18	µg/GJ
5977	ships using bunker fuel oil	1.A.3.d.1	DIOX	11.69	ng/GJ
5977	ships using bunker fuel oil	1.A.3.d.1	Cd	0.5	mg/GJ
5977	ships using bunker fuel oil	1.A.3.d.1	Cr	17.91	mg/GJ
5977	ships using bunker fuel oil	1.A.3.d.1	Cu	31.1	mg/GJ
5977	ships using bunker fuel oil	1.A.3.d.1	Ni	796.22	mg/GJ
5977	ships using bunker fuel oil	1.A.3.d.1	Se	5.23	mg/GJ
5977	ships using bunker fuel oil	1.A.3.d.1	Zn	29.86	mg/GJ
5977	ships using bunker fuel oil	1.A.3.d.1	Benzo(b)	1244.091	µg/GJ
5977	ships using bunker fuel oil	1.A.3.d.1	Benzo(a)	746.454	µg/GJ
5977	ships using bunker fuel oil	1.A.3.d.1	SO2	746.45	g/GJ
5977	ships using bunker fuel oil	1.A.3.d.1	NOX	1973.13	g/GJ
5977	ships using bunker fuel oil	1.A.3.d.1	NH3	0.174	g/GJ
5977	ships using bunker fuel oil	1.A.3.d.1	NMVOC	67.18	g/GJ
5977	ships using bunker fuel oil	1.A.3.d.1	CO	184.13	g/GJ
5977	ships using bunker fuel oil	1.A.3.d.1	TSP	154.27	g/GJ
5977	ships using bunker fuel oil	1.A.3.d.1	PM10	154.27	g/GJ
5977	ships using bunker fuel oil	1.A.3.d.1	PM25	139.34	g/GJ
5977	ships using bunker fuel oil	1.A.3.d.1	BC	0.167	g/GJ
5980	International navigation	1.A.3.d.1	As	0.94	mg/GJ
5980	International navigation	1.A.3.d.1	Hg	0.7	mg/GJ
5980	International navigation	1.A.3.d.1	Pb	3.04	mg/GJ
5980	International navigation	1.A.3.d.1	HCB	1.87	µg/GJ
5980	International navigation	1.A.3.d.1	DIOX	3.04	ng/GJ
5980	International navigation	1.A.3.d.1	PCBs	0.89	µg/GJ
5980	International navigation	1.A.3.d.1	Cd	0.234	mg/GJ
5980	International navigation	1.A.3.d.1	Cr	1.171	mg/GJ
5980	International navigation	1.A.3.d.1	Cu	20.604	mg/GJ
5980	International navigation	1.A.3.d.1	Ni	23.414	mg/GJ
5980	International navigation	1.A.3.d.1	Se	2.341	mg/GJ
5980	International navigation	1.A.3.d.1	Zn	28.096	mg/GJ
5980	International navigation	1.A.3.d.1	Benzo(b)	1170.686	µg/GJ
5980	International navigation	1.A.3.d.1	Benzo(a)	702.412	µg/GJ
5980	International navigation	1.A.3.d.1	SO2	46.83	g/GJ
5980	International navigation	1.A.3.d.1	NOX	1837.98	g/GJ
5980	International navigation	1.A.3.d.1	NH3	0.164	g/GJ
5980	International navigation	1.A.3.d.1	NMVOC	65.56	g/GJ
5980	International navigation	1.A.3.d.1	CO	173.26	g/GJ
5980	International navigation	1.A.3.d.1	TSP	35.12	g/GJ

Tech_ID	Naziv tehnologije	Kategorija	Polutant	Faktor emisije	Jedinica
5980	International navigation	1.A.3.d.1	PM10	35.12	g/GJ
5980	International navigation	1.A.3.d.1	PM25	32.78	g/GJ
5980	International navigation	1.A.3.d.1	BC	0.102	g/GJ
198	1.B.2.c.2_Venting and flaring (gas)	1.B.2.c.2	SO2	0.013	kg/t
198	1.B.2.c.2_Venting and flaring (gas)	1.B.2.c.2	TSP	2.6	kg/t
198	1.B.2.c.2_Venting and flaring (gas)	1.B.2.c.2	PM25	2.6	kg/t
198	1.B.2.c.2_Venting and flaring (gas)	1.B.2.c.2	PM10	2.6	kg/t
198	1.B.2.c.2_Venting and flaring (gas)	1.B.2.c.2	BC	0.624	kg/t
198	1.B.2.c.2_Venting and flaring (gas)	1.B.2.c.2	Pb	4.9	mg/t
198	1.B.2.c.2_Venting and flaring (gas)	1.B.2.c.2	Cd	20	mg/t
198	1.B.2.c.2_Venting and flaring (gas)	1.B.2.c.2	Hg	4.7	mg/t
198	1.B.2.c.2_Venting and flaring (gas)	1.B.2.c.2	As	3.8	mg/t
198	1.B.2.c.2_Venting and flaring (gas)	1.B.2.c.2	Cr	1.3	mg/t
198	1.B.2.c.2_Venting and flaring (gas)	1.B.2.c.2	Cu	1.6	mg/t
198	1.B.2.c.2_Venting and flaring (gas)	1.B.2.c.2	Ni	38	mg/t
198	1.B.2.c.2_Venting and flaring (gas)	1.B.2.c.2	Zn	520	mg/t
198	1.B.2.c.2_Venting and flaring (gas)	1.B.2.c.2	Se	0.43	mg/t
6122	Road tanker, top loading	1.B.2.a.5	NMVOC	12.33	kg/kt*kPa
6123	Road tanker, bottom loading, VRU	1.B.2.a.5	NMVOC	0.247	kg/kt*kPa
6123	Road tanker, bottom loading, VRU	1.B.2.a.5	NMVOC	0.247	kg/kt*kPa
6124	Rail tanker, uncontrolled	1.B.2.a.5	NMVOC	15.07	kg/kt*kPa
6124	Rail tanker, uncontrolled	1.B.2.a.5	NMVOC	15.07	kg/kt*kPa
6125	Rail tanker, VRU	1.B.2.a.5	NMVOC	0.301	kg/kt*kPa
6125	Rail tanker, VRU	1.B.2.a.5	NMVOC	0.301	kg/kt*kPa
6126	Marine tanker, uncontrolled	1.B.2.a.5	NMVOC	5.48	kg/kt*kPa
6127	Storage tank-Filling without Stage 1B	1.B.2.a.5	NMVOC	32.88	kg/kt*kPa
6128	Storage tank-Breathing	1.B.2.a.5	NMVOC	4.11	kg/kt*kPa
6129	Storage tank-Auto refuelling uncontrolled	1.B.2.a.5	NMVOC	50.68	kg/kt*kPa
6130	Storage tank-Auto refuelling: drips and spills	1.B.2.a.5	NMVOC	2.74	kg/kt*kPa
6132	INA-RNS	1.B.2.c.1	NOX	29.2	g/GJ
6132	INA-RNS	1.B.2.c.1	CO	133	g/GJ
6132	INA-RNS	1.B.2.c.1	TSP	0.89	g/GJ
6132	INA-RNS	1.B.2.c.1	PM25	0.89	g/GJ
6132	INA-RNS	1.B.2.c.1	PM10	0.89	g/GJ
6132	INA-RNS	1.B.2.c.1	As	0.352	mg/GJ

Tech_ID	Naziv tehnologije	Kategorija	Polutant	Faktor emisije	Jedinica
6132	INA-RNS	1.B.2.c.1	Cd	2.19	mg/GJ
6132	INA-RNS	1.B.2.c.1	Cr	6.69	mg/GJ
6133	INA-RNS	1.B.2.c.1	SO2	77	g/GJ
6133	INA-RNS	1.B.2.c.1	NMVOC	2	g/GJ
6132	INA-RNS	1.B.2.c.1	Hg	0.372	mg/GJ
6134	INA-RNR	1.B.2.c.1	SO2	77	g/GJ
6134	INA-RNR	1.B.2.c.1	NMVOC	2	g/GJ
6135	INA-RNR	1.B.2.c.1	NOX	29.2	g/GJ
6135	INA-RNR	1.B.2.c.1	CO	133	g/GJ
6135	INA-RNR	1.B.2.c.1	TSP	0.89	g/GJ
6135	INA-RNR	1.B.2.c.1	PM25	0.89	g/GJ
6135	INA-RNR	1.B.2.c.1	PM10	0.89	g/GJ
6135	INA-RNR	1.B.2.c.1	As	0.352	mg/GJ
6135	INA-RNR	1.B.2.c.1	Cd	2.19	mg/GJ
6135	INA-RNR	1.B.2.c.1	Cr	6.69	mg/GJ
6135	INA-RNR	1.B.2.c.1	Hg	0.372	mg/GJ
6135	INA-RNR	1.B.2.c.1	Cu	3.29	mg/GJ
6135	INA-RNR	1.B.2.c.1	Ni	7.37	mg/GJ
6135	INA-RNR	1.B.2.c.1	Pb	1.61	mg/GJ
6135	INA-RNR	1.B.2.c.1	Zn	17	mg/GJ
6135	INA-RNR	1.B.2.c.1	Benzo(b)	1.14	µg/GJ
6135	INA-RNR	1.B.2.c.1	Benzo(k)	0.63	µg/GJ
6135	INA-RNR	1.B.2.c.1	Benzo(a)	0.67	µg/GJ
6135	INA-RNR	1.B.2.c.1	Indeno	0.63	µg/GJ
6138	2.G Use of Firework	3.D.3	Ni	30	g/t
6138	2.G Use of Firework	3.D.3	Cd	1.48	g/t
6132	INA-RNS	1.B.2.c.1	Cu	3.29	mg/GJ
6132	INA-RNS	1.B.2.c.1	Ni	7.37	mg/GJ
6132	INA-RNS	1.B.2.c.1	Pb	1.61	mg/GJ
6132	INA-RNS	1.B.2.c.1	Zn	17	mg/GJ
6132	INA-RNS	1.B.2.c.1	Benzo(b)	1.14	µg/GJ
6132	INA-RNS	1.B.2.c.1	Benzo(k)	0.63	µg/GJ
6132	INA-RNS	1.B.2.c.1	Benzo(a)	0.67	µg/GJ
6132	INA-RNS	1.B.2.c.1	Indeno	0.63	µg/GJ
6138	2.G Use of Firework	3.D.3	Zn	260	g/t
6138	2.G Use of Firework	3.D.3	TSP	109830	g/t
6138	2.G Use of Firework	3.D.3	PM25	51940	g/t
6138	2.G Use of Firework	3.D.3	PM10	99920	g/t
6138	2.G Use of Firework	3.D.3	NOX	260	g/t
6138	2.G Use of Firework	3.D.3	CO	7150	g/t
6138	2.G Use of Firework	3.D.3	Cu	444	g/t
6138	2.G Use of Firework	3.D.3	SO2	3020	g/t
6138	2.G Use of Firework	3.D.3	As	1.33	g/t
6138	2.G Use of Firework	3.D.3	Hg	0.057	g/t
6138	2.G Use of Firework	3.D.3	Pb	784	g/t
6138	2.G Use of Firework	3.D.3	Cr	15.6	g/t
6148	Adhesive tape manufacturing	3.C	NMVOC	3	g/m2
6159	Compost production	6.D	NH3	0.24	kg/t waste

Tech_ID	Naziv tehnologije	Kategorija	Polutant	Faktor emisije	Jedinica
6408	biomass	1.A.1.a	Pb	20.6	mg/GJ
6408	biomass	1.A.1.a	Se	1.2	mg/GJ
6408	biomass	1.A.1.a	Zn	181	mg/GJ
6408	biomass	1.A.1.a	DIOX	50	ng/GJ
6408	biomass	1.A.1.a	Benzo(b)	0.043	µg/GJ
6408	biomass	1.A.1.a	Benzo(k)	0.0155	µg/GJ
6408	biomass	1.A.1.a	Benzo(a)	1.12	µg/GJ
6408	biomass	1.A.1.a	Indeno	0.0374	µg/GJ
6408	biomass	1.A.1.a	NOX	81	g/GJ
6408	biomass	1.A.1.a	NMVOC	7.31	g/GJ
6408	biomass	1.A.1.a	CO	90	g/GJ
6408	biomass	1.A.1.a	TSP	172	g/GJ
6408	biomass	1.A.1.a	PM25	133	g/GJ
6408	biomass	1.A.1.a	PM10	155	g/GJ
6408	biomass	1.A.1.a	BC	4.389	g/GJ
6408	biomass	1.A.1.a	PCBs	3.5	µg/GJ
6408	biomass	1.A.1.a	HCB	5	µg/GJ
6408	biomass	1.A.1.a	As	9.46	mg/GJ
6408	biomass	1.A.1.a	Cd	1.76	mg/GJ
6408	biomass	1.A.1.a	Cr	9.03	mg/GJ
6408	biomass	1.A.1.a	Cu	21.1	mg/GJ
6408	biomass	1.A.1.a	Hg	0.56	mg/GJ
6408	biomass	1.A.1.a	Ni	14.2	mg/GJ
6408	biomass	1.A.1.a	SO2	10.8	g/GJ
6429	Dry cleaning	3.B.2	NMVOC	400	caput
6449	Mules and asses	4.B.07	NH3	1.598078807	kg/animal
6449	Mules and asses	4.B.07	TSP	0.34	kg/animal
6449	Mules and asses	4.B.07	PM25	0.1	kg/animal
6449	Mules and asses	4.B.07	NOX	0.050285347	kg/animal
6449	Mules and asses	4.B.07	NMVOC	0.277173711	kg/animal
6449	Mules and asses	4.B.07	PM10	0.16	kg/animal
6795	LF-GO_2018	1.A.4.b.1	TSP	1.9	g/GJ
6460	Sheep- grazing	4.D.2.c	NOX	0.949256	kg/animal
6616	Ducks	4.D.1.b	NH3	0.178509521	kg/animal
6587	Geese	4.D.1.b	NOX	0.091718345	kg/animal
6616	Ducks	4.D.1.b	NOX	0.070623978	kg/animal
6744	Našicecement_2018	1.A.2.f.1	Pb	0.098	mg/GJ
6744	Našicecement_2018	1.A.2.f.1	Cd	0.008	mg/GJ
6744	Našicecement_2018	1.A.2.f.1	Hg	0.049	mg/GJ
6744	Našicecement_2018	1.A.2.f.1	As	0.0265	mg/GJ
6744	Našicecement_2018	1.A.2.f.1	Cr	0.041	mg/GJ
6744	Našicecement_2018	1.A.2.f.1	Cu	0.0647	mg/GJ
6744	Našicecement_2018	1.A.2.f.1	Ni	0.049	mg/GJ
6744	Našicecement_2018	1.A.2.f.1	Se	0.0253	mg/GJ
6744	Našicecement_2018	1.A.2.f.1	Zn	0.424	mg/GJ
6744	Našicecement_2018	1.A.2.f.1	HCB	4.6	µg/GJ
6744	Našicecement_2018	1.A.2.f.1	PCBs	103	µg/GJ
6744	Našicecement_2018	1.A.2.f.1	DIOX	4.1	ng/GJ

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6744	Našicecement_2018	1.A.2.f.1	Benzo(a)	6.50E-05	µg/GJ
6744	Našicecement_2018	1.A.2.f.1	Benzo(b)	0.00028	µg/GJ
6744	Našicecement_2018	1.A.2.f.1	Benzo(k)	7.70E-05	µg/GJ
6744	Našicecement_2018	1.A.2.f.1	Indeno	4.30E-05	µg/GJ
6744	Našicecement_2018	1.A.2.f.1	SO2	409.06	t
6744	Našicecement_2018	1.A.2.f.1	NOX	636.79319	t
6744	Našicecement_2018	1.A.2.f.1	NMVOC	123.951	t
6744	Našicecement_2018	1.A.2.f.1	CO	1177.71635	t
6783	3Dc	4.D.2.a	TSP	1.56	kg/ha
6783	3Dc	4.D.2.a	PM25	0.06	kg/ha
6783	3Dc	4.D.2.a	PM10	1.56	kg/ha
6793	gas oil_2018	1.A.1.a	Pb	8	mg/GJ
6793	gas oil_2018	1.A.1.a	Se	0.1	mg/GJ
6793	gas oil_2018	1.A.1.a	Zn	18	mg/GJ
6793	gas oil_2018	1.A.1.a	DIOX	1.4	ng/GJ
6793	gas oil_2018	1.A.1.a	Benzo(b)	15	µg/GJ
6793	gas oil_2018	1.A.1.a	Benzo(k)	1.7	µg/GJ
6793	gas oil_2018	1.A.1.a	Benzo(a)	1.9	µg/GJ
6793	gas oil_2018	1.A.1.a	Indeno	1.5	µg/GJ
6793	gas oil_2018	1.A.1.a	SO2	40.27	g/GJ
6793	gas oil_2018	1.A.1.a	NOX	306	g/GJ
6793	gas oil_2018	1.A.1.a	NMVOC	20	g/GJ
6793	gas oil_2018	1.A.1.a	CO	93	g/GJ
6793	gas oil_2018	1.A.1.a	TSP	21	g/GJ
6793	gas oil_2018	1.A.1.a	HCB	0.22	µg/GJ
6793	gas oil_2018	1.A.1.a	PCBs	0.13	µg/GJ
6794	residual fuel_2018	1.A.1.a	HCB	0.22	µg/GJ
6794	residual fuel_2018	1.A.1.a	PCBs	0.13	µg/GJ
6795	LF-GO_2018	1.A.4.b.1	PM25	1.9	g/GJ
6795	LF-GO_2018	1.A.4.b.1	PM10	1.9	g/GJ
6795	LF-GO_2018	1.A.4.b.1	BC	0.16	g/GJ
6795	LF-GO_2018	1.A.4.b.1	As	0.002	mg/GJ
6795	LF-GO_2018	1.A.4.b.1	Cd	0.001	mg/GJ
6795	LF-GO_2018	1.A.4.b.1	Cr	0.2	mg/GJ
6795	LF-GO_2018	1.A.4.b.1	Cu	0.13	mg/GJ
6795	LF-GO_2018	1.A.4.b.1	Hg	0.12	mg/GJ
6795	LF-GO_2018	1.A.4.b.1	Ni	0.005	mg/GJ
6795	LF-GO_2018	1.A.4.b.1	Pb	0.012	mg/GJ
6795	LF-GO_2018	1.A.4.b.1	Se	0.002	mg/GJ
6795	LF-GO_2018	1.A.4.b.1	Zn	0.42	mg/GJ
6795	LF-GO_2018	1.A.4.b.1	DIOX	5.9	ng/GJ
6795	LF-GO_2018	1.A.4.b.1	Benzo(b)	40	µg/GJ
6795	LF-GO_2018	1.A.4.b.1	Benzo(k)	70	µg/GJ
6795	LF-GO_2018	1.A.4.b.1	Benzo(a)	80	µg/GJ
6795	LF-GO_2018	1.A.4.b.1	Indeno	160	µg/GJ
6795	LF-GO_2018	1.A.4.b.1	SO2	40.27	g/GJ
6795	LF-GO_2018	1.A.4.b.1	NOX	51	g/GJ
6795	LF-GO_2018	1.A.4.b.1	NMVOC	0.69	g/GJ

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6795	LF-GO_2018	1.A.4.b.1	CO	57	g/GJ
6796	LF-KER_2018	1.A.4.b.1	PM10	1.9	g/GJ
6796	LF-KER_2018	1.A.4.b.1	BC	0.16	g/GJ
6796	LF-KER_2018	1.A.4.b.1	As	0.002	mg/GJ
6796	LF-KER_2018	1.A.4.b.1	Cd	0.001	mg/GJ
6796	LF-KER_2018	1.A.4.b.1	Cr	0.2	mg/GJ
6796	LF-KER_2018	1.A.4.b.1	Cu	0.13	mg/GJ
6796	LF-KER_2018	1.A.4.b.1	Hg	0.12	mg/GJ
6796	LF-KER_2018	1.A.4.b.1	Ni	0.005	mg/GJ
6796	LF-KER_2018	1.A.4.b.1	Pb	0.012	mg/GJ
6796	LF-KER_2018	1.A.4.b.1	Se	0.002	mg/GJ
6796	LF-KER_2018	1.A.4.b.1	Zn	0.42	mg/GJ
6796	LF-KER_2018	1.A.4.b.1	DIOX	5.9	ng/GJ
6796	LF-KER_2018	1.A.4.b.1	Benzo(b)	40	µg/GJ
6796	LF-KER_2018	1.A.4.b.1	Benzo(k)	70	µg/GJ
6796	LF-KER_2018	1.A.4.b.1	Benzo(a)	80	µg/GJ
6796	LF-KER_2018	1.A.4.b.1	Indeno	160	µg/GJ
6796	LF-KER_2018	1.A.4.b.1	SO2	16.11	g/GJ
6796	LF-KER_2018	1.A.4.b.1	NOX	51	g/GJ
6796	LF-KER_2018	1.A.4.b.1	NMVOC	0.69	g/GJ
6793	gas oil_2018	1.A.1.a	PM25	18	g/GJ
6793	gas oil_2018	1.A.1.a	PM10	21	g/GJ
6793	gas oil_2018	1.A.1.a	BC	10.08	g/GJ
6793	gas oil_2018	1.A.1.a	As	0.5	mg/GJ
6793	gas oil_2018	1.A.1.a	Cd	0.15	mg/GJ
6793	gas oil_2018	1.A.1.a	Cr	10	mg/GJ
6793	gas oil_2018	1.A.1.a	Cu	3	mg/GJ
6793	gas oil_2018	1.A.1.a	Hg	0.1	mg/GJ
6793	gas oil_2018	1.A.1.a	Ni	125	mg/GJ
6793	gas oil_2018	1.A.1.a	NH3	0	g/GJ
6794	residual fuel_2018	1.A.1.a	Pb	8	mg/GJ
6794	residual fuel_2018	1.A.1.a	Se	0.1	mg/GJ
6794	residual fuel_2018	1.A.1.a	Zn	18	mg/GJ
6794	residual fuel_2018	1.A.1.a	DIOX	6	ng/GJ
6794	residual fuel_2018	1.A.1.a	Benzo(b)	15	µg/GJ
6794	residual fuel_2018	1.A.1.a	Benzo(k)	1.7	µg/GJ
6794	residual fuel_2018	1.A.1.a	Benzo(a)	1.9	µg/GJ
6794	residual fuel_2018	1.A.1.a	Indeno	1.5	µg/GJ
6794	residual fuel_2018	1.A.1.a	SO2	437.42	g/GJ
6794	residual fuel_2018	1.A.1.a	NOX	306	g/GJ
6794	residual fuel_2018	1.A.1.a	NMVOC	20	g/GJ
6794	residual fuel_2018	1.A.1.a	CO	93	g/GJ
6794	residual fuel_2018	1.A.1.a	TSP	21	g/GJ
6794	residual fuel_2018	1.A.1.a	PM25	18	g/GJ
6794	residual fuel_2018	1.A.1.a	PM10	21	g/GJ
6794	residual fuel_2018	1.A.1.a	BC	10.08	g/GJ
6794	residual fuel_2018	1.A.1.a	As	0.5	mg/GJ
6794	residual fuel_2018	1.A.1.a	Cd	0.15	mg/GJ

Tech_ID	Naziv tehnologije	Kategorija	Polutant	Faktor emisije	Jedinica
6794	residual fuel_2018	1.A.1.a	Cr	10	mg/GJ
6794	residual fuel_2018	1.A.1.a	Cu	3	mg/GJ
6794	residual fuel_2018	1.A.1.a	Hg	0.1	mg/GJ
6794	residual fuel_2018	1.A.1.a	Ni	125	mg/GJ
6794	residual fuel_2018	1.A.1.a	NH3	0	g/GJ
6796	LF-KER_2018	1.A.4.b.1	CO	57	g/GJ
6796	LF-KER_2018	1.A.4.b.1	TSP	1.9	g/GJ
6796	LF-KER_2018	1.A.4.b.1	PM25	1.9	g/GJ
6797	LF-HFO_2018	1.A.4.b.1	Cd	0.001	mg/GJ
6797	LF-HFO_2018	1.A.4.b.1	Cr	0.2	mg/GJ
6797	LF-HFO_2018	1.A.4.b.1	Cu	0.13	mg/GJ
6797	LF-HFO_2018	1.A.4.b.1	Hg	0.12	mg/GJ
6797	LF-HFO_2018	1.A.4.b.1	Ni	0.005	mg/GJ
6797	LF-HFO_2018	1.A.4.b.1	Pb	0.012	mg/GJ
6797	LF-HFO_2018	1.A.4.b.1	Se	0.002	mg/GJ
6797	LF-HFO_2018	1.A.4.b.1	Zn	0.42	mg/GJ
6797	LF-HFO_2018	1.A.4.b.1	DIOX	5.9	ng/GJ
6797	LF-HFO_2018	1.A.4.b.1	Benzo(b)	40	µg/GJ
6797	LF-HFO_2018	1.A.4.b.1	Benzo(k)	70	µg/GJ
6797	LF-HFO_2018	1.A.4.b.1	Benzo(a)	80	µg/GJ
6797	LF-HFO_2018	1.A.4.b.1	Indeno	160	µg/GJ
6797	LF-HFO_2018	1.A.4.b.1	SO2	437.42	g/GJ
6797	LF-HFO_2018	1.A.4.b.1	NOX	51	g/GJ
6797	LF-HFO_2018	1.A.4.b.1	NMVOC	0.69	g/GJ
6797	LF-HFO_2018	1.A.4.b.1	CO	57	g/GJ
6797	LF-HFO_2018	1.A.4.b.1	TSP	1.9	g/GJ
6797	LF-HFO_2018	1.A.4.b.1	PM25	1.9	g/GJ
6797	LF-HFO_2018	1.A.4.b.1	PM10	1.9	g/GJ
6797	LF-HFO_2018	1.A.4.b.1	BC	0.16	g/GJ
6797	LF-HFO_2018	1.A.4.b.1	As	0.002	mg/GJ
6808	High-efficiency stoves	1.A.4.b.1	NH3	37	g/GJ
6808	High-efficiency stoves	1.A.4.b.1	NMVOC	350	g/GJ
6808	High-efficiency stoves	1.A.4.b.1	CO	4000	g/GJ
6808	High-efficiency stoves	1.A.4.b.1	TSP	400	g/GJ
6808	High-efficiency stoves	1.A.4.b.1	PM25	370	g/GJ
6808	High-efficiency stoves	1.A.4.b.1	PM10	380	g/GJ
6808	High-efficiency stoves	1.A.4.b.1	BC	59.2	g/GJ
6808	High-efficiency stoves	1.A.4.b.1	PCBs	0.03	µg/GJ
6808	High-efficiency stoves	1.A.4.b.1	HCB	5	µg/GJ
6808	High-efficiency stoves	1.A.4.b.1	As	0.19	mg/GJ
6808	High-efficiency stoves	1.A.4.b.1	Cd	13	mg/GJ
6808	High-efficiency stoves	1.A.4.b.1	Cr	23	mg/GJ
6808	High-efficiency stoves	1.A.4.b.1	Cu	6	mg/GJ
6808	High-efficiency stoves	1.A.4.b.1	Hg	0.56	mg/GJ
6808	High-efficiency stoves	1.A.4.b.1	Ni	2	mg/GJ
6811	Rockwool_2018	2.A.7.1	NH3	109.430104	t
6811	Rockwool_2018	2.A.7.1	NMVOC	24.152	t
6811	Rockwool_2018	2.A.7.1	TSP	30.76501991	t

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6811	Rockwool_2018	2.A.7.1	PM25	23.86667782	t
6811	Rockwool_2018	2.A.7.1	PM10	27.077975	t
6811	Rockwool_2018	2.A.7.1	BC	0.477333556	t
6812	Ammonia-2018	2.B.1	NOX	1.875	kg/t
6812	Ammonia-2018	2.B.1	NH3	0.05	kg/t
6812	Ammonia-2018	2.B.1	CO	0.006	kg/t
6812	Ammonia-2018	2.B.1	NMVOC	0.09	kg/t
6813	Nitric acid-2018	2.B.2	NOX	0.441052713	kg/t
6814	Sulfuric acid-2018	2.B.5.a	SO2	2.019871025	kg/t
6815	NPK-2018	2.B.5.a	NOX	0.092828899	kg/t
6815	NPK-2018	2.B.5.a	NH3	7.897476335	kg/t
6815	NPK-2018	2.B.5.a	TSP	0.398954401	kg/t
6816	Urea-2018	2.B.5.a	NH3	1.434996465	kg/t
6816	Urea-2018	2.B.5.a	TSP	1.5	kg/t
6816	Urea-2018	2.B.5.a	PM25	0.9	kg/t
6816	Urea-2018	2.B.5.a	PM10	1.2	kg/t
6816	Urea-2018	2.B.5.a	BC	0.0162	kg/t
6817	Other solvent_2018	3.D.3	NMVOC	139631.5966	g/t
6818	Polyurethane foam	3.C	NMVOC	120	kg/t
6135	INA-RNR	1.B.2.c.1	Se	1.56	mg/GJ
6132	INA-RNS	1.B.2.c.1	Se	1.56	mg/GJ
6819	Sheep	4.B.03	NH3	0.096383787	kg/animal
6819	Sheep	4.B.03	TSP	0.139	kg/animal
6819	Sheep	4.B.03	PM25	0.0167	kg/animal
6819	Sheep	4.B.03	NOX	0.000849441	kg/animal
6819	Sheep	4.B.03	NMVOC	0.076583598	kg/animal
6819	Sheep	4.B.03	PM10	0.0556	kg/animal
6820	Dairy cows - grazing	4.D.2.c	NH3	2.475164237	kg/animal
6820	Dairy cows - grazing	4.D.2.c	NOX	4.465002153	kg/animal
6821	Horses - grazing	4.D.2.c	NH3	5.37795	kg/animal
6821	Horses - grazing	4.D.2.c	NOX	2.771828571	kg/animal
6822	Goats - grazing	4.D.2.c	NH3	0.803580103	kg/animal
6822	Goats - grazing	4.D.2.c	NOX	1.932793973	kg/animal
6824	Non dairy (other) - grazing	4.D.2.c	NH3	0.995649147	kg/animal
6825	Non dairy (young) - grazing	4.D.2.c	NOX	2.993454951	kg/animal
6826	Sows	4.D.1.b	NH3	1.996901464	kg/animal
6826	Sows	4.D.1.b	NOX	3.048630992	kg/animal
6827	Goats	4.D.1.b	NH3	0.070146188	kg/animal
6835	Layers	4.D.1.b	NOX	0.050121092	kg/animal
6835	Layers	4.D.1.b	NH3	0.182657995	kg/animal
6839	Broilers	4.D.1.b	NH3	0.124245313	kg/animal
6839	Broilers	4.D.1.b	NOX	0.036213304	kg/animal
6841	Turkeys	4.D.1.b	NH3	0.357841571	kg/animal
6841	Turkeys	4.D.1.b	NOX	0.136365108	kg/animal
6842	Fatting pigs	4.D.1.b	NH3	0.341303026	kg/animal
6842	Fatting pigs	4.D.1.b	NOX	0.929788715	kg/animal
6843	Non dairy (young) - housing	4.D.1.b	NH3	6.278383688	kg/animal
6844	Non dairy (other) - housing	4.D.1.b	NH3	6.278383688	kg/animal

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6845	Dairy cows - housing	4.D.1.b	NH3	12.41665369	kg/animal
6846	Dairy cattle	4.B.01.a	NH3	14.98487902	kg/animal
6846	Dairy cattle	4.B.01.a	TSP	1.38	kg/animal
6846	Dairy cattle	4.B.01.a	PM25	0.41	kg/animal
6846	Dairy cattle	4.B.01.a	NOX	0.046662411	kg/animal
6846	Dairy cattle	4.B.01.a	NMVOC	18.54819704	kg/animal
6846	Dairy cattle	4.B.01.a	PM10	0.63	kg/animal
6847	Calves (telad)	4.B.01.b	TSP	0.34	kg/animal
6847	Calves (telad)	4.B.01.b	PM25	0.1	kg/animal
6847	Calves (telad)	4.B.01.b	NOX	0.072821524	kg/animal
6847	Calves (telad)	4.B.01.b	NMVOC	9.858223445	kg/animal
6847	Calves (telad)	4.B.01.b	PM10	0.16	kg/animal
6847	Calves (telad)	4.B.01.b	NH3	7.334848693	kg/animal
6848	Non-dariy cattle	4.B.01.b	NH3	7.334848693	kg/animal
6848	Non-dariy cattle	4.B.01.b	TSP	0.59	kg/animal
6848	Non-dariy cattle	4.B.01.b	PM25	0.18	kg/animal
6848	Non-dariy cattle	4.B.01.b	NOX	0.072821524	kg/animal
6848	Non-dariy cattle	4.B.01.b	NMVOC	9.858223445	kg/animal
6848	Non-dariy cattle	4.B.01.b	PM10	0.27	kg/animal
6850	Goats	4.B.04	NH3	0.196265426	kg/animal
6850	Goats	4.B.04	TSP	0.139	kg/animal
6850	Goats	4.B.04	PM25	0.0167	kg/animal
6850	Goats	4.B.04	NOX	0.000849441	kg/animal
6850	Goats	4.B.04	NMVOC	0.057480327	kg/animal
6850	Goats	4.B.04	PM10	0.0556	kg/animal
6851	Horses	4.B.06	NH3	1.598078807	kg/animal
6851	Horses	4.B.06	TSP	0.48	kg/animal
6851	Horses	4.B.06	PM25	0.14	kg/animal
6851	Horses	4.B.06	NOX	0.050285347	kg/animal
6851	Horses	4.B.06	NMVOC	2.312860471	kg/animal
6851	Horses	4.B.06	PM10	0.22	kg/animal
6852	Swine: Sows	4.B.08	NH3	8.70999973	kg/animal
6852	Swine: Sows	4.B.08	TSP	1.53	kg/animal
6852	Swine: Sows	4.B.08	PM25	0.12	kg/animal
6852	Swine: Sows	4.B.08	NOX	0.055252418	kg/animal
6852	Swine: Sows	4.B.08	NMVOC	3.152934519	kg/animal
6852	Swine: Sows	4.B.08	PM10	0.69	kg/animal
6853	Swine: Fattng pigs	4.B.08	NH3	3.074575706	kg/animal
6853	Swine: Fattng pigs	4.B.08	TSP	0.75	kg/animal
6853	Swine: Fattng pigs	4.B.08	PM25	0.06	kg/animal
6853	Swine: Fattng pigs	4.B.08	NOX	0.008764314	kg/animal
6853	Swine: Fattng pigs	4.B.08	NMVOC	0.46352491	kg/animal
6853	Swine: Fattng pigs	4.B.08	PM10	0.34	kg/animal
6854	Laying hens	4.B.09.a	NMVOC	0.079116829	kg/animal
6854	Laying hens	4.B.09.a	PM10	0.119	kg/animal
6854	Laying hens	4.B.09.a	NH3	0.156445122	kg/animal
6854	Laying hens	4.B.09.a	TSP	0.119	kg/animal
6854	Laying hens	4.B.09.a	PM25	0.023	kg/animal

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6854	Laying hens	4.B.09.a	NOX	0.000194566	kg/animal
6856	Broilers	4.B.09.b	NMVOC	0.08369016	kg/animal
6856	Broilers	4.B.09.b	PM10	0.069	kg/animal
6856	Broilers	4.B.09.b	NH3	0.106257728	kg/animal
6856	Broilers	4.B.09.b	TSP	0.069	kg/animal
6856	Broilers	4.B.09.b	PM25	0.009	kg/animal
6856	Broilers	4.B.09.b	NOX	0.003247679	kg/animal
6858	Turkeys	4.B.09.c	NMVOC	0.283035076	kg/animal
6858	Turkeys	4.B.09.c	PM10	0.52	kg/animal
6858	Turkeys	4.B.09.c	NH3	0.530235268	kg/animal
6858	Turkeys	4.B.09.c	TSP	0.52	kg/animal
6858	Turkeys	4.B.09.c	PM25	0.07	kg/animal
6858	Turkeys	4.B.09.c	NOX	0.011757872	kg/animal
6859	Other poultry	4.B.09.d	NMVOC	0.05475894	kg/animal
6859	Other poultry	4.B.09.d	PM10	0.24	kg/animal
6859	Other poultry	4.B.09.d	NH3	0.55946286	kg/animal
6859	Other poultry	4.B.09.d	TSP	0.24	kg/animal
6859	Other poultry	4.B.09.d	PM25	0.03	kg/animal
6859	Other poultry	4.B.09.d	NOX	0.005414128	kg/animal
6860	Other poultry	4.B.09.d	NMVOC	0.108630857	kg/animal
6860	Other poultry	4.B.09.d	PM10	0.14	kg/animal
6860	Other poultry	4.B.09.d	NH3	0.198978336	kg/animal
6860	Other poultry	4.B.09.d	TSP	0.14	kg/animal
6860	Other poultry	4.B.09.d	PM25	0.02	kg/animal
6860	Other poultry	4.B.09.d	NOX	0.006190192	kg/animal
6863	Other poultry	4.B.09.d	NMVOC	0.05475894	kg/animal
6863	Other poultry	4.B.09.d	PM10	0.24	kg/animal
6863	Other poultry	4.B.09.d	NH3	0.55946286	kg/animal
6863	Other poultry	4.B.09.d	TSP	0.24	kg/animal
6863	Other poultry	4.B.09.d	PM25	0.03	kg/animal
6863	Other poultry	4.B.09.d	NOX	0.005414128	kg/animal
6800	HFO_2018	1.A.1.b	DIOX	2.5	ng/GJ
6800	HFO_2018	1.A.1.b	As	3.98	mg/GJ
6800	HFO_2018	1.A.1.b	Cd	1.2	mg/GJ
6800	HFO_2018	1.A.1.b	Cr	2.55	mg/GJ
6800	HFO_2018	1.A.1.b	Cu	5.31	mg/GJ
6800	HFO_2018	1.A.1.b	Hg	0.341	mg/GJ
6800	HFO_2018	1.A.1.b	Ni	255	mg/GJ
6800	HFO_2018	1.A.1.b	Pb	4.56	mg/GJ
6800	HFO_2018	1.A.1.b	Benzo(b)	4.5	µg/GJ
6800	HFO_2018	1.A.1.b	Benzo(k)	4.5	µg/GJ
6800	HFO_2018	1.A.1.b	Indeno	6.92	µg/GJ
6800	HFO_2018	1.A.1.b	SO2	437.42	g/GJ
6800	HFO_2018	1.A.1.b	NOX	142	g/GJ
6800	HFO_2018	1.A.1.b	NMVOC	2.3	g/GJ
6800	HFO_2018	1.A.1.b	CO	15.1	g/GJ
6800	HFO_2018	1.A.1.b	TSP	35.4	g/GJ
6800	HFO_2018	1.A.1.b	PM25	19.3	g/GJ

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6800	HFO_2018	1.A.1.b	PM10	25.2	g/GJ
6800	HFO_2018	1.A.1.b	BC	1.0808	g/GJ
6800	HFO_2018	1.A.1.b	Se	2.06	mg/GJ
6800	HFO_2018	1.A.1.b	Zn	87.8	mg/GJ
6824	Non dairy (other) - grazing	4.D.2.c	NOX	2.993454951	kg/animal
6825	Non dairy (young) - grazing	4.D.2.c	NH3	0.995649147	kg/animal
6957	1.A.3.a_kerosene_cruise2_2018	1.A.3.a.1.2	Se	0.11	mg/GJ
6957	1.A.3.a_kerosene_cruise2_2018	1.A.3.a.1.2	Zn	29	mg/GJ
6957	1.A.3.a_kerosene_cruise2_2018	1.A.3.a.1.2	Benzo(b)	15	µg/GJ
6957	1.A.3.a_kerosene_cruise2_2018	1.A.3.a.1.2	Benzo(a)	1.9	µg/GJ
6957	1.A.3.a_kerosene_cruise2_2018	1.A.3.a.1.2	SO2	10.99217704	g/GJ
6957	1.A.3.a_kerosene_cruise2_2018	1.A.3.a.1.2	NOX	291.17	g/GJ
6957	1.A.3.a_kerosene_cruise2_2018	1.A.3.a.1.2	NMVOC	11.37	g/GJ
6957	1.A.3.a_kerosene_cruise2_2018	1.A.3.a.1.2	CO	25.02	g/GJ
6957	1.A.3.a_kerosene_cruise2_2018	1.A.3.a.1.2	TSP	4.55	g/GJ
6957	1.A.3.a_kerosene_cruise2_2018	1.A.3.a.1.2	PM25	4.55	g/GJ
6957	1.A.3.a_kerosene_cruise2_2018	1.A.3.a.1.2	PM10	4.55	g/GJ
6957	1.A.3.a_kerosene_cruise2_2018	1.A.3.a.1.2	Benzo(k)	1.7	µg/GJ
6957	1.A.3.a_kerosene_cruise2_2018	1.A.3.a.1.2	Indeno	1.5	µg/GJ
6957	1.A.3.a_kerosene_cruise2_2018	1.A.3.a.1.2	DIOX	1.4	ng/GJ
6957	1.A.3.a_kerosene_cruise2_2018	1.A.3.a.1.2	BC	2.18	g/GJ
6958	1.A.3.a_kerosene_LTO1-2018	1.A.3.a.1.1	PM25	1.93	g/GJ
6958	1.A.3.a_kerosene_LTO1-2018	1.A.3.a.2.1	PM25	1.93	g/GJ
6958	1.A.3.a_kerosene_LTO1-2018	1.A.3.a.1.1	PM10	1.93	g/GJ
6958	1.A.3.a_kerosene_LTO1-2018	1.A.3.a.2.1	PM10	1.93	g/GJ
6958	1.A.3.a_kerosene_LTO1-2018	1.A.3.a.1.1	Benzo(k)	1.7	µg/GJ
6958	1.A.3.a_kerosene_LTO1-2018	1.A.3.a.2.1	Benzo(k)	1.7	µg/GJ
6958	1.A.3.a_kerosene_LTO1-2018	1.A.3.a.1.1	Indeno	1.5	µg/GJ
6958	1.A.3.a_kerosene_LTO1-2018	1.A.3.a.2.1	Indeno	1.5	µg/GJ
6958	1.A.3.a_kerosene_LTO1-2018	1.A.3.a.1.1	DIOX	1.4	ng/GJ
6958	1.A.3.a_kerosene_LTO1-2018	1.A.3.a.2.1	DIOX	1.4	ng/GJ
6958	1.A.3.a_kerosene_LTO1-2018	1.A.3.a.1.1	Hg	0.12	mg/GJ
6958	1.A.3.a_kerosene_LTO1-2018	1.A.3.a.2.1	Hg	0.12	mg/GJ
6958	1.A.3.a_kerosene_LTO1-2018	1.A.3.a.1.1	As	0.03	mg/GJ
6958	1.A.3.a_kerosene_LTO1-2018	1.A.3.a.2.1	As	0.03	mg/GJ
6958	1.A.3.a_kerosene_LTO1-2018	1.A.3.a.1.1	Cd	0.006	mg/GJ
6958	1.A.3.a_kerosene_LTO1-2018	1.A.3.a.2.1	Cd	0.006	mg/GJ
6958	1.A.3.a_kerosene_LTO1-2018	1.A.3.a.1.1	Cr	0.2	mg/GJ
6958	1.A.3.a_kerosene_LTO1-2018	1.A.3.a.2.1	Cr	0.2	mg/GJ
6958	1.A.3.a_kerosene_LTO1-2018	1.A.3.a.1.1	Cu	0.22	mg/GJ
6958	1.A.3.a_kerosene_LTO1-2018	1.A.3.a.2.1	Cu	0.22	mg/GJ
6958	1.A.3.a_kerosene_LTO1-2018	1.A.3.a.1.1	Ni	0.008	mg/GJ
6958	1.A.3.a_kerosene_LTO1-2018	1.A.3.a.2.1	Ni	0.008	mg/GJ
6958	1.A.3.a_kerosene_LTO1-2018	1.A.3.a.1.1	Pb	0.08	mg/GJ
6958	1.A.3.a_kerosene_LTO1-2018	1.A.3.a.2.1	Pb	0.08	mg/GJ
6958	1.A.3.a_kerosene_LTO1-2018	1.A.3.a.1.1	Se	0.11	mg/GJ
6958	1.A.3.a_kerosene_LTO1-2018	1.A.3.a.2.1	Se	0.11	mg/GJ
6958	1.A.3.a_kerosene_LTO1-2018	1.A.3.a.1.1	Zn	29	mg/GJ

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6958	1.A.3.a_kerosene_LTO1-2018	1.A.3.a.2.1	Zn	29	mg/GJ
6958	1.A.3.a_kerosene_LTO1-2018	1.A.3.a.1.1	Benzo(b)	15	µg/GJ
6958	1.A.3.a_kerosene_LTO1-2018	1.A.3.a.2.1	Benzo(b)	15	µg/GJ
6958	1.A.3.a_kerosene_LTO1-2018	1.A.3.a.1.1	BC	0.93	g/GJ
6958	1.A.3.a_kerosene_LTO1-2018	1.A.3.a.2.1	BC	0.93	g/GJ
6958	1.A.3.a_kerosene_LTO1-2018	1.A.3.a.1.1	Benzo(a)	1.9	µg/GJ
6958	1.A.3.a_kerosene_LTO1-2018	1.A.3.a.2.1	Benzo(a)	1.9	µg/GJ
6958	1.A.3.a_kerosene_LTO1-2018	1.A.3.a.1.1	SO2	10.99217704	g/GJ
6958	1.A.3.a_kerosene_LTO1-2018	1.A.3.a.2.1	SO2	10.99217704	g/GJ
6958	1.A.3.a_kerosene_LTO1-2018	1.A.3.a.1.1	NOX	228.86	g/GJ
6958	1.A.3.a_kerosene_LTO1-2018	1.A.3.a.2.1	NOX	228.86	g/GJ
6958	1.A.3.a_kerosene_LTO1-2018	1.A.3.a.1.1	NMVOC	13.79	g/GJ
6958	1.A.3.a_kerosene_LTO1-2018	1.A.3.a.2.1	NMVOC	13.79	g/GJ
6958	1.A.3.a_kerosene_LTO1-2018	1.A.3.a.1.1	CO	325.36	g/GJ
6958	1.A.3.a_kerosene_LTO1-2018	1.A.3.a.2.1	CO	325.36	g/GJ
6958	1.A.3.a_kerosene_LTO1-2018	1.A.3.a.1.1	TSP	1.93	g/GJ
6958	1.A.3.a_kerosene_LTO1-2018	1.A.3.a.2.1	TSP	1.93	g/GJ
6959	1.A.3.a_kerosene_LTO2_2018	1.A.3.a.1.1	PM25	1.93	g/GJ
6959	1.A.3.a_kerosene_LTO2_2018	1.A.3.a.1.1	PM10	1.93	g/GJ
6959	1.A.3.a_kerosene_LTO2_2018	1.A.3.a.1.1	Benzo(k)	1.7	µg/GJ
6959	1.A.3.a_kerosene_LTO2_2018	1.A.3.a.1.1	Indeno	1.5	µg/GJ
6959	1.A.3.a_kerosene_LTO2_2018	1.A.3.a.1.1	DIOX	1.4	ng/GJ
6959	1.A.3.a_kerosene_LTO2_2018	1.A.3.a.1.1	Hg	0.12	mg/GJ
6959	1.A.3.a_kerosene_LTO2_2018	1.A.3.a.1.1	As	0.03	mg/GJ
6959	1.A.3.a_kerosene_LTO2_2018	1.A.3.a.1.1	Cd	0.006	mg/GJ
6959	1.A.3.a_kerosene_LTO2_2018	1.A.3.a.1.1	Cr	0.2	mg/GJ
6961	1.A.3.a_kerosene_cruise1_2018	1.A.3.a.2.2	CO	45.5	g/GJ
6961	1.A.3.a_kerosene_cruise1_2018	1.A.3.a.2.2	TSP	4.55	g/GJ
6961	1.A.3.a_kerosene_cruise1_2018	1.A.3.a.2.2	PM25	4.55	g/GJ
6961	1.A.3.a_kerosene_cruise1_2018	1.A.3.a.2.2	PM10	4.55	g/GJ
6961	1.A.3.a_kerosene_cruise1_2018	1.A.3.a.2.2	Benzo(k)	1.7	µg/GJ
6961	1.A.3.a_kerosene_cruise1_2018	1.A.3.a.2.2	Indeno	1.5	µg/GJ
6961	1.A.3.a_kerosene_cruise1_2018	1.A.3.a.2.2	DIOX	1.4	ng/GJ
6961	1.A.3.a_kerosene_cruise1_2018	1.A.3.a.2.2	Hg	0.12	mg/GJ
6965	1.A.3.c_diesel-2018	1.A.3.c	Ni	1.64	mg/GJ
6965	1.A.3.c_diesel-2018	1.A.3.c	NH3	0.16	g/GJ
6965	1.A.3.c_diesel-2018	1.A.3.c	Pb	0.08	mg/GJ
6965	1.A.3.c_diesel-2018	1.A.3.c	Se	0.23	mg/GJ
6965	1.A.3.c_diesel-2018	1.A.3.c	Zn	23.41	mg/GJ
6965	1.A.3.c_diesel-2018	1.A.3.c	DIOX	1.4	ng/GJ
6965	1.A.3.c_diesel-2018	1.A.3.c	Benzo(b)	1.17	µg/GJ
6965	1.A.3.c_diesel-2018	1.A.3.c	Benzo(k)	1.7	µg/GJ
6965	1.A.3.c_diesel-2018	1.A.3.c	Benzo(a)	0.7	µg/GJ
6965	1.A.3.c_diesel-2018	1.A.3.c	Indeno	1.5	µg/GJ
6965	1.A.3.c_diesel-2018	1.A.3.c	SO2	0.348573659	g/GJ
6965	1.A.3.c_diesel-2018	1.A.3.c	NOX	1226.88	g/GJ
6965	1.A.3.c_diesel-2018	1.A.3.c	NMVOC	108.87	g/GJ
6965	1.A.3.c_diesel-2018	1.A.3.c	CO	250.53	g/GJ

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6965	1.A.3.c_diesel-2018	1.A.3.c	TSP	35.59	g/GJ
6965	1.A.3.c_diesel-2018	1.A.3.c	PM25	32.08	g/GJ
6965	1.A.3.c_diesel-2018	1.A.3.c	PM10	33.72	g/GJ
6965	1.A.3.c_diesel-2018	1.A.3.c	BC	0.21	g/GJ
6965	1.A.3.c_diesel-2018	1.A.3.c	As	0.03	mg/GJ
6965	1.A.3.c_diesel-2018	1.A.3.c	Cd	0.23	mg/GJ
6965	1.A.3.c_diesel-2018	1.A.3.c	Cr	1.17	mg/GJ
6965	1.A.3.c_diesel-2018	1.A.3.c	Cu	39.8	mg/GJ
6965	1.A.3.c_diesel-2018	1.A.3.c	Hg	0.12	mg/GJ
6967	AS+ASN	4.D.1.a	NH3	0.171214286	kg/kg fertilizer
7007	Sheep	4.D.1.b	NH3	0.034413713	kg/animal
7007	Sheep	4.D.1.b	NOX	0.096463017	kg/animal
7009	1.A.3.d.ii_gas oil/diesel_2018	1.A.3.d.2	Zn	28.096	mg/GJ
7009	1.A.3.d.ii_gas oil/diesel_2018	1.A.3.d.2	SO2	0.348573659	g/GJ
7009	1.A.3.d.ii_gas oil/diesel_2018	1.A.3.d.2	NOX	899.09	g/GJ
7009	1.A.3.d.ii_gas oil/diesel_2018	1.A.3.d.2	NH3	0.164	g/GJ
7009	1.A.3.d.ii_gas oil/diesel_2018	1.A.3.d.2	NMVOC	174.43	g/GJ
7009	1.A.3.d.ii_gas oil/diesel_2018	1.A.3.d.2	CO	463.59	g/GJ
7009	1.A.3.d.ii_gas oil/diesel_2018	1.A.3.d.2	TSP	107.7	g/GJ
7009	1.A.3.d.ii_gas oil/diesel_2018	1.A.3.d.2	PM10	107.7	g/GJ
7009	1.A.3.d.ii_gas oil/diesel_2018	1.A.3.d.2	PM25	107.7	g/GJ
7009	1.A.3.d.ii_gas oil/diesel_2018	1.A.3.d.2	Hg	0.7	mg/GJ
7009	1.A.3.d.ii_gas oil/diesel_2018	1.A.3.d.2	Pb	3.04	mg/GJ
7009	1.A.3.d.ii_gas oil/diesel_2018	1.A.3.d.2	HCB	1.87	µg/GJ
7009	1.A.3.d.ii_gas oil/diesel_2018	1.A.3.d.2	DIOX	3.04	ng/GJ
7009	1.A.3.d.ii_gas oil/diesel_2018	1.A.3.d.2	PCBs	0.89	µg/GJ
7009	1.A.3.d.ii_gas oil/diesel_2018	1.A.3.d.2	As	0.94	mg/GJ
7009	1.A.3.d.ii_gas oil/diesel_2018	1.A.3.d.2	Cd	0.234	mg/GJ
7009	1.A.3.d.ii_gas oil/diesel_2018	1.A.3.d.2	Cr	1.171	mg/GJ
7009	1.A.3.d.ii_gas oil/diesel_2018	1.A.3.d.2	Cu	20.604	mg/GJ
7009	1.A.3.d.ii_gas oil/diesel_2018	1.A.3.d.2	Ni	23.414	mg/GJ
7009	1.A.3.d.ii_gas oil/diesel_2018	1.A.3.d.2	Se	2.341	mg/GJ
7009	1.A.3.d.ii_gas oil/diesel_2018	1.A.3.d.2	BC	0.59	g/GJ
7011	1.A.3.d.ii_ fuel oil_2018	1.A.3.d.2	Hg	0.5	mg/GJ
7011	1.A.3.d.ii_ fuel oil_2018	1.A.3.d.2	Pb	4.48	mg/GJ
7011	1.A.3.d.ii_ fuel oil_2018	1.A.3.d.2	HCB	3.48	µg/GJ
7011	1.A.3.d.ii_ fuel oil_2018	1.A.3.d.2	PCBs	14.18	µg/GJ
7011	1.A.3.d.ii_ fuel oil_2018	1.A.3.d.2	DIOX	11.69	ng/GJ
7011	1.A.3.d.ii_ fuel oil_2018	1.A.3.d.2	Cd	0.5	mg/GJ
7011	1.A.3.d.ii_ fuel oil_2018	1.A.3.d.2	Cr	17.91	mg/GJ
7011	1.A.3.d.ii_ fuel oil_2018	1.A.3.d.2	Cu	31.1	mg/GJ
7011	1.A.3.d.ii_ fuel oil_2018	1.A.3.d.2	Ni	796.22	mg/GJ
7011	1.A.3.d.ii_ fuel oil_2018	1.A.3.d.2	Se	5.23	mg/GJ
7011	1.A.3.d.ii_ fuel oil_2018	1.A.3.d.2	Zn	29.86	mg/GJ
7011	1.A.3.d.ii_ fuel oil_2018	1.A.3.d.2	Benzo(b)	1244.091	µg/GJ
7011	1.A.3.d.ii_ fuel oil_2018	1.A.3.d.2	Benzo(a)	746.454	µg/GJ
7011	1.A.3.d.ii_ fuel oil_2018	1.A.3.d.2	SO2	1259.65816	g/GJ

Tech_ID	Naziv tehnologije	Kategorija	Polutant	Faktor emisije	Jedinica
7011	1.A.3.d.ii_ fuel oil_2018	1.A.3.d.2	NOX	1973.13	g/GJ
7011	1.A.3.d.ii_ fuel oil_2018	1.A.3.d.2	NH3	0.174	g/GJ
7011	1.A.3.d.ii_ fuel oil_2018	1.A.3.d.2	NMVOC	67.18	g/GJ
7011	1.A.3.d.ii_ fuel oil_2018	1.A.3.d.2	CO	184.13	g/GJ
7011	1.A.3.d.ii_ fuel oil_2018	1.A.3.d.2	TSP	154.27	g/GJ
7011	1.A.3.d.ii_ fuel oil_2018	1.A.3.d.2	PM10	154.27	g/GJ
7011	1.A.3.d.ii_ fuel oil_2018	1.A.3.d.2	PM25	139.34	g/GJ
7011	1.A.3.d.ii_ fuel oil_2018	1.A.3.d.2	BC	0.167	g/GJ
7011	1.A.3.d.ii_ fuel oil_2018	1.A.3.d.2	As	16.92	mg/GJ
7014	1.A.3.d.2_diesel_2018	1.A.3.d.2	As	0.94	mg/GJ
7014	1.A.3.d.2_diesel_2018	1.A.3.d.2	Cd	0.234	mg/GJ
7014	1.A.3.d.2_diesel_2018	1.A.3.d.2	Cr	1.171	mg/GJ
7014	1.A.3.d.2_diesel_2018	1.A.3.d.2	Cu	39.803	mg/GJ
7014	1.A.3.d.2_diesel_2018	1.A.3.d.2	Ni	1.639	mg/GJ
7014	1.A.3.d.2_diesel_2018	1.A.3.d.2	Se	0.234	mg/GJ
7014	1.A.3.d.2_diesel_2018	1.A.3.d.2	Zn	23.414	mg/GJ
7014	1.A.3.d.2_diesel_2018	1.A.3.d.2	Benzo(b)	1170.686	µg/GJ
7014	1.A.3.d.2_diesel_2018	1.A.3.d.2	Benzo(a)	702.412	µg/GJ
7014	1.A.3.d.2_diesel_2018	1.A.3.d.2	SO2	0.348573659	g/GJ
7014	1.A.3.d.2_diesel_2018	1.A.3.d.2	NOX	899.09	g/GJ
7014	1.A.3.d.2_diesel_2018	1.A.3.d.2	NH3	163.9	g/GJ
7014	1.A.3.d.2_diesel_2018	1.A.3.d.2	NMVOC	174.43	g/GJ
7014	1.A.3.d.2_diesel_2018	1.A.3.d.2	CO	463.59	g/GJ
7014	1.A.3.d.2_diesel_2018	1.A.3.d.2	TSP	107.7	g/GJ
7014	1.A.3.d.2_diesel_2018	1.A.3.d.2	PM10	107.7	g/GJ
7014	1.A.3.d.2_diesel_2018	1.A.3.d.2	PM25	107.7	g/GJ
7014	1.A.3.d.2_diesel_2018	1.A.3.d.2	Hg	0.7	mg/GJ
7014	1.A.3.d.2_diesel_2018	1.A.3.d.2	Pb	3.04	mg/GJ
7014	1.A.3.d.2_diesel_2018	1.A.3.d.2	HCB	1.87	µg/GJ
7014	1.A.3.d.2_diesel_2018	1.A.3.d.2	DIOX	3.04	ng/GJ
7014	1.A.3.d.2_diesel_2018	1.A.3.d.2	PCBs	8.9	µg/GJ
7014	1.A.3.d.2_diesel_2018	1.A.3.d.2	BC	0.59	g/GJ
7016	Field burning of agricultural wastes	4.F.5	SO2	0.0005	kg/kg product
7016	Field burning of agricultural wastes	4.F.5	NOX	0.0023	kg/kg product
7016	Field burning of agricultural wastes	4.F.5	NMVOC	0.0005	kg/kg product
7016	Field burning of agricultural wastes	4.F.5	CO	0.0667	kg/kg product
7016	Field burning of agricultural wastes	4.F.5	NH3	0.0024	kg/kg product
7016	Field burning of agricultural wastes	4.F.5	TSP	0.0058	kg/kg product
7016	Field burning of agricultural wastes	4.F.5	PM10	0.0057	kg/kg product
7016	Field burning of agricultural wastes	4.F.5	PM25	0.0054	kg/kg product
7016	Field burning of agricultural wastes	4.F.5	Pb	0.11	mg/kg product

Tech_ID	Naziv tehnologije	Kategorija	Polutant	Faktor emisije	Jedinica
7016	Field burning of agricultural wastes	4.F.5	Cd	0.88	mg/kg product
7016	Field burning of agricultural wastes	4.F.5	Hg	0.14	mg/kg product
7016	Field burning of agricultural wastes	4.F.5	As	0.0064	mg/kg product
7016	Field burning of agricultural wastes	4.F.5	Cr	0.08	mg/kg product
7016	Field burning of agricultural wastes	4.F.5	Cu	0.073	mg/kg product
7016	Field burning of agricultural wastes	4.F.5	Ni	0.052	mg/kg product
7016	Field burning of agricultural wastes	4.F.5	Se	0.02	mg/kg product
7016	Field burning of agricultural wastes	4.F.5	Zn	0.56	mg/kg product
7016	Field burning of agricultural wastes	4.F.5	DIOX	0.5	µg/kg product
7016	Field burning of agricultural wastes	4.F.5	Benzo(a)	0.393	mg/kg product
7016	Field burning of agricultural wastes	4.F.5	Benzo(b)	1.097	mg/kg product
7016	Field burning of agricultural wastes	4.F.5	Benzo(k)	0.468	mg/kg product
7030	Rijeka-2018	1.A.1.a	Cd	0	mg/GJ
7030	Rijeka-2018	1.A.1.a	Hg	0	mg/GJ
7030	Rijeka-2018	1.A.1.a	Ni	0	mg/GJ
7030	Rijeka-2018	1.A.1.a	Pb	0	mg/GJ
7030	Rijeka-2018	1.A.1.a	SO2	0	t
7030	Rijeka-2018	1.A.1.a	NOX	0	t
7030	Rijeka-2018	1.A.1.a	CO	0	t
7030	Rijeka-2018	1.A.1.a	TSP	0	t
7030	Rijeka-2018	1.A.1.a	PM25	0	t
7030	Rijeka-2018	1.A.1.a	PM10	0	t
7030	Rijeka-2018	1.A.1.a	BC	0	t
7031	TE-TO Os-2018	1.A.1.a	Cd	0	mg/GJ
7031	TE-TO Os-2018	1.A.1.a	Hg	0.181	mg/GJ
7031	TE-TO Os-2018	1.A.1.a	Ni	0	mg/GJ
7031	TE-TO Os-2018	1.A.1.a	Pb	0	mg/GJ
7031	TE-TO Os-2018	1.A.1.a	SO2	0	t
7031	TE-TO Os-2018	1.A.1.a	NOX	11.34	t
7031	TE-TO Os-2018	1.A.1.a	CO	0.26	t
7031	TE-TO Os-2018	1.A.1.a	TSP	0.06	t
7031	TE-TO Os-2018	1.A.1.a	PM25	0.03	t
7031	TE-TO Os-2018	1.A.1.a	PM10	0.02	t
7031	TE-TO Os-2018	1.A.1.a	BC	0.0133	t
7032	Cement production_C_2018	1.A.2.f.1	Cd	0.008	mg/GJ
7032	Cement production_C_2018	1.A.2.f.1	Hg	0.049	mg/GJ
7032	Cement production_C_2018	1.A.2.f.1	As	0.0265	mg/GJ
7032	Cement production_C_2018	1.A.2.f.1	Cr	0.041	mg/GJ
7032	Cement production_C_2018	1.A.2.f.1	Cu	0.0647	mg/GJ

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7032	Cement production_C_2018	1.A.2.f.1	Ni	0.049	mg/GJ
7032	Cement production_C_2018	1.A.2.f.1	Se	0.0253	mg/GJ
7032	Cement production_C_2018	1.A.2.f.1	Zn	0.424	mg/GJ
7032	Cement production_C_2018	1.A.2.f.1	HCB	4.6	µg/GJ
7032	Cement production_C_2018	1.A.2.f.1	PCBs	103	µg/GJ
7032	Cement production_C_2018	1.A.2.f.1	DIOX	4.1	ng/GJ
7032	Cement production_C_2018	1.A.2.f.1	Benzo(a)	6.50E-05	µg/GJ
7032	Cement production_C_2018	1.A.2.f.1	Benzo(b)	0.00028	µg/GJ
7032	Cement production_C_2018	1.A.2.f.1	Benzo(k)	7.70E-05	µg/GJ
7032	Cement production_C_2018	1.A.2.f.1	Indeno	4.30E-05	µg/GJ
7032	Cement production_C_2018	1.A.2.f.1	SO2	84.44349	t
7032	Cement production_C_2018	1.A.2.f.1	NOX	970.0654	t
7032	Cement production_C_2018	1.A.2.f.1	NMVOC	18	t
7032	Cement production_C_2018	1.A.2.f.1	CO	1382.4	t
7032	Cement production_C_2018	1.A.2.f.1	Pb	0.098	mg/GJ
7033	Cement production_H_2018	1.A.2.f.1	Cd	0.008	mg/GJ
7033	Cement production_H_2018	1.A.2.f.1	Hg	0.049	mg/GJ
7033	Cement production_H_2018	1.A.2.f.1	As	0.0265	mg/GJ
7033	Cement production_H_2018	1.A.2.f.1	Cr	0.041	mg/GJ
7033	Cement production_H_2018	1.A.2.f.1	Cu	0.0647	mg/GJ
7033	Cement production_H_2018	1.A.2.f.1	Ni	0.049	mg/GJ
7033	Cement production_H_2018	1.A.2.f.1	Se	0.0253	mg/GJ
7033	Cement production_H_2018	1.A.2.f.1	Zn	0.424	mg/GJ
7033	Cement production_H_2018	1.A.2.f.1	HCB	4.6	µg/GJ
7033	Cement production_H_2018	1.A.2.f.1	PCBs	103	µg/GJ
7033	Cement production_H_2018	1.A.2.f.1	DIOX	4.1	ng/GJ
7033	Cement production_H_2018	1.A.2.f.1	Benzo(a)	6.50E-05	µg/GJ
7033	Cement production_H_2018	1.A.2.f.1	Benzo(b)	0.00028	µg/GJ
7033	Cement production_H_2018	1.A.2.f.1	Benzo(k)	7.70E-05	µg/GJ
7033	Cement production_H_2018	1.A.2.f.1	Indeno	4.30E-05	µg/GJ
7033	Cement production_H_2018	1.A.2.f.1	SO2	78.2	t
7033	Cement production_H_2018	1.A.2.f.1	NOX	835.5	t
7033	Cement production_H_2018	1.A.2.f.1	NMVOC	54.3	t
7033	Cement production_H_2018	1.A.2.f.1	CO	1331.1	t
7033	Cement production_H_2018	1.A.2.f.1	Pb	0.098	mg/GJ
6895	SWDS-2018	6.A.1	NMVOC	0.699904956	kg/t
6895	SWDS-2018	6.A.1	TSP	0.463	g/t
6895	SWDS-2018	6.A.1	PM25	0.033	g/t
6895	SWDS-2018	6.A.1	PM10	0.219	g/t
6926	cropland	4.D.1.c	NMVOC	0.803139985	kg/ha
6956	Grassland	4.D.1.c	NMVOC	0.41	kg/ha
6957	1.A.3.a_kerosene_cruise2_2018	1.A.3.a.1.2	Hg	0.12	mg/GJ
6957	1.A.3.a_kerosene_cruise2_2018	1.A.3.a.1.2	As	0.03	mg/GJ
6957	1.A.3.a_kerosene_cruise2_2018	1.A.3.a.1.2	Cd	0.006	mg/GJ
6957	1.A.3.a_kerosene_cruise2_2018	1.A.3.a.1.2	Cr	0.2	mg/GJ
6957	1.A.3.a_kerosene_cruise2_2018	1.A.3.a.1.2	Cu	0.22	mg/GJ
6957	1.A.3.a_kerosene_cruise2_2018	1.A.3.a.1.2	Ni	0.008	mg/GJ
6957	1.A.3.a_kerosene_cruise2_2018	1.A.3.a.1.2	Pb	0.08	mg/GJ

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7016	Field burning of agricultural wastes	4.F.5	Indeno	0.336	mg/kg product
7016	Field burning of agricultural wastes	4.F.5	BC	500	kg/kg product
7024	TE-TO Zg 2018	1.A.1.a	Hg	1.427	mg/GJ
7024	TE-TO Zg 2018	1.A.1.a	Ni	0	mg/GJ
7024	TE-TO Zg 2018	1.A.1.a	Pb	0	mg/GJ
7024	TE-TO Zg 2018	1.A.1.a	SO2	7.94	t
7024	TE-TO Zg 2018	1.A.1.a	NOX	215.78	t
7024	TE-TO Zg 2018	1.A.1.a	CO	44.44	t
7024	TE-TO Zg 2018	1.A.1.a	TSP	5.476	t
7024	TE-TO Zg 2018	1.A.1.a	PM25	1.369	t
7024	TE-TO Zg 2018	1.A.1.a	PM10	2.738	t
7024	TE-TO Zg 2018	1.A.1.a	BC	0.03	t
7025	EL-TO Zg 2018	1.A.1.a	Cd	0	mg/GJ
7025	EL-TO Zg 2018	1.A.1.a	Hg	0.541	mg/GJ
7025	EL-TO Zg 2018	1.A.1.a	Ni	0	mg/GJ
7025	EL-TO Zg 2018	1.A.1.a	Pb	0	mg/GJ
7025	EL-TO Zg 2018	1.A.1.a	SO2	1.187	t
7025	EL-TO Zg 2018	1.A.1.a	NOX	444.443	t
7025	EL-TO Zg 2018	1.A.1.a	CO	20.594	t
7025	EL-TO Zg 2018	1.A.1.a	TSP	3.034	t
7025	EL-TO Zg 2018	1.A.1.a	PM25	0.7585	t
7025	EL-TO Zg 2018	1.A.1.a	PM10	1.517	t
7025	EL-TO Zg 2018	1.A.1.a	BC	0.02	t
7026	KTE Jertovec 2018	1.A.1.a	Hg	0.028	mg/GJ
7026	KTE Jertovec 2018	1.A.1.a	SO2	0	t
7026	KTE Jertovec 2018	1.A.1.a	NOX	41.53	t
7026	KTE Jertovec 2018	1.A.1.a	CO	1.57	t
7026	KTE Jertovec 2018	1.A.1.a	TSP	0	t
7026	KTE Jertovec 2018	1.A.1.a	PM25	0	t
7026	KTE Jertovec 2018	1.A.1.a	PM10	0	t
7026	KTE Jertovec 2018	1.A.1.a	Cd	0	kg
7026	KTE Jertovec 2018	1.A.1.a	Pb	0	kg
7026	KTE Jertovec 2018	1.A.1.a	Ni	0	kg
7026	KTE Jertovec 2018	1.A.1.a	BC	0	t
7027	TE Sisak 2018	1.A.1.a	Cd	0	kg
7027	TE Sisak 2018	1.A.1.a	Hg	0.74	no unit
7027	TE Sisak 2018	1.A.1.a	BC	0.014625	t
7027	TE Sisak 2018	1.A.1.a	Ni	0	mg/GJ
7027	TE Sisak 2018	1.A.1.a	Pb	0	mg/GJ
7027	TE Sisak 2018	1.A.1.a	SO2	4.14	t
7027	TE Sisak 2018	1.A.1.a	NOX	173.35	t
7027	TE Sisak 2018	1.A.1.a	CO	36.13	t
7027	TE Sisak 2018	1.A.1.a	TSP	2.34	t
7027	TE Sisak 2018	1.A.1.a	PM25	0.585	t
7027	TE Sisak 2018	1.A.1.a	PM10	1.17	t
7028	Petrokemija_2018	1.A.2.c	SO2	0.05	t

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7028	Petrokemija_2018	1.A.2.c	NOX	154.86	t
7028	Petrokemija_2018	1.A.2.c	CO	75.14	t
7029	DE-TE Plomin-2018	1.A.1.a	Cd	2.756	mg/GJ
7029	DE-TE Plomin-2018	1.A.1.a	Hg	98.42	mg/GJ
7029	DE-TE Plomin-2018	1.A.1.a	Ni	133.85	mg/GJ
7029	DE-TE Plomin-2018	1.A.1.a	Pb	112.2	mg/GJ
7029	DE-TE Plomin-2018	1.A.1.a	SO2	369.55	t
7029	DE-TE Plomin-2018	1.A.1.a	NOX	536.78	t
7029	DE-TE Plomin-2018	1.A.1.a	CO	0	t
7029	DE-TE Plomin-2018	1.A.1.a	TSP	0.3	t
7029	DE-TE Plomin-2018	1.A.1.a	PM25	0.075	t
7029	DE-TE Plomin-2018	1.A.1.a	PM10	0.075	t
7029	DE-TE Plomin-2018	1.A.1.a	BC	0.0033	t
7034	Cement production_CA_2018	1.A.2.f.1	Pb	0.098	mg/GJ
7034	Cement production_CA_2018	1.A.2.f.1	Cd	0.008	mg/GJ
7034	Cement production_CA_2018	1.A.2.f.1	Hg	0.049	mg/GJ
7034	Cement production_CA_2018	1.A.2.f.1	As	0.0265	mg/GJ
7034	Cement production_CA_2018	1.A.2.f.1	Cr	0.041	mg/GJ
7034	Cement production_CA_2018	1.A.2.f.1	Cu	0.0647	mg/GJ
7034	Cement production_CA_2018	1.A.2.f.1	Ni	0.049	mg/GJ
7034	Cement production_CA_2018	1.A.2.f.1	Se	0.0253	mg/GJ
7034	Cement production_CA_2018	1.A.2.f.1	Zn	0.424	mg/GJ
7034	Cement production_CA_2018	1.A.2.f.1	HCB	4.6	µg/GJ
7034	Cement production_CA_2018	1.A.2.f.1	PCBs	103	µg/GJ
7034	Cement production_CA_2018	1.A.2.f.1	DIOX	4.1	ng/GJ
7034	Cement production_CA_2018	1.A.2.f.1	Benzo(a)	6.50E-05	µg/GJ
7034	Cement production_CA_2018	1.A.2.f.1	Benzo(b)	0.00028	µg/GJ
7034	Cement production_CA_2018	1.A.2.f.1	Benzo(k)	7.70E-05	µg/GJ
7034	Cement production_CA_2018	1.A.2.f.1	Indeno	4.30E-05	µg/GJ
7034	Cement production_CA_2018	1.A.2.f.1	SO2	2142	t
7034	Cement production_CA_2018	1.A.2.f.1	NOX	3101.69	t
7034	Cement production_CA_2018	1.A.2.f.1	NMVOC	18	t
7034	Cement production_CA_2018	1.A.2.f.1	CO	1956.011	t
7035	1.A.2.f.1_DE_Rockwool_2018	1.A.2.f.1	NOX	5.288838	t
7035	1.A.2.f.1_DE_Rockwool_2019	1.A.2.f.1	CO	1.369548	t
7035	1.A.2.f.1_DE_Rockwool_2020	1.A.2.f.1	SO2	204.154892	t
7056	1.B.2.b.ii_NG transmission_2018	1.B.2.b.2	NMVOC	0.015285769	kg/1000 m3
7058	LF-HFO_2018	1.A.2.a	Pb	0.08	mg/GJ
7058	LF-HFO_2018	1.A.2.b	Pb	0.08	mg/GJ
7058	LF-HFO_2018	1.A.2.c	Pb	0.08	mg/GJ
7058	LF-HFO_2018	1.A.2.d	Pb	0.08	mg/GJ
7058	LF-HFO_2018	1.A.2.e	Pb	0.08	mg/GJ
7058	LF-HFO_2018	1.A.2.f.1	Pb	0.08	mg/GJ
7058	LF-HFO_2018	1.A.2.a	Se	0.11	mg/GJ
7058	LF-HFO_2018	1.A.2.b	Se	0.11	mg/GJ
7058	LF-HFO_2018	1.A.2.c	Se	0.11	mg/GJ
7058	LF-HFO_2018	1.A.2.d	Se	0.11	mg/GJ

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7058	LF-HFO_2018	1.A.2.e	Se	0.11	mg/GJ
7058	LF-HFO_2018	1.A.2.f.1	Se	0.11	mg/GJ
7058	LF-HFO_2018	1.A.2.a	Zn	29	mg/GJ
7058	LF-HFO_2018	1.A.2.b	Zn	29	mg/GJ
7058	LF-HFO_2018	1.A.2.c	Zn	29	mg/GJ
7058	LF-HFO_2018	1.A.2.d	Zn	29	mg/GJ
7058	LF-HFO_2018	1.A.2.e	Zn	29	mg/GJ
7058	LF-HFO_2018	1.A.2.f.1	Zn	29	mg/GJ
7058	LF-HFO_2018	1.A.2.a	DIOX	1.4	ng/GJ
7058	LF-HFO_2018	1.A.2.b	DIOX	1.4	ng/GJ
7058	LF-HFO_2018	1.A.2.c	DIOX	1.4	ng/GJ
7058	LF-HFO_2018	1.A.2.d	DIOX	1.4	ng/GJ
7058	LF-HFO_2018	1.A.2.e	DIOX	1.4	ng/GJ
7058	LF-HFO_2018	1.A.2.f.1	DIOX	1.4	ng/GJ
7058	LF-HFO_2018	1.A.2.a	Benzo(b)	15	µg/GJ
7058	LF-HFO_2018	1.A.2.b	Benzo(b)	15	µg/GJ
7058	LF-HFO_2018	1.A.2.c	Benzo(b)	15	µg/GJ
7058	LF-HFO_2018	1.A.2.d	Benzo(b)	15	µg/GJ
7058	LF-HFO_2018	1.A.2.e	Benzo(b)	15	µg/GJ
7058	LF-HFO_2018	1.A.2.f.1	Benzo(b)	15	µg/GJ
7058	LF-HFO_2018	1.A.2.a	Benzo(k)	1.7	µg/GJ
7058	LF-HFO_2018	1.A.2.b	Benzo(k)	1.7	µg/GJ
7058	LF-HFO_2018	1.A.2.c	Benzo(k)	1.7	µg/GJ
7058	LF-HFO_2018	1.A.2.d	Benzo(k)	1.7	µg/GJ
7058	LF-HFO_2018	1.A.2.e	Benzo(k)	1.7	µg/GJ
7058	LF-HFO_2018	1.A.2.f.1	Benzo(k)	1.7	µg/GJ
7058	LF-HFO_2018	1.A.2.a	Benzo(a)	1.9	µg/GJ
7058	LF-HFO_2018	1.A.2.b	Benzo(a)	1.9	µg/GJ
7058	LF-HFO_2018	1.A.2.c	Benzo(a)	1.9	µg/GJ
7058	LF-HFO_2018	1.A.2.d	Benzo(a)	1.9	µg/GJ
7058	LF-HFO_2018	1.A.2.e	Benzo(a)	1.9	µg/GJ
7058	LF-HFO_2018	1.A.2.f.1	Benzo(a)	1.9	µg/GJ
7058	LF-HFO_2018	1.A.2.a	Indeno	1.5	µg/GJ
7058	LF-HFO_2018	1.A.2.b	Indeno	1.5	µg/GJ
7058	LF-HFO_2018	1.A.2.c	Indeno	1.5	µg/GJ
7058	LF-HFO_2018	1.A.2.d	Indeno	1.5	µg/GJ
7058	LF-HFO_2018	1.A.2.e	Indeno	1.5	µg/GJ
7058	LF-HFO_2018	1.A.2.f.1	Indeno	1.5	µg/GJ
7058	LF-HFO_2018	1.A.2.a	SO2	445.38	g/GJ
7058	LF-HFO_2018	1.A.2.b	SO2	445.38	g/GJ
7058	LF-HFO_2018	1.A.2.c	SO2	445.38	g/GJ
7058	LF-HFO_2018	1.A.2.d	SO2	445.38	g/GJ
7058	LF-HFO_2018	1.A.2.e	SO2	445.38	g/GJ
7058	LF-HFO_2018	1.A.2.f.1	SO2	445.38	g/GJ
7058	LF-HFO_2018	1.A.2.a	NOX	513	g/GJ
7058	LF-HFO_2018	1.A.2.b	NOX	513	g/GJ
7058	LF-HFO_2018	1.A.2.c	NOX	513	g/GJ
7058	LF-HFO_2018	1.A.2.d	NOX	513	g/GJ

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7058	LF-HFO_2018	1.A.2.e	NOX	513	g/GJ
7058	LF-HFO_2018	1.A.2.f.1	NOX	513	g/GJ
7058	LF-HFO_2018	1.A.2.a	NMVOC	25	g/GJ
7058	LF-HFO_2018	1.A.2.b	NMVOC	25	g/GJ
7058	LF-HFO_2018	1.A.2.c	NMVOC	25	g/GJ
7058	LF-HFO_2018	1.A.2.d	NMVOC	25	g/GJ
7058	LF-HFO_2018	1.A.2.e	NMVOC	25	g/GJ
7058	LF-HFO_2018	1.A.2.f.1	NMVOC	25	g/GJ
7058	LF-HFO_2018	1.A.2.a	CO	66	g/GJ
7058	LF-HFO_2018	1.A.2.b	CO	66	g/GJ
7058	LF-HFO_2018	1.A.2.c	CO	66	g/GJ
7058	LF-HFO_2018	1.A.2.d	CO	66	g/GJ
7058	LF-HFO_2018	1.A.2.e	CO	66	g/GJ
7058	LF-HFO_2018	1.A.2.f.1	CO	66	g/GJ
7058	LF-HFO_2018	1.A.2.a	TSP	20	g/GJ
7058	LF-HFO_2018	1.A.2.b	TSP	20	g/GJ
7058	LF-HFO_2018	1.A.2.c	TSP	20	g/GJ
7058	LF-HFO_2018	1.A.2.d	TSP	20	g/GJ
7058	LF-HFO_2018	1.A.2.e	TSP	20	g/GJ
7058	LF-HFO_2018	1.A.2.f.1	TSP	20	g/GJ
7058	LF-HFO_2018	1.A.2.a	PM25	20	g/GJ
7058	LF-HFO_2018	1.A.2.b	PM25	20	g/GJ
7058	LF-HFO_2018	1.A.2.c	PM25	20	g/GJ
7058	LF-HFO_2018	1.A.2.d	PM25	20	g/GJ
7058	LF-HFO_2018	1.A.2.e	PM25	20	g/GJ
7058	LF-HFO_2018	1.A.2.f.1	PM25	20	g/GJ
7058	LF-HFO_2018	1.A.2.a	PM10	20	g/GJ
7058	LF-HFO_2018	1.A.2.b	PM10	20	g/GJ
7058	LF-HFO_2018	1.A.2.c	PM10	20	g/GJ
7058	LF-HFO_2018	1.A.2.d	PM10	20	g/GJ
7058	LF-HFO_2018	1.A.2.e	PM10	20	g/GJ
7058	LF-HFO_2018	1.A.2.f.1	PM10	20	g/GJ
7058	LF-HFO_2018	1.A.2.a	BC	11.2	g/GJ
7058	LF-HFO_2018	1.A.2.b	BC	11.2	g/GJ
7058	LF-HFO_2018	1.A.2.c	BC	11.2	g/GJ
7058	LF-HFO_2018	1.A.2.d	BC	11.2	g/GJ
7058	LF-HFO_2018	1.A.2.e	BC	11.2	g/GJ
7058	LF-HFO_2018	1.A.2.f.1	BC	11.2	g/GJ
7058	LF-HFO_2018	1.A.2.a	As	0.03	mg/GJ
7058	LF-HFO_2018	1.A.2.b	As	0.03	mg/GJ
7058	LF-HFO_2018	1.A.2.c	As	0.03	mg/GJ
7058	LF-HFO_2018	1.A.2.d	As	0.03	mg/GJ
7058	LF-HFO_2018	1.A.2.e	As	0.03	mg/GJ
7058	LF-HFO_2018	1.A.2.f.1	As	0.03	mg/GJ
7058	LF-HFO_2018	1.A.2.a	Cd	0.006	mg/GJ
7058	LF-HFO_2018	1.A.2.b	Cd	0.006	mg/GJ
7058	LF-HFO_2018	1.A.2.c	Cd	0.006	mg/GJ
7058	LF-HFO_2018	1.A.2.d	Cd	0.006	mg/GJ

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7058	LF-HFO_2018	1.A.2.e	Cd	0.006	mg/GJ
7058	LF-HFO_2018	1.A.2.f.1	Cd	0.006	mg/GJ
7058	LF-HFO_2018	1.A.2.a	Cr	0.2	mg/GJ
7058	LF-HFO_2018	1.A.2.b	Cr	0.2	mg/GJ
7058	LF-HFO_2018	1.A.2.c	Cr	0.2	mg/GJ
7058	LF-HFO_2018	1.A.2.d	Cr	0.2	mg/GJ
7058	LF-HFO_2018	1.A.2.e	Cr	0.2	mg/GJ
7058	LF-HFO_2018	1.A.2.f.1	Cr	0.2	mg/GJ
7058	LF-HFO_2018	1.A.2.a	Cu	0.22	mg/GJ
7058	LF-HFO_2018	1.A.2.b	Cu	0.22	mg/GJ
7058	LF-HFO_2018	1.A.2.c	Cu	0.22	mg/GJ
7058	LF-HFO_2018	1.A.2.d	Cu	0.22	mg/GJ
7058	LF-HFO_2018	1.A.2.e	Cu	0.22	mg/GJ
7058	LF-HFO_2018	1.A.2.f.1	Cu	0.22	mg/GJ
7058	LF-HFO_2018	1.A.2.a	Hg	0.12	mg/GJ
7058	LF-HFO_2018	1.A.2.b	Hg	0.12	mg/GJ
7058	LF-HFO_2018	1.A.2.c	Hg	0.12	mg/GJ
7058	LF-HFO_2018	1.A.2.d	Hg	0.12	mg/GJ
7058	LF-HFO_2018	1.A.2.e	Hg	0.12	mg/GJ
7058	LF-HFO_2018	1.A.2.f.1	Hg	0.12	mg/GJ
7058	LF-HFO_2018	1.A.2.a	Ni	0.008	mg/GJ
7058	LF-HFO_2018	1.A.2.b	Ni	0.008	mg/GJ
7058	LF-HFO_2018	1.A.2.c	Ni	0.008	mg/GJ
7058	LF-HFO_2018	1.A.2.d	Ni	0.008	mg/GJ
7058	LF-HFO_2018	1.A.2.e	Ni	0.008	mg/GJ
7058	LF-HFO_2018	1.A.2.f.1	Ni	0.008	mg/GJ
7059	LF-GO_2018	1.A.2.a	As	4.2	mg/GJ
7059	LF-GO_2018	1.A.2.b	As	4.2	mg/GJ
7059	LF-GO_2018	1.A.2.c	As	4.2	mg/GJ
7059	LF-GO_2018	1.A.2.d	As	4.2	mg/GJ
7059	LF-GO_2018	1.A.2.e	As	4.2	mg/GJ
7059	LF-GO_2018	1.A.2.f.1	As	4.2	mg/GJ
7059	LF-GO_2018	1.A.2.a	Cd	0.4	mg/GJ
7059	LF-GO_2018	1.A.2.b	Cd	0.4	mg/GJ
7059	LF-GO_2018	1.A.2.c	Cd	0.4	mg/GJ
7059	LF-GO_2018	1.A.2.d	Cd	0.4	mg/GJ
7059	LF-GO_2018	1.A.2.e	Cd	0.4	mg/GJ
7059	LF-GO_2018	1.A.2.f.1	Cd	0.4	mg/GJ
7059	LF-GO_2018	1.A.2.a	Cr	3.1	mg/GJ
7059	LF-GO_2018	1.A.2.b	Cr	3.1	mg/GJ
7059	LF-GO_2018	1.A.2.c	Cr	3.1	mg/GJ
7059	LF-GO_2018	1.A.2.d	Cr	3.1	mg/GJ
7059	LF-GO_2018	1.A.2.e	Cr	3.1	mg/GJ
7059	LF-GO_2018	1.A.2.f.1	Cr	3.1	mg/GJ
7059	LF-GO_2018	1.A.2.a	Cu	2	mg/GJ
7059	LF-GO_2018	1.A.2.b	Cu	2	mg/GJ
7059	LF-GO_2018	1.A.2.c	Cu	2	mg/GJ
7059	LF-GO_2018	1.A.2.d	Cu	2	mg/GJ

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7059	LF-GO_2018	1.A.2.e	Cu	2	mg/GJ
7059	LF-GO_2018	1.A.2.f.1	Cu	2	mg/GJ
7059	LF-GO_2018	1.A.2.a	Hg	4.4	mg/GJ
7059	LF-GO_2018	1.A.2.b	Hg	4.4	mg/GJ
7059	LF-GO_2018	1.A.2.c	Hg	4.4	mg/GJ
7059	LF-GO_2018	1.A.2.d	Hg	4.4	mg/GJ
7059	LF-GO_2018	1.A.2.e	Hg	4.4	mg/GJ
7059	LF-GO_2018	1.A.2.f.1	Hg	4.4	mg/GJ
7059	LF-GO_2018	1.A.2.a	Ni	3.9	mg/GJ
7059	LF-GO_2018	1.A.2.b	Ni	3.9	mg/GJ
7059	LF-GO_2018	1.A.2.c	Ni	3.9	mg/GJ
7059	LF-GO_2018	1.A.2.d	Ni	3.9	mg/GJ
7059	LF-GO_2018	1.A.2.e	Ni	3.9	mg/GJ
7059	LF-GO_2018	1.A.2.f.1	Ni	3.9	mg/GJ
7059	LF-GO_2018	1.A.2.a	Pb	3.9	mg/GJ
7059	LF-GO_2018	1.A.2.b	Pb	3.9	mg/GJ
7059	LF-GO_2018	1.A.2.c	Pb	3.9	mg/GJ
7059	LF-GO_2018	1.A.2.d	Pb	3.9	mg/GJ
7059	LF-GO_2018	1.A.2.e	Pb	3.9	mg/GJ
7059	LF-GO_2018	1.A.2.f.1	Pb	3.9	mg/GJ
7059	LF-GO_2018	1.A.2.a	Se	1.8	mg/GJ
7059	LF-GO_2018	1.A.2.b	Se	1.8	mg/GJ
7059	LF-GO_2018	1.A.2.c	Se	1.8	mg/GJ
7059	LF-GO_2018	1.A.2.d	Se	1.8	mg/GJ
7059	LF-GO_2018	1.A.2.e	Se	1.8	mg/GJ
7059	LF-GO_2018	1.A.2.f.1	Se	1.8	mg/GJ
7059	LF-GO_2018	1.A.2.a	Zn	10.4	mg/GJ
7059	LF-GO_2018	1.A.2.b	Zn	10.4	mg/GJ
7059	LF-GO_2018	1.A.2.c	Zn	10.4	mg/GJ
7059	LF-GO_2018	1.A.2.d	Zn	10.4	mg/GJ
7059	LF-GO_2018	1.A.2.e	Zn	10.4	mg/GJ
7059	LF-GO_2018	1.A.2.f.1	Zn	10.4	mg/GJ
7059	LF-GO_2018	1.A.2.a	DIOX	9.07	ng/GJ
7059	LF-GO_2018	1.A.2.b	DIOX	9.07	ng/GJ
7059	LF-GO_2018	1.A.2.c	DIOX	9.07	ng/GJ
7059	LF-GO_2018	1.A.2.d	DIOX	9.07	ng/GJ
7059	LF-GO_2018	1.A.2.e	DIOX	9.07	ng/GJ
7059	LF-GO_2018	1.A.2.f.1	DIOX	9.07	ng/GJ
7059	LF-GO_2018	1.A.2.a	Benzo(b)	1285.71	µg/GJ
7059	LF-GO_2018	1.A.2.b	Benzo(b)	1285.71	µg/GJ
7059	LF-GO_2018	1.A.2.c	Benzo(b)	1285.71	µg/GJ
7059	LF-GO_2018	1.A.2.d	Benzo(b)	1285.71	µg/GJ
7059	LF-GO_2018	1.A.2.e	Benzo(b)	1285.71	µg/GJ
7059	LF-GO_2018	1.A.2.f.1	Benzo(b)	1285.71	µg/GJ
7059	LF-GO_2018	1.A.2.a	Benzo(k)	1285.71	µg/GJ
7059	LF-GO_2018	1.A.2.b	Benzo(k)	1285.71	µg/GJ
7059	LF-GO_2018	1.A.2.c	Benzo(k)	1285.71	µg/GJ
7059	LF-GO_2018	1.A.2.d	Benzo(k)	1285.71	µg/GJ

Tech_ID	Naziv tehnologije	Kategorija	Polutant	Faktor emisije	Jedinica
7059	LF-GO_2018	1.A.2.e	Benzo(k)	1285.71	µg/GJ
7059	LF-GO_2018	1.A.2.f.1	Benzo(k)	1285.71	µg/GJ
7059	LF-GO_2018	1.A.2.a	Benzo(a)	32.2	µg/GJ
7059	LF-GO_2018	1.A.2.b	Benzo(a)	32.2	µg/GJ
7059	LF-GO_2018	1.A.2.c	Benzo(a)	32.2	µg/GJ
7059	LF-GO_2018	1.A.2.d	Benzo(a)	32.2	µg/GJ
7059	LF-GO_2018	1.A.2.e	Benzo(a)	32.2	µg/GJ
7059	LF-GO_2018	1.A.2.f.1	Benzo(a)	32.2	µg/GJ
7059	LF-GO_2018	1.A.2.a	Indeno	967.03	µg/GJ
7059	LF-GO_2018	1.A.2.b	Indeno	967.03	µg/GJ
7059	LF-GO_2018	1.A.2.c	Indeno	967.03	µg/GJ
7059	LF-GO_2018	1.A.2.d	Indeno	967.03	µg/GJ
7059	LF-GO_2018	1.A.2.e	Indeno	967.03	µg/GJ
7059	LF-GO_2018	1.A.2.f.1	Indeno	967.03	µg/GJ
7059	LF-GO_2018	1.A.2.a	SO2	34.65	g/GJ
7059	LF-GO_2018	1.A.2.b	SO2	34.65	g/GJ
7059	LF-GO_2018	1.A.2.c	SO2	34.65	g/GJ
7059	LF-GO_2018	1.A.2.d	SO2	34.65	g/GJ
7059	LF-GO_2018	1.A.2.e	SO2	34.65	g/GJ
7059	LF-GO_2018	1.A.2.f.1	SO2	34.65	g/GJ
7059	LF-GO_2018	1.A.2.a	NOX	155	g/GJ
7059	LF-GO_2018	1.A.2.b	NOX	155	g/GJ
7059	LF-GO_2018	1.A.2.c	NOX	155	g/GJ
7059	LF-GO_2018	1.A.2.d	NOX	155	g/GJ
7059	LF-GO_2018	1.A.2.e	NOX	155	g/GJ
7059	LF-GO_2018	1.A.2.f.1	NOX	155	g/GJ
7059	LF-GO_2018	1.A.2.a	NH3	0.31	g/GJ
7059	LF-GO_2018	1.A.2.b	NH3	0.31	g/GJ
7059	LF-GO_2018	1.A.2.c	NH3	0.31	g/GJ
7059	LF-GO_2018	1.A.2.d	NH3	0.31	g/GJ
7059	LF-GO_2018	1.A.2.e	NH3	0.31	g/GJ
7059	LF-GO_2018	1.A.2.f.1	NH3	0.31	g/GJ
7059	LF-GO_2018	1.A.2.a	NMVOC	20	g/GJ
7059	LF-GO_2018	1.A.2.b	NMVOC	20	g/GJ
7059	LF-GO_2018	1.A.2.c	NMVOC	20	g/GJ
7059	LF-GO_2018	1.A.2.d	NMVOC	20	g/GJ
7059	LF-GO_2018	1.A.2.e	NMVOC	20	g/GJ
7059	LF-GO_2018	1.A.2.f.1	NMVOC	20	g/GJ
7059	LF-GO_2018	1.A.2.a	CO	73	g/GJ
7059	LF-GO_2018	1.A.2.b	CO	73	g/GJ
7059	LF-GO_2018	1.A.2.c	CO	73	g/GJ
7059	LF-GO_2018	1.A.2.d	CO	73	g/GJ
7059	LF-GO_2018	1.A.2.e	CO	73	g/GJ
7059	LF-GO_2018	1.A.2.f.1	CO	73	g/GJ
7059	LF-GO_2018	1.A.2.a	TSP	100	g/GJ
7059	LF-GO_2018	1.A.2.b	TSP	100	g/GJ
7059	LF-GO_2018	1.A.2.c	TSP	100	g/GJ
7059	LF-GO_2018	1.A.2.d	TSP	100	g/GJ

Tech_ID	Naziv tehnologije	Kategorija	Polutant	Faktor emisije	Jedinica
7059	LF-GO_2018	1.A.2.e	TSP	100	g/GJ
7059	LF-GO_2018	1.A.2.f.1	TSP	100	g/GJ
7059	LF-GO_2018	1.A.2.a	PM25	35	g/GJ
7059	LF-GO_2018	1.A.2.b	PM25	35	g/GJ
7059	LF-GO_2018	1.A.2.c	PM25	35	g/GJ
7059	LF-GO_2018	1.A.2.d	PM25	35	g/GJ
7059	LF-GO_2018	1.A.2.e	PM25	35	g/GJ
7059	LF-GO_2018	1.A.2.f.1	PM25	35	g/GJ
7059	LF-GO_2018	1.A.2.a	PM10	60	g/GJ
7059	LF-GO_2018	1.A.2.b	PM10	60	g/GJ
7059	LF-GO_2018	1.A.2.c	PM10	60	g/GJ
7059	LF-GO_2018	1.A.2.d	PM10	60	g/GJ
7059	LF-GO_2018	1.A.2.e	PM10	60	g/GJ
7059	LF-GO_2018	1.A.2.f.1	PM10	60	g/GJ
7059	LF-GO_2018	1.A.2.a	HCB	0.62	µg/GJ
7059	LF-GO_2018	1.A.2.b	HCB	0.62	µg/GJ
7059	LF-GO_2018	1.A.2.c	HCB	0.62	µg/GJ
7059	LF-GO_2018	1.A.2.d	HCB	0.62	µg/GJ
7059	LF-GO_2018	1.A.2.e	HCB	0.62	µg/GJ
7059	LF-GO_2018	1.A.2.f.1	HCB	0.62	µg/GJ
7060	1.A.4.a_LF-gas oil_2018	1.A.4.a.1	Pb	8	mg/GJ
7060	1.A.4.a_LF-gas oil_2018	1.A.4.c.1	Pb	8	mg/GJ
7060	1.A.4.a_LF-gas oil_2018	1.A.4.a.1	Se	0.1	mg/GJ
7060	1.A.4.a_LF-gas oil_2018	1.A.4.c.1	Se	0.1	mg/GJ
7060	1.A.4.a_LF-gas oil_2018	1.A.4.a.1	Zn	18	mg/GJ
7060	1.A.4.a_LF-gas oil_2018	1.A.4.c.1	Zn	18	mg/GJ
7060	1.A.4.a_LF-gas oil_2018	1.A.4.a.1	DIOX	1.4	ng/GJ
7060	1.A.4.a_LF-gas oil_2018	1.A.4.c.1	DIOX	1.4	ng/GJ
7060	1.A.4.a_LF-gas oil_2018	1.A.4.a.1	Benzo(b)	15	µg/GJ
7060	1.A.4.a_LF-gas oil_2018	1.A.4.c.1	Benzo(b)	15	µg/GJ
7060	1.A.4.a_LF-gas oil_2018	1.A.4.a.1	Benzo(k)	1.7	µg/GJ
7060	1.A.4.a_LF-gas oil_2018	1.A.4.c.1	Benzo(k)	1.7	µg/GJ
7060	1.A.4.a_LF-gas oil_2018	1.A.4.a.1	Benzo(a)	1.9	µg/GJ
7060	1.A.4.a_LF-gas oil_2018	1.A.4.c.1	Benzo(a)	1.9	µg/GJ
7060	1.A.4.a_LF-gas oil_2018	1.A.4.a.1	Indeno	1.5	µg/GJ
7060	1.A.4.a_LF-gas oil_2018	1.A.4.c.1	Indeno	1.5	µg/GJ
7060	1.A.4.a_LF-gas oil_2018	1.A.4.a.1	SO2	34.65	g/GJ
7060	1.A.4.a_LF-gas oil_2018	1.A.4.c.1	SO2	34.65	g/GJ
7060	1.A.4.a_LF-gas oil_2018	1.A.4.a.1	NOX	306	g/GJ
7060	1.A.4.a_LF-gas oil_2018	1.A.4.c.1	NOX	306	g/GJ
7060	1.A.4.a_LF-gas oil_2018	1.A.4.a.1	NMVOC	20	g/GJ
7060	1.A.4.a_LF-gas oil_2018	1.A.4.c.1	NMVOC	20	g/GJ
7060	1.A.4.a_LF-gas oil_2018	1.A.4.a.1	CO	93	g/GJ
7060	1.A.4.a_LF-gas oil_2018	1.A.4.c.1	CO	93	g/GJ
7060	1.A.4.a_LF-gas oil_2018	1.A.4.a.1	TSP	21	g/GJ
7060	1.A.4.a_LF-gas oil_2018	1.A.4.c.1	TSP	21	g/GJ
7060	1.A.4.a_LF-gas oil_2018	1.A.4.a.1	HCB	0.22	µg/GJ
7060	1.A.4.a_LF-gas oil_2018	1.A.4.c.1	HCB	0.22	µg/GJ

Tech_ID	Naziv tehnologije	Kategorija	Polutant	Faktor emisije	Jedinica
7060	1.A.4.a_LF-gas oil_2018	1.A.4.a.1	PCBs	0.13	µg/GJ
7060	1.A.4.a_LF-gas oil_2018	1.A.4.c.1	PCBs	0.13	µg/GJ
7060	1.A.4.a_LF-gas oil_2018	1.A.4.a.1	PM25	18	g/GJ
7060	1.A.4.a_LF-gas oil_2018	1.A.4.c.1	PM25	18	g/GJ
7060	1.A.4.a_LF-gas oil_2018	1.A.4.a.1	PM10	21	g/GJ
7060	1.A.4.a_LF-gas oil_2018	1.A.4.c.1	PM10	21	g/GJ
7060	1.A.4.a_LF-gas oil_2018	1.A.4.a.1	BC	10.08	g/GJ
7060	1.A.4.a_LF-gas oil_2018	1.A.4.c.1	BC	10.08	g/GJ
7060	1.A.4.a_LF-gas oil_2018	1.A.4.a.1	As	0.5	mg/GJ
7060	1.A.4.a_LF-gas oil_2018	1.A.4.c.1	As	0.5	mg/GJ
7060	1.A.4.a_LF-gas oil_2018	1.A.4.a.1	Cd	0.15	mg/GJ
7060	1.A.4.a_LF-gas oil_2018	1.A.4.c.1	Cd	0.15	mg/GJ
7060	1.A.4.a_LF-gas oil_2018	1.A.4.a.1	Cr	10	mg/GJ
7060	1.A.4.a_LF-gas oil_2018	1.A.4.c.1	Cr	10	mg/GJ
7060	1.A.4.a_LF-gas oil_2018	1.A.4.a.1	Cu	3	mg/GJ
7060	1.A.4.a_LF-gas oil_2018	1.A.4.c.1	Cu	3	mg/GJ
7060	1.A.4.a_LF-gas oil_2018	1.A.4.a.1	Hg	0.1	mg/GJ
7060	1.A.4.a_LF-gas oil_2018	1.A.4.c.1	Hg	0.1	mg/GJ
7060	1.A.4.a_LF-gas oil_2018	1.A.4.a.1	Ni	125	mg/GJ
7060	1.A.4.a_LF-gas oil_2018	1.A.4.c.1	Ni	125	mg/GJ
7060	1.A.4.a_LF-gas oil_2018	1.A.4.a.1	NH3	0	g/GJ
7060	1.A.4.a_LF-gas oil_2018	1.A.4.c.1	NH3	0	g/GJ
7061	residual fuel_2018	1.A.4.a.1	HCB	0.22	µg/GJ
7061	residual fuel_2018	1.A.4.c.1	HCB	0.22	µg/GJ
7061	residual fuel_2018	1.A.4.a.1	PCBs	0.13	µg/GJ
7061	residual fuel_2018	1.A.4.c.1	PCBs	0.13	µg/GJ
7061	residual fuel_2018	1.A.4.a.1	Pb	8	mg/GJ
7061	residual fuel_2018	1.A.4.c.1	Pb	8	mg/GJ
7061	residual fuel_2018	1.A.4.a.1	Se	0.1	mg/GJ
7061	residual fuel_2018	1.A.4.c.1	Se	0.1	mg/GJ
7061	residual fuel_2018	1.A.4.a.1	Zn	18	mg/GJ
7061	residual fuel_2018	1.A.4.c.1	Zn	18	mg/GJ
7061	residual fuel_2018	1.A.4.a.1	DIOX	6	ng/GJ
7061	residual fuel_2018	1.A.4.c.1	DIOX	6	ng/GJ
7061	residual fuel_2018	1.A.4.a.1	Benzo(b)	15	µg/GJ
7061	residual fuel_2018	1.A.4.c.1	Benzo(b)	15	µg/GJ
7061	residual fuel_2018	1.A.4.a.1	Benzo(k)	1.7	µg/GJ
7061	residual fuel_2018	1.A.4.c.1	Benzo(k)	1.7	µg/GJ
7061	residual fuel_2018	1.A.4.a.1	Benzo(a)	1.9	µg/GJ
7061	residual fuel_2018	1.A.4.c.1	Benzo(a)	1.9	µg/GJ
7061	residual fuel_2018	1.A.4.a.1	Indeno	1.5	µg/GJ
7061	residual fuel_2018	1.A.4.c.1	Indeno	1.5	µg/GJ
7061	residual fuel_2018	1.A.4.a.1	SO2	445.38	g/GJ
7061	residual fuel_2018	1.A.4.c.1	SO2	445.38	g/GJ
7061	residual fuel_2018	1.A.4.a.1	NOX	306	g/GJ
7061	residual fuel_2018	1.A.4.c.1	NOX	306	g/GJ
7061	residual fuel_2018	1.A.4.a.1	NMVOC	20	g/GJ
7061	residual fuel_2018	1.A.4.c.1	NMVOC	20	g/GJ

Tech_ID	Naziv tehnologije	Kategorija	Polutant	Faktor emisije	Jedinica
7061	residual fuel_2018	1.A.4.a.1	CO	93	g/GJ
7061	residual fuel_2018	1.A.4.c.1	CO	93	g/GJ
7061	residual fuel_2018	1.A.4.a.1	TSP	21	g/GJ
7061	residual fuel_2018	1.A.4.c.1	TSP	21	g/GJ
7061	residual fuel_2018	1.A.4.a.1	PM25	18	g/GJ
7061	residual fuel_2018	1.A.4.c.1	PM25	18	g/GJ
7061	residual fuel_2018	1.A.4.a.1	PM10	21	g/GJ
7061	residual fuel_2018	1.A.4.c.1	PM10	21	g/GJ
7061	residual fuel_2018	1.A.4.a.1	BC	10.08	g/GJ
7061	residual fuel_2018	1.A.4.c.1	BC	10.08	g/GJ
7061	residual fuel_2018	1.A.4.a.1	As	0.5	mg/GJ
7061	residual fuel_2018	1.A.4.c.1	As	0.5	mg/GJ
7061	residual fuel_2018	1.A.4.a.1	Cd	0.15	mg/GJ
7061	residual fuel_2018	1.A.4.c.1	Cd	0.15	mg/GJ
7061	residual fuel_2018	1.A.4.a.1	Cr	10	mg/GJ
7061	residual fuel_2018	1.A.4.c.1	Cr	10	mg/GJ
7061	residual fuel_2018	1.A.4.a.1	Cu	3	mg/GJ
7061	residual fuel_2018	1.A.4.c.1	Cu	3	mg/GJ
7061	residual fuel_2018	1.A.4.a.1	Hg	0.1	mg/GJ
7061	residual fuel_2018	1.A.4.c.1	Hg	0.1	mg/GJ
7061	residual fuel_2018	1.A.4.a.1	Ni	125	mg/GJ
7061	residual fuel_2018	1.A.4.c.1	Ni	125	mg/GJ
7061	residual fuel_2018	1.A.4.a.1	NH3	0	g/GJ
7061	residual fuel_2018	1.A.4.c.1	NH3	0	g/GJ
7064	3Df Use of Clopyralid -from 2010	4.G	HCB	2.5	mg/kg
7068	3Df Use of Chlorothalonil - from 2010	4.G	HCB	40	mg/kg
7069	3Df Use of Picloram-from 1990	4.G	HCB	50	mg/kg

12.5. Appendix 5. The energy balance for the Republic of Croatia - 2018

Table A5-1: National Energy balance for 2018, natural units

ENERGY BALANCE 2016 *natural units*	Anthracite	Hard coal	Brown coal	Lignite	Crude oil	Natural gas
	103 t	103 t	103 t	103 t	103 t	106 m3
Production					732.1	1230.1
Import	3.1	495.9	30.4	5.2	2965.5	1589.2
Export						113.3
Import-processing						
Export-processing						
Stock change		49.9			-63.5	64.5
Bunkers						
Energy supplied	**3.1**	**545.8**	**30.4**	**5.2**	**3634.1**	**2770.5**
Production						
hydro power plants						
– small HPP						
Wind power plants						
Solar power plants						
Geothermal power plants						
thermal power plants						
public cogeneration plants						
public heating plants						
industrial cogeneration plants						
– in rafineries						
– in gas production						
Industrial heating plants						
Petroleum refineries						
NGL-plant						
Coke plant						
Gas works						
Total production						
Transformation sector						
hydro power plants						
– small HPP						
Wind power plants						
Solar power plants						
Geothermal power plants						
thermal power plants		492.1				0.5
public cogeneration plants						583.0
public heating plants						53.8
industrial cogeneration plants			28.1			277.5
– in rafineries						53.1
– in gas production						49.7
Industrial heating plants						75.5
Petroleum refineries					3590.1	106.6
NGL-plant					44.0	9.9
Coke plant						
Gas works						
Total transformation sector		**492.1**	**28.1**		**3634.1**	**1106.8**
Energy sector own use						
Oil and gas extraction						21.2
Coal production						
Electric energy supply industry						
hydro power plants						
thermal power plants						
public cogeneration plants						
industrial cogeneration plants						
Wind power						
Petroleum refineries						73.1
NGL-plant						34.7
Gas works						
Total energy sector own use						**129.0**
Losses						**30.0**
Final energy demand	**3.1**	**53.7**	**2.3**	**5.2**		**1504.7**
Non energy use						**427.7**
Energy sector						
Petrochemical industry						427.7
Other industry						
Construction						
Transport						
Agriculture						
Energy consumption	**3.1**	**53.7**	**2.3**	**5.2**		**1077.0**
Industry	**3.1**	**53.7**	**1.0**	**0.1**		**239.4**
Iron and steel	3.1					17.1
Non-ferrous metals						12.0
Non-metallic minerals						51.0
Chemical						10.0
Construction materials		53.4	1.0	0.1		56.8
Pulp and paper						7.1
Food production						45.4
Not elsewhere specified		0.3				40.0
Transport						**5.1**
Rail						
Road						0.2
Air						
– international						
– domestic						
Sea and River						
Public transport						4.9
Not elsewhere specified						
Other sectors			**1.3**	**5.1**		**832.5**
Households			1.3	5.0		564.7
Services				0.1		244.3
Agriculture						23.5
Construction						

Table A5-1: National Energy balance for 2018, natural units, cont.

ENERGY BALANCE 2016 *natural units*	Hydro energy	Fuel wood	Wind energy	Solar energy	Geothermal energy	Landfill gas	Biofuels	Other biomass
	TJ	103 m3	TJ	TJ	TJ	103 m3	103 t	TJ
Production	66978.5	5165.8	11489.3	1227.9	392.2	173475.0	0.4	16565.7
Import		67.6					33.3	1184.5
Export		595.8						6234.2
Import-processing								
Export-processing								
Stock change							-2.9	-50.1
Bunkers								
Energy supplied	**66978.5**	**4637.6**	**11489.3**	**1227.9**	**392.2**	**173475.0**	**30.8**	**11465.9**
Production								
hydro power plants								
– small HPP								
Wind power plants								
Solar power plants								
Geothermal power plants								
thermal power plants								
public cogeneration plants								
public heating plants								
industrial cogeneration plants								
– in rafineries								
– in gas production								
Industrial heating plants								
Petroleum refineries								
NGL-plant								
Coke plant								
Gas works								
Total production								
Transformation sector								
hydro power plants	66978.5							
– small HPP	1018.7							
Wind power plants			11489.3					
Solar power plants				644.4				
Geothermal power plants					72.0			
thermal power plants						17819.0		
public cogeneration plants						149061.0		7004.1
public heating plants								2.7
industrial cogeneration plants						6595.0		
– in rafineries								
– in gas production								
Industrial heating plants								244.6
Petroleum refineries								
NGL-plant								
Coke plant								
Gas works								
Total transformation sector	**66978.5**		**11489.3**	**644.4**	**72.0**	**173475.0**		**7251.4**
Energy sector own use								
Oil and gas extraction								
Coal production								
Electric energy supply industry								
hydro power plants								
thermal power plants								
public cogeneration plants								
industrial cogeneration plants								
Wind power								
Petroleum refineries								
NGL-plant								
Gas works								
Total energy sector own use								
Losses								
Final energy demand		**4637.6**		**583.5**	**320.2**		**30.8**	**4214.5**
Non energy use								
Energy sector								
Petrochemical industry								
Other industry								
Construction								
Transport								
Agriculture								
Energy consumption		**4637.6**		**583.5**	**320.2**		**30.8**	**4214.5**
Industry		**48.3**						**1552.5**
Iron and steel		0.4						3.1
Non-ferrous metals		0.3						
Non-metallic minerals								0.9
Chemical								
Construction materials		9.7						885.5
Pulp and paper								91.2
Food production		2.4						148.8
Not elsewhere specified		35.5						423.0
Transport							**30.8**	
Rail								
Road							30.8	
Air								
– international								
– domestic								
Sea and River								
Public transport								
Not elsewhere specified								
Other sectors		**4589.3**		**583.5**	**320.2**			**2662.0**
Households		4576.9		408.5				2350.8
Services		12.4		175.0	171.8			311.2
Agriculture					148.4			
Construction								

Table A5-1: National Energy balance for 2018, natural units, cont.

ENERGY BALANCE 2016 *natural units*	Coke oven coke	petroleum gases	motor gasoline	motor gasoline	Petroleum	Jet fuel	Diesel oil	Light heating oil	Low sulphur fuel oil	Standard fuel oil
	103 t	103 t	103 t	103 t	103 t	103 t	103 t	103 t	103 t	103 t
Production		253.6	894.8			192.2	1395.5	160.1	37.7	631.6
Import	31.0	40.9	133.9	0.5	2.9	25.0	1314.3	21.2	57.1	
Export	1.4	159.1	479.0			9.7	938.3	37.7	17.1	577.9
Import-processing										
Export-processing										
Stock change	1.1	2.7	-51.0			-22.3	-38.3	-0.3	-8.0	1.7
Bunkers							16.2			4.5
Energy supplied	**30.7**	**138.1**	**498.7**	**0.5**	**2.9**	**185.2**	**1717.0**	**143.3**	**69.7**	**50.9**
Production										
hydro power plants										
– small HPP										
Wind power plants										
Solar power plants										
Geothermal power plants										
thermal power plants										
public cogeneration plants										
public heating plants										
industrial cogeneration plants										
– in rafineries										
– in gas production										
Industrial heating plants										
Petroleum refineries		216.1	894.8			192.2	1395.5	160.1	37.7	631.6
NGL-plant		37.5								
Coke plant										
Gas works										
Total production		**253.6**	**894.8**			**192.2**	**1395.5**	**160.1**	**37.7**	**631.6**
Transformation sector										
hydro power plants										
– small HPP										
Wind power plants										
Solar power plants										
Geothermal power plants										
thermal power plants								0.9		
public cogeneration plants										
public heating plants								2.9	2.5	
industrial cogeneration plants									39.4	0.6
– in rafineries									39.4	0.6
– in gas production										
Industrial heating plants									11.0	30.2
Petroleum refineries										
NGL-plant										
Coke plant										
Gas works										
Total transformation sector								**3.8**	**52.9**	**30.8**
Energy sector own use										
Oil and gas extraction										
Coal production										
Electric energy supply industry										
hydro power plants										
thermal power plants										
public cogeneration plants										
industrial cogeneration plants										
Wind power										
Petroleum refineries									12.7	16.0
NGL-plant										
Gas works										
Total energy sector own use									**12.7**	**16.0**
Losses										
Final energy demand	**30.7**	**138.1**	**498.7**	**0.5**	**2.9**	**185.2**	**1717.0**	**139.5**	**4.1**	**4.1**
Non energy use										
Energy sector										
Petrochemical industry										
Other industry										
Construction										
Transport										
Agriculture										
Energy consumption	**30.7**	**138.1**	**498.7**	**0.5**	**2.9**	**185.2**	**1717.0**	**139.5**	**4.1**	**4.1**
Industry	**30.7**	**8.8**			**2.9**		**12.3**	**15.0**	**4.1**	**4.1**
Iron and steel	1.0	0.9						0.7	0.4	
Non-ferrous metals		0.8						0.1		
Non-metallic minerals		0.3								
Chemical					2.9			0.4		
Construction materials	26.2	1.3					12.3	3.0	2.1	0.7
Pulp and paper		0.2								
Food production	3.5	1.1						6.3	1.3	3.2
Not elsewhere specified		4.2						4.5	0.3	0.2
Transport		**70.4**	**487.9**	**0.5**		**185.2**	**1446.7**			
Rail							14.7			
Road		70.4	487.9				1360.2			
Air				0.5		185.2				
– international				0.1		175.5				
– domestic				0.4		9.7				
Sea and River							47.2			
Public transport							24.6			
Not elsewhere specified										
Other sectors		**58.9**	**10.8**				**258.0**	**124.5**		
Households		42.4						70.6		
Services		11.7						37.2		
Agriculture		2.6	7.6				174.1	11.8		
Construction		2.2	3.2				83.9	4.9		

Table A5-1: National Energy balance for 2018, natural units, cont.

ENERGY BALANCE 2016 *natural units*	Naphta	White spirit	Bitumen	Other oils	Lubricants	Petroleum coke	Etan	Other derivates
	103 t	103 t	103 t	103 t	103 t	103 t	103 t	103 t
Production	59.3		0.5	10.8		57.5		106.2
Import		3.0	125.7	31.8	6.6	180.9		
Export	39.7	0.1	15.0	8.3	0.2	17.5		125.9
Import-processing								
Export-processing								
Stock change	-0.8					-1.0		26.0
Bunkers								
Energy supplied	**18.8**	**2.9**	**111.2**	**34.3**	**6.4**	**219.9**		**6.3**
Production								
hydro power plants								
– small HPP								
Wind power plants								
Solar power plants								
Geothermal power plants								
thermal power plants								
public cogeneration plants								
public heating plants								
industrial cogeneration plants								
– in rafineries								
– in gas production								
Industrial heating plants								
Petroleum refineries	38.6		0.5	10.8		57.5		106.2
NGL-plant	20.7							
Coke plant								
Gas works								
Total production	**59.3**		**0.5**	**10.8**		**57.5**		**106.2**
Transformation sector								
hydro power plants								
– small HPP								
Wind power plants								
Solar power plants								
Geothermal power plants								
thermal power plants								
public cogeneration plants								
public heating plants								
industrial cogeneration plants								
– in rafineries								
– in gas production								
Industrial heating plants								
Petroleum refineries	18.8							
NGL-plant								
Coke plant								
Gas works								
Total transformation sector	**18.8**							
Energy sector own use								
Oil and gas extraction								
Coal production								
Electric energy supply industry								
hydro power plants								
thermal power plants								
public cogeneration plants								
industrial cogeneration plants								
Wind power								
Petroleum refineries						24.0		
NGL-plant								
Gas works								
Total energy sector own use						**24.0**		
Losses								
Final energy demand	**0.0**	**2.9**	**111.2**	**34.3**	**6.4**	**195.9**		**6.3**
Non energy use		**2.9**	**111.2**	**34.3**	**6.4**			**6.3**
Energy sector				2.3				
Petrochemical industry								6.3
Other industry		2.9	13.5	6.7	6.4			
Construction			97.7	1.4				
Transport				22.6				
Agriculture				1.3				
Energy consumption	**0.0**					**195.9**		
Industry						**195.9**		
Iron and steel						0.3		
Non-ferrous metals						0.3		
Non-metallic minerals								
Chemical								
Construction materials						195.3		
Pulp and paper								
Food production								
Not elsewhere specified								
Transport								
Rail								
Road								
Air								
– international								
– domestic								
Sea and River								
Public transport								
Not elsewhere specified								
Other sectors								
Households								
Services								
Agriculture								
Construction								

Table A5-1: National Energy balance for 2018, natural units, cont.

ENERGY BALANCE 2016 *natural units*	Refinery gas	Refinery semiproducts	Aditives	Gas works gas	Electricity	Steam and hot water	waste, non renewable
	103 t	103 t	103 t	103 m3	GWh	TJ	
Production	187.0				13631.7	26615.3	817.7
Import		242.7	54.2		7404.3		
Export					2016.7		
Import-processing							
Export-processing							
Stock change		-0.2	-0.8				
Bunkers							
Energy supplied	**187.0**	**242.5**	**53.4**		**19019.3**	**26615.3**	**817.7**
Production							
hydro power plants					7784.9		
– small HPP					118.4		
Wind power plants					1335.4		
Solar power plants					74.9		
Geothermal power plants					2.0		
thermal power plants					1472.3		
public cogeneration plants					2595.5	10967.9	
public heating plants						1730.3	
industrial cogeneration plants					366.7	8888.4	
– in rafineries					109.1	3170.0	
– in gas production					129.3	575.0	
Industrial heating plants						4397.4	
Petroleum refineries	187.0						
NGL-plant							
Coke plant							
Gas works							
Total production	**187.0**				**13631.7**	**25984.0**	
Transformation sector							
hydro power plants							
– small HPP							
Wind power plants							
Solar power plants							
Geothermal power plants							
thermal power plants							
public cogeneration plants							
public heating plants							
industrial cogeneration plants	23.4						
– in rafineries	23.4						
– in gas production							
Industrial heating plants	16.1						
Petroleum refineries		242.5	53.4				
NGL-plant							
Coke plant							
Gas works							
Total transformation sector	**39.5**	**242.5**	**53.4**				
Energy sector own use							
Oil and gas extraction					127.2	418.0	
Coal production						276.8	
Electric energy supply industry					62.5		
hydro power plants					207.8		
thermal power plants					137.3		
public cogeneration plants					200.3	1297.0	
industrial cogeneration plants							
Wind power					6.4		
Petroleum refineries	147.5				286.4	5007.7	
NGL-plant					48.3	157.0	
Gas works							
Total energy sector own use	**147.5**				**1076.2**	**7156.5**	
Losses					**1824.0**	**1689.0**	
Final energy demand		**0.0**	**0.0**		**16119.1**	**17769.8**	**817.7**
Non energy use							
Energy sector							
Petrochemical industry							
Other industry							
Construction							
Transport							
Agriculture							
Energy consumption		**0.0**	**0.0**		**16119.1**	**17769.8**	**817.7**
Industry					**3610.7**	**10829.0**	**817.7**
Iron and steel					376.9	58.4	
Non-ferrous metals					98.7		
Non-metallic minerals					153.2	10.1	
Chemical					313.8	4370.9	
Construction materials					559.8		817.7
Pulp and paper					221.8	1008.3	
Food production					661.5	3002.4	
Not elsewhere specified					1225.0	2378.9	
Transport					**340.3**		
Rail					174.4		
Road					1.0		
Air					35.8		
– international							
– domestic					35.8		
Sea and River					22.5		
Public transport					63.3		
Not elsewhere specified					43.3		
Other sectors					**12168.1**	**6940.8**	
Households					6201.7	5302.2	
Services					5825.2	1391.8	
Agriculture					63.3	246.8	
Construction					77.9		

Table A5-2: National Energy balance for 2018, energy units

PJ	Anthracite	Hard coal	Brown coal	Lignite	Crude oil	Natural gas
Production	-	-	-	-	31.26	43.075
Import	0.09	12.45	0.58	0.06	126.63	55.050
Export	-	-	-	-	-	3.925
Import-processing	-	-	-	-	-	-
Export-processing	-	-	-	-	-	-
Stock change	-	1.25	-	-	- 2.71	2.234
Bunkers	-	-	-	-	-	-
Energy supplied	**0.09**	**13.70**	**0.58**	**0.06**	**155.18**	**96.43**
Production	-	-	-	-	-	-
hydro power plants	-	-	-	-	-	-
– small HPP	-	-	-	-	-	-
Wind power plants	-	-	-	-	-	-
Solar power plants	-	-	-	-	-	-
Geothermal power plants	-	-	-	-	-	-
thermal power plants	-	-	-	-	-	-
public cogeneration plants	-	-	-	-	-	-
public heating plants	-	-	-	-	-	-
industrial cogeneration plants	-	-	-	-	-	-
– in rafineries	-	-	-	-	-	-
– in gas production	-	-	-	-	-	-
Industrial heating plants	-	-	-	-	-	-
Petroleum refineries	-	-	-	-	-	-
NGL-plant	-	-	-	-	-	-
Coke plant	-	-	-	-	-	-
Gas works	-	-	-	-	-	-
Total production	**-**	**-**	**-**	**-**	**-**	**-**
Gross production	**0.09**	**13.70**	**0.58**	**0.06**	**155.18**	**96.43**
Transformation sector	-	-	-	-	-	-
hydro power plants	-	-	-	-	-	-
– small HPP	-	-	-	-	-	-
Wind power plants	-	-	-	-	-	-
Solar power plants	-	-	-	-	-	-
Geothermal power plants	-	-	-	-	-	-
thermal power plants	-	12.30	-	-	-	0.02
public cogeneration plants	-	-	-	-	-	20.20
public heating plants	-	-	-	-	-	1.86
industrial cogeneration plants	-	-	0.53	-	-	9.61
– in rafineries	-	-	-	-	-	1.84
– in gas production	-	-	-	-	-	1.72
Industrial heating plants	-	-	-	-	-	2.62
Petroleum refineries	-	-	-	-	153.30	3.69
NGL-plant	-	-	-	-	1.88	0.81
Coke plant	-	-	-	-	-	-
Gas works	-	-	-	-	-	-
Total transformation sector	**-**	**12.30**	**0.53**	**-**	**155.18**	**38.80**
Energy sector own use	-	-	-	-	-	-
Oil and gas extraction	-	-	-	-	-	0.73
Coal production	-	-	-	-	-	-
Electric energy supply industry	-	-	-	-	-	-
hydro power plants	-	-	-	-	-	-
thermal power plants	-	-	-	-	-	-
public cogeneration plants	-	-	-	-	-	-
industrial cogeneration plants	-	-	-	-	-	-
Industrial heating plants	-	-	-	-	-	-
Petroleum refineries	-	-	-	-	-	2.53
NGL-plant	-	-	-	-	-	1.20
Gas works	-	-	-	-	-	-
Total energy sector own use	**-**	**-**	**-**	**-**	**-**	**4.47**
Losses	-	-	-	-	-	1.04
Final energy demand	**0.09**	**1.40**	**0.04**	**0.06**	**- 0.00**	**52.12**
Non energy use	**-**	**-**	**-**	**-**	**-**	**14.82**
Energy sector	-	-	-	-	-	-
Petrochemical industry	-	-	-	-	-	14.82
Other industry	-	-	-	-	-	-
Construction	-	-	-	-	-	-
Transport	-	-	-	-	-	-
Agriculture	-	-	-	-	-	-
Energy consumption	**0.09**	**1.40**	**0.04**	**0.06**	**- 0.00**	**37.31**
Industry	**0.09**	**1.40**	**0.02**	**0.00**	**-**	**8.29**
Iron and steel	0.09	-	-	-	-	0.59
Non-ferrous metals	-	-	-	-	-	0.42
Non-metallic minerals	-	-	-	-	-	1.77
Chemical	-	-	-	-	-	0.35
Construction materials	-	1.39	0.02	0.00	-	1.97
Pulp and paper	-	-	-	-	-	0.25
Food production	-	-	-	-	-	1.57
Not elsewhere specified	-	0.01	-	-	-	1.39
Transport	**-**	**-**	**-**	**-**	**-**	**0.18**
Rail	-	-	-	-	-	-
Road	-	-	-	-	-	0.01
Air	-	-	-	-	-	-
– international	-	-	-	-	-	-
– domestic	-	-	-	-	-	-
Sea and River	-	-	-	-	-	-
Public transport	-	-	-	-	-	0.17
Not elsewhere specified	-	-	-	-	-	-
Other sectors	**-**	**-**	**0.02**	**0.06**	**-**	**28.84**
Households	-	-	0.02	0.06	-	19.56
Services	-	-	-	0.00	-	8.46
Agriculture	-	-	-	-	-	0.81
Construction	-	-	-	-	-	-

Table A5-2: National Energy balance for 2018, energy units, cont.

PJ	Hydro energy	Fuel wood	Wind energy	Solar energy	Geothermal energy	Landfill gas	Biofuels	Other biomass
Production	66.98	46.492	11.489	1.228	0.392	3.0812	0.015	16.566
Import	-	0.61	-	-	-	-	1.22	1.18
Export	-	5.36	-	-	-	-	-	6.23
Import-processing	-	-	-	-	-	-	-	-
Export-processing	-	-	-	-	-	-	-	-
Stock change	-	-	-	-	-	-	- 0.11	- 0.05
Bunkers	-	-	-	-	-	-	-	-
Energy supplied	**66.98**	**41.74**	**11.49**	**1.23**	**0.39**	**3.0812**	**1.13**	**11.47**
Production	-	-	-	-	-	-	-	-
hydro power plants	-	-	-	-	-	-	-	-
– small HPP	-	-	-	-	-	-	-	-
Wind power plants	-	-	-	-	-	-	-	-
Solar power plants	-	-	-	-	-	-	-	-
Geothermal power plants	-	-	-	-	-	-	-	-
thermal power plants	-	-	-	-	-	-	-	-
public cogeneration plants	-	-	-	-	-	-	-	-
public heating plants	-	-	-	-	-	-	-	-
industrial cogeneration plants	-	-	-	-	-	-	-	-
– in rafineries	-	-	-	-	-	-	-	-
– in gas production	-	-	-	-	-	-	-	-
Industrial heating plants	-	-	-	-	-	-	-	-
Petroleum refineries	-	-	-	-	-	-	-	-
NGL-plant	-	-	-	-	-	-	-	-
Coke plant	-	-	-	-	-	-	-	-
Gas works	-	-	-	-	-	-	-	-
Total production	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Gross production	**66.98**	**41.74**	**11.49**	**1.23**	**0.39**	**3.0812**	**1.13**	**11.47**
Transformation sector	-	-	-	-	-	-	-	-
hydro power plants	66.98	-	-	-	-	-	-	-
– small HPP	1.02	-	-	-	-	-	-	-
Wind power plants	-	-	11.49	-	-	-	-	-
Solar power plants	-	-	-	0.64	-	-	-	-
Geothermal power plants	-	-	-	-	0.07	-	-	-
thermal power plants	-	-	-	-	-	0.3079	-	-
public cogeneration plants	-	-	-	-	-	2.6392	-	7.00
public heating plants	-	-	-	-	-	-	-	0.00
industrial cogeneration plants	-	-	-	-	-	0.1341	-	-
– in rafineries	-	-	-	-	-	-	-	-
– in gas production	-	-	-	-	-	-	-	-
Industrial heating plants	-	-	-	-	-	-	-	0.24
Petroleum refineries	-	-	-	-	-	-	-	-
NGL-plant	-	-	-	-	-	-	-	-
Coke plant	-	-	-	-	-	-	-	-
Gas works	-	-	-	-	-	-	-	-
Total transformation sector	**66.98**	**-**	**11.49**	**0.64**	**0.07**	**3.0812**	**-**	**7.25**
Energy sector own use	-	-	-	-	-	-	-	-
Oil and gas extraction	-	-	-	-	-	-	-	-
Coal production	-	-	-	-	-	-	-	-
Electric energy supply industry	-	-	-	-	-	-	-	-
hydro power plants	-	-	-	-	-	-	-	-
thermal power plants	-	-	-	-	-	-	-	-
public cogeneration plants	-	-	-	-	-	-	-	-
industrial cogeneration plants	-	-	-	-	-	-	-	-
Industrial heating plants	-	-	-	-	-	-	-	-
Petroleum refineries	-	-	-	-	-	-	-	-
NGL-plant	-	-	-	-	-	-	-	-
Gas works	-	-	-	-	-	-	-	-
Total energy sector own use	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Losses	-	-	-	-	-	-	-	-
Final energy demand	**-**	**41.74**	**-**	**0.58**	**0.32**	**-**	**1.13**	**4.21**
Non energy use	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Energy sector	-	-	-	-	-	-	-	-
Petrochemical industry	-	-	-	-	-	-	-	-
Other industry	-	-	-	-	-	-	-	-
Construction	-	-	-	-	-	-	-	-
Transport	-	-	-	-	-	-	-	-
Agriculture	-	-	-	-	-	-	-	-
Energy consumption	**-**	**41.74**	**-**	**0.58**	**0.32**	**-**	**1.13**	**4.21**
Industry	**-**	**0.43**	**-**	**-**	**-**	**-**	**-**	**1.55**
Iron and steel	-	0.00	-	-	-	-	-	0.00
Non-ferrous metals	-	0.00	-	-	-	-	-	-
Non-metallic minerals	-	-	-	-	-	-	-	0.00
Chemical	-	-	-	-	-	-	-	-
Construction materials	-	0.09	-	-	-	-	-	0.89
Pulp and paper	-	-	-	-	-	-	-	0.09
Food production	-	0.02	-	-	-	-	-	0.15
Not elsewhere specified	-	0.32	-	-	-	-	-	0.42
Transport	**-**	**-**	**-**	**-**	**-**	**-**	**1.13**	**-**
Rail	-	-	-	-	-	-	-	-
Road	-	-	-	-	-	-	1.13	-
Air	-	-	-	-	-	-	-	-
– international	-	-	-	-	-	-	-	-
– domestic	-	-	-	-	-	-	-	-
Sea and River	-	-	-	-	-	-	-	-
Public transport	-	-	-	-	-	-	-	-
Not elsewhere specified	-	-	-	-	-	-	-	-
Other sectors	**-**	**41.30**	**-**	**0.58**	**0.32**	**-**	**-**	**2.66**
Households	-	41.19	-	0.41	-	-	-	2.35
Services	-	0.11	-	0.18	0.17	-	-	0.31
Agriculture	-	-	-	-	0.15	-	-	-
Construction	-	-	-	-	-	-	-	-

Table A5-2: National Energy balance for 2018, energy units, cont.

PJ	Coke oven coke	Liquefied petroleum gases	Unleaded motor gasoline	Standard motor gasoline	Petroleum	Jet fuel	Diesel oil	Light heating oil	Low sulphur fuel oil	Standard fuel oil
Production	220.58	-	-	-	-	-	-	-	-	-
Import	197.87	0.91	1.92	5.97	0.02	0.13	1.10	56.13	0.91	2.29
Export	15.52	0.04	7.46	21.36	-	-	0.43	40.07	1.61	0.69
Import-processing	-	-	-	-	-	-	-	-	-	-
Export-processing	-	-	-	-	-	-	-	-	-	-
Stock change	0.62	0.03	0.13	-2.27	-	-	-0.98	-1.64	-0.01	-0.32
Bunkers	-	-	-	-	-	-	-	0.69	-	-
Energy supplied	**403.54**	**0.90**	**-5.42**	**-17.66**	**0.02**	**0.13**	**-0.31**	**13.73**	**-0.72**	**1.29**
Production	-	-	-	-	-	-	-	-	-	-
hydro power plants	-	-	-	-	-	-	-	-	-	-
– small HPP	-	-	-	-	-	-	-	-	-	-
Wind power plants	-	-	-	-	-	-	-	-	-	-
Solar power plants	-	-	-	-	-	-	-	-	-	-
Geothermal power plants	-	-	-	-	-	-	-	-	-	-
thermal power plants	-	-	-	-	-	-	-	-	-	-
public cogeneration plants	-	-	-	-	-	-	-	-	-	-
public heating plants	-	-	-	-	-	-	-	-	-	-
industrial cogeneration plants	-	-	-	-	-	-	-	-	-	-
– in rafineries	-	-	-	-	-	-	-	-	-	-
– in gas production	-	-	-	-	-	-	-	-	-	-
Industrial heating plants	-	-	-	-	-	-	-	-	-	-
Petroleum refineries	-	-	10.13	39.90	-	-	8.45	59.60	6.84	1.52
NGL-plant	-	-	1.76	-	-	-	-	-	-	-
Coke plant	-	-	-	-	-	-	-	-	-	-
Gas works	-	-	-	-	-	-	-	-	-	-
Total production	**-**	**-**	**11.89**	**39.90**	**-**	**-**	**8.45**	**59.60**	**6.84**	**1.52**
Gross production	**403.54**	**0.90**	**6.48**	**22.24**	**0.02**	**0.13**	**8.14**	**73.33**	**6.12**	**2.80**
Transformation sector	-	-	-	-	-	-	-	-	-	-
hydro power plants	66.98	-	-	-	-	-	-	-	-	-
– small HPP	1.02	-	-	-	-	-	-	-	-	-
Wind power plants	11.49	-	-	-	-	-	-	-	-	-
Solar power plants	0.64	-	-	-	-	-	-	-	-	-
Geothermal power plants	0.07	-	-	-	-	-	-	-	-	-
thermal power plants	12.63	-	-	-	-	-	-	-	0.04	-
public cogeneration plants	29.84	-	-	-	-	-	-	-	-	-
public heating plants	1.87	-	-	-	-	-	-	-	0.12	0.10
industrial cogeneration plants	10.28	-	-	-	-	-	-	-	-	1.58
– in rafineries	1.84	-	-	-	-	-	-	-	-	1.58
– in gas production	1.72	-	-	-	-	-	-	-	-	-
Industrial heating plants	2.86	-	-	-	-	-	-	-	-	0.44
Petroleum refineries	156.99	-	-	-	-	-	-	-	-	-
NGL-plant	2.69	-	-	-	-	-	-	-	-	-
Coke plant	-	-	-	-	-	-	-	-	-	-
Gas works	-	-	-	-	-	-	-	-	-	-
Total transformation sector	**296.33**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**0.16**	**2.13**
Energy sector own use	-	-	-	-	-	-	-	-	-	-
Oil and gas extraction	0.73	-	-	-	-	-	-	-	-	-
Coal production	-	-	-	-	-	-	-	-	-	-
Electric energy supply industry	-	-	-	-	-	-	-	-	-	-
hydro power plants	-	-	-	-	-	-	-	-	-	-
thermal power plants	-	-	-	-	-	-	-	-	-	-
public cogeneration plants	-	-	-	-	-	-	-	-	-	-
industrial cogeneration plants	-	-	-	-	-	-	-	-	-	-
Industrial heating plants	-	-	-	-	-	-	-	-	-	-
Petroleum refineries	2.53	-	-	-	-	-	-	-	-	0.51
NGL-plant	1.20	-	-	-	-	-	-	-	-	-
Gas works	-	-	-	-	-	-	-	-	-	-
Total energy sector own use	**4.47**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**0.51**
Losses	1.04	-	-	-	-	-	-	-	-	-
Final energy demand	**101.70**	**0.90**	**6.48**	**22.24**	**0.02**	**0.13**	**8.14**	**73.33**	**5.96**	**0.16**
Non energy use	**14.82**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Energy sector	-	-	-	-	-	-	-	-	-	-
Petrochemical industry	14.82	-	-	-	-	-	-	-	-	-
Other industry	-	-	-	-	-	-	-	-	-	-
Construction	-	-	-	-	-	-	-	-	-	-
Transport	-	-	-	-	-	-	-	-	-	-
Agriculture	-	-	-	-	-	-	-	-	-	-
Energy consumption	**86.89**	**0.90**	**6.48**	**22.24**	**0.02**	**0.13**	**8.14**	**73.33**	**5.96**	**0.16**
Industry	**11.79**	**0.90**	**0.41**	**-**	**-**	**0.13**	**-**	**0.53**	**0.64**	**0.16**
Iron and steel	0.69	0.03	0.04	-	-	-	-	-	0.03	0.02
Non-ferrous metals	0.42	-	0.04	-	-	-	-	-	0.00	-
Non-metallic minerals	1.77	-	0.01	-	-	-	-	-	-	-
Chemical	0.35	-	-	-	-	0.13	-	-	0.02	-
Construction materials	4.35	0.77	0.06	-	-	-	-	0.53	0.13	0.08
Pulp and paper	0.34	-	0.01	-	-	-	-	-	-	-
Food production	1.74	0.10	0.05	-	-	-	-	-	0.27	0.05
Not elsewhere specified	2.14	-	0.20	-	-	-	-	-	0.19	0.01
Transport	**1.31**	**-**	**3.30**	**21.76**	**0.02**	**-**	**8.14**	**61.79**	**-**	**-**
Rail	-	-	-	-	-	-	-	0.63	-	-
Road	1.14	-	3.30	21.76	-	-	-	58.09	-	-
Air	-	-	-	-	0.02	-	8.14	-	-	-
– international	-	-	-	-	0.00	-	7.71	-	-	-
– domestic	-	-	-	-	0.02	-	0.43	-	-	-
Sea and River	-	-	-	-	-	-	-	2.02	-	-
Public transport	0.17	-	-	-	-	-	-	1.05	-	-
Not elsewhere specified	-	-	-	-	-	-	-	-	-	-
Other sectors	**73.79**	**-**	**2.76**	**0.48**	**-**	**-**	**-**	**11.02**	**5.32**	**-**
Households	63.60	-	1.99	-	-	-	-	-	3.02	-
Services	9.23	-	0.55	-	-	-	-	-	1.59	-
Agriculture	0.96	-	0.12	0.34	-	-	-	7.44	0.50	-
Construction	-	-	0.10	0.14	-	-	-	3.58	0.21	-

Table A5-2: National Energy balance for 2018, energy units, cont.

PJ	Naphtha	White spirit	Bitumen	Lubricants	Paraffin and wax	Petroleum coke	Etan	Other derivates
Production	-	-	-	-	-	-	-	-
Import	-	-	0.10	4.21	1.07	0.22	5.61	-
Export	23.23	1.77	0.00	0.50	0.28	0.01	0.54	-
Import-processing	-	-	-	-	-	-	-	-
Export-processing	-	-	-	-	-	-	-	-
Stock change	0.07	-0.04	-	-	-	-	-0.03	-
Bunkers	0.18	-	-	-	-	-	-	-
Energy supplied	**-23.34**	**-1.81**	**0.10**	**3.71**	**0.79**	**0.21**	**5.03**	**-**
Production	-	-	-	-	-	-	-	-
hydro power plants	-	-	-	-	-	-	-	-
– small HPP	-	-	-	-	-	-	-	-
Wind power plants	-	-	-	-	-	-	-	-
Solar power plants	-	-	-	-	-	-	-	-
Geothermal power plants	-	-	-	-	-	-	-	-
thermal power plants	-	-	-	-	-	-	-	-
public cogeneration plants	-	-	-	-	-	-	-	-
public heating plants	-	-	-	-	-	-	-	-
industrial cogeneration plants	-	-	-	-	-	-	-	-
– in rafineries	-	-	-	-	-	-	-	-
– in gas production	-	-	-	-	-	-	-	-
Industrial heating plants	-	-	-	-	-	-	-	-
Petroleum refineries	25.38	1.72	-	0.02	0.36	-	1.78	-
NGL-plant	-	0.92	-	-	-	-	-	-
Coke plant	-	-	-	-	-	-	-	-
Gas works	-	-	-	-	-	-	-	-
Total production	**25.38**	**2.64**	**-**	**0.02**	**0.36**	**-**	**1.78**	**-**
Gross production	**2.05**	**0.84**	**0.10**	**3.73**	**1.15**	**0.21**	**6.82**	**-**
Transformation sector	-	-	-	-	-	-	-	-
hydro power plants	-	-	-	-	-	-	-	-
– small HPP	-	-	-	-	-	-	-	-
Wind power plants	-	-	-	-	-	-	-	-
Solar power plants	-	-	-	-	-	-	-	-
Geothermal power plants	-	-	-	-	-	-	-	-
thermal power plants	-	-	-	-	-	-	-	-
public cogeneration plants	-	-	-	-	-	-	-	-
public heating plants	-	-	-	-	-	-	-	-
industrial cogeneration plants	0.02	-	-	-	-	-	-	-
– in rafineries	0.02	-	-	-	-	-	-	-
– in gas production	-	-	-	-	-	-	-	-
Industrial heating plants	1.21	-	-	-	-	-	-	-
Petroleum refineries	-	0.84	-	-	-	-	-	-
NGL-plant	-	-	-	-	-	-	-	-
Coke plant	-	-	-	-	-	-	-	-
Gas works	-	-	-	-	-	-	-	-
Total transformation sector	**1.24**	**0.84**	**-**	**-**	**-**	**-**	**-**	**-**
Energy sector own use	-	-	-	-	-	-	-	-
Oil and gas extraction	-	-	-	-	-	-	-	-
Coal production	-	-	-	-	-	-	-	-
Electric energy supply industry	-	-	-	-	-	-	-	-
hydro power plants	-	-	-	-	-	-	-	-
thermal power plants	-	-	-	-	-	-	-	-
public cogeneration plants	-	-	-	-	-	-	-	-
industrial cogeneration plants	-	-	-	-	-	-	-	-
Industrial heating plants	-	-	-	-	-	-	-	-
Petroleum refineries	0.64	-	-	-	-	-	0.74	-
NGL-plant	-	-	-	-	-	-	-	-
Gas works	-	-	-	-	-	-	-	-
Total energy sector own use	**0.64**	**-**	**-**	**-**	**-**	**-**	**0.74**	**-**
Losses	-	-	-	-	-	-	-	-
Final energy demand	**0.16**	**0.00**	**0.10**	**3.73**	**1.15**	**0.21**	**6.07**	**-**
Non energy use	**-**	**-**	**0.0972**	**3.7252**	**1.1491**	**0.2144**	**-**	**-**
Energy sector	-	-	-	-	0.08	-	-	-
Petrochemical industry	-	-	-	-	-	-	-	-
Other industry	-	-	0.10	0.45	0.22	0.21	-	-
Construction	-	-	-	3.27	0.05	-	-	-
Transport	-	-	-	-	0.76	-	-	-
Agriculture	-	-	-	-	0.04	-	-	-
Energy consumption	**0.16**	**0.00**	**-**	**-**	**-**	**-**	**6.07**	**-**
Industry	**0.16**	**-**	**-**	**-**	**-**	**-**	**6.07**	**-**
Iron and steel	-	-	-	-	-	-	0.01	-
Non-ferrous metals	-	-	-	-	-	-	0.01	-
Non-metallic minerals	-	-	-	-	-	-	-	-
Chemical	-	-	-	-	-	-	-	-
Construction materials	0.03	-	-	-	-	-	6.05	-
Pulp and paper	-	-	-	-	-	-	-	-
Food production	0.13	-	-	-	-	-	-	-
Not elsewhere specified	0.01	-	-	-	-	-	-	-
Transport	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Rail	-	-	-	-	-	-	-	-
Road	-	-	-	-	-	-	-	-
Air	-	-	-	-	-	-	-	-
– international	-	-	-	-	-	-	-	-
– domestic	-	-	-	-	-	-	-	-
Sea and River	-	-	-	-	-	-	-	-
Public transport	-	-	-	-	-	-	-	-
Not elsewhere specified	-	-	-	-	-	-	-	-
Other sectors	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Households	-	-	-	-	-	-	-	-
Services	-	-	-	-	-	-	-	-
Agriculture	-	-	-	-	-	-	-	-
Construction	-	-	-	-	-	-	-	-

Table A5-2: National Energy balance for 2018, energy units, cont.

PJ	Refinery gas	Refinery semiproducts	Aditives	Gas works gas	Electricity	Steam and hot water	Industrial waste, non renewable
Production	-	-	-	-	-	-	0.63
Import	-	-	10.36	2.31	-	26.66	-
Export	5.06	-	-	-	-	7.26	-
Import-processing	-	-	-	-	-	-	-
Export-processing	-	-	-	-	-	-	-
Stock change	1.04	-	-0.01	-0.03	-	-	-
Bunkers	-	-	-	-	-	-	-
Energy supplied	**-4.01**	**-**	**10.35**	**2.28**	**-**	**19.40**	**0.63**
Production	-	-	-	-	-	-	-
hydro power plants	-	-	-	-	-	28.03	-
– small HPP	-	-	-	-	-	0.43	-
Wind power plants	-	-	-	-	-	4.81	-
Solar power plants	-	-	-	-	-	0.27	-
Geothermal power plants	-	-	-	-	-	0.01	-
thermal power plants	-	-	-	-	-	5.30	-
public cogeneration plants	-	-	-	-	-	9.34	10.97
public heating plants	-	-	-	-	-	-	1.73
industrial cogeneration plants	-	-	-	-	-	1.32	8.89
– in rafineries	-	-	-	-	-	0.39	3.17
– in gas production	-	-	-	-	-	0.47	0.58
Industrial heating plants	-	-	-	-	-	-	4.40
Petroleum refineries	4.27	7.97	-	-	-	-	-
NGL-plant	-	-	-	-	-	-	-
Coke plant	-	-	-	-	-	-	-
Gas works	-	-	-	-	-	-	-
Total production	**4.27**	**7.97**	**-**	**-**	**-**	**49.07**	**25.98**
Gross production	**0.25**	**7.97**	**10.35**	**2.28**	**-**	**68.47**	**26.62**
Transformation sector	-	-	-	-	-	-	-
hydro power plants	-	-	-	-	-	-	-
– small HPP	-	-	-	-	-	-	-
Wind power plants	-	-	-	-	-	-	-
Solar power plants	-	-	-	-	-	-	-
Geothermal power plants	-	-	-	-	-	-	-
thermal power plants	-	-	-	-	-	-	-
public cogeneration plants	-	-	-	-	-	-	-
public heating plants	-	-	-	-	-	-	-
industrial cogeneration plants	-	1.00	-	-	-	-	-
– in rafineries	-	1.00	-	-	-	-	-
– in gas production	-	-	-	-	-	-	-
Industrial heating plants	-	0.69	-	-	-	-	-
Petroleum refineries	-	-	10.35	2.28	-	-	-
NGL-plant	-	-	-	-	-	-	-
Coke plant	-	-	-	-	-	-	-
Gas works	-	-	-	-	-	-	-
Total transformation sector	**-**	**1.68**	**10.35**	**2.28**	**-**	**-**	**-**
Energy sector own use	-	-	-	-	-	-	-
Oil and gas extraction	-	-	-	-	-	0.46	0.42
Coal production	-	-	-	-	-	-	0.28
Electric energy supply industry	-	-	-	-	-	0.23	-
hydro power plants	-	-	-	-	-	0.75	-
thermal power plants	-	-	-	-	-	0.49	-
public cogeneration plants	-	-	-	-	-	0.72	1.30
industrial cogeneration plants	-	-	-	-	-	-	-
Industrial heating plants	-	-	-	-	-	0.02	-
Petroleum refineries	-	6.28	-	-	-	1.03	5.01
NGL-plant	-	-	-	-	-	0.17	0.16
Gas works	-	-	-	-	-	-	-
Total energy sector own use	**-**	**6.28**	**-**	**-**	**-**	**3.87**	**7.16**
Losses	-	-	-	-	-	6.57	1.69
Final energy demand	**0.25**	**-0.00**	**0.00**	**-**	**-**	**58.03**	**17.77**
Non energy use	**0.25**	**-**	**-**	**-**	**-**	**-**	**-**
Energy sector	-	-	-	-	-	-	-
Petrochemical industry	0.25	-	-	-	-	-	-
Other industry	-	-	-	-	-	-	-
Construction	-	-	-	-	-	-	-
Transport	-	-	-	-	-	-	-
Agriculture	-	-	-	-	-	-	-
Energy consumption	**-0.00**	**-0.00**	**0.00**	**-**	**-**	**58.03**	**17.77**
Industry	**-**	**-**	**-**	**-**	**-**	**13.00**	**10.83**
Iron and steel	-	-	-	-	-	1.36	0.06
Non-ferrous metals	-	-	-	-	-	0.36	-
Non-metallic minerals	-	-	-	-	-	0.55	0.01
Chemical	-	-	-	-	-	1.13	4.37
Construction materials	-	-	-	-	-	2.02	-
Pulp and paper	-	-	-	-	-	0.80	1.01
Food production	-	-	-	-	-	2.38	3.00
Not elsewhere specified	-	-	-	-	-	4.41	2.38
Transport	**-**	**-**	**-**	**-**	**-**	**1.23**	**-**
Rail	-	-	-	-	-	0.63	-
Road	-	-	-	-	-	0.00	-
Air	-	-	-	-	-	0.13	-
– international	-	-	-	-	-	-	-
– domestic	-	-	-	-	-	0.13	-
Sea and River	-	-	-	-	-	0.08	-
Public transport	-	-	-	-	-	0.23	-
Not elsewhere specified	-	-	-	-	-	0.16	-
Other sectors	**-**	**-**	**-**	**-**	**-**	**43.81**	**6.94**
Households	-	-	-	-	-	22.33	5.30
Services	-	-	-	-	-	20.97	1.39
Agriculture	-	-	-	-	-	0.23	0.25
Construction	-	-	-	-	-	0.28	-

12.6. Appendix 6. NFR 2018

Table A6-1 Emissions data for the Main pollutants and particulate matter according to NFR categories

ANNEX 1: National sector emissions: Main pollutants, particulate matter, heavy metals and persistent organic pollutants

NFR 2019-1

COUNTRY:	HR	(as ISO2 code)
DATE:	10.2.2020	(as DD.MM.YYYY)
YEAR:	2018	(as YYYY, year of emissions and activity data)
Version:	v1.0	(as v1.0 for the initial submission)

HR: 10.2.2020: 2018	NFR sectors to be reported			Main Pollutants (from 1990)				Particulate Matter (from 2000)			
				NOx (as NO_2)	NMVOC	SOx (as SO_2)	NH_3	$PM_{2.5}$	PM_{10}	TSP	BC
NFR Aggregation for Gridding and LPS (GNFR)	NFR Code	Long name	Notes	kt	kt	kt	kt	kt	kt	kt	kt
A_PublicPower	1A1a	Public electricity and heat production		2,41519	0,28161	0,51062	0,00749	0,94215	1,09962	1,22438	0,03323
B_Industry	1A1b	Petroleum refining		1,59319	0,04348	2,1575	NE	0,09694	0,12559	0,17112	0,00646
B_Industry	1A1c	Manufacture of solid fuels and other energy industries		0,27213	0,08458	0,00246	0,00055	0,00287	0,00287	0,00287	0,00011
B_Industry	1A2a	Stationary combustion in manufacturing industries and construction: Iron and steel		0,08857	0,0293	0,11731	0,00026	0,01599	0,01784	0,01993	0,0014
B_Industry	1A2b	Stationary combustion in manufacturing industries and construction: Non-ferrous metals		0,03444	0,01132	0,00048	0,0001	0,00088	0,001	0,00119	0,00012
B_Industry	1A2c	Stationary combustion in manufacturing industries and construction: Chemicals		0,22778	0,0474	0,00552	4,5E-05	0,00559	0,00921	0,01499	2,1E-05
B_Industry	1A2d	Stationary combustion in manufacturing industries and construction: Pulp, Paper and Print		0,14294	0,06714	0,01469	0,00361	0,01547	0,01577	0,01645	0,00419
B_Industry	1A2e	Stationary combustion in manufacturing industries and construction: Food processing, beverages and tobacco		0,65742	0,23482	0,75215	0,009	0,12239	0,13557	0,15248	0,01811
B_Industry	1A2f	Stationary combustion in manufacturing industries and construction: Non-metallic minerals		2,94334	0,62208	1,28962	0,03961	0,2108	0,23002	0,26057	0,04558
I_Offroad	1A2gvii	Mobile combustion in manufacturing industries and construction (please specify in the IIR)		1,35241	0,25139	0,00145	0,00077	0,07091	0,07091	0,07091	0,05061
B_Industry	1A2gviii	Stationary combustion in manufacturing industries and construction: Other (please specify in the IIR)		IE	IE	IE	IE	IE	IE	IE	IE
H_Aviation	1A3ai(i)	International aviation LTO (civil)		0,26749	0,01612	0,01285	NE	0,00226	0,00226	0,00226	0,00109
H_Aviation	1A3aii(i)	Domestic aviation LTO (civil)		0,02938	0,01115	0,00132	0,00016	0,00031	0,00037	0,00037	0,00012
F_RoadTransport	1A3bi	Road transport: Passenger cars		10,8646	1,99286	0,01998	0,39391	0,56049	0,56049	0,56049	0,41364
F_RoadTransport	1A3bii	Road transport: Light duty vehicles		1,7845	0,12095	0,00361	0,01026	0,09886	0,09886	0,09886	0,07261
F_RoadTransport	1A3biii	Road transport: Heavy duty vehicles and buses		8,96959	0,40547	0,00727	0,01329	0,18492	0,18492	0,18492	0,11781
F_RoadTransport	1A3biv	Road transport: Mopeds & motorcycles		0,15018	1,54654	0,00033	0,0014	0,02582	0,02582	0,02582	0,0046
F_RoadTransport	1A3bv	Road transport: Gasoline evaporation		NA	1,55055	NA	NA	NA	NA	NA	NA
F_RoadTransport	1A3bvi	Road transport: Automobile tyre and brake wear		NA	NA	NA	NA	0,3227	0,61031	0,79356	0,08753
F_RoadTransport	1A3bvii	Road transport: Automobile road abrasion		NA	NA	NA	NA	0,15706	0,29086	0,58172	NA
I_Offroad	1A3c	Railways		0,77028	0,06835	0,00022	0,0001	0,02014	0,02117	0,02234	0,00013
G_Shipping	1A3di(ii)	International inland waterways		IE	IE	IE	IE	IE	IE	IE	IE
G_Shipping	1A3dii	National navigation (shipping)		1,81249	0,35164	0,0007	0,00033	0,21711	0,21711	0,21711	0,00119
I_Offroad	1A3ei	Pipeline transport		NO	NO	NO	NO	NO	NO	NO	NO
I_Offroad	1A3eii	Other (please specify in the IIR)		NO	NO	NO	NO	NO	NO	NO	NO
C_OtherStationaryComb	1A4ai	Commercial/Institutional: Stationary		1,20017	0,36862	0,06777	0,01701	0,09504	0,10108	0,10405	0,03288
I_Offroad	1A4aii	Commercial/Institutional: Mobile		IE	IE	IE	IE	IE	IE	IE	IE
C_OtherStationaryComb	1A4bi	Residential: Stationary		4,39356	19,6898	0,78657	2,60417	23,1033	23,6893	24,8736	2,74218
I_Offroad	1A4bii	Residential: Household and gardening (mobile)		0,04279	0,30692	5,1E-05	3E-05	0,00907	0,00907	0,00907	0,00045
C_OtherStationaryComb	1A4ci	Agriculture/Forestry/Fishing: Stationary		0,22348	0,03161	0,01809	0,00014	0,0098	0,01131	0,01131	0,00511
I_Offroad	1A4cii	Agriculture/Forestry/Fishing: Off-road vehicles and other machinery		2,39729	0,22436	0,00259	0,00138	0,0932	0,0932	0,0932	0,05984
I_Offroad	1A4ciii	Agriculture/Forestry/Fishing: National fishing		IE	IE	IE	IE	IE	IE	IE	IE
C_OtherStationaryComb	1A5a	Other stationary (including military)		IE	IE	IE	IE	IE	IE	IE	IE
I_Offroad	1A5b	Other, Mobile (including military, land based and recreational boats)		IE	IE	IE	IE	IE	IE	IE	IE
D_Fugitive	1B1a	Fugitive emission from solid fuels: Coal mining and handling		NA	NO	NA	NA	NO	NO	NO	NO
D_Fugitive	1B1b	Fugitive emission from solid fuels: Solid fuel transformation		NO	NO	NO	NO	NO	NO	NO	NO
D_Fugitive	1B1c	Other fugitive emissions from solid fuels		NO	NO	NO	NO	NO	NO	NO	NO
D_Fugitive	1B2ai	Fugitive emissions oil: Exploration, production, transport		NA	0,06955	NE	NA	NA	NA	NA	NA
D_Fugitive	1B2aiv	Fugitive emissions oil: Refining and storage		0,11348	1,10287	4,0607	0,09079	0,17833	0,41044	0,5888	0,00018

HR: 10.2.2020: 2018	NFR sectors to be reported			Main Pollutants (from 1990)				Particulate Matter (from 2000)			
				NOx (as NO_2)	NMVOC	SOx (as SO_2)	NH_3	$PM_{2.5}$	PM_{10}	TSP	BC
NFR Aggregation for Gridding and LPS (GNFR)	**NFR Code**	**Long name**	**Notes**	**kt**	**kt**	**kt**	**kt**	**kt**	**kt**	**kt**	**kt**
D_Fugitive	1B2av	Distribution of oil products		NA	2,31591	NE	NA	NA	NA	NA	NA
D_Fugitive	1B2b	Fugitive emissions from natural gas (exploration, production, processing, transmission, storage, distribution and other)		NA	0,16536	NE	NA	NA	NA	NA	NA
D_Fugitive	1B2c	Venting and flaring (oil, gas, combined oil and gas)		0,04504	0,03526	0,33128	NE	0,03925	0,03925	0,03925	0,00924
D_Fugitive	1B2d	Other fugitive emissions from energy production		NO	NO	NO	NO	NO	NO	NO	NO
B_Industry	2A1	Cement production		IE	IE	IE	IE	0,18142	0,3592	0,04233	0,00907
B_Industry	2A2	Lime production		IE	IE	IE	IE	0,00439	0,02926	0,05852	2E-05
B_Industry	2A3	Glass production		IE	0,02415	IE	0,10943	0,09158	0,10326	0,11541	0,00052
B_Industry	2A5a	Quarrying and mining of minerals other than coal		NA	NA	NA	NA	0,12104	1,21041	2,46924	NA
B_Industry	2A5b	Construction and demolition		NA	NA	NA	NA	0,01827	0,18268	0,36447	NA
B_Industry	2A5c	Storage, handling and transport of mineral products		IE	IE	IE	IE	IE	IE	IE	IE
B_Industry	2A6	Other mineral products (please specify in the IIR)		NO	NO	NO	NO	NO	NO	NO	NO
B_Industry	2B1	Ammonia production		0,74379	0,0357	NE	0,01983	NE	NA	NA	NA
B_Industry	2B2	Nitric acid production		0,12768	NA	NA	NE	NE	NA	NA	NA
B_Industry	2B3	Adipic acid production		NO	NO	NO	NO	NO	NO	NO	NO
B_Industry	2B5	Carbide production		NO	NO	NO	NO	NO	NO	NO	NO
B_Industry	2B6	Titanium dioxide production		NO	NO	NO	NO	NO	NO	NO	NO
B_Industry	2B7	Soda ash production		NO	NO	NO	NO	NO	NO	NO	NO
B_Industry	2B10a	Chemical industry: Other (please specify in the IIR)		0,02482	7E-06	0,11608	2,6301	0,32503	0,43337	0,6484	0,00585
B_Industry	2B10b	Storage, handling and transport of chemical products (please specify in the IIR)		NA	NA	NA	NA	IE	IE	IE	IE
B_Industry	2C1	Iron and steel production		0,01765	0,00632	0,00815	IE	0,00285	0,00326	0,00417	1E-05
B_Industry	2C2	Ferroalloys production		NO	NO	NO	NO	NO	NO	NO	NO
B_Industry	2C3	Aluminium production		NO	NO	NO	NO	NO	NO	NO	NO
B_Industry	2C4	Magnesium production		NO	NO	NO	NO	NO	NO	NO	NO
B_Industry	2C5	Lead production		NO	NO	NO	NO	NO	NO	NO	NO
B_Industry	2C6	Zinc production		NO	NO	NO	NO	NO	NO	NO	NO
B_Industry	2C7a	Copper production		NO	NO	NO	NO	NO	NO	NO	NO
B_Industry	2C7b	Nickel production		NO	NO	NO	NO	NO	NO	NO	NO
B_Industry	2C7c	Other metal production (please specify in the IIR)		NO	NO	NO	NO	NO	NO	NO	NO
B_Industry	2C7d	Storage, handling and transport of metal products (please specify in the IIR)		NO	NO	NO	NO	NO	NO	NO	NO
E_Solvents	2D3a	Domestic solvent use including fungicides		NA	4,38594	NA	NA	NA	NA	NA	NA
B_Industry	2D3b	Road paving with asphalt		NE	0,01369	NE	NA	0,34227	2,56703	11,9795	0,01951
B_Industry	2D3c	Asphalt roofing		NE	0,00207	NA	NA	0,00127	0,00636	0,02542	1,7E-07
E_Solvents	2D3d	Coating applications		NA	12,0005	NA	NA	NA	NA	NA	NA
E_Solvents	2D3e	Degreasing		NA	0,09699	NA	NA	NE	NA	NA	NA
E_Solvents	2D3f	Dry cleaning		NA	0,0346	NA	NA	NE	NA	NA	NA
E_Solvents	2D3g	Chemical products		NE	2,3298	NA	NA	NA	NA	NA	NA
E_Solvents	2D3h	Printing		NA	2,32255	NA	NA	NE	NA	NA	NE
E_Solvents	2D3i	Other solvent use (please specify in the IIR)		NE	4,41468	NE	NE	0,04016	0,06023	0,07362	NE
E_Solvents	2G	Other product use (please specify in the IIR)		0,0221	0,90793	0,00492	0,04998	0,40975	0,48791	0,50405	0,14631
B_Industry	2H1	Pulp and paper industry		NE	0,00194	NE	NE	NE	NE	NE	NE
B_Industry	2H2	Food and beverages industry		NA	3,40451	NA	NA	NE	NE	NE	NE
B_Industry	2H3	Other industrial processes (please specify in the IIR)		NO	NO	NO	NO	NO	NO	NO	NO
B_Industry	2I	Wood processing		NE	NE	NE	NE	NE	NE	0,11373	NE

HR: 10.2.2020: 2018	NFR sectors to be reported			Main Pollutants (from 1990)				Particulate Matter (from 2000)			
				NOx (as NO_2)	NMVOC	SOx (as SO_2)	NH_3	$PM_{2.5}$	PM_{10}	TSP	BC
NFR Aggregation for Gridding and LPS (GNFR)	**NFR Code**	**Long name**	**Notes**	**kt**	**kt**	**kt**	**kt**	**kt**	**kt**	**kt**	**kt**
B_Industry	2J	Production of POPs		NO	NO	NO	NO	NO	NO	NO	NO
B_Industry	2K	Consumption of POPs and heavy metals (e.g. electrical and scientific equipment)		NA	NA	NA	NA	NA	NA	NA	NA
B_Industry	2L	Other production, consumption, storage, transportation or handling of bulk products (please specify in the IIR)		NO	NO	NO	NO	NO	NO	NO	NO
K_AgriLivestock	3B1a	Manure management - Dairy cattle		0,00634	2,51979	NA	2,03571	0,0557	0,08559	0,18747	NA
K_AgriLivestock	3B1b	Manure management - Non-dairy cattle		0,02026	2,74329	NA	2,0411	0,03009	0,04764	0,10169	NA
K_AgriLivestock	3B2	Manure management - Sheep		0,00054	0,04873	NA	0,06133	0,01063	0,03538	0,08844	NA
K_AgriLivestock	3B3	Manure management - Swine		0,0167	0,91904	NA	4,1983	0,07416	0,42178	0,93164	NA
K_AgriLivestock	3B4a	Manure management - Buffalo		NO	NO	NA	NO	NO	NO	NO	NA
K_AgriLivestock	3B4d	Manure management - Goats		6,8E-05	0,0046	NA	0,01571	0,00134	0,00445	0,01113	NA
K_AgriLivestock	3B4e	Manure management - Horses		0,00119	0,0547	NA	0,03779	0,00331	0,0052	0,01135	NA
K_AgriLivestock	3B4f	Manure management - Mules and asses		0,00019	0,00103	NA	0,00592	0,00037	0,00059	0,00126	NA
K_AgriLivestock	3B4gi	Manure management - Laying hens		0,00054	0,21978	NA	0,4346	0,06389	0,33058	0,33058	NA
K_AgriLivestock	3B4gii	Manure management - Broilers		0,02444	0,62978	NA	0,7996	0,06773	0,51923	0,51923	NA
K_AgriLivestock	3B4giii	Manure management - Turkeys		0,0052	0,12511	NA	0,23438	0,03094	0,22985	0,22985	NA
K_AgriLivestock	3B4giv	Manure management - Other poultry		0,00366	0,03956	NA	0,35351	0,01948	0,15469	0,15469	NA
K_AgriLivestock	3B4h	Manure management - Other animals (please specify in the IIR)		NO	NO	NA	NO	NO	NO	NO	NA
L_AgriOther	3Da1	Inorganic N-fertilizers (includes also urea application)		2,58492	NA	NA	11,9919	NA	NA	NA	NA
L_AgriOther	3Da2a	Animal manure applied to soils		1,8729	NA	NA	5,7571	NA	NA	NA	NA
L_AgriOther	3Da2b	Sewage sludge applied to soils		0,00266	NA	NA	0,00865	NA	NA	NA	NA
L_AgriOther	3Da2c	Other organic fertilisers applied to soils (including compost)		NE	NA	NA	NE	NA	NA	NA	NA
L_AgriOther	3Da3	Urine and dung deposited by grazing animals		2,27415	NA	NA	1,07589	NA	NA	NA	NA
L_AgriOther	3Da4	Crop residues applied to soils		NE	NA	NA	NE	NA	NA	NA	NA
L_AgriOther	3Db	Indirect emissions from managed soils		NE	NA	NA	NA	NA	NA	NA	NA
L_AgriOther	3Dc	Farm-level agricultural operations including storage, handling and transport of agricultural products		NA	NA	NA	NA	0,08914	2,31761	2,31761	NA
L_AgriOther	3Dd	Off-farm storage, handling and transport of bulk agricultural products		NE	NE	NA	NE	NE	NE	NE	NA
L_AgriOther	3De	Cultivated crops		NA	1,7123	NA	NE	NA	NA	NA	NA
L_AgriOther	3Df	Use of pesticides		NA	NA	NA	NA	NA	NA	NA	NA
L_AgriOther	3F	Field burning of agricultural residues		0,00166	0,00036	0,00036	0,00173	0,0039	0,00412	0,00419	0,00036
L_AgriOther	3I	Agriculture other (please specify in the IIR)		NO	NO	NO	NO	NO	NO	NO	NO
J_Waste	5A	Biological treatment of waste - Solid waste disposal on land		NA	1,12097	NA	NE	5,3E-05	0,00035	0,00074	NA
J_Waste	5B1	Biological treatment of waste - Composting		NE	NE	NE	0,01142	NE	NE	NE	NE
J_Waste	5B2	Biological treatment of waste - Anaerobic digestion at biogas facilities		IE	IE	IE	IE	IE	IE	IE	IE
J_Waste	5C1a	Municipal waste incineration		NO	NO	NO	NO	NO	NO	NO	NO
J_Waste	5C1bi	Industrial waste incineration		IE	IE	IE	IE	IE	IE	IE	IE
J_Waste	5C1bii	Hazardous waste incineration		NO	NO	NO	NO	NO	NO	NO	NO
J_Waste	5C1biii	Clinical waste incineration		NO	NO	NO	NO	NO	NO	NO	NO
J_Waste	5C1biv	Sewage sludge incineration		NO	NO	NO	NO	NO	NO	NO	NO
J_Waste	5C1bv	Cremation		0,00531	8,4E-05	0,00073	NA	0,00022	0,00022	0,00025	NE
J_Waste	5C1bvi	Other waste incineration (please specify in the IIR)		NO	NO	NO	NO	NO	NO	NO	NO
J_Waste	5C2	Open burning of waste		NO	NO	NO	NO	NO	NO	NO	NO
J_Waste	5D1	Domestic wastewater handling		NA	NE	NA	0,59375	NE	NE	NE	NE
J_Waste	5D2	Industrial wastewater handling		NA	0,00448	NA	NE	NE	NE	NE	NE
J_Waste	5D3	Other wastewater handling		NA	NO	NA	NO	NO	NO	NO	NO
J_Waste	5E	Other waste (please specify in the IIR)		NE	NE	NE	NE	0,13747	0,13747	0,13747	NE

HR: 10.2.2020: 2018	NFR sectors to be reported			Main Pollutants (from 1990)				Particulate Matter (from 2000)			
				NOx (as NO_2)	NMVOC	SOx (as SO_2)	NH_3	$PM_{2.5}$	PM_{10}	TSP	BC
NFR Aggregation for Gridding and LPS (GNFR)	**NFR Code**	**Long name**	**Notes**	**kt**	**kt**	**kt**	**kt**	**kt**	**kt**	**kt**	**kt**
M_Other	6A	Other (included in national total for entire territory) (please specify in the IIR)		NO	NO	NO	NO	NO	NO	NO	NO
	NATIONAL TOTAL	National total (based on fuel sold)	(a)	50,55	72,17	10,30	35,66	28,73	37,81	51,57	3,89
	1A3bi(fu)	Road transport: Passenger cars (fuel used)	(b)								
	1A3bii(fu)	Road transport: Light duty vehicles (fuel used)	(b)								
	1A3biii(fu)	Road transport: Heavy duty vehicles and buses (fuel used)	(b)								
	1A3biv(fu)	Road transport: Mopeds & motorcycles (fuel used)	(b)								
	1A3bv(fu)	Road transport: Gasoline evaporation (fuel used)	(b)								
	1A3bvi(fu)	Road transport: Automobile tyre and brake wear (fuel used)	(b)								
	1A3bvii(fu)	Road transport: Automobile road abrasion (fuel used)	(b)								
	ADJUSTMENTS	Sum of approved adjustments (negative value) from Annex VII (CLRTAP)									
	COMPLIANCE TOTAL (CLRTAP)	National total for compliance calculations and checks (CLRTAP)	(c)	50,55	72,17	10,30	35,66	28,73	37,81	51,57	3,89
	ADJUSTMENTS AND FLEXIBILITIES	Sum of approved adjustments from Annex VII and other flexibilities (negative value) (NECD)	(d)								
	COMPLIANCE TOTAL (NECD)	National total for compliance calculations and checks (NECD)	(e)	50,55	72,17	10,30	35,66	28,73	37,81	51,57	3,89
MEMO ITEMS - NOT TO BE INCLUDED IN NATIONAL TOTALS											
O_AviCruise	1A3ai(ii)	International aviation cruise (civil)		1,90605	0,07443	0,07196	NE	0,02979	0,02979	0,02979	0,01427
O_AviCruise	1A3aii(ii)	Domestic aviation cruise (civil)		0,07187	0,0007	0,00337	NE	0,0014	0,0014	0,0014	0,00067
P_IntShipping	1A3di(i)	International maritime navigation		1,62855	0,05751	0,1674	0,00014	0,04788	0,0522	0,0522	0,0001
z_Memo	1A5c	Multilateral operations		NA	NA	NA	NA	NA	NA	NA	NA
z_Memo	6B	Other not included in national total of the entire territory (please specify in the IIR)		NO	NO	NO	NO	NO	NO	NO	NO
N_Natural	11A	Volcanoes		NO	NO	NO	NO	NO	NO	NO	NO
N_Natural	11B	Forest fires		0,1033	0,3099	0,02066	0,02066	NE	NE	NE	NE
N_Natural	11C	Other natural emissions (please specify in the IIR)		NO	NO	NO	NO	NO	NO	NO	NO

Note (a): Sum of NFR categories (rows 14-140). The geographic area of the National Total corresponds to the geographical scope of EMEP, which is identical with the NECD territory, except for Portugal (EMEP domain includes emissions of Madeira and the Azores, but the NECD territory does not cover emissions of Madeira and the Azores). The geographical scope of EMEP means the area within which, co-ordinated by the centres of the EMEP, monitoring is carried out (see EMEP Protocol, Article 1/4).

Note (b): UNECE reporting guidelines 2014, paragraph 23: The Parties Austria, Belgium, Ireland, Lithuania, Luxembourg, the Netherlands, Switzerland and the United Kingdom of Great Britain and Northern Ireland may choose to use the national emission total calculated on the basis of fuels used in the geographic area of the Party as a basis for compliance with their respective emission ceilings.
If one Party has chosen to report emission on the basis of fuel used for compliance, it shall report those information for all the related NFR categories available in the reporting template (row 143-149).

Note (c): The 'National Total for Compliance (CLRTAP)' includes the 'National Total (based on fuel sold)' (row 141) corrected for i) approved adjustments to national totals (row 151) and, if applicable, ii) national totals based on transport fuel used (rows 143-149).

Note (d): Reporting of adjustments and additional flexibilities according to the NEC Directive, Article 5/2-4. Should only include approved items from Annex VII and should be reported as a negative value.

Note (e): The 'National Total for Compliance (NECD)' includes the 'National Total (based on fuel sold)' (row 141) corrected for i) approved adjustments and flexibilities to national totals (row 153) and, if applicable, ii) national totals based on transport fuel used (rows 143-149) as well as iii) the subtraction of sectors 3B + 3D for NOx and NMVOC (only from 2020 onwards and for the year 2005 as a basis for emission reduction commitment calculations), according to the NEC Directive, Article 4/3(d).

Table A6-2 Emissions data for the CO and heavy metals according to NFR categories

HR: 10.2.2020: 2018	NFR sectors to be reported		Other (from 1990)	Priority Heavy Metals (from 1990)			Additional Heavy Metals (from 1990, voluntary reporting)					
			CO	Pb	Cd	Hg	As	Cr	Cu	Ni	Se	Zn
NFR Aggregation for Gridding and LPS (GNFR)	**NFR Code**	**Long name**	**kt**	**t**	**t**	**t**	**t**	**t**	**t**	**t**	**t**	**t**
A_PublicPower	1A1a	Public electricity and heat production	0,89374	0,25833	0,01512	0,10576	0,09329	0,08478	0,19798	0,26141	0,01206	1,39787
B_Industry	1A1b	Petroleum refining	0,34629	0,03638	0,01149	0,00276	0,02255	0,0433	0,04831	1,84034	0,0134	0,59975
B_Industry	1A1c	Manufacture of solid fuels and other energy industries	0,10664	4E-05	3,3E-06	0,00037	0,00037	4,8E-05	9,6E-06	4,8E-05	0,00021	0,00268
B_Industry	1A2a	Stationary combustion in manufacturing industries and construction: Iron and steel	0,13896	0,00355	0,00032	0,00057	0,00068	0,00188	0,00221	0,0017	0,00032	0,029
B_Industry	1A2b	Stationary combustion in manufacturing industries and construction: Non-ferrous metals	0,01499	9,5E-05	3,7E-05	0,00027	6,4E-05	8,1E-05	2,6E-05	2,8E-05	3,5E-05	0,00176
B_Industry	1A2c	Stationary combustion in manufacturing industries and construction: Chemicals	0,10549	0,00057	5,8E-05	0,00351	0,00068	0,00046	0,00029	0,00057	0,0003	0,002
B_Industry	1A2d	Stationary combustion in manufacturing industries and construction: Pulp, Paper and Print	0,10432	0,00265	0,00127	0,00093	0,00018	0,00227	0,0006	0,00022	0,00015	0,05192
B_Industry	1A2e	Stationary combustion in manufacturing industries and construction: Food processing, beverages and tobacco	0,8892	0,02481	0,00439	0,00387	0,00413	0,0151	0,01321	0,00986	0,00202	0,26711
B_Industry	1A2f	Stationary combustion in manufacturing industries and construction: Non-metallic minerals	4,25304	0,33609	0,03428	0,12404	0,06797	0,13314	0,17287	0,12936	0,06217	1,71643
I_Offroad	1A2gvii	Mobile combustion in manufacturing industries and construction (please specify in the IIR)	3,1529	0,012	0,00099	NE	NE	0,00497	0,16898	0,00696	0,00099	0,0994
B_Industry	1A2gviii	Stationary combustion in manufacturing industries and construction: Other (please specify in the IIR)	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE
H_Aviation	1A3ai(i)	International aviation LTO (civil)	0,38028	9,4E-05	7E-06	0,00014	3,5E-05	0,00023	0,00026	9,4E-06	0,00013	0,03389
H_Aviation	1A3aii(i)	Domestic aviation LTO (civil)	0,63893	0,13692	6,9E-06	1,4E-05	3,6E-06	9,1E-05	0,00138	1,8E-05	1,5E-05	0,00507
F_RoadTransport	1A3bi	Road transport: Passenger cars	21,012	2,65713	0,00013	0,00823	0,00022	0,00959	0,00656	0,00124	0,00017	0,02956
F_RoadTransport	1A3bii	Road transport: Light duty vehicles	0,68048	0,14696	1,2E-05	0,00115	2,3E-05	0,00176	0,00119	6,2E-05	2,2E-05	0,00393
F_RoadTransport	1A3biii	Road transport: Heavy duty vehicles and buses	2,16487	0,21019	2,1E-05	0,00222	4,2E-05	0,00355	0,00238	8,4E-05	4,2E-05	0,00753
F_RoadTransport	1A3biv	Road transport: Mopeds & motorcycles	4,25613	0,11644	0,00141	0,00021	7,2E-06	0,00607	0,23975	0,00988	0,0014	0,13947
F_RoadTransport	1A3bv	Road transport: Gasoline evaporation	NA	NA	NA	NA	NA	NA	NA	NA	NA	NE
F_RoadTransport	1A3bvi	Road transport: Automobile tyre and brake wear	NE	0,86872	0,00395	2,6E-06	2,6E-12	0,32265	7,07072	0,05056	0,00645	2,56999
F_RoadTransport	1A3bvii	Road transport: Automobile road abrasion	NE	NE	NE	NE	NE	NE	NE	NE	NE	NA
I_Offroad	1A3c	Railways	0,15729	5E-05	0,00014	7,5E-05	1,9E-05	0,00073	0,02499	0,00103	0,00014	0,0147
G_Shipping	1A3di(ii)	International inland waterways	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE
G_Shipping	1A3dii	National navigation (shipping)	0,93456	0,00613	0,00047	0,00141	0,00189	0,00236	0,04389	0,04453	0,00446	0,05606
I_Offroad	1A3ei	Pipeline transport	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
I_Offroad	1A3eii	Other (please specify in the IIR)	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
C_OtherStationaryComb	1A4ai	Commercial/Institutional: Stationary	0,65451	0,02439	0,00575	0,00132	0,00179	0,02575	0,00735	0,19958	0,0009	0,25197
I_Offroad	1A4aii	Commercial/Institutional: Mobile	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE
C_OtherStationaryComb	1A4bi	Residential: Stationary	163,435	1,23923	0,59114	0,04093	0,01147	1,04715	0,27516	0,09212	0,02314	23,2956
I_Offroad	1A4bii	Residential: Household and gardening (mobile)	5,90465	0,0285	7,6E-05	NE	NE	0,00038	0,01292	0,00053	7,6E-05	0,0076
C_OtherStationaryComb	1A4ci	Agriculture/Forestry/Fishing: Stationary	0,07401	0,00404	7,6E-05	0,00014	0,00035	0,00505	0,00151	0,06301	0,0001	0,00975
I_Offroad	1A4cii	Agriculture/Forestry/Fishing: Off-road vehicles and other machinery	1,24548	NA	0,00174	NE	NE	0,00871	0,29597	0,01219	0,00174	0,1741
I_Offroad	1A4ciii	Agriculture/Forestry/Fishing: National fishing	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE
C_OtherStationaryComb	1A5a	Other stationary (including military)	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE
I_Offroad	1A5b	Other, Mobile (including military, land based and recreational boats)	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE
D_Fugitive	1B1a	Fugitive emission from solid fuels: Coal mining and handling	NA	NO	NO	NO	NO	NO	NO	NO	NO	NO
D_Fugitive	1B1b	Fugitive emission from solid fuels: Solid fuel transformation	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
D_Fugitive	1B1c	Other fugitive emissions from solid fuels	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
D_Fugitive	1B2ai	Fugitive emissions oil: Exploration, production, transport	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
D_Fugitive	1B2aiv	Fugitive emissions oil: Refining and storage	22,1649	0,18732	0,03575	0,04355	0,28897	0,18725	0,08135	0,41894	0,01178	0,07384
D_Fugitive	1B2av	Distribution of oil products	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
D_Fugitive	1B2b	Fugitive emissions from natural gas (exploration, production, processing, transmission, storage, distribution and other)	NA	NA	NA	4,1E-05	NA	NA	NA	NA	NA	NA
D_Fugitive	1B2c	Venting and flaring (oil, gas, combined oil and gas)	0,20401	0,00141	0,00212	0,00038	0,00035	0,00559	0,00276	0,0067	0,0013	0,02185
D_Fugitive	1B2d	Other fugitive emissions from energy production	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
B_Industry	2A1	Cement production	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE
B_Industry	2A2	Lime production	IE	IE	IE	IE	NA	NA	NA	NA	NA	NA
B_Industry	2A3	Glass production	IE	0,47967	0,03668	0,00085	0,05361	0,0649	0,00198	0,13826	0,22573	0,1044

HR: 10.2.2020: 2018	NFR sectors to be reported		Other (from 1990)	Priority Heavy Metals (from 1990)			Additional Heavy Metals (from 1990, voluntary reporting)					
			CO	Pb	Cd	Hg	As	Cr	Cu	Ni	Se	Zn
NFR Aggregation for Gridding and LPS (GNFR)	**NFR Code**	**Long name**	**kt**	**t**	**t**	**t**	**t**	**t**	**t**	**t**	**t**	**t**
B_Industry	2A5a	Quarrying and mining of minerals other than coal	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
B_Industry	2A5b	Construction and demolition	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
B_Industry	2A5c	Storage, handling and transport of mineral products	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE
B_Industry	2A6	Other mineral products (please specify in the IIR)	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
B_Industry	2B1	Ammonia production	0,00238	NA	NA	NA	NA	NA	NA	NA	NA	NA
B_Industry	2B2	Nitric acid production	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
B_Industry	2B3	Adipic acid production	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
B_Industry	2B5	Carbide production	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
B_Industry	2B6	Titanium dioxide production	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
B_Industry	2B7	Soda ash production	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
B_Industry	2B10a	Chemical industry: Other (please specify in the IIR)	1,2E-05	NO	NO	NO	NE	NE	NE	NE	NE	NE
B_Industry	2B10b	Storage, handling and transport of chemical products (please specify in the IIR)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
B_Industry	2C1	Iron and steel production	0,23082	0,35302	0,02716	0,00679	0,00204	0,01358	0,00272	0,09504	IE	0,48879
B_Industry	2C2	Ferroalloys production	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
B_Industry	2C3	Aluminium production	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
B_Industry	2C4	Magnesium production	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
B_Industry	2C5	Lead production	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
B_Industry	2C6	Zinc production	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
B_Industry	2C7a	Copper production	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
B_Industry	2C7b	Nickel production	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
B_Industry	2C7c	Other metal production (please specify in the IIR)	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
B_Industry	2C7d	Storage, handling and transport of metal products (please specify in the IIR)	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
E_Solvents	2D3a	Domestic solvent use including fungicides	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
B_Industry	2D3b	Road paving with asphalt	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA
B_Industry	2D3c	Asphalt roofing	0,00015	NE	NE	NE	NA	NA	NA	NA	NA	NA
E_Solvents	2D3d	Coating applications	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
E_Solvents	2D3e	Degreasing	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
E_Solvents	2D3f	Dry cleaning	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
E_Solvents	2D3g	Chemical products	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
E_Solvents	2D3h	Printing	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
E_Solvents	2D3i	Other solvent use (please specify in the IIR)	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
E_Solvents	2G	Other product use (please specify in the IIR)	0,67517	1,27714	0,06744	9,3E-05	0,00217	0,02541	0,7883	0,08138	NE	0,45605
B_Industry	2H1	Pulp and paper industry	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA
B_Industry	2H2	Food and beverages industry	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
B_Industry	2H3	Other industrial processes (please specify in the IIR)	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
B_Industry	2I	Wood processing	NE	NA	NA	NA	NE	NA	NE	NA	NA	NA
B_Industry	2J	Production of POPs	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
B_Industry	2K	Consumption of POPs and heavy metals (e.g. electrical and scientific equipment)	NA	NE	NE	0,04088	NE	NE	NE	NE	NE	NE
B_Industry	2L	Other production, consumption, storage, transportation or handling of bulk products (please specify in the IIR)	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
K_AgriLivestock	3B1a	Manure management - Dairy cattle	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
K_AgriLivestock	3B1b	Manure management - Non-dairy cattle	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
K_AgriLivestock	3B2	Manure management - Sheep	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
K_AgriLivestock	3B3	Manure management - Swine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
K_AgriLivestock	3B4a	Manure management - Buffalo	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
K_AgriLivestock	3B4d	Manure management - Goats	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
K_AgriLivestock	3B4e	Manure management - Horses	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
K_AgriLivestock	3B4f	Manure management - Mules and asses	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
K_AgriLivestock	3B4gi	Manure management - Laying hens	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
K_AgriLivestock	3B4gii	Manure management - Broilers	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

HR: 10.2.2020: 2018	NFR sectors to be reported		Other (from 1990)	Priority Heavy Metals (from 1990)			Additional Heavy Metals (from 1990, voluntary reporting)					
			CO	Pb	Cd	Hg	As	Cr	Cu	Ni	Se	Zn
NFR Aggregation for Gridding and LPS (GNFR)	NFR Code	Long name	kt	t	t	t	t	t	t	t	t	t
K_AgriLivestock	3B4giii	Manure management - Turkeys	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
K_AgriLivestock	3B4giv	Manure management - Other poultry	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
K_AgriLivestock	3B4h	Manure management - Other animals (please specify in the IIR)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
L_AgriOther	3Da1	Inorganic N-fertilizers (includes also urea application)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
L_AgriOther	3Da2a	Animal manure applied to soils	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
L_AgriOther	3Da2b	Sewage sludge applied to soils	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
L_AgriOther	3Da2c	Other organic fertilisers applied to soils (including compost)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
L_AgriOther	3Da3	Urine and dung deposited by grazing animals	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
L_AgriOther	3Da4	Crop residues applied to soils	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
L_AgriOther	3Db	Indirect emissions from managed soils	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
L_AgriOther	3Dc	Farm-level agricultural operations including storage, handling and transport of agricultural products	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
L_AgriOther	3Dd	Off-farm storage, handling and transport of bulk agricultural products	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
L_AgriOther	3De	Cultivated crops	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
L_AgriOther	3Df	Use of pesticides	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
L_AgriOther	3F	Field burning of agricultural residues	0,04821	8E-05	0,00064	0,0001	4,6E-06	5,8E-05	5,3E-05	3,8E-05	1,4E-05	0,0004
L_AgriOther	3I	Agriculture other (please specify in the IIR)	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
J_Waste	5A	Biological treatment of waste - Solid waste disposal on land	NE	NA	NA	NE	NA	NA	NA	NA	NA	NA
J_Waste	5B1	Biological treatment of waste - Composting	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA
J_Waste	5B2	Biological treatment of waste - Anaerobic digestion at biogas facilities	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE
J_Waste	5C1a	Municipal waste incineration	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
J_Waste	5C1bi	Industrial waste incineration	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE
J_Waste	5C1bii	Hazardous waste incineration	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
J_Waste	5C1biii	Clinical waste incineration	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
J_Waste	5C1biv	Sewage sludge incineration	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
J_Waste	5C1bv	Cremation	0,0009	0,00019	3,2E-05	0,0096	8,8E-05	8,7E-05	8E-05	0,00011	0,00013	0,00103
J_Waste	5C1bvi	Other waste incineration (please specify in the IIR)	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
J_Waste	5C2	Open burning of waste	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
J_Waste	5D1	Domestic wastewater handling	NA	NE	NE	NE	NE	NE	NE	NE	NE	NE
J_Waste	5D2	Industrial wastewater handling	NA	NE	NE	NE	NE	NE	NE	NE	NE	NE
J_Waste	5D3	Other wastewater handling	NA	NO	NO	NO	NO	NO	NO	NO	NO	NO
J_Waste	5E	Other waste (please specify in the IIR)	NE	0,0004	0,0008	0,0008	0,00128	0,00122	0,00284	NE	NE	NE
M_Other	6A	Other (included in national total for entire territory) (please specify in the IIR)	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
	NATIONAL TOTAL	National total (based on fuel sold)	234,87	8,41	0,84	0,40	0,55	2,02	9,47	3,47	0,37	31,91
	1A3bi(fu)	Road transport: Passenger cars (fuel used)										
	1A3bii(fu)	Road transport: Light duty vehicles (fuel used)										
	1A3biii(fu)	Road transport: Heavy duty vehicles and buses (fuel used)										
	1A3biv(fu)	Road transport: Mopeds & motorcycles (fuel used)										
	1A3bv(fu)	Road transport: Gasoline evaporation (fuel used)										
	1A3bvi(fu)	Road transport: Automobile tyre and brake wear (fuel used)										
	1A3bvii(fu)	Road transport: Automobile road abrasion (fuel used)										

HR: 10.2.2020: 2018	NFR sectors to be reported		Other (from 1990)	Priority Heavy Metals (from 1990)			Additional Heavy Metals (from 1990, voluntary reporting)					
			CO	Pb	Cd	Hg	As	Cr	Cu	Ni	Se	Zn
NFR Aggregation for Gridding and LPS (GNFR)	NFR Code	Long name	kt	t	t	t	t	t	t	t	t	t
	ADJUSTMENTS	Sum of approved adjustments (negative value) from Annex VII (CLRTAP)										
	COMPLIANCE TOTAL (CLRTAP)	National total for compliance calculations and checks (CLRTAP)	234,87	8,41	0,84	0,40	0,55	2,02	9,47	3,47	0,37	31,91
	ADJUSTMENTS AND FLEXIBILITIES	Sum of approved adjustments from Annex VII and other flexibilities (negative value) (NECD)										
	COMPLIANCE TOTAL (NECD)	National total for compliance calculations and checks (NECD)	234,87	8,41	0,84	0,40	0,55	2,02	9,47	3,47	0,37	31,91
MEMO ITEMS - NOT TO BE INCLUDED IN NATIONAL TOTALS												
O_AviCruise	1A3ai(ii)	International aviation cruise (civil)	0,16379	0,00052	3,9E-05	0,00079	0,0002	0,00131	0,00144	5,2E-05	0,00072	0,18984
O_AviCruise	1A3aii(ii)	Domestic aviation cruise (civil)	0,01396	2,5E-05	1,8E-06	3,7E-05	9,2E-06	6,1E-05	6,7E-05	2,5E-06	3,4E-05	0,0089
P_IntShipping	1A3di(i)	International maritime navigation	0,15318	0,00291	0,00025	0,00057	0,00371	0,00405	0,01988	0,1602	0,00257	0,02484
z_Memo	1A5c	Multilateral operations	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
z_Memo	6B	Other not included in national total of the entire territory (please specify in the IIR)	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
N_Natural	11A	Volcanoes	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
N_Natural	11B	Forest fires	3,099	NA	NA	NA	NA	NA	NA	NA	NA	NA
N_Natural	11C	Other natural emissions (please specify in the IIR)	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO

Table A6-3 Emissions data for POPs according to NFR categories

HR: 10.2.2020: 2018	NFR sectors to be reported		POPs (from 1990)							
				PAHs						
			PCDD/ PCDF (dioxins/ furans)	benzo(a) pyrene	benzo(b) fluoranthene	benzo(k) fluoranthene	Indeno (1,2,3-cd) pyrene	Total 1-4	HCB	PCBs
NFR Aggregation for Gridding and LPS (GNFR)	**NFR Code**	**Long name**	**g I-TEQ**	**t**	**t**	**t**	**t**	**t**	**kg**	**kg**
A_PublicPower	1A1a	Public electricity and heat production	0,48728	0,00786	0,000346	0,00013	0,00029	0,00863	0,04276	2,13285
B_Industry	1A1b	Petroleum refining	0,01438	8,3E-06	3,41E-05	2,7E-05	3,8E-05	0,00011	NE	NE
B_Industry	1A1c	Manufacture of solid fuels and other energy industries	0,00191	2,6E-06	1,07E-05	4E-06	4E-06	2,1E-05	NE	NE
B_Industry	1A2a	Stationary combustion in manufacturing industries and construction: Iron and steel	0,02572	0,00607	0,009545	0,0037	0,00304	0,02235	0,00013	0,02043
B_Industry	1A2b	Stationary combustion in manufacturing industries and construction: Non-ferrous metals	0,00054	0,00035	0,001363	0,00052	0,0005	0,00274	1,6E-05	1,6E-07
B_Industry	1A2c	Stationary combustion in manufacturing industries and construction: Chemicals	0,00179	0,0005	0,002165	0,00094	0,00088	0,00448	9E-05	NE
B_Industry	1A2d	Stationary combustion in manufacturing industries and construction: Pulp, Paper and Print	0,01063	0,00219	0,00667	0,00231	0,00218	0,01335	0,00049	5,9E-06
B_Industry	1A2e	Stationary combustion in manufacturing industries and construction: Food processing, beverages and tobacco	0,15833	0,03494	0,058758	0,02163	0,01784	0,13318	0,00177	0,10822
B_Industry	1A2f	Stationary combustion in manufacturing industries and construction: Non-metallic minerals	0,29655	0,05371	0,086072	0,03263	0,02677	0,19918	0,01688	0,38402
I_Offroad	1A2gvii	Mobile combustion in manufacturing industries and construction (please specify in the IIR)	NE	0,00301	0,004938	NE	NE	0,00795	NE	NE
B_Industry	1A2gviii	Stationary combustion in manufacturing industries and construction: Other (please specify in the IIR)	IE	IE	IE	IE	IE	IE	IE	IE
H_Aviation	1A3ai(i)	International aviation LTO (civil)	0,00164	0,00222	0,017532	0,00199	0,00175	0,02349	NA	NA
H_Aviation	1A3aii(i)	Domestic aviation LTO (civil)	0,0003	0,00023	0,0018	0,00021	0,00019	0,00242	NA	NA
F_RoadTransport	1A3bi	Road transport: Passenger cars	0,70651	0,02576	0,029204	0,02237	0,02525	0,10259	0,00068	0,00015
F_RoadTransport	1A3bii	Road transport: Light duty vehicles	0,11144	0,00505	0,005656	0,00443	0,00471	0,01985	0,00011	1,9E-05
F_RoadTransport	1A3biii	Road transport: Heavy duty vehicles and buses	0,11554	0,00223	0,013526	0,01511	0,00347	0,03435	9,4E-05	2E-05
F_RoadTransport	1A3biv	Road transport: Mopeds & motorcycles	0,01036	0,00019	0,000228	0,00015	0,00025	0,00081	1E-05	3,4E-06
F_RoadTransport	1A3bv	Road transport: Gasoline evaporation	NE	NE	NE	NE	NA	NE	NA	NE
F_RoadTransport	1A3bvi	Road transport: Automobile tyre and brake wear	NE	NE	NE	NE	NE	NE	NA	NE
F_RoadTransport	1A3bvii	Road transport: Automobile road abrasion	NE	NE	NE	NE	NE	NE	NA	NE
I_Offroad	1A3c	Railways	0,00088	0,00044	0,000735	1,1E-06	9,4E-07	0,00118	NE	NE
G_Shipping	1A3di(ii)	International inland waterways	IE	IE	IE	IE	IE	IE	IE	IE
G_Shipping	1A3dii	National navigation (shipping)	0,37897	8,6E-05	0,000144	NE	NE	0,00023	0,00377	0,00278
I_Offroad	1A3ei	Pipeline transport	NO	NO	NO	NO	NO	NO	NO	NO
I_Offroad	1A3eii	Other (please specify in the IIR)	NO	NO	NO	NO	NO	NO	NO	NO
C_OtherStationaryComb	1A4ai	Commercial/Institutional: Stationary	0,04949	0,00429	0,006885	0,00215	0,00173	0,01506	0,00246	0,00023
I_Offroad	1A4aii	Commercial/Institutional: Mobile	IE	IE	IE	IE	IE	IE	IE	IE
C_OtherStationaryComb	1A4bi	Residential: Stationary	23,6308	4,63598	4,323591	1,63896	2,71286	13,3114	0,22734	0,01629
I_Offroad	1A4bii	Residential: Household and gardening (mobile)	NE	0,0003	0,000304	NE	NE	0,00061	NE	NE
C_OtherStationaryComb	1A4ci	Agriculture/Forestry/Fishing: Stationary	0,00119	1,6E-06	1,03E-05	1,9E-06	1,8E-06	1,6E-05	0,00011	6,6E-08
I_Offroad	1A4cii	Agriculture/Forestry/Fishing: Off-road vehicles and other machinery	NE	0,00522	0,008705	NE	NE	0,01393	NE	NE
I_Offroad	1A4ciii	Agriculture/Forestry/Fishing: National fishing	IE	IE	IE	IE	IE	IE	IE	IE
C_OtherStationaryComb	1A5a	Other stationary (including military)	IE	IE	IE	IE	IE	IE	IE	IE
I_Offroad	1A5b	Other, Mobile (including military, land based and recreational boats)	IE	IE	IE	IE	IE	IE	IE	IE
D_Fugitive	1B1a	Fugitive emission from solid fuels: Coal mining and handling	NA	NA	NA	NA	NA	NA	NA	NA
D_Fugitive	1B1b	Fugitive emission from solid fuels: Solid fuel transformation	NO	NO	NO	NO	NO	NO	NO	NO
D_Fugitive	1B1c	Other fugitive emissions from solid fuels	NO	NO	NO	NO	NO	NO	NO	NO
D_Fugitive	1B2ai	Fugitive emissions oil: Exploration, production, transport	NE	NA	NA	NA	NA	NA	NA	NA
D_Fugitive	1B2aiv	Fugitive emissions oil: Refining and storage	0,01078	0,0004	0,000681	0,00047	0,00035	0,0019	NA	NA
D_Fugitive	1B2av	Distribution of oil products	NE	NA	NA	NA	NA	NA	NA	NA
D_Fugitive	1B2b	Fugitive emissions from natural gas (exploration, production, processing, transmission, storage, distribution and other)	NE	NA	NA	NA	NA	NA	NA	NA

HR: 10.2.2020: 2018	NFR sectors to be reported		POPs (from 1990)							
				PAHs						
			PCDD/ PCDF (dioxins/ furans)	benzo(a) pyrene	benzo(b) fluoranthene	benzo(k) fluoranthene	Indeno (1,2,3-cd) pyrene	Total 1-4	HCB	PCBs
NFR Aggregation for Gridding and LPS (GNFR)	**NFR Code**	**Long name**	**g I-TEQ**	**t**	**t**	**t**	**t**	**t**	**kg**	**kg**
D_Fugitive	1B2c	Venting and flaring (oil, gas, combined oil and gas)	NE	5,6E-07	9,49E-07	5,2E-07	5,2E-07	2,6E-06	NA	NA
D_Fugitive	1B2d	Other fugitive emissions from energy production	NO	NO	NO	NO	NO	NO	NO	NO
B_Industry	2A1	Cement production	IE	IE	IE	IE	IE	IE	IE	IE
B_Industry	2A2	Lime production	NA	NA	NA	NA	NA	NA	NA	NA
B_Industry	2A3	Glass production	IE	IE	IE	IE	IE	IE	IE	IE
B_Industry	2A5a	Quarrying and mining of minerals other than coal	NA	NA	NA	NA	NA	NA	NA	NA
B_Industry	2A5b	Construction and demolition	NA	NA	NA	NA	NA	NA	NA	NA
B_Industry	2A5c	Storage, handling and transport of mineral products	IE	IE	IE	IE	IE	IE	IE	IE
B_Industry	2A6	Other mineral products (please specify in the IIR)	NO	NO	NO	NO	NO	NO	NO	NO
B_Industry	2B1	Ammonia production	NA	NA	NA	NA	NA	NA	NA	NA
B_Industry	2B2	Nitric acid production	NA	NA	NA	NA	NA	NA	NA	NA
B_Industry	2B3	Adipic acid production	NO	NO	NO	NO	NO	NO	NO	NO
B_Industry	2B5	Carbide production	NO	NO	NO	NO	NO	NO	NO	NO
B_Industry	2B6	Titanium dioxide production	NO	NO	NO	NO	NO	NO	NO	NO
B_Industry	2B7	Soda ash production	NO	NO	NO	NO	NO	NO	NO	NO
B_Industry	2B10a	Chemical industry: Other (please specify in the IIR)	NA	NA	NA	NA	NA	NA	NA	NA
B_Industry	2B10b	Storage, handling and transport of chemical products (please specify in the IIR)	NA	NA	NA	NA	NA	NA	NA	NA
B_Industry	2C1	Iron and steel production	0,40733	IE	IE	IE	IE	0,06517	IE	0,33944
B_Industry	2C2	Ferroalloys production	NO	NO	NO	NO	NO	NO	NO	NO
B_Industry	2C3	Aluminium production	NO	NO	NO	NO	NO	NO	NO	NO
B_Industry	2C4	Magnesium production	NO	NO	NO	NO	NO	NO	NO	NO
B_Industry	2C5	Lead production	NO	NO	NO	NO	NO	NO	NO	NO
B_Industry	2C6	Zinc production	NO	NO	NO	NO	NO	NO	NO	NO
B_Industry	2C7a	Copper production	NO	NO	NO	NO	NO	NO	NO	NO
B_Industry	2C7b	Nickel production	NO	NO	NO	NO	NO	NO	NO	NO
B_Industry	2C7c	Other metal production (please specify in the IIR)	NO	NO	NO	NO	NO	NO	NO	NO
B_Industry	2C7d	Storage, handling and transport of metal products (please specify in the IIR)	NO	NO	NO	NO	NO	NO	NO	NO
E_Solvents	2D3a	Domestic solvent use including fungicides	NA	NA	NA	NA	NA	NA	NA	NA
B_Industry	2D3b	Road paving with asphalt	NE	NE	NE	NE	NE	NE	NE	NA
B_Industry	2D3c	Asphalt roofing	NE	NE	NE	NE	NE	NE	NE	NA
E_Solvents	2D3d	Coating applications	NA	NA	NA	NA	NA	NA	NA	NA
E_Solvents	2D3e	Degreasing	NA	NA	NA	NA	NA	NA	NA	NA
E_Solvents	2D3f	Dry cleaning	NA	NA	NA	NA	NA	NA	NA	NA
E_Solvents	2D3g	Chemical products	NA	NA	NA	NA	NA	NA	NA	NA
E_Solvents	2D3h	Printing	NA	NA	NA	NA	NA	NA	NA	NA
E_Solvents	2D3i	Other solvent use (please specify in the IIR)	NE	0,00061	0,00031	0,00031	0,00031	0,00154	NE	NE
E_Solvents	2G	Other product use (please specify in the IIR)	0,0012	0,00134	0,000542	0,00054	0,00054	0,00296	NE	NE
B_Industry	2H1	Pulp and paper industry	NA	NA	NE	NE	NE	NE	NE	NA
B_Industry	2H2	Food and beverages industry	NA	NA	NA	NA	NA	NA	NA	NA
B_Industry	2H3	Other industrial processes (please specify in the IIR)	NO	NO	NO	NO	NO	NO	NO	NO
B_Industry	2I	Wood processing	NA	NA	NA	NA	NA	NA	NA	NA
B_Industry	2J	Production of POPs	NO	NO	NO	NO	NO	NO	NO	NO
B_Industry	2K	Consumption of POPs and heavy metals (e.g. electrical and scientific equipment)	NA	NA	NA	NA	NA	NA	NE	408,784

HR: 10.2.2020: 2018	NFR sectors to be reported		POPs (from 1990)							
				PAHs						
			PCDD/ PCDF (dioxins/ furans)	benzo(a) pyrene	benzo(b) fluoranthene	benzo(k) fluoranthene	Indeno (1,2,3-cd) pyrene	Total 1-4	HCB	PCBs
NFR Aggregation for Gridding and LPS (GNFR)	**NFR Code**	**Long name**	**g I-TEQ**	**t**	**t**	**t**	**t**	**t**	**kg**	**kg**
B_Industry	2L	Other production, consumption, storage, transportation or handling of bulk products (please specify in the IIR)	NO	NO	NO	NO	NO	NO	NO	NO
K_AgriLivestock	3B1a	Manure management - Dairy cattle	NA	NA	NA	NA	NA	NA	NA	NA
K_AgriLivestock	3B1b	Manure management - Non-dairy cattle	NA	NA	NA	NA	NA	NA	NA	NA
K_AgriLivestock	3B2	Manure management - Sheep	NA	NA	NA	NA	NA	NA	NA	NA
K_AgriLivestock	3B3	Manure management - Swine	NA	NA	NA	NA	NA	NA	NA	NA
K_AgriLivestock	3B4a	Manure management - Buffalo	NA	NA	NA	NA	NA	NA	NA	NA
K_AgriLivestock	3B4d	Manure management - Goats	NA	NA	NA	NA	NA	NA	NA	NA
K_AgriLivestock	3B4e	Manure management - Horses	NA	NA	NA	NA	NA	NA	NA	NA
K_AgriLivestock	3B4f	Manure management - Mules and asses	NA	NA	NA	NA	NA	NA	NA	NA
K_AgriLivestock	3B4gi	Manure management - Laying hens	NA	NA	NA	NA	NA	NA	NA	NA
K_AgriLivestock	3B4gii	Manure management - Broilers	NA	NA	NA	NA	NA	NA	NA	NA
K_AgriLivestock	3B4giii	Manure management - Turkeys	NA	NA	NA	NA	NA	NA	NA	NA
K_AgriLivestock	3B4giv	Manure management - Other poultry	NA	NA	NA	NA	NA	NA	NA	NA
K_AgriLivestock	3B4h	Manure management - Other animals (please specify in the IIR)	NA	NA	NA	NA	NA	NA	NA	NA
L_AgriOther	3Da1	Inorganic N-fertilizers (includes also urea application)	NA	NA	NA	NA	NA	NA	NA	NA
L_AgriOther	3Da2a	Animal manure applied to soils	NA	NA	NA	NA	NA	NA	NA	NA
L_AgriOther	3Da2b	Sewage sludge applied to soils	NA	NA	NA	NA	NA	NA	NA	NA
L_AgriOther	3Da2c	Other organic fertilisers applied to soils (including compost)	NA	NA	NA	NA	NA	NA	NA	NA
L_AgriOther	3Da3	Urine and dung deposited by grazing animals	NA	NA	NA	NA	NA	NA	NA	NA
L_AgriOther	3Da4	Crop residues applied to soils	NA	NA	NA	NA	NA	NA	NA	NA
L_AgriOther	3Db	Indirect emissions from managed soils	NA	NA	NA	NA	NA	NA	NA	NA
L_AgriOther	3Dc	Farm-level agricultural operations including storage, handling and transport of agricultural products	NA	NA	NA	NA	NA	NA	NA	NA
L_AgriOther	3Dd	Off-farm storage, handling and transport of bulk agricultural products	NA	NA	NA	NA	NA	NA	NA	NA
L_AgriOther	3De	Cultivated crops	NA	NA	NA	NA	NA	NA	NA	NA
L_AgriOther	3Df	Use of pesticides	NA	NA	NA	NA	NA	NA	0,26675	NA
L_AgriOther	3F	Field burning of agricultural residues	0,36136	0,00028	0,000793	0,00034	0,00024	0,00166	NE	NE
L_AgriOther	3I	Agriculture other (please specify in the IIR)	NO	NO	NO	NO	NO	NO	NO	NO
J_Waste	5A	Biological treatment of waste - Solid waste disposal on land	NA	NA	NA	NA	NA	NA	NA	NA
J_Waste	5B1	Biological treatment of waste - Composting	NA	NA	NA	NA	NA	NA	NA	NA
J_Waste	5B2	Biological treatment of waste - Anaerobic digestion at biogas facilities	IE	IE	IE	IE	IE	IE	IE	IE
J_Waste	5C1a	Municipal waste incineration	NO	NO	NO	NO	NO	NO	NO	NO
J_Waste	5C1bi	Industrial waste incineration	IE	IE	IE	IE	IE	IE	IE	IE
J_Waste	5C1bii	Hazardous waste incineration	NO	NO	NO	NO	NO	NO	NO	NO
J_Waste	5C1biii	Clinical waste incineration	NO	NO	NO	NO	NO	NO	NO	NO
J_Waste	5C1biv	Sewage sludge incineration	NO	NO	NO	NO	NO	NO	NO	NO
J_Waste	5C1bv	Cremation	0,00017	8,5E-08	4,64E-08	4,1E-08	4,5E-08	2,2E-07	0,00097	0,00264
J_Waste	5C1bvi	Other waste incineration (please specify in the IIR)	NO	NO	NO	NO	NO	NO	NO	NO
J_Waste	5C2	Open burning of waste	NO	NO	NO	NO	NO	NO	NO	NO
J_Waste	5D1	Domestic wastewater handling	NA	NA	NA	NA	NA	NA	NA	NA
J_Waste	5D2	Industrial wastewater handling	NA	NA	NA	NA	NA	NA	NA	NA
J_Waste	5D3	Other wastewater handling	NA	NA	NA	NA	NA	NA	NA	NA
J_Waste	5E	Other waste (please specify in the IIR)	1,38721	NE	NE	NE	NE	NE	NE	NE
M_Other	6A	Other (included in national total for entire territory) (please specify in the IIR)	NO	NO	NO	NO	NO	NO	NO	NO
	NATIONAL TOTAL	National total (based on fuel sold)	28,17	4,79	4,58	1,75	2,80	13,99	0,56	411,79

HR: 10.2.2020: 2018	NFR sectors to be reported		POPs (from 1990)							
				PAHs						
			PCDD/ PCDF (dioxins/ furans)	benzo(a) pyrene	benzo(b) fluoranthene	benzo(k) fluoranthene	Indeno (1,2,3-cd) pyrene	Total 1-4	HCB	PCBs
NFR Aggregation for Gridding and LPS (GNFR)	**NFR Code**	**Long name**	**g I-TEQ**	**t**	**t**	**t**	**t**	**t**	**kg**	**kg**
	1A3bi(fu)	Road transport: Passenger cars (fuel used)								
	1A3bii(fu)	Road transport: Light duty vehicles (fuel used)								
	1A3biii(fu)	Road transport: Heavy duty vehicles and buses (fuel used)								
	1A3biv(fu)	Road transport: Mopeds & motorcycles (fuel used)								
	1A3bv(fu)	Road transport: Gasoline evaporation (fuel used)								
	1A3bvi(fu)	Road transport: Automobile tyre and brake wear (fuel used)								
	1A3bvii(fu)	Road transport: Automobile road abrasion (fuel used)								
	ADJUSTMENTS	Sum of approved adjustments (negative value) from Annex VII (CLRTAP)								
	COMPLIANCE TOTAL (CLRTAP)	National total for compliance calculations and checks (CLRTAP)	28,17	4,79	4,58	1,75	2,80	13,99	0,56	411,79
	ADJUSTMENTS AND FLEXIBILITIES	Sum of approved adjustments from Annex VII and other flexibilities (negative value) (NECD)								
	COMPLIANCE TOTAL (NECD)	National total for compliance calculations and checks (NECD)	28,17	4,79	4,58	1,75	2,80	13,99	0,56	411,79
MEMO ITEMS - NOT TO BE INCLUDED IN NATIONAL TOTALS										
O_AviCruise	1A3ai(ii)	International aviation cruise (civil)	0,00916	0,01244	0,098193	0,01113	0,00982	0,13158	NE	NE
O_AviCruise	1A3aii(ii)	Domestic aviation cruise (civil)	0,00043	0,00058	0,004601	0,00052	0,00046	0,00617	NE	NE
P_IntShipping	1A3di(i)	International maritime navigation	0,00422	0,00062	0,001035	NE	NE	0,00166	0,00192	0,00318
z_Memo	1A5c	Multilateral operations	NA	NA	NA	NA	NA	NA	NA	NA
z_Memo	6B	Other not included in national total of the entire territory (please specify in the IIR)	NO	NO	NO	NO	NO	NO	NO	NO
N_Natural	11A	Volcanoes	NO	NO	NO	NO	NO	NO	NO	NO
N_Natural	11B	Forest fires	NA	NA	NA	NA	NA	NA	NA	NA
N_Natural	11C	Other natural emissions (please specify in the IIR)	NO	NO	NO	NO	NO	NO	NO	NO

Table A6-4 Activity data according to NFR categories

HR: 10.2.2020: 2018	NFR sectors to be reported		Activity Data (from 1990)						
			Liquid Fuels	Solid Fuels	Gaseous Fuels	Biomass	Other Fuels	Other activity (specified)	Other Activity Units
NFR Aggregation for Gridding and LPS (GNFR)	**NFR Code**	**Long name**	**TJ NCV**	**TJ NCV**	**TJ NCV**	**TJ NCV**	**TJ NCV**		
A_PublicPower	1A1a	Public electricity and heat production	258,33	12402	21367,7	9951,18	NO	NA	TJ NCV
B_Industry	1A1b	Petroleum refining	12809,6	NA	4534,38	NO	NO	NA	TJ NCV
B_Industry	1A1c	Manufacture of solid fuels and other energy industries	NO	NO	3657,98	27,4997	NO	NA	TJ NCV
B_Industry	1A2a	Stationary combustion in manufacturing industries and construction: Iron and steel	55,273	120,171	669,185	6,7	NO	NA	TJ NCV
B_Industry	1A2b	Stationary combustion in manufacturing industries and construction: Non-ferrous metals	4,271	NO	453,192	2,7	NO	NA	TJ NCV
B_Industry	1A2c	Stationary combustion in manufacturing industries and construction: Chemicals	682,554	NO	4259,65	NO	NO	NA	TJ NCV
B_Industry	1A2d	Stationary combustion in manufacturing industries and construction: Pulp, Paper and Print	28,133	NO	1616,67	97,5	NO	NA	TJ NCV
B_Industry	1A2e	Stationary combustion in manufacturing industries and construction: Food processing, beverages and tobacco	638,821	636,485	3972,83	241	NO	NA	TJ NCV
B_Industry	1A2f	Stationary combustion in manufacturing industries and construction: Non-metallic minerals	6817,01	2184,31	5803,21	1066,2	285,661	NA	TJ NCV
I_Offroad	1A2gvii	Mobile combustion in manufacturing industries and construction (please specify in the IIR)	4251,39	NA	NO	NO	NA	NA	TJ NCV
B_Industry	1A2gviii	Stationary combustion in manufacturing industries and construction: Other (please specify in the IIR)	IE	IE	IE	IE	IE	NA	TJ NCV
H_Aviation	1A3ai(i)	International aviation LTO (civil)	141,944	NA	NO	NO	NA	NA	TJ NCV
H_Aviation	1A3aii(i)	Domestic aviation LTO (civil)	1168,79	NA	NO	NO	NA	NA	TJ NCV
F_RoadTransport	1A3bi	Road transport: Passenger cars	53707,8	NA	11,1009	2866,05	NA	NA	TJ NCV
F_RoadTransport	1A3bii	Road transport: Light duty vehicles	8322,36	NA	NO	566,529	NA	NA	TJ NCV
F_RoadTransport	1A3biii	Road transport: Heavy duty vehicles and buses	16539,7	NA	165,563	1152,02	NA	NA	TJ NCV
F_RoadTransport	1A3biv	Road transport: Mopeds & motorcycles	1007,09	NA	NO	36,9345	NA	NA	TJ NCV
F_RoadTransport	1A3bv	Road transport: Gasoline evaporation	IE	NA	NA	NA	NA	NA	TJ NCV
F_RoadTransport	1A3bvi	Road transport: Automobile tyre and brake wear	NA	NA	NA	NA	NA	29232,1	Mileage [10^6 km]
F_RoadTransport	1A3bvii	Road transport: Automobile road abrasion	NA	NA	NA	NA	NA	29232,1	Mileage [10^6 km]
I_Offroad	1A3c	Railways	627,837	NO	NO	NO	NA	NA	TJ NCV
G_Shipping	1A3di(ii)	International inland waterways	IE	NO	NO	NO	NA	NA	TJ NCV
G_Shipping	1A3dii	National navigation (shipping)	2015,91	NO	NO	NO	NA	NA	TJ NCV
I_Offroad	1A3ei	Pipeline transport	NO	NA	NA	NA	NA	NA	TJ NCV
I_Offroad	1A3eii	Other (please specify in the IIR)	NO	NO	NO	NO	NO	NO	TJ NCV
C_OtherStationaryComb	1A4ai	Commercial/Institutional: Stationary	2457,41	4,32	8026,11	464,735	NO	NA	TJ NCV
I_Offroad	1A4aii	Commercial/Institutional: Mobile	IE	IE	IE	IE	IE	IE	TJ NCV
C_OtherStationaryComb	1A4bi	Residential: Stationary	5003,46	83,95	19561,2	45457,2	NO	NA	TJ NCV
I_Offroad	1A4bii	Residential: Household and gardening (mobile)	338,884	NA	NO	NO	NA	NA	TJ NCV
C_OtherStationaryComb	1A4ci	Agriculture/Forestry/Fishing: Stationary	625,892	NO	814,04	NO	NO	NA	TJ NCV
I_Offroad	1A4cii	Agriculture/Forestry/Fishing: Off-road vehicles and other machinery	7435,81	NA	NO	NO	NA	NA	TJ NCV
I_Offroad	1A4ciii	Agriculture/Forestry/Fishing: National fishing	IE	IE	IE	IE	IE	NA	TJ NCV
C_OtherStationaryComb	1A5a	Other stationary (including military)	IE	IE	IE	IE	NA	NA	TJ NCV
I_Offroad	1A5b	Other, Mobile (including military, land based and recreational boats)	IE	IE	IE	IE	NA	NA	TJ NCV
D_Fugitive	1B1a	Fugitive emission from solid fuels: Coal mining and handling	NA	NA	NA	NA	NA	NO	Coal produced [Mt]
D_Fugitive	1B1b	Fugitive emission from solid fuels: Solid fuel transformation	NA	NA	NA	NA	NA	NO	Coal used for transformation [Mt]
D_Fugitive	1B1c	Other fugitive emissions from solid fuels	NA	NA	NA	NA	NA	NA	Please specify and/or provide details in the IIR
D_Fugitive	1B2ai	Fugitive emissions oil: Exploration, production, transport	NA	NA	NA	NA	NA	732,1	Crude oil produced [Mt]
D_Fugitive	1B2aiv	Fugitive emissions oil: Refining and storage	NA	NA	NA	NA	NA	3697,6	Crude oil refined [Mt]
D_Fugitive	1B2av	Distribution of oil products	NA	NA	NA	NA	NA	7161,8	Oil consumed [Mt]
D_Fugitive	1B2b	Fugitive emissions from natural gas (exploration, production, processing, transmission, storage, distribution and other)	NA	NA	NA	NA	NA	0,13921	Gas throughput [TJ]
D_Fugitive	1B2c	Venting and flaring (oil, gas, combined oil and gas)	NA	NA	NA	NA	NA	689781	Gas vented flared [TJ]
D_Fugitive	1B2d	Other fugitive emissions from energy production	NA	NA	NA	NA	NA	NO	Please specify and/or provide details in the IIR
B_Industry	2A1	Cement production	NA	NA	NA	NA	NA	2325,85	Clinker produced [kt]

HR: 10.2.2020: 2018	NFR sectors to be reported		Activity Data (from 1990)						
			Liquid Fuels	Solid Fuels	Gaseous Fuels	Biomass	Other Fuels	Other activity (specified)	Other Activity Units
NFR Aggregation for Gridding and LPS (GNFR)	NFR Code	Long name	TJ NCV	TJ NCV	TJ NCV	TJ NCV	TJ NCV		
B_Industry	2A2	Lime production	NA	NA	NA	NA	NA	146,29	Lime produced [kt]
B_Industry	2A3	Glass production	NA	NA	NA	NA	NA	404,609	Glass produced [kt]
B_Industry	2A5a	Quarrying and mining of minerals other than coal	NA	NA	NA	NA	NA	24,2082	Material quarried [kt]
B_Industry	2A5b	Construction and demolition	NA	NA	NA	NA	NA	2249797	Floor space constructed/demolished [m2]
B_Industry	2A5c	Storage, handling and transport of mineral products	NA	NA	NA	NA	NA	IE	Amount [kt]
B_Industry	2A6	Other mineral products (please specify in the IIR)	NA	NA	NA	NA	NA	NO	Please specify and/or provide details in the IIR
B_Industry	2B1	Ammonia production	NA	NA	NA	NA	NA	396,69	Ammonia produced [kt]
B_Industry	2B2	Nitric acid production	NA	NA	NA	NA	NA	289,498	Nitric acid produced [kt]
B_Industry	2B3	Adipic acid production	NA	NA	NA	NA	NA	NO	Adipic acid produced [kt]
B_Industry	2B5	Carbide production	NA	NA	NA	NA	NA	NO	Carbide produced [kt]
B_Industry	2B6	Titanium dioxide production	NA	NA	NA	NA	NA	NO	Titanium dioxide produced [kt]
B_Industry	2B7	Soda ash production	NA	NA	NA	NA	NA	NO	Soda ash produced [kt]
B_Industry	2B10a	Chemical industry: Other (please specify in the IIR)	NA	NA	NA	NA	NA	686,022	Please specify and/or provide details in the IIR
B_Industry	2B10b	Storage, handling and transport of chemical products (please specify in the IIR)	NA	NA	NA	NA	NA	IE	Please specify and/or provide details in the IIR
B_Industry	2C1	Iron and steel production	NA	NA	NA	NA	NA	135,775	Steel produced [kt]
B_Industry	2C2	Ferroalloys production	NA	NA	NA	NA	NA	NO	Ferroalloys produced [kt]
B_Industry	2C3	Aluminium production	NA	NA	NA	NA	NA	NO	Aluminium produced [kt]
B_Industry	2C4	Magnesium production	NA	NA	NA	NA	NA	NO	Magnesium produced [kt]
B_Industry	2C5	Lead production	NA	NA	NA	NA	NA	NO	Lead produced [kt]
B_Industry	2C6	Zinc production	NA	NA	NA	NA	NA	NO	Zinc produced [kt]
B_Industry	2C7a	Copper production	NA	NA	NA	NA	NA	NO	Copper produced [kt]
B_Industry	2C7b	Nickel production	NA	NA	NA	NA	NA	NO	Nickel produced [kt]
B_Industry	2C7c	Other metal production (please specify in the IIR)	NA	NA	NA	NA	NA	NO	Please specify and/or provide details in the IIR
B_Industry	2C7d	Storage, handling and transport of metal products (please specify in the IIR)	NA	NA	NA	NA	NA	IE	Amount (kt)
E_Solvents	2D3a	Domestic solvent use including fungicides	NA	NA	NA	NA	NA	NA	Solvents used [kt]
B_Industry	2D3b	Road paving with asphalt	NA	NA	NA	NA	NA	NA	Please specify and/or provide details in the IIR
B_Industry	2D3c	Asphalt roofing	NA	NA	NA	NA	NA	NA	Please specify and/or provide details in the IIR
E_Solvents	2D3d	Coating applications	NA	NA	NA	NA	NA	48,002	Paint applied [kt]
E_Solvents	2D3e	Degreasing	NA	NA	NA	NA	NA	0,1366	Solvents used [kt]
E_Solvents	2D3f	Dry cleaning	NA	NA	NA	NA	NA	0,0865	Solvents used [kt]
E_Solvents	2D3g	Chemical products	NA	NA	NA	NA	NA	NA	Please specify and/or provide details in the IIR
E_Solvents	2D3h	Printing	NA	NA	NA	NA	NA	NA	Please specify and/or provide details in the IIR
E_Solvents	2D3i	Other solvent use (please specify in the IIR)	NA	NA	NA	NA	NA	NA	Please specify and/or provide details in the IIR
E_Solvents	2G	Other product use (please specify in the IIR)	NA	NA	NA	NA	NA	IE	Please specify and/or provide details in the IIR
B_Industry	2H1	Pulp and paper industry	NA	NA	NA	NA	NA	38,7673	Pulp production [kt]
B_Industry	2H2	Food and beverages industry	NA	NA	NA	NA	NA	1632,31	Bread, Wine, Beer, Spirits production [kt]
B_Industry	2H3	Other industrial processes (please specify in the IIR)	NA	NA	NA	NA	NA	NO	Please specify and/or provide details in the IIR
B_Industry	2I	Wood processing	NA	NA	NA	NA	NA	113,729	Please specify and/or provide details in the IIR
B_Industry	2J	Production of POPs	NA	NA	NA	NA	NA	NA	Please specify and/or provide details in the IIR
B_Industry	2K	Consumption of POPs and heavy metals (e.g. electrical and scientific equipment)	NA	NA	NA	NA	NA	NA	Please specify and/or provide details in the IIR
B_Industry	2L	Other production, consumption, storage, transportation or handling of bulk products (please specify in the IIR)	NA	NA	NA	NA	NA	NA	Please specify and/or provide details in the IIR
K_AgriLivestock	3B1a	Manure management - Dairy cattle	NA	NA	NA	NA	NA	135,851	Population size (1000 head)
K_AgriLivestock	3B1b	Manure management - Non-dairy cattle	NA	NA	NA	NA	NA	278,274	Population size (1000 head)
K_AgriLivestock	3B2	Manure management - Sheep	NA	NA	NA	NA	NA	636,294	Population size (1000 head)
K_AgriLivestock	3B3	Manure management - Swine	NA	NA	NA	NA	NA	1080,46	Population size (1000 head)

HR: 10.2.2020: 2018	NFR sectors to be reported		Activity Data (from 1990)						
			Liquid Fuels	Solid Fuels	Gaseous Fuels	Biomass	Other Fuels	Other activity (specified)	Other Activity Units
NFR Aggregation for Gridding and LPS (GNFR)	NFR Code	Long name	TJ NCV	TJ NCV	TJ NCV	TJ NCV	TJ NCV		
B_Industry	2A2	Lime production	NA	NA	NA	NA	NA	146,29	Lime produced [kt]
B_Industry	2A3	Glass production	NA	NA	NA	NA	NA	404,609	Glass produced [kt]
B_Industry	2A5a	Quarrying and mining of minerals other than coal	NA	NA	NA	NA	NA	24,2082	Material quarried [kt]
B_Industry	2A5b	Construction and demolition	NA	NA	NA	NA	NA	2249797	Floor space constructed/demolished [m2]
B_Industry	2A5c	Storage, handling and transport of mineral products	NA	NA	NA	NA	NA	IE	Amount [kt]
B_Industry	2A6	Other mineral products (please specify in the IIR)	NA	NA	NA	NA	NA	NO	Please specify and/or provide details in the IIR
K_AgriLivestock	3B4a	Manure management - Buffalo	NA	NA	NA	NA	NA	NO	Population size (1000 head)
K_AgriLivestock	3B4d	Manure management - Goats	NA	NA	NA	NA	NA	80,064	Population size (1000 head)
K_AgriLivestock	3B4e	Manure management - Horses	NA	NA	NA	NA	NA	23,649	Population size (1000 head)
K_AgriLivestock	3B4f	Manure management - Mules and asses	NA	NA	NA	NA	NA	3,705	Population size (1000 head)
K_AgriLivestock	3B4gi	Manure management - Laying hens	NA	NA	NA	NA	NA	2777,95	Population size (1000 head)
K_AgriLivestock	3B4gii	Manure management - Broilers	NA	NA	NA	NA	NA	7525,12	Population size (1000 head)
K_AgriLivestock	3B4giii	Manure management - Turkeys	NA	NA	NA	NA	NA	442,028	Population size (1000 head)
K_AgriLivestock	3B4giv	Manure management - Other poultry	NA	NA	NA	NA	NA	667,703	Population size (1000 head)
K_AgriLivestock	3B4h	Manure management - Other animals (please specify in the IIR)	NA	NA	NA	NA	NA	NO	Population size (1000 head)
L_AgriOther	3Da1	Inorganic N-fertilizers (includes also urea application)	NA	NA	NA	NA	NA	9,9E+07	Use of inorganic fertilizers (kg N)
L_AgriOther	3Da2a	Animal manure applied to soils	NA	NA	NA	NA	NA	NA	Please specify and/or provide details in the IIR
L_AgriOther	3Da2b	Sewage sludge applied to soils	NA	NA	NA	NA	NA	NA	Please specify and/or provide details in the IIR
L_AgriOther	3Da2c	Other organic fertilisers applied to soils (including compost)	NA	NA	NA	NA	NA	NE	Please specify and/or provide details in the IIR
L_AgriOther	3Da3	Urine and dung deposited by grazing animals	NA	NA	NA	NA	NA	NA	Please specify and/or provide details in the IIR
L_AgriOther	3Da4	Crop residues applied to soils	NA	NA	NA	NA	NA	NA	Please specify and/or provide details in the IIR
L_AgriOther	3Db	Indirect emissions from managed soils	NA	NA	NA	NA	NA	NA	Please specify and/or provide details in the IIR
L_AgriOther	3Dc	Farm-level agricultural operations including storage, handling and transport of agricultural products	NA	NA	NA	NA	NA	NA	Please specify and/or provide details in the IIR
L_AgriOther	3Dd	Off-farm storage, handling and transport of bulk agricultural products	NA	NA	NA	NA	NA	NA	Please specify and/or provide details in the IIR
L_AgriOther	3De	Cultivated crops	NA	NA	NA	NA	NA	NA	Please specify and/or provide details in the IIR
L_AgriOther	3Df	Use of pesticides	NA	NA	NA	NA	NA	NA	Please specify and/or provide details in the IIR
L_AgriOther	3F	Field burning of agricultural residues	NA	NA	NA	NA	NA	NE	Area burned [ha]
L_AgriOther	3I	Agriculture other (please specify in the IIR)	NA	NA	NA	NA	NA	NO	Please specify and/or provide details in the IIR
J_Waste	5A	Biological treatment of waste - Solid waste disposal on land	NA	NA	NA	NA	NA	1601,6	Deposition [kt]
J_Waste	5B1	Biological treatment of waste - Composting	NA	NA	NA	NA	NA	47,594	Organic domestic waste [kt]
J_Waste	5B2	Biological treatment of waste - Anaerobic digestion at biogas facilities	NA	NA	NA	NA	NA	IE	N in feedstock [kt]
J_Waste	5C1a	Municipal waste incineration	NA	NA	NA	NA	NA	NO	Waste incinerated [kt]
J_Waste	5C1bi	Industrial waste incineration	NA	NA	NA	NA	NA	IE	Waste incinerated [kt]
J_Waste	5C1bii	Hazardous waste incineration	NA	NA	NA	NA	NA	NO	Waste incinerated [kt]
J_Waste	5C1biii	Clinical waste incineration	NA	NA	NA	NA	NA	NO	Waste incinerated [kt]
J_Waste	5C1biv	Sewage sludge incineration	NA	NA	NA	NA	NA	NO	Sludge incinerated [kt]
J_Waste	5C1bv	Cremation	NA	NA	NA	NA	NA	6440	Corpses [Number]
J_Waste	5C1bvi	Other waste incineration (please specify in the IIR)	NA	NA	NA	NA	NA	NO	Please specify and/or provide details in the IIR
J_Waste	5C2	Open burning of waste	NA	NA	NA	NA	NA	NO	Please specify and/or provide details in the IIR
J_Waste	5D1	Domestic wastewater handling	NA	NA	NA	NA	NA	NE	Total organic product [kt DC]
J_Waste	5D2	Industrial wastewater handling	NA	NA	NA	NA	NA	NE	Total organic product [kt DC]
J_Waste	5D3	Other wastewater handling	NA	NA	NA	NA	NA	NO	Total organic product [kt DC]
J_Waste	5E	Other waste (please specify in the IIR)	NA	NA	NA	NA	NA	NA	Please specify and/or provide details in the IIR
M_Other	6A	Other (included in national total for entire territory) (please specify in the IIR)	NA	NA	NA	NA	NA	NO	Please specify and/or provide details in the IIR
	NATIONAL TOTAL	National total (based on fuel sold)							

HR: 10.2.2020: 2018	NFR sectors to be reported		Activity Data (from 1990)						
			Liquid Fuels	Solid Fuels	Gaseous Fuels	Biomass	Other Fuels	Other activity (specified)	Other Activity Units
NFR Aggregation for Gridding and LPS (GNFR)	NFR Code	Long name	TJ NCV	TJ NCV	TJ NCV	TJ NCV	TJ NCV		
B_Industry	2A2	Lime production	NA	NA	NA	NA	NA	146,29	Lime produced [kt]
B_Industry	2A3	Glass production	NA	NA	NA	NA	NA	404,609	Glass produced [kt]
B_Industry	2A5a	Quarrying and mining of minerals other than coal	NA	NA	NA	NA	NA	24,2082	Material quarried [kt]
B_Industry	2A5b	Construction and demolition	NA	NA	NA	NA	NA	2249797	Floor space constructed/demolished [m2]
B_Industry	2A5c	Storage, handling and transport of mineral products	NA	NA	NA	NA	NA	IE	Amount [kt]
B_Industry	2A6	Other mineral products (please specify in the IIR)	NA	NA	NA	NA	NA	NO	Please specify and/or provide details in the IIR
	1A3bi(fu)	Road transport: Passenger cars (fuel used)							TJ NCV
	1A3bii(fu)	Road transport: Light duty vehicles (fuel used)							TJ NCV
	1A3biii(fu)	Road transport: Heavy duty vehicles and buses (fuel used)							TJ NCV
	1A3biv(fu)	Road transport: Mopeds & motorcycles (fuel used)							TJ NCV
	1A3bv(fu)	Road transport: Gasoline evaporation (fuel used)							TJ NCV
	1A3bvi(fu)	Road transport: Automobile tyre and brake wear (fuel used)							Mileage [10^6 km]
	1A3bvii(fu)	Road transport: Automobile road abrasion (fuel used)							Mileage [10^6 km]
	ADJUSTMENTS	Sum of approved adjustments (negative value) from Annex VII (CLRTAP)							
	COMPLIANCE TOTAL (CLRTAP)	National total for compliance calculations and checks (CLRTAP)							
	ADJUSTMENTS AND FLEXIBILITIES	Sum of approved adjustments from Annex VII and other flexibilities (negative value) (NECD)							
	COMPLIANCE TOTAL (NECD)	National total for compliance calculations and checks (NECD)							
MEMO ITEMS - NOT TO BE INCLUDED IN NATIONAL TOTALS									
O_AviCruise	1A3ai(ii)	International aviation cruise (civil)	6546,19	NA	NO	NO	NA	NA	TJ NCV
O_AviCruise	1A3aii(ii)	Domestic aviation cruise (civil)	306,763	NA	NO	NO	NA	NA	TJ NCV
P_IntShipping	1A3di(i)	International maritime navigation	872,757	NO	NO	NO	NA	NA	TJ NCV
z_Memo	1A5c	Multilateral operations	NA	NA	NA	NA	NA	NA	TJ NCV
z_Memo	6B	Other not included in national total of the entire territory (please specify in the IIR)	NA	NA	NA	NA	NA	NO	Please specify and/or provide details in the IIR
N_Natural	11A	Volcanoes	NA	NA	NA	NA	NA	NO	Please specify and/or provide details in the IIR
N_Natural	11B	Forest fires	NA	NA	NA	NA	NA	1033	Area of forest burned [ha]
N_Natural	11C	Other natural emissions (please specify in the IIR)	NA	NA	NA	NA	NA	NO	Please specify and/or provide details in the IIR

12.7. Apendix 7. Uncertainty analysis

NFR Source		Pollutant	Emissions 1990	Emissions 2018	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total emissions in year 2013	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into the trend in total national emissions
	NFR Izvor	Onečišćujuća tvar	Emisija 1990	Emisija 2018	Nesigurnost podatka o aktivnosti	Nesigurnost faktora emisije	Ukupna nesigurnost	Ukupna nesigurnost kao % ukupne emisije u promatranoj godini t	Tip A osjetljivost	Tip B osjetljivost	Nesigurnost trenda emisije izražena preko nesigurnosti faktora emisije	Nesigurnost trenda emisije izražena preko nesigurnosti podatka o aktivnosti	Nesigurnost trenda emisije izražena preko ukupne emisije
			kt	kt	%	%	%	%	%	%	%	%	%
1 A 1 Energy Industries	1 A 1 Termoelektrane, javne toplane i kotlovnice	SO2	99,3234264	2,67058937	3,0	10,0	10,44	2,70819	-0,02004	0,01585	-0,20037	0,06723	0,21134
1 A 2 Manufacturing Industries and Construction	1 A 2 Izgaranje u industriji	SO2	35,2457811	2,18121251	3,0	10,0	10,44	2,21192	0,00017	0,01294	0,00167	0,05491	0,05493
1 A 3 b Road Transport	1 A 3 b Cestovni promet	SO2	4,43160703	0,03118717	3,0	20,0	20,22	0,06126	-0,00142	0,00019	-0,02842	0,00079	0,02843
1 A 3 Other mobile source and machinery	1 A 3 Ostali pokretni izvori i strojevi	SO2	1,27455525	0,0150877	3,0	20,0	20,22	0,02964	-0,00037	0,00009	-0,00745	0,00038	0,00746
1 A 4 a Commercial, institutional combustion	1 A 4 a Izgaranje u sektoru opće potrošnje	SO2	6,89342072	0,06777079	5,0	20,0	20,62	0,13570	-0,00210	0,00040	-0,04191	0,00284	0,04201
1 A 4 b Residential combustion , 1 A 4 c Combustion in Agriculture/Forestry/ Fishing	1 A 4 b Izgaranje u sektoru kućanstva, 1 A 4 c Izgaranje u Poljoprivredi/šumarstvu/ribarstvu	SO2	17,8215901	0,80730627	3,0	20,0	20,22	1,58584	-0,00167	0,00479	-0,03335	0,02032	0,03906
1 B Extraction and distribution of fossil fuels	1 B Ekstrakcija i distribucija fosilnih goriva	SO2	0,61496454	0,331276	10,0	50,0	50,99	1,64072	0,00174	0,00197	0,08713	0,02780	0,09146
1 B 2 a iv Refining / storage	1 B 2 a iv Rafiniranje / skladištenje	SO2	1,80036063	4,06070007	3,0	50,0	50,09	19,75648	0,02344	0,02409	1,17195	0,10222	1,17640
2 B 10 a, 2 H Chemical industry: Other, Pulp and Paper industry	2 B 10 a Kemijska industrija: ostalo i 2H Industrija papira	SO2	0,74568753	0,11607916	3,0	20,0	20,22	0,22802	0,00042	0,00069	0,00837	0,00292	0,00886
2 C Metal production	2 C Industrija metala	SO2	0,38150828	0,0081465	7,5	20,0	21,36	0,01690	-0,00009	0,00005	-0,00180	0,00051	0,00187
2 G Other product use	2 G Ostala uporaba proizvoda	SO2	0,00214118	0,00491958	10,0	20,0	22,36	0,01068	0,00003	0,00003	0,00057	0,00041	0,00070
3 F Field burning of agricultural residues	3 F Spaljivanje poljoprivrednih ostataka na polju	SO2	0,00054456	0,00036136	50,0	50,0	70,71	0,00248	0,00000	0,00000	0,00010	0,00015	0,00018
5 C Waste incineration	5 C Termička obrada otpada	SO2	0,00008735	0	5,0	20,0	20,62	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000
5 C 1 b v Cremation	5 C 1 b v Kremiranje	SO2	0,00016543	0,00072772	50,0	20,0	53,85	0,00381	0,00000	0,00000	0,00009	0,00031	0,00032
TOTAL	TOTAL		168,54	10,30	% Uncertainty in total inventory			20,19			Trend uncertainty:		1,20

NFR Source		Pollutant	Emissions 1990	Emissions 2018	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total emissions in year 2013	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into the trend in total national emissions
	NFR Izvor	Onečišćujuća tvar	Emisija 1990	Emisija 2018	Nesigurnost podatka o aktivnosti	Nesigurnost faktora emisije	Ukupna nesigurnost	Ukupna nesigurnost kao % ukupne emisije u promatranoj godini t	Tip A osjetljivost	Tip B osjetljivost	Nesigurnost trenda emisije izražena preko nesigurnosti faktora emisije	Nesigurnost trenda emisije izražena preko nesigurnosti podatka o aktivnosti	Nesigurnost trenda emisije izražena preko ukupne emisije
			kt	kt	%	%	%	%	%	%	%	%	%
1 A 1 Energy Industries	1 A 1 Termoelektrane, javne toplane i kotlovnice	NO2	16,6402352	4,28051063	3,0	20,0	20,22	1,71257	-0,03226	0,03957	-0,64517	0,16788	0,66665
1 A 2 Manufacturing Industries and Construction	1 A 2 Izgaranje u industriji	NO2	22,9407573	5,44689117	3,0	20,0	20,22	2,17923	-0,04864	0,05035	-0,97276	0,21362	0,99594
1 A 3 b Road Transport	1 A 3 b Cestovni promet	NO2	36,4125667	21,7688501	3,0	20,0	20,22	8,70942	0,04380	0,20123	0,87602	0,85376	1,22324
1 A 3 Other mobile source and machinery	1 A 3 Ostali pokretni izvori i strojevi	NO2	3,92945961	2,87963958	3,0	100,0	100,04	5,69935	0,00964	0,02662	0,96428	0,11294	0,97087
1 A 4 a Commercial, institutional combustion	1 A 4 a Izgaranje u sektoru opće potrošnje	NO2	2,48002058	1,20017309	5,0	50,0	50,25	1,19307	0,00038	0,01109	0,01910	0,07845	0,08074
1 A 4 b Residential combustion , 1 A 4 c Combustion in Agriculture/Forestry/ Fishing	1 A 4 b Izgaranje u sektoru kućanstva, 1 A 4 c Izgaranje u Poljoprivredi/šumarstvu/ribarstvu	NO2	12,6905509	7,05711589	3,0	50,0	50,09	6,99310	0,01041	0,06524	0,52037	0,27677	0,58940
1 B Extraction and distribution of fossil fuels	1 B Ekstrakcija i distribucija fosilnih goriva	NO2	0,07078659	0,04503962	10,0	50,0	50,99	0,04543	0,00011	0,00042	0,00553	0,00589	0,00808
1 B 2 a iv Refining / storage	1 B 2 a iv Rafiniranje / skladištenje	NO2	0,25627738	0,1134836	3,0	50,0	50,09	0,11245	-0,00006	0,00105	-0,00290	0,00445	0,00531
2 B 10 a Chemical industry: Other; H Pulp and Paper industry	2 B 10 a Kemijska industrija: ostalo i 2H Industrija papira	NO2	0,52730198	0,0248234	3,0	50,0	50,09	0,02460	-0,00205	0,00023	-0,10241	0,00097	0,10241
2 B 1, 2 B 2 Ammonia and Nitric acid production	3 B 1, 2 B 2 Proizvodnja amonijaka i nitratne kiseline	NO2	2,09103104	0,87147698	3,0	50,0	50,09	0,86357	-0,00098	0,00806	-0,04880	0,03418	0,05958
2 C Metal production	2 C Industrija metala	NO2	0,09649594	0,01765075	7,5	50,0	50,56	0,01765	-0,00025	0,00016	-0,01268	0,00173	0,01280
2 G Other product use	2 G Ostala uporaba proizvoda	NO2	0,02194814	0,02209945	10,0	30,0	31,62	0,01383	0,00011	0,00020	0,00328	0,00289	0,00437
3 D a, b, c, d, e	3 D a, b, c, d, e	NO2	9,78974468	6,73462838	5,0	100,0	100,12	13,33975	0,01995	0,06226	1,99505	0,44021	2,04304
3B1, 3B2, 3B4d, 3B4e, 3B4f,	3B1, 3B2, 3B4d, 3B4e, 3B4f,	NO2	0,07549399	0,02858748	10,0	100,0	100,50	0,05684	-0,00006	0,00026	-0,00618	0,00374	0,00722
3B3, 3B4g	3B3, 3B4g	NO2	0,15086578	0,05053385	50,0	100,0	111,80	0,11177	-0,00018	0,00047	-0,01845	0,03303	0,03784
3 F Field burning of agricultural residues	3 F Spaljivanje poljoprivrednih ostataka na polju	NO2	0,00250499	0,00166227	50,0	50,0	70,71	0,00233	0,00000	0,00002	0,00023	0,00109	0,00111
5 C 1 b v Cremation	5 C 1 b v Kremiranje	NO2	0,0012078	0,005313	50,0	20,0	53,85	0,00566	0,00004	0,00005	0,00088	0,00347	0,00358
5 C Waste incineration	5 C Termička obrada otpada	NO2	0,0005395	0	5,0	20,0	20,62	0,00000	0,00000	0,00000	-0,00005	0,00000	0,00005
TOTAL			108,18	50,55	% Uncertainty in total inventory			18,58			Trend uncertainty:		2,90

NFR Source		Pollutant	Emissions 1990	Emissions 2018	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total emissions in year 2013	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into the trend in total national emissions
	NFR Izvor	Onečišćujuća tvar	Emisija 1990	Emisija 2018	Nesigurnost podatka o aktivnosti	Nesigurnost faktora emisije	Ukupna nesigurnost	Ukupna nesigurnost kao % ukupne emisije u promatranoj godini t	Tip A osjetljivost	Tip B osjetljivost	Nesigurnost trenda emisije izražena preko nesigurnosti faktora emisije	Nesigurnost trenda emisije izražena preko nesigurnosti podatka o aktivnosti	Nesigurnost trenda emisije izražena preko ukupne emisije
			kt	kt	%	%	%	%	%	%	%	%	%
1 A 1 Energy Industries	1 A 1 Termoelektrane, javne toplane i kotlovnice	NMVOC	0,96061597	0,40967057	3,0	50,0	50,09	0,28433	0,00002	0,00240	0,00113	0,01017	0,01024
1 A 2 Manufacturing Industries and Construction	1 A 2 Izgaranje u industriji	NMVOC	4,34420928	1,26344989	3,0	50,0	50,09	0,87688	-0,00335	0,00740	-0,16729	0,03138	0,17020
1 A 3 b Road Transport	1 A 3 b Cestovni promet	NMVOC	34,5414094	5,61635946	3,0	20,0	20,22	1,57380	-0,05243	0,03287	-1,04861	0,13947	1,05785
1 A 3 Other mobile source and machinery	1 A 3 Ostali pokretni izvori i strojevi	NMVOC	0,54257922	0,44725576	3,0	100,0	100,04	0,61999	0,00128	0,00262	0,12763	0,01111	0,12811
1 A 4 a Commercial, institutional combustion	1 A 4 a Izgaranje u sektoru opće potrošnje	NMVOC	0,28713358	0,36861724	5,0	50,0	50,25	0,25665	0,00145	0,00216	0,07238	0,01526	0,07397
1 A 4 b Residential combustion , 1 A 4 c Combustion in Agriculture/Forestry/ Fishing	1 A 4 b Izgaranje u sektoru kućanstva, 1 A 4 c Izgaranje u Poljoprivredi/šumarstvu/ribarstvu	NMVOC	25,3678198	20,2526635	3,0	50,0	50,09	14,05608	0,05574	0,11855	2,78677	0,50295	2,83179
1 B Extraction and distribution of fossil fuels	1 B Ekstrakcija i distribucija fosilnih goriva	NMVOC	4,25736175	2,58607976	10,0	50,0	50,99	1,82709	0,00461	0,01514	0,23044	0,21407	0,31453
1 B 2 a iv Refining / storage	1 B 2 a iv Rafiniranje / skladištenje	NMVOC	2,17941373	1,1028693	3,0	50,0	50,09	0,76543	0,00107	0,00646	0,05331	0,02739	0,05994
2 B 1, 2 B 10 a, 2 H 1, 2 H 2 Ammonia production, Chemical industry: Other, Pulp and Paper industry, Food and beverages industry	2 B 1, 2 B 10 a, 2 H 1, 2 H 2 Proizvodnja amonijaka, Kemijska industrija: ostalo, Industrija papira, Industrija hrane i pića	NMVOC	23,3997289	3,44215478	3,0	50,0	50,09	2,38898	-0,03766	0,02015	-1,88306	0,08548	1,88500
2 A 1, 2 A 2, 2 A 3 Cement, Lime and glass production	2 A 1, 2 A 2, 2 A 3 Proizvodnja cementa, vapna i stakla	NMVOC	0	0,024152	3,0	20,0	20,22	0,00677	0,00014	0,00014	0,00283	0,00060	0,00289
2 C Metal production	2 C Industrija metala	NMVOC	0,00963595	0,00632375	7,5	50,0	50,56	0,00443	0,00001	0,00004	0,00066	0,00039	0,00077
2D3b, 2D3c, 2D3g, 2D3h	2D3b, 2D3c, 2D3g, 2D3h	NMVOC	5,33891778	4,66810112	30	20,0	36,06	2,33208	0,01412	0,02732	0,28236	1,15926	1,19315
2D3a, 2D3i, 2G, 2D3e, 2D3f, 2D3d	2D3a, 2D3i, 2G, 2D3e, 2D3f, 2D3d	NMVOC	58,4385948	21,8406323	10	20,0	22,36	6,76678	-0,01660	0,12784	-0,33210	1,80794	1,83818
3B	3B	NMVOC	9,140066	7,30540324	10,0	100	100,50	10,17271	0,02015	0,04276	2,01494	0,60473	2,10373
3 D a, b, c, d, e	3 D a, b, c, d, e	NMVOC	1,6895301	1,71230449	5	100,0	100,12	2,37550	0,00584	0,01002	0,58444	0,07087	0,58872
3 F Field burning of agricultural residues	3 F Spaljivanje poljoprivrednih ostataka na polju	NMVOC	0,00054456	0,00036136	50,0	50,0	70,71	0,00035	0,00000	0,00000	0,00004	0,00015	0,00015
5 A Biological treatment of waste - Solid waste disposal on land	5 A Biološka obrada otpada -Odlagališta otpada	NMVOC	0,34108565	1,1209692	50	50	70,71	1,09827	0,00572	0,00656	0,28589	0,46396	0,54497
5 C 1 b v Cremation	5 C 1 b v Kremiranje	NMVOC	1,9032E-05	0,00008372	50,0	50	70,71	0,00008	0,00000	0,00000	0,00002	0,00003	0,00004
5 C Waste incineration	5 C Termička obrada otpada	NMVOC	0,001948	0	5,0	50	50,25	0,00000	0,00000	0,00000	-0,00024	0,00000	0,00024
5D2	5D2	NMVOC	0,0023753	0,00447755	5,0	50	50,25	0,00312	0,00002	0,00003	0,00102	0,00019	0,00103
TOTAL			170,84	72,17	% Uncertainty in total inventory			19,30			Trend uncertainty:		4,77

NFR Source		Pollutant	Emissions 1990	Emissions 2018	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total emissions in year 2013	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into the trend in total national emissions
	NFR Izvor	Onečišćujuća tvar	Emisija 1990	Emisija 2018	Nesigurnost podatka o aktivnosti	Nesigurnost faktora emisije	Ukupna nesigurnost	Ukupna nesigurnost kao % ukupne emisije u promatranoj godini t	Tip A osjetljivost	Tip B osjetljivost	Nesigurnost trenda emisije izražena preko nesigurnosti faktora emisije	Nesigurnost trenda emisije izražena preko nesigurnosti podatka o aktivnosti	Nesigurnost trenda emisije izražena preko ukupne emisije
			kt	kt	%	%	%	%	%	%	%	%	%
1 A 1 Energy Industries	1 A 1 Termoelektrane, javne toplane i kotlovnice	CO	2,66710433	1,3466734	3,0	20,0	20,22	0,11596	0,00039	0,00243	0,00781	0,01031	0,01293
1 A 2 Manufacturing Industries and Construction	1 A 2 Izgaranje u industriji	CO	21,6254803	8,65889325	3,0	20,0	20,22	0,74558	-0,00091	0,01562	-0,01827	0,06629	0,06876
1 A 3 b Road Transport	1 A 3 b Cestovni promet	CO	235,498288	28,1135108	3,0	20,0	20,22	2,42074	-0,12882	0,05073	-2,57646	0,21523	2,58543
1 A 3 Other mobile source and machinery	1 A 3 Ostali pokretni izvori i strojevi	CO	3,22049716	2,11105582	3,0	100,0	100,04	0,89922	0,00135	0,00381	0,13463	0,01616	0,13560
1 A 4 a Commercial, institutional combustion	1 A 4 a Izgaranje u sektoru opće potrošnje	CO	1,55960095	0,65450994	5,0	50,0	50,25	0,14003	-0,00001	0,00118	-0,00058	0,00835	0,00837
1 A 4 b Residential combustion , 1 A 4 c Combustion in Agriculture/Forestry/ Fishing	1 A 4 b Izgaranje u sektoru kućanstva, 1 A 4 c Izgaranje u Poljoprivredi/šumarstvu/ribarstvu	CO	198,341765	170,659558	3,0	50,0	50,09	36,39586	0,15571	0,30795	7,78539	1,30652	7,89426
1 B Extraction and distribution of fossil fuels	1 B Ekstrakcija i distribucija fosilnih goriva	CO	0,57464789	0,2040099	10,0	50,0	50,99	0,04429	-0,00007	0,00037	-0,00357	0,00521	0,00631
1 B 2 a iv Refining / storage	1 B 2 a iv Rafiniranje / skladištenje	CO	50,0414877	22,1649062	3,0	50,0	50,09	4,72702	0,00172	0,04000	0,08622	0,16969	0,19034
2 B 10 a, 2 H Chemical industry: Other, Pulp and Paper industry, 2 B 1 Ammonia production	2 B 10 a Kemijska industrija: ostalo i 2H Industrija papira, 2 B 1 Proizvodnja amonijaka	CO	30,7066832	0,00239214	3,0	50,0	50,09	0,00051	-0,02347	0,00000	-1,17330	0,00002	1,17330
2 C Metal production	2 C Industrija metala	CO	9,2006946	0,2308175	7,5	50,0	50,56	0,04969	-0,00662	0,00042	-0,33094	0,00442	0,33097
2D3b, 2D3c, 2D3d, 2D3g, 2D3h	2D3b, 2D3c, 2D3d, 2D3g, 2D3h	CO	0,00023289	0,00015094	30	100,0	104,40	0,00007	0,00000	0,00000	0,00001	0,00001	0,00001
2 G Other product use	2 G Ostala uporaba proizvoda	CO	0,67128345	0,67517115	5	100,0	100,12	0,28782	0,00070	0,00122	0,07049	0,00861	0,07102
3 F Field burning of agricultural residues	3 F Spaljivanje poljoprivrednih ostataka na polju	CO	0,07264484	0,04820596	50,0	17,0	52,81	0,01084	0,00003	0,00009	0,00053	0,00615	0,00617
5 C Waste incineration	5 C Termička obrada otpada	CO	0,0000441	0	50,0	100,0	111,80	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000
5 C 1 b v Cremation	5 C 1 b v Kremiranje	CO	0,00020496	0,0009016	50,0	50,0	70,71	0,00027	0,00000	0,00000	0,00007	0,00012	0,00014
TOTAL			554,18	234,87	% Uncertainty in total inventory			36,80			Trend uncertainty:		8,40

NFR Source		Pollutant	Emissions 1990	Emissions 2018	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total emissions in year 2013	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into the trend in total national emissions
	NFR Izvor	Onečišćujuća tvar	Emisija 1990	Emisija 2018	Nesigurnost podatka o aktivnosti	Nesigurnost faktora emisije	Ukupna nesigurnost	Ukupna nesigurnost kao % ukupne emisije u promatranoj godini t	Tip A osjetljivost	Tip B osjetljivost	Nesigurnost trenda emisije izražena preko nesigurnosti faktora emisije	Nesigurnost trenda emisije izražena preko nesigurnosti podatka o aktivnosti	Nesigurnost trenda emisije izražena preko ukupne emisije
			kt	kt	%	%	%	%	%	%	%	%	%
1 A 1 Energy Industries	1 A 1 Termoelektrane, javne toplane i kotlovnice	NH3	0,00893257	0,00804362	3,0	1000,00	1000,00	0,22555	0,00004	0,00015	0,03940	0,00063	0,03941
1 A 2 Manufacturing Industries and Construction	1 A 2 Izgaranje u industriji	NH3	0,13420015	0,05339067	3,0	1000,00	1000,00	1,49713	-0,00066	0,00099	-0,66266	0,00421	0,66267
1 A 3 b Road Transport	1 A 3 b Cestovni promet	NH3	0,05538792	0,41887263	3,0	400	400,01	4,69836	0,00711	0,00779	2,84306	0,03305	2,84325
1 A 3 Other mobile source and machinery	1 A 3 Ostali pokretni izvori i strojevi	NH3	0,00098152	0,00058801	3,0	1000,00	1000,00	0,01649	0,00000	0,00001	-0,00117	0,00005	0,00117
1 A 4 a Commercial, institutional combustion	1 A 4 a Izgaranje u sektoru opće potrošnje	NH3	0,00073058	0,01701284	5,0	1000,00	1000,01	0,47706	0,00031	0,00032	0,30743	0,00224	0,30744
1 A 4 b Residential combustion , 1 A 4 c Combustion in Agriculture/Forestry/ Fishing	1 A 4 b Izgaranje u sektoru kućanstva, 1 A 4 c Izgaranje u Poljoprivredi/šumarstvu/ribarstvu	NH3	3,02517547	2,60572729	3,0	1000,00	1000,00	73,06737	0,01114	0,04847	11,13640	0,20563	11,13830
1 B Extraction and distribution of fossil fuels	1 B Ekstrakcija i distribucija fosilnih goriva	NH3	0,0020572	0	10,0	1000,00	1000,05	0,00000	-0,00003	0,00000	-0,02538	0,00000	0,02538
1 B 2 a iv Refining / storage	1 B 2 a iv Rafiniranje / skladištenje	NH3	0,2050219	0,09078688	3,0	1000,00	1000,00	2,54576	-0,00084	0,00169	-0,84086	0,00716	0,84089
2 B 10 a Chemical industry: Other, 2 H 1 Pulp and Paper industry, 2 H 2 Food and beverages industry	2 B 10 a Kemijska industrija: ostalo, 2 H 1 Industrija papira, 2 H 2 Industrija hrane i pića	NH3	3,48320198	2,63010355	3,0	400	400,01	29,50106	0,00594	0,04892	2,37645	0,20755	2,38550
2 A 3 Glass production, 2 B 1 Ammonia production	2 A 3 Proizvodnja stakla, 2 B 1 Proizvodnja amonijaka	NH3	0,01724735	0,12926459	3,0	400	400,01	1,44992	0,00219	0,00240	0,87662	0,01020	0,87668
2D3a, 2D3i, 2G	2D3a, 2D3i, 2G	NH3	0,05017765	0,04997502	10	400	400,12	0,56071	0,00031	0,00093	0,12418	0,01315	0,12488
3B1, 3B2, 3B4d, 3B4e, 3B4f	3B1, 3B2, 3B4d, 3B4e, 3B4f	NH3	9,02986013	4,19756455	10,0	100	100,50	11,82907	-0,03328	0,07808	-3,32782	1,10415	3,50621
3B3, 3B4g	3B3, 3B4g	NH3	11,6139186	6,02039361	50,0	100	111,80	18,87437	-0,03124	0,11198	-3,12435	7,91820	8,51231
3 D a, b, c, d, e	3 D a, b, c, d, e	NH3	25,44	18,83	5	100	100,12	52,87692	0,03626	0,35031	3,62568	2,47704	4,39105
3 F Field burning of agricultural residues	3 F Spaljivanje poljoprivrednih ostataka na polju	NH3	0,00261391	0,00173455	50,0	100	111,80	0,00544	0,00000	0,00003	0,00000	0,00228	0,00228
5B1	5B1	NH3	0,00	0,01142256	50	400	403,11	0,12912	0,00021	0,00021	0,08498	0,01502	0,08630
5D1	5D1	NH3	0,69	0,59	30,0	1000,00	1000,45	16,65676	0,00249	0,01104	2,48979	0,46855	2,53349
TOTAL			53,76	35,66	% Uncertainty in total inventory			99,06			Trend uncertainty:		15,82

NFR Source		Pollutant	Emissions 1990	Emissions 2018	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total emissions in year 2013	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into the trend in total national emissions
	NFR Izvor	Onečišćujuća tvar	Emisija 1990	Emisija 2018	Nesigurnost podatka o aktivnosti	Nesigurnost faktora emisije	Ukupna nesigurnost	Ukupna nesigurnost kao % ukupne emisije u promatranoj godini t	Tip A osjetljivost	Tip B osjetljivost	Nesigurnost trenda emisije izražena preko nesigurnosti faktora emisije	Nesigurnost trenda emisije izražena preko nesigurnosti podatka o aktivnosti	Nesigurnost trenda emisije izražena preko ukupne emisije
			kt	kt	%	%	%	%	%	%	%	%	%
1 A 1 Energy Industries	1 A 1 Termoelektrane, javne toplane i kotlovnice	BC	0,11611067	0,03980794	3,0	50,0	50,09	0,51258	-0,00804	0,00735	-0,40177	0,03117	0,40298
1 A 2 Manufacturing Industries and Construction	1 A 2 Izgaranje u industriji	BC	0,77	0,12003238	3,0	50,0	50,09	1,54557	-0,07916	0,02215	-3,95811	0,09398	3,95923
1 A 3 b Road Transport	1 A 3 b Cestovni promet	BC	0,57881432	0,69617865	3,0	100,0	100,04	17,90429	0,05174	0,12848	5,17365	0,54510	5,20229
1 A 3 Other mobile source and machinery	1 A 3 Ostali pokretni izvori i strojevi	BC	0,00407704	0,00253161	3,0	500,0	500,01	0,32540	-0,00007	0,00047	-0,03648	0,00198	0,03654
1 A 4 a Commercial, institutional combustion	1 A 4 a Izgaranje u sektoru opće potrošnje	BC	0,07563552	0,0328819	5,0	78,0	78,16	0,66067	-0,00395	0,00607	-0,30827	0,04291	0,31124
1 A 4 b Residential combustion , 1 A 4 c Combustion in Agriculture/Forestry/ Fishing	1 A 4 b Izgaranje u sektoru kućanstva, 1 A 4 c Izgaranje u Poljoprivredi/šumarstvu/ribarstvu	BC	3,66637722	2,80757713	3,0	76,0	76,06	54,89394	0,03216	0,51814	2,44381	2,19829	3,28705
1 B Extraction and distribution of fossil fuels	1 B Ekstrakcija i distribucija fosilnih goriva	BC	0,0267969	0,00924294	10,0	50,0	50,99	0,12115	-0,00184	0,00171	-0,09223	0,02412	0,09533
1 B 2 a iv Refining / storage	1 B 2 a iv Rafiniranje / skladištenje	BC	0,00039979	0,00017703	3,0	50,0	50,09	0,00228	-0,00002	0,00003	-0,00101	0,00014	0,00102
2 B 10 a, 2 H 1, 2 H 2 Chemical industry: Other, Pulp and Paper industry, Food and beverages industry	2 B 10 a Kemijska industrija: ostalo, 2 H 1 Industrija papira, 2 H 2 Industrija hrane i pića	BC	0,00621899	0,0058505	3,0	50,0	50,09	0,07533	0,00026	0,00108	0,01279	0,00458	0,01358
2 A 1, 2 A 2, 2 A 3 Cement, Lime and glass production	2 A 1, 2 A 2, 2 A 3 Proizvodnja cementa, vapna i stakla	BC	0,00811471	0,0096103	3,0	50,0	50,09	0,12375	0,00070	0,00177	0,03492	0,00752	0,03572
2 C Metal production	2 C Industrija metala	BC	0,01841216	1,0265E-05	7,5	50,0	50,56	0,00013	-0,00244	0,00000	-0,12187	0,00002	0,12187
2D3b, 2D3c, 2D3d, 2D3g, 2D3h	2D3b, 2D3c, 2D3d, 2D3g, 2D3h	BC	0,00456985	0,01950958	30	50,0	58,31	0,29243	0,00300	0,00360	0,14975	0,15276	0,21392
2D3a, 2D3i, 2G	2D3a, 2D3i, 2G	BC	0,14690565	0,14631242	10	100,0	100,50	3,77992	0,00754	0,02700	0,75361	0,38187	0,84484
3 F Field burning of agricultural residues	3 F Spaljivanje poljoprivrednih ostataka na polju	BC	0,00054456	0,00036136	50,0	25,0	55,90	0,00519	-0,00001	0,00007	-0,00014	0,00472	0,00472
5 C Waste incineration	5 C Termička obrada otpada	BC	0,000055	0,000000	5,0	50,0	50,25	0,00000	-0,00001	0,00000	-0,00036	0,00000	0,00036
TOTAL			5,42	3,89	% Uncertainty in total inventory			57,89			Trend uncertainty:		7,39

NFR Source		Pollutant	Emissions 1990	Emissions 2018	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total emissions in year 2013	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into the trend in total national emissions
	NFR Izvor	Onečišćujuća tvar	Emisija 1990	Emisija 2018	Nesigurnost podatka o aktivnosti	Nesigurnost faktora emisije	Ukupna nesigurnost	Ukupna nesigurnost kao % ukupne emisije u promatranoj godini t	Tip A osjetljivost	Tip B osjetljivost	Nesigurnost trenda emisije izražena preko nesigurnosti faktora emisije	Nesigurnost trenda emisije izražena preko nesigurnosti podatka o aktivnosti	Nesigurnost trenda emisije izražena preko ukupne emisije
			kt	kt	%	%	%	%	%	%	%	%	%
1 A 1 Energy Industries	1 A 1 Termoelektrane, javne toplane i kotlovnice	PM2.5	1,0440582	1,04196143	3,0	50,0	50,09	1,81675	0,00691	0,02690	0,34542	0,11412	0,36378
1 A 2 Manufacturing Industries and Construction	1 A 2 Izgaranje u industriji	PM2.5	2,72787738	0,44203992	3,0	50,0	50,09	0,77073	-0,04078	0,01141	-2,03912	0,04841	2,03969
1 A 3 b Road Transport	1 A 3 b Cestovni promet	PM2.5	1,2419715	1,34985236	3,0	100,0	100,04	4,70083	0,01107	0,03485	1,10659	0,14784	1,11642
1 A 3 Other mobile source and machinery	1 A 3 Ostali pokretni izvori i strojevi	PM2.5	0,26755789	0,23982227	3,0	500,0	500,01	4,17408	0,00107	0,00619	0,53435	0,02627	0,53499
1 A 4 a Commercial, institutional combustion	1 A 4 a Izgaranje u sektoru opće potrošnje	PM2.5	0,2224452	0,0950368	5,0	78,0	78,16	0,25857	-0,00181	0,00245	-0,14079	0,01735	0,14186
1 A 4 b Residential combustion , 1 A 4 c Combustion in Agriculture/Forestry/ Fishing	1 A 4 b Izgaranje u sektoru kućanstva, 1 A 4 c Izgaranje u Poljoprivredi/šumarstvu/ribarstvu	PM2.5	30,1570459	23,2153563	3,0	76,0	76,06	61,46391	0,02180	0,59929	1,65666	2,54257	3,03466
1 B Extraction and distribution of fossil fuels	1 B Ekstrakcija i distribucija fosilnih goriva	PM2.5	0,07863937	0,03925296	10,0	50,0	50,99	0,06967	-0,00049	0,00101	-0,02461	0,01433	0,02848
1 B 2 a iv Refining / storage	1 B 2 a iv Rafiniranje / skladištenje	PM2.5	0,30753285	0,17833393	3,0	50,0	50,09	0,31094	-0,00128	0,00460	-0,06418	0,01953	0,06709
2 B 10 a, 2 H 1, 2 H 2 Chemical industry: Other, Pulp and Paper industry, Food and beverages industry	2 B 10 a Kemijska industrija: ostalo, 2 H 1 Industrija papira, 2 H 2 Industrija hrane i pića	PM2.5	0,28536899	0,32502771	3,0	50,0	50,09	0,56671	0,00293	0,00839	0,14636	0,03560	0,15062
2 A 1, 2 A 2, 2 A 3 Cement, Lime and glass production	2 A 1, 2 A 2, 2 A 3 Proizvodnja cementa, vapna i stakla	PM2.5	0,24101446	0,27738952	3,0	50,0	50,09	0,48365	0,00255	0,00716	0,12733	0,03038	0,13090
2 A 5 a, 2 A 5 b Quarrying and mining of mineral products, Construction and demolition	2 A 5 a, 2 A 5 b Vađenje kamen, Građenje i rušenje objekata	PM2.5	0,1580463	0,13930942	5,0	50,0	50,25	0,24367	0,00057	0,00360	0,02853	0,02543	0,03822
2 C Metal production	2 C Industrija metala	PM2.5	0,2683954	0,00285128	7,5	50,0	50,56	0,00502	-0,00506	0,00007	-0,25321	0,00078	0,25321
2D3b, 2D3c, 2D3d, 2D3g, 2D3h	2D3b, 2D3c, 2D3d, 2D3g, 2D3h	PM2.5	0,0821296	0,34354146	30	50,0	58,31	0,69729	0,00730	0,00887	0,36479	0,37625	0,52406
2D3a, 2D3i, 2G	2D3a, 2D3i, 2G	PM2.5	0,43597726	0,44990516	10	100,0	100,50	1,57389	0,00327	0,01161	0,32674	0,16425	0,36570
3B1, 3B2, 3B4d, 3B4e, 3B4f,	3B1, 3B2, 3B4d, 3B4e, 3B4f,	PM2.5	0,2519867	0,10143501	10,0	100,0	100,50	0,35485	-0,00221	0,00262	-0,22054	0,03703	0,22362
3B3, 3B4g	3B3, 3B4g	PM2.5	0,50505199	0,25619409	50,0	100,0	111,80	0,99705	-0,00305	0,00661	-0,30547	0,46764	0,55857
3 D a, b, c, d, e	3 D a, b, c, d, e	PM2.5	0,18358398	0,0891387	5	50,0	50,25	0,15592	-0,00121	0,00230	-0,06067	0,01627	0,06281
3 F Field burning of agricultural residues	3 F Spaljivanje poljoprivrednih ostataka na polju	PM2.5	0,00588129	0,00390273	50,0	25,0							
5 A Biological treatment of waste - Solid waste disposal on land	5 A Biološka obrada otpada -Odlagališta otpada	PM2.5	3,4664E-05	5,2853E-05	50	100,0	111,80	0,00021	0,00000	0,00000	0,00007	0,00010	0,00012
5 C 1 b v Cremation	5 C 1 b v Kremiranje	PM2.5	5,0801E-05	0,00022347	50,0	80,0	94,34	0,00073	0,00000	0,00001	0,00038	0,00041	0,00056
5 C Waste incineration	5 C Termička obrada otpada	PM2.5	0,000001	0	5,0	50,0	50,25	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000
5 E Other waste (Building and car fires)	5 E Ostali otpad (Požari na građevinama i vozilima)	PM2.5	0,2735262	0,13747033	10,0	700,0	700,07	3,35000	-0,00169	0,00355	-1,18126	0,05019	1,18232
TOTAL			38,74	28,73	% Uncertainty in total inventory			61,95			Trend uncertainty:		4,16

NFR Source		Pollutant	Emissions 1990	Emissions 2018	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total emissions in year 2013	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into the trend in total national emissions
	NFR Izvor	Onečišćujuća tvar	Emisija 1990	Emisija 2018	Nesigurnost podatka o aktivnosti	Nesigurnost faktora emisije	Ukupna nesigurnost	Ukupna nesigurnost kao % ukupne emisije u promatranoj godini t	Tip A osjetljivost	Tip B osjetljivost	Nesigurnost trenda emisije izražena preko nesigurnosti faktora emisije	Nesigurnost trenda emisije izražena preko nesigurnosti podatka o aktivnosti	Nesigurnost trenda emisije izražena preko ukupne emisije
			kt	kt	%	%	%	%	%	%	%	%	%
1 A 1 Energy Industries	1 A 1 Termoelektrane, javne toplane i kotlovnice	PM10	1,63595337	1,22807754	3,0	50,0	50,09	1,62685	0,00022	0,02416	0,01113	0,10249	0,10309
1 A 2 Manufacturing Industries and Construction	1 A 2 Izgaranje u industriji	PM10	2,8407079	0,48030183	3,0	50,0	50,09	0,63626	-0,03209	0,00945	-1,60467	0,04008	1,60518
1 A 3 b Road Transport	1 A 3 b Cestovni promet	PM10	1,48622719	1,77125753	3,0	100,0	100,04	4,68649	0,01309	0,03484	1,30936	0,14782	1,31768
1 A 3 Other mobile source and machinery	1 A 3 Ostali pokretni izvori i strojevi	PM10	0,27350848	0,24090705	3,0	500,0	500,01	3,18565	0,00074	0,00474	0,36862	0,02010	0,36916
1 A 4 a Commercial, institutional combustion	1 A 4 a Izgaranje u sektoru opće potrošnje	PM10	0,25106859	0,1010823	5,0	78,0	78,16	0,20894	-0,00168	0,00199	-0,13141	0,01406	0,13216
1 A 4 b Residential combustion , 1 A 4 c Combustion in Agriculture/Forestry/ Fishing	1 A 4 b Izgaranje u sektoru kućanstva, 1 A 4 c Izgaranje u Poljoprivredi/šumarstvu/ribarstvu	PM10	30,9153443	23,8029111	3,0	76,0	76,06	47,87983	0,01582	0,46820	1,20248	1,98642	2,32203
1 B Extraction and distribution of fossil fuels	1 B Ekstrakcija i distribucija fosilnih goriva	PM10	0,13232627	0,03925296	10,0	50,0	50,99	0,05293	-0,00116	0,00077	-0,05819	0,01092	0,05920
1 B 2 a iv Refining / storage	1 B 2 a iv Rafiniranje / skladištenje	PM10	0,70476278	0,41043831	3,0	50,0	50,09	0,54371	-0,00224	0,00807	-0,11184	0,03425	0,11697
2 B 10 a, 2 H 1, 2 H 2 Chemical industry: Other, Pulp and Paper industry, Food and beverages industry	2 B 10 a Kemijska industrija: ostalo, 2 H 1 Industrija papira, 2 H 2 Industrija hrane i pića	PM10	0,38872364	0,43337028	3,0	50,0	50,09	0,57409	0,00284	0,00852	0,14186	0,03617	0,14640
2 A 1, 2 A 2, 2 A 3 Cement, Lime and glass production	2 A 1, 2 A 2, 2 A 3 Proizvodnja cementa, vapna i stakla	PM10	0,44815586	0,49172255	3,0	50,0	50,09	0,65139	0,00312	0,00967	0,15577	0,04104	0,16109
2 A 5 a, 2 A 5 b Quarrying and mining of mineral products, Construction and demolition	2 A 5 a, 2 A 5 b Vađenje kamen, Građenje i rušenje objekata	PM10	1,58046303	1,39309417	5,0	50,0	50,25	1,85132	0,00428	0,02740	0,21395	0,19376	0,28865
2 C Metal production	2 C Industrija metala	PM10	0,36259418	0,0032586	7,5	50,0	50,56	0,00436	-0,00524	0,00006	-0,26201	0,00068	0,26201
2D3b, 2D3c, 2D3d, 2D3g, 2D3h	2D3b, 2D3c, 2D3d, 2D3g, 2D3h	PM10	0,611069	2,57338331	30	50,0	58,31	3,96839	0,04167	0,05062	2,08368	2,14756	2,99228
2D3a, 2D3i, 2G	2D3a, 2D3i, 2G	PM10	0,50634248	0,54814268	10	100,0	100,50	1,45688	0,00337	0,01078	0,33739	0,15248	0,37025
3B1, 3B2, 3B4d, 3B4e, 3B4f,	3B1, 3B2, 3B4d, 3B4e, 3B4f,	PM10	0,41683651	0,17884827	10,0	100,0	100,50	0,47535	-0,00258	0,00352	-0,25801	0,04975	0,26276
3B3, 3B4g	3B3, 3B4g	PM10	3,23153926	1,6561368	50,0	100,0	111,80	4,89691	-0,01469	0,03258	-1,46912	2,30349	2,73210
3 D a, b, c, d, e	3 D a, b, c, d, e	PM10	4,77318348	2,3176062	5	50,0	50,25	3,07993	-0,02422	0,04559	-1,21103	0,32235	1,25320
3 F Field burning of agricultural residues	3 F Spaljivanje poljoprivrednih ostataka na polju	PM10	0,00620803	0,00411955	50,0	25,0	55,90	0,00609	-0,00001	0,00008	-0,00024	0,00573	0,00574
5 A Biological treatment of waste - Solid waste disposal on land	5 A Biološka obrada otpada -Odlagališta otpada	PM10	0,00023005	0,00035075	50	100,0	111,80	0,00104	0,00000	0,00001	0,00035	0,00049	0,00060
5 C 1 b v Cremation	5 C 1 b v Kremiranje	PM10	5,0801E-05	0,00022347	50,0	80,0	94,34	0,00056	0,00000	0,00000	0,00029	0,00031	0,00043
5 C Waste incineration	5 C Termička obrada otpada	PM10	0,00000175	0	5,0	50,0	50,25	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000
5 E Other waste (Building and car fires)	5 E Ostali otpad (Požari na građevinama i vozilima)	PM10	0,2735262	0,13747033	10,0	700,0	700,07	2,54520	-0,00130	0,00270	-0,90826	0,03824	0,90907
TOTAL			50,84	37,81	% Uncertainty in total inventory			**48,89**			Trend uncertainty:		**5,40**

NFR Source		Pollutant	Emissions 1990	Emissions 2018	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total emissions in year 2013	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into the trend in total national emissions
	NFR Izvor	Onečišćujuća tvar	Emisija 1990	Emisija 2018	Nesigurnost podatka o aktivnosti	Nesigurnost faktora emisije	Ukupna nesigurnost	Ukupna nesigurnost kao % ukupne emisije u promatranoj godini t	Tip A osjetljivost	Tip B osjetljivost	Nesigurnost trenda emisije izražena preko nesigurnosti faktora emisije	Nesigurnost trenda emisije izražena preko nesigurnosti podatka o aktivnosti	Nesigurnost trenda emisije izražena preko ukupne emisije
			kt	kt	%	%	%	%	%	%	%	%	%
1 A 1 Energy Industries	1 A 1 Termoelektrane, javne toplane i kotlovnice	TSP	2,7455401	1,39837096	3,0	50,0	50,09	1,35829	-0,01624	0,02340	-0,81197	0,09928	0,81802
1 A 2 Manufacturing Industries and Construction	1 A 2 Izgaranje u industriji	TSP	2,94526497	0,53650379	3,0	50,0	50,09	0,52113	-0,03354	0,00898	-1,67686	0,03809	1,67729
1 A 3 b Road Transport	1 A 3 b Cestovni promet	TSP	1,7510617	2,24536216	3,0	100,0	100,04	4,35614	0,01228	0,03757	1,22841	0,15941	1,23871
1 A 3 Other mobile source and machinery	1 A 3 Ostali pokretni izvori i strojevi	TSP	0,27797945	0,24208111	3,0	500,0	500,01	2,34725	0,00004	0,00405	0,01840	0,01719	0,02518
1 A 4 a Commercial, institutional combustion	1 A 4 a Izgaranje u sektoru opće potrošnje	TSP	0,25733132	0,1040502	5,0	78,0	78,16	0,15771	-0,00197	0,00174	-0,15403	0,01231	0,15452
1 A 4 b Residential combustion , 1 A 4 c Combustion in Agriculture/Forestry/ Fishing	1 A 4 b Izgaranje u sektoru kućanstva, 1 A 4 c Izgaranje u Poljoprivredi/šumarstvu/ribarstvu	TSP	32,5166366	24,9871402	3,0	76,0	76,06	36,85429	-0,05115	0,41814	-3,88704	1,77401	4,27273
1 B Extraction and distribution of fossil fuels	1 B Ekstrakcija i distribucija fosilnih goriva	TSP	0,25224617	0,03925296	10,0	50,0	50,99	0,03881	-0,00299	0,00066	-0,14928	0,00929	0,14957
1 B 2 a iv Refining / storage	1 B 2 a iv Rafiniranje / skladištenje	TSP	0,89697081	0,5887999	3,0	50,0	50,09	0,57192	-0,00310	0,00985	-0,15497	0,04180	0,16051
2 B 10 a, 2 H 1, 2 H 2, 2 I Chemical industry: Other, Pulp and Paper industry, Food and beverages industry, Wood processing	2 B 10 a Kemijska industrija: ostalo, 2 H 1 Industrija papira, 2 H 2 Industrija hrane i pića, 2 I Prerada drva	TSP	0,8354831	0,76212635	3,0	50,0	50,09	0,74028	0,00069	0,01275	0,03443	0,05411	0,06413
2 A 1, 2 A 2, 2 A 3 Cement, Lime and glass production	2 A 1, 2 A 2, 2 A 3 Proizvodnja cementa, vapna i stakla	TSP	0,24253308	0,21625928	3,0	50,0	50,09	0,21006	0,00012	0,00362	0,00583	0,01535	0,01642
2 A 5 a, 2 A 5 b Quarrying and mining of mineral products, Construction and demolition	2 A 5 a, 2 A 5 b Vađenje kamen, Građenje i rušenje objekata	TSP	3,21383302	2,83370484	5,0	50,0	50,25	2,76125	0,00101	0,04742	0,05046	0,33531	0,33908
2 C Metal production	2 C Industrija metala	TSP	0,48292718	0,00417366	7,5	50,0	50,56	0,00409	-0,00690	0,00007	-0,34517	0,00074	0,34517
2D3b, 2D3c, 2D3d, 2D3g, 2D3h	2D3b, 2D3c, 2D3d, 2D3g, 2D3h	TSP	2,845118	12,0048852	30	50,0	58,31	13,57430	0,15973	0,20089	7,98650	8,52311	11,68022
2D3a, 2D3i, 2G	2D3a, 2D3i, 2G	TSP	0,53760027	0,5776715	10	100,0	100,50	1,12580	0,00190	0,00967	0,19034	0,13671	0,23434
3B1, 3B2, 3B4d, 3B4e, 3B4f	3B1, 3B2, 3B4d, 3B4e, 3B4f,	TSP	0,92532961	0,40134802	10,0	100,0	100,50	0,78217	-0,00665	0,00672	-0,66451	0,09498	0,67127
3B3, 3B4g	3B3, 3B4g	TSP	3,97622926	2,1659938	50,0	100,0	111,80	4,69604	-0,02116	0,03625	-2,11593	2,56298	3,32356
3 D a, b, c, d, e	3 D a, b, c, d, e	TSP	4,77318348	2,3176062	5	50,0	50,25	2,25834	-0,03012	0,03878	-1,50604	0,27424	1,53080
3 F Field burning of agricultural residues	3 F Spaljivanje poljoprivrednih ostataka na polju	TSP	0,00631694	0,00419182	50,0	25,0	55,90	0,00454	-0,00002	0,00007	-0,00053	0,00496	0,00499
5 A Biological treatment of waste - Solid waste disposal on land	5 A Biološka obrada otpada -Odlagališta otpada	TSP	0,00048635	0,00074154	50	100,0	111,80	0,00161	0,00001	0,00001	0,00054	0,00088	0,00103
5 C 1 b v Cremation	5 C 1 b v Kremiranje	TSP	5,6452E-05	0,00024833	50,0	80,0	94,34	0,00045	0,00000	0,00000	0,00027	0,00029	0,00040
5 C Waste incineration	5 C Termička obrada otpada	TSP	0,0023825	0	5,0	50,0	50,25	0,00000	-0,00003	0,00000	-0,00172	0,00000	0,00172
5 E Other waste (Building and car fires)	5 E Ostali otpad (Požari na građevinama i vozilima)	TSP	0,2735262	0,13747033	10,0	700,0	700,07	1,86626	-0,00165	0,00230	-1,15456	0,03253	1,15502
TOTAL			59,76	51,57	% Uncertainty in total inventory			40,13			Trend uncertainty:		13,24

NFR Source		Pollutant	Emissions 1990	Emissions 2018	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total emissions in year 2013	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into the trend in total national emissions
	NFR Izvor	Onečišćujuća tvar	Emisija 1990	Emisija 2018	Nesigurnost podatka o aktivnosti	Nesigurnost faktora emisije	Ukupna nesigurnost	Ukupna nesigurnost kao % ukupne emisije u promatranoj godini t	Tip A osjetljivost	Tip B osjetljivost	Nesigurnost trenda emisije izražena preko nesigurnosti faktora emisije	Nesigurnost trenda emisije izražena preko nesigurnosti podatka o aktivnosti	Nesigurnost trenda emisije izražena preko ukupne emisije
			kt	kt	%	%	%	%	%	%	%	%	%
1 A 1 Energy Industries	1 A 1 Termoelektrane, javne toplane i kotlovnice	PAH	0,02584834	0,0087638	3,0	100,0	100,04	0,06267	-0,00036	0,00040	-0,03589	0,00171	0,03593
1 A 2 Manufacturing Industries and Construction	1 A 2 Izgaranje u industriji	PAH	2,34971717	0,38322615	3,0	100,0	100,04	2,74029	-0,05153	0,01758	-5,15316	0,07458	5,15370
1 A 3 b Road Transport	1 A 3 b Cestovni promet	PAH	0,06504643	0,15759826	3,0	400,0	400,01	4,50578	0,00531	0,00723	2,12555	0,03067	2,12577
1 A 3 Other mobile source and machinery	1 A 3 Ostali pokretni izvori i strojevi	PAH	0,05749444	0,02731971	3,0	400,0	400,01	0,78108	-0,00044	0,00125	-0,17571	0,00532	0,17579
1 A 4 a Commercial, institutional combustion	1 A 4 a Izgaranje u sektoru opće potrošnje	PAH	0,13131512	0,01505659	5,0	400,0	400,03	0,43049	-0,00317	0,00069	-1,26980	0,00488	1,26981
1 A 4 b Residential combustion , 1 A 4 c Combustion in Agriculture/Forestry/ Fishing	1 A 4 b Izgaranje u sektoru kućanstva, 1 A 4 c Izgaranje u Poljoprivredi/šumarstvu/ribarstvu	PAH	18,2501386	13,3259441	3,0	400,0	400,01	380,99290	0,07342	0,61123	29,36696	2,59324	29,48124
1 B Extraction and distribution of fossil fuels	1 B Ekstrakcija i distribucija fosilnih goriva	PAH	0,29468499	2,5551E-06	10,0	400,0	400,12	0,00007	-0,00867	0,00000	-3,46916	0,00000	3,46916
1 B 2 a iv Refining / storage	1 B 2 a iv Rafiniranje / skladištenje	PAH	0,00429265	0,00190085	3,0	400,0	400,01	0,05435	-0,00004	0,00009	-0,01567	0,00037	0,01567
2 C Metal production	2 C Industrija metala	PAH	0,61685761	0,065172	7,5	400,0	400,07	1,86356	-0,01516	0,00299	-6,06555	0,03171	6,06563
2 D 3 i, 2G	3 D 3 i, 2G	PAH	0,00385834	0,0045046	10,0	400,0	400,12	0,12882	0,00009	0,00021	0,03722	0,00292	0,03733
3 F Field burning of agricultural residues	3 F Spaljivanje poljoprivrednih ostataka na polju	PAH	0,00249846	0,00165794	50,0	100,0	111,80	0,01325	0,00000	0,00008	0,00025	0,00538	0,00538
5 C Waste incineration	5 C Termička obrada otpada	PAH	0,000005	0	50,0	100,0	111,80	0,00000	0,00000	0,00000	-0,00001	0,00000	0,00001
5 C 1 b v Cremation	5 C 1 b v Kremiranje	PAH	4,9542E-08	2,1793E-07	50	100,0	111,80	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000
TOTAL			21,80	13,99	% Uncertainty in total inventory			381,04			Trend uncertainty:		30,83

NFR Source		Pollutant	Emissions 1990	Emissions 2018	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total emissions in year 2013	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into the trend in total national emissions
	NFR Izvor	Onečišćujuća tvar	Emisija 1990	Emisija 2018	Nesigurnost podatka o aktivnosti	Nesigurnost faktora emisije	Ukupna nesigurnost	Ukupna nesigurnost kao % ukupne emisije u promatranoj godini t	Tip A osjetljivost	Tip B osjetljivost	Nesigurnost trenda emisije izražena preko nesigurnosti faktora emisije	Nesigurnost trenda emisije izražena preko nesigurnosti podatka o aktivnosti	Nesigurnost trenda emisije izražena preko ukupne emisije
			kg	kg	%	%	%	%	%	%	%	%	%
1 A 1 Energy Industries	1 A 1 Termoelektrane, javne toplane i kotlovnice	HCB	0,00500698	0,0427591	3,0	100,0	100,04	7,57930	0,00597	0,00603	0,59734	0,02558	0,59789
1 A 2 Manufacturing Industries and Construction	1 A 2 Izgaranje u industriji	HCB	0,03371407	0,01936367	3,0	100,0	100,04	3,43232	0,00235	0,00273	0,23521	0,01158	0,23549
1 A 3 b Road Transport	1 A 3 b Cestovni promet	HCB	0,00042881	0,00088657	3,0	400,0	400,01	0,62833	0,00012	0,00013	0,04808	0,00053	0,04809
1 A 3 Other mobile source and machinery	1 A 3 Ostali pokretni izvori i strojevi	HCB	0,0035192	0,00376976	3,0	400,0	400,01	2,67172	0,00049	0,00053	0,19684	0,00226	0,19685
1 A 4 a Commercial, institutional combustion	1 A 4 a Izgaranje u sektoru opće potrošnje	HCB	0,00201686	0,00246427	5,0	400,0	400,03	1,74658	0,00032	0,00035	0,12994	0,00246	0,12997
1 A 4 b Residential combustion , 1 A 4 c Combustion in Agriculture/Forestry/ Fishing	1 A 4 b Izgaranje u sektoru kućanstva, 1 A 4 c Izgaranje u Poljoprivredi/šumarstvu/ribarstvu	HCB	0,21397433	0,22744901	3,0	400,0	400,01	161,19871	0,02966	0,03207	11,86527	0,13608	11,86605
3 D f Use of pesticides	3 D f Uporaba pesticida	HCB	6,8180805	0,26675163	3,0	30,0	30,15	14,24933	-0,03854	0,03762	-1,15606	0,15959	1,16703
5 C Waste incineration	5 C Termička obrada otpada	HCB	0,0145	0	50,0	100,0	111,80	0,00000	-0,00016	0,00000	-0,01627	0,00000	0,01627
5 C 1 b v Cremation	5 C 1 b v Kremiranje	HCB	0,0002196	0,000966	50,0	100,0	111,80	0,19135	0,00013	0,00014	0,01338	0,00963	0,01648
TOTAL			7,09	0,56	% Uncertainty in total inventory			162,07			Trend uncertainty:		11,94

NFR Source		Pollutant	Emissions 1990	Emissions 2018	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total emissions in year 2013	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into the trend in total national emissions
	NFR Izvor	Onečišćujuća tvar	Emisija 1990	Emisija 2018	Nesigurnost podatka o aktivnosti	Nesigurnost faktora emisije	Ukupna nesigurnost	Ukupna nesigurnost kao % ukupne emisije u promatranoj godini t	Tip A osjetljivost	Tip B osjetljivost	Nesigurnost trenda emisije izražena preko nesigurnosti faktora emisije	Nesigurnost trenda emisije izražena preko nesigurnosti podatka o aktivnosti	Nesigurnost trenda emisije izražena preko ukupne emisije
			g I-TEQ	g I-TEQ	%	%	%	%	%	%	%	%	%
1 A 1 Energy Industries	1 A 1 Termoelektrane, javne toplane i kotlovnice	PCDD/PCDF	0,2129213	0,50356951	3,0	100,0	100,04	1,78827	0,00777	0,01027	0,77727	0,04356	0,77849
1 A 2 Manufacturing Industries and Construction	1 A 2 Izgaranje u industriji	PCDD/PCDF	2,71062964	0,4935634	3,0	100,0	100,04	1,75274	-0,02166	0,01006	-2,16639	0,04269	2,16681
1 A 3 b Road Transport	1 A 3 b Cestovni promet	PCDD/PCDF	0,5989716	0,9438575	3,0	400,0	400,01	13,40160	0,01223	0,01924	4,89092	0,08164	4,89160
1 A 3 Other mobile source and machinery	1 A 3 Ostali pokretni izvori i strojevi	PCDD/PCDF	0,35938016	0,38178947	3,0	400,0	400,01	5,42094	0,00358	0,00778	1,43009	0,03302	1,43047
1 A 4 a Commercial, institutional combustion	1 A 4 a Izgaranje u sektoru opće potrošnje	PCDD/PCDF	0,21185927	0,04949036	5,0	400,0	400,03	0,70274	-0,00147	0,00101	-0,58864	0,00713	0,58868
1 A 4 b Residential combustion , 1 A 4 c Combustion in Agriculture/Forestry/ Fishing	1 A 4 b Izgaranje u sektoru kućanstva, 1 A 4 c Izgaranje u Poljoprivredi/šumarstvu/ribarstvu	PCDD/PCDF	33,7567672	23,6319454	3,0	400,0	400,01	335,54428	0,08593	0,48177	34,37381	2,04399	34,43453
1 B Extraction and distribution of fossil fuels	1 B Ekstrakcija i distribucija fosilnih goriva	PCDD/PCDF	1,668	0	10,0	400,0	400,12	0,00000	-0,01952	0,00000	-7,80937	0,00000	7,80937
1 B 2 a iv Refining / storage	1 B 2 a iv Rafiniranje / skladištenje	PCDD/PCDF	0,02434635	0,01078094	3,0	400,0	400,01	0,15308	-0,00007	0,00022	-0,02611	0,00093	0,02613
2 C Metal production	2 C Industrija metala	PCDD/PCDF	0,5307944	0,407325	7,5	400,0	400,07	5,78436	0,00209	0,00830	0,83552	0,08808	0,84015
2 G Other product use	2 G Ostala uporaba proizvoda	PCDD/PCDF	0,0012091	0,00120422	10,0	400,0	400,12	0,01710	0,00001	0,00002	0,00416	0,00035	0,00417
3 F Field burning of agricultural residues	3 F Spaljivanje poljoprivrednih ostataka na polju	PCDD/PCDF	0,544564	0,361364	50,0	100,0	111,80	1,43410	0,00099	0,00737	0,09907	0,52092	0,53026
5 C Waste incineration	5 C Termička obrada otpada	PCDD/PCDF	5,69	0,00	50,0	100,0	111,80	0,00000	-0,06652	0,00000	-6,65160	0,00000	6,65160
5 C 1 b v Cremation	5 C 1 b v Kremiranje	PCDD/PCDF	3,9528E-05	0,00017388	50,0	100,0	111,80	0,00069	0,00000	0,00000	0,00031	0,00025	0,00040
5 E Other waste (Building and car fires)	5 E Ostali otpad (Požari na građevinama i vozilima)	PCDD/PCDF	2,745048	1,387206	30,0	100,0	104,40	5,14082	-0,00386	0,02828	-0,38584	1,19983	1,26035
TOTAL			49,05	28,17	% Uncertainty in total inventory			**335,96**			Trend uncertainty:		**36,40**

NFR Source		Pollutant	Emissions 1990	Emissions 2018	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total emissions in year 2013	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into the trend in total national emissions
	NFR Izvor	Onečišćujuća tvar	Emisija 1990	Emisija 2018	Nesigurnost podatka o aktivnosti	Nesigurnost faktora emisije	Ukupna nesigurnost	Ukupna nesigurnost kao % ukupne emisije u promatranoj godini t	Tip A osjetljivost	Tip B osjetljivost	Nesigurnost trenda emisije izražena preko nesigurnosti faktora emisije	Nesigurnost trenda emisije izražena preko nesigurnosti podatka o aktivnosti	Nesigurnost trenda emisije izražena preko ukupne emisije
			kt	kt	%	%	%	%	%	%	%	%	%
1 A 1 Energy Industries	1 A 1 Termoelektrane, javne toplane i kotlovnice	Pb	0,62418557	0,29475443	3,0	100,0	100,04	3,50532	0,00054	0,00056	0,05439	0,00239	0,05445
1 A 2 Manufacturing Industries and Construction	1 A 2 Izgaranje u industriji	Pb	0,67593872	0,37977349	3,0	100,0	100,04	4,51640	0,00070	0,00073	0,07048	0,00308	0,07054
1 A 3 b Road Transport	1 A 3 b Cestovni promet	Pb	440,035247	3,99945109	3,0	200,0	200,02	95,09363	-0,00582	0,00764	-1,16425	0,03242	1,16470
1 A 3 Other mobile source and machinery	1 A 3 Ostali pokretni izvori i strojevi	Pb	0,36298604	0,14319302	3,0	400,0	400,01	6,80873	0,00026	0,00027	0,10497	0,00116	0,10497
1 A 4 a Commercial, institutional combustion	1 A 4 a Izgaranje u sektoru opće potrošnje	Pb	0,17477713	0,02438527	5,0	400,0	400,03	1,15956	0,00004	0,00005	0,01649	0,00033	0,01649
1 A 4 b Residential combustion , 1 A 4 c Combustion in Agriculture/Forestry/ Fishing	1 A 4 b Izgaranje u sektoru kućanstva, 1 A 4 c Izgaranje u Poljoprivredi/šumarstvu/ribarstvu	Pb	3,5135867	1,27176815	3,0	400,0	400,01	60,47172	0,00232	0,00243	0,92864	0,01031	0,92870
1 B Extraction and distribution of fossil fuels	1 B Ekstrakcija i distribucija fosilnih goriva	Pb	0,21397622	0,001413	10,0	400,0	400,12	0,06718	0,00000	0,00000	-0,00155	0,00004	0,00155
1 B 2 a iv Refining / storage	1 B 2 a iv Rafiniranje / skladištenje	Pb	0,4100438	0,18732198	3,0	400,0	400,01	8,90703	0,00035	0,00036	0,13811	0,00152	0,13812
2 A 3 Glass production	2 A 3 Proizvodnja stakla	Pb	0,468333	0,47967062	3,0								
2 C Metal production	2 C Industrija metala	Pb	76,3933844	0,353015	7,5	400,0	400,07	16,78810	-0,00167	0,00067	-0,66750	0,00715	0,66753
2 G Other product use	2 G Ostala uporaba proizvoda	Pb	0,555856	1,277136	10,0	400,0	400,12	60,74423	0,00242	0,00244	0,96912	0,03451	0,96974
3 F Field burning of agricultural residues	3 F Spaljivanje poljoprivrednih ostataka na polju	Pb	0,0001198	7,95E-05	50,0	100,0	111,80	0,00106	0,00000	0,00000	0,00001	0,00001	0,00002
5 C Waste incineration	5 C Termička obrada otpada	Pb	0,009005	0	50,0	100,0	111,80	0,00000	0,00000	0,00000	-0,00003	0,00000	0,00003
5 C 1 b v Cremation	5 C 1 b v Kremiranje	Pb	4,3964E-05	0,00019339	50,0	700,0	701,78	0,01613	0,00000	0,00000	0,00026	0,00003	0,00026
5 E Other waste (Building and car fires)	5 E Ostali otpad (Požari na građevinama i vozilima)	Pb	0,00079725	0,00039854	30,0	700,0	700,64	0,03319	0,00000	0,00000	0,00052	0,00003	0,00052
TOTAL			523,44	8,41	% Uncertainty in total inventory			129,73			Trend uncertainty:		1,91

NFR Source		Pollutant	Emissions 1990	Emissions 2018	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total emissions in year 2013	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into the trend in total national emissions
	NFR Izvor	Onečišćujuća tvar	Emisija 1990	Emisija 2018	Nesigurnost podatka o aktivnosti	Nesigurnost faktora emisije	Ukupna nesigurnost	Ukupna nesigurnost kao % ukupne emisije u promatranoj godini t	Tip A osjetljivost	Tip B osjetljivost	Nesigurnost trenda emisije izražena preko nesigurnosti faktora emisije	Nesigurnost trenda emisije izražena preko nesigurnosti podatka o aktivnosti	Nesigurnost trenda emisije izražena preko ukupne emisije
			kt	kt	%	%	%	%	%	%	%	%	%
1 A 1 Energy Industries	1 A 1 Termoelektrane, javne toplane i kotlovnice	Cd	0,0398587	0,02660963	3,0	100,0	100,04	3,15608	-0,00294	0,02368	-0,29429	0,10046	0,31096
1 A 2 Manufacturing Industries and Construction	1 A 2 Izgaranje u industriji	Cd	0,08382496	0,04134244	3,0	100,0	100,04	4,90349	-0,01919	0,03679	-1,91859	0,15608	1,92492
1 A 3 b Road Transport	1 A 3 b Cestovni promet	Cd	0,00393895	0,00552951	3,0	200,0	200,02	1,31123	0,00229	0,00492	0,45789	0,02088	0,45837
1 A 3 Other mobile source and machinery	1 A 3 Ostali pokretni izvori i strojevi	Cd	0,00120389	0,00063001	3,0	400,0	400,01	0,29877	-0,00024	0,00056	-0,09740	0,00238	0,09742
1 A 4 a Commercial, institutional combustion	1 A 4 a Izgaranje u sektoru opće potrošnje	Cd	0,00264174	0,00574507	5,0	400,0	400,03	2,72460	0,00335	0,00511	1,33909	0,03615	1,33958
1 A 4 b Residential combustion , 1 A 4 c Combustion in Agriculture/Forestry/ Fishing	1 A 4 b Izgaranje u sektoru kućanstva, 1 A 4 c Izgaranje u Poljoprivredi/šumarstvu/ribarstvu	Cd	0,56116569	0,59303214	3,0	400,0	400,01	281,23150	0,15214	0,52772	60,85487	2,23891	60,89604
1 B Extraction and distribution of fossil fuels	1 B Ekstrakcija i distribucija fosilnih goriva	Cd	0,00777703	0,00211892	10,0	400,0	400,12	1,00513	-0,00331	0,00189	-1,32350	0,02667	1,32376
1 B 2 a iv Refining / storage	1 B 2 a iv Rafiniranje / skladištenje	Cd	0,08072737	0,03574733	3,0	400,0	400,01	16,95233	-0,02209	0,03181	-8,83768	0,13496	8,83871
2 A 3 Glass production	2 A 3 Proizvodnja stakla	Cd	0,0358137	0,03668069	3,0	400,0	400,01	17,39495	0,00872	0,03264	3,48676	0,13848	3,48951
2 C Metal production	2 C Industrija metala	Cd	0,2367564	0,027155	7,5	400,0	400,07	12,87952	-0,13369	0,02416	-53,47633	0,25630	53,47695
2 G Other product use	2 G Ostala uporaba proizvoda	Cd	0,06634072	0,06743866	10,0	400,0	400,12	31,99029	0,01569	0,06001	6,27633	0,84868	6,33345
3 F Field burning of agricultural residues	3 F Spaljivanje poljoprivrednih ostataka na polju	Cd	0,00095843	0,000636	50,0	100,0	111,80	0,08430	-0,00007	0,00057	-0,00742	0,04002	0,04070
5 C Waste incineration	5 C Termička obrada otpada	Cd	0,001145	0,000000	50,0	100,0	111,80	0,00000	-0,00076	0,00000	-0,07648	0,00000	0,07648
5 C 1 b v Cremation	5 C 1 b v Kremiranje	Cd	7,3639E-06	3,2393E-05	50,0	100,0	111,80	0,00429	0,00002	0,00003	0,00239	0,00204	0,00314
5 E Other waste (Building and car fires)	5 E Ostali otpad (Požari na građevinama i vozilima)	Cd	0,00161105	0,0008049	30,0	700,0	700,64	0,66858	-0,00036	0,00072	-0,25187	0,03039	0,25370
TOTAL			1,12	0,84	% Uncertainty in total inventory			284,46			Trend uncertainty:		81,89

NFR Source		Pollutant	Emissions 1990	Emissions 2018	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total emissions in year 2013	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into the trend in total national emissions
	NFR Izvor	Onečišćujuća tvar	Emisija 1990	Emisija 2018	Nesigurnost podatka o aktivnosti	Nesigurnost faktora emisije	Ukupna nesigurnost	Ukupna nesigurnost kao % ukupne emisije u promatranoj godini t	Tip A osjetljivost	Tip B osjetljivost	Nesigurnost trenda emisije izražena preko nesigurnosti faktora emisije	Nesigurnost trenda emisije izražena preko nesigurnosti podatka o aktivnosti	Nesigurnost trenda emisije izražena preko ukupne emisije
			kt	kt	%	%	%	%	%	%	%	%	%
1 A 1 Energy Industries	1 A 1 Termoelektrane, javne toplane i kotlovnice	Hg	0,06344416	0,10889016	3,0	100,0	100,04	27,16807	0,07665	0,09679	7,66483	0,41066	7,67583
1 A 2 Manufacturing Industries and Construction	1 A 2 Izgaranje u industriji	Hg	0,12	0,13318226	3,0	100,0	100,04	33,22894	0,08084	0,11839	8,08369	0,50227	8,09928
1 A 3 b Road Transport	1 A 3 b Cestovni promet	Hg	0,00862819	0,01180205	3,0	200,0	200,02	5,88723	0,00776	0,01049	1,55131	0,04451	1,55195
1 A 3 Other mobile source and machinery	1 A 3 Ostali pokretni izvori i strojevi	Hg	0,00322001	0,00164109	3,0	400,0	400,01	1,63712	0,00044	0,00146	0,17542	0,00619	0,17553
1 A 4 a Commercial, institutional combustion	1 A 4 a Izgaranje u sektoru opće potrošnje	Hg	0,00806037	0,0013176	5,0	400,0	400,03	1,31448	-0,00138	0,00117	-0,55300	0,00828	0,55306
1 A 4 b Residential combustion , 1 A 4 c Combustion in Agriculture/Forestry/ Fishing	1 A 4 b Izgaranje u sektoru kućanstva, 1 A 4 c Izgaranje u Poljoprivredi/šumarstvu/ribarstvu	Hg	0,05808745	0,04106935	3,0	400,0	400,01	40,96989	0,01809	0,03651	7,23726	0,15489	7,23892
1 B Extraction and distribution of fossil fuels	1 B Ekstrakcija i distribucija fosilnih goriva	Hg	0,70839317	0,00042022	10,0	400,0	400,12	0,41932	-0,22267	0,00037	-89,06782	0,00528	89,06782
1 B 2 a iv Refining / storage	1 B 2 a iv Rafiniranje / skladištenje	Hg	0,08969708	0,04355141	3,0	400,0	400,01	43,44593	0,01029	0,03871	4,11420	0,16425	4,11748
2 A 3 Glass production	2 A 3 Proizvodnja stakla	Hg	0,00082647	0,00084648	3,0	400,0	400,01	0,84443	0,00049	0,00075	0,19623	0,00319	0,19626
2 C Metal production	2 C Industrija metala	Hg	0,00857783	0,00678875	7,5	400,0	400,07	6,77331	0,00332	0,00603	1,32661	0,06401	1,32815
2 G Other product use	2 G Ostala uporaba proizvoda	Hg	4,0413E-05	9,2853E-05	10,0	400,0	400,12	0,09265	0,00007	0,00008	0,02789	0,00117	0,02792
2 K Consumption of POPs and heavy metals (e.g. electrical and scientific equipment)	2 K Uporaba POO i teških metala (npr. električna i znanstvaena oprema)	Hg	0,04778	0,04087843	50,0	400,0	403,11	41,09563	0,02119	0,03634	8,47583	2,56942	8,85672
3 F Field burning of agricultural residues	3 F Spaljivanje poljoprivrednih ostataka na polju	Hg	0,00015248	0,00010118	50,0	100,0	111,80	0,02821	0,00004	0,00009	0,00416	0,00636	0,00760
5 C Waste incineration	5 C Termička obrada otpada	Hg	0,006034	0,000000	50,0	100,0	111,80	0,00000	-0,00191	0,00000	-0,19117	0,00000	0,19117
5 C 1 b v Cremation	5 C 1 b v Kremiranje	Hg	0,00218136	0,0095956	50,0	100,0	111,80	2,67548	0,00784	0,00853	0,78383	0,60313	0,98902
5 E Other waste (Building and car fires)	5 E Ostali otpad (Požari na građevinama i vozilima)	Hg	0,00161105	0,0008049	30,0	700,0	700,64	1,40641	0,00021	0,00072	0,14353	0,03036	0,14670
TOTAL			1,12	0,40	% Uncertainty in total inventory			84,81			Trend uncertainty:		90,61

NFR Source		Pollutant	Emissions 1990	Emissions 2018	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total emissions in year 2013	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into the trend in total national emissions
	NFR Izvor	Onečišćujuća tvar	Emisija 1990	Emisija 2018	Nesigurnost podatka o aktivnosti	Nesigurnost faktora emisije	Ukupna nesigurnost	Ukupna nesigurnost kao % ukupne emisije u promatranoj godini t	Tip A osjetljivost	Tip B osjetljivost	Nesigurnost trenda emisije izražena preko nesigurnosti faktora emisije	Nesigurnost trenda emisije izražena preko nesigurnosti podatka o aktivnosti	Nesigurnost trenda emisije izražena preko ukupne emisije
			kt	kt	%	%	%	%	%	%	%	%	%
1 A 1 Energy Industries	1 A 1 Termoelektrane, javne toplane i kotlovnice	As	0,77941468	0,11621004	3,0	100,0	100,04	20,97605	0,00767	0,01352	0,76662	0,05737	0,76876
1 A 2 Manufacturing Industries and Construction	1 A 2 Izgaranje u industriji	As	0,09943151	0,07369734	3,0	100,0	100,04	13,30246	0,00783	0,00858	0,78286	0,03638	0,78370
1 A 3 b Road Transport	1 A 3 b Cestovni promet	As	0,00026716	0,00029116	3,0	200,0	200,02	0,10507	0,00003	0,00003	0,00638	0,00014	0,00638
1 A 3 Other mobile source and machinery	1 A 3 Ostali pokretni izvori i strojevi	As	0,00392465	0,00195245	3,0	400,0	400,01	1,40908	0,00020	0,00023	0,07910	0,00096	0,07910
1 A 4 a Commercial, institutional combustion	1 A 4 a Izgaranje u sektoru opće potrošnje	As	0,00731397	0,00179207	5,0	400,0	400,03	1,29340	0,00015	0,00021	0,06146	0,00147	0,06147
1 A 4 b Residential combustion , 1 A 4 c Combustion in Agriculture/Forestry/ Fishing	1 A 4 b Izgaranje u sektoru kućanstva, 1 A 4 c Izgaranje u Poljoprivredi/šumarstvu/ribarstvu	As	0,024281	0,01181995	3,0	400,0	400,01	8,53046	0,00119	0,00138	0,47726	0,00584	0,47730
1 B Extraction and distribution of fossil fuels	1 B Ekstrakcija i distribucija fosilnih goriva	As	0,00786199	0,00034925	10,0	400,0	400,12	0,25212	-0,00002	0,00004	-0,00735	0,00057	0,00737
1 B 2 a iv Refining / storage	1 B 2 a iv Rafiniranje / skladištenje	As	0,01793942	0,28896789	3,0	400,0	400,01	208,54821	0,03349	0,03363	13,39603	0,14266	13,39679
2 A 3 Glass production	2 A 3 Proizvodnja stakla	As	0,0523431	0,05361025	3,0	100,0	100,04	9,67671	0,00585	0,00624	0,58451	0,02647	0,58511
2 C Metal production	2 C Industrija metala	As	7,59739707	0,00203663	7,5	400,0	400,07	1,47005	-0,05628	0,00024	-22,51360	0,00251	22,51360
2 G Other product use	2 G Ostala uporaba proizvoda	As	0,00094297	0,00216657	10,0	400,0	400,12	1,56406	0,00025	0,00025	0,09801	0,00357	0,09808
3 F Field burning of agricultural residues	3 F Spaljivanje poljoprivrednih ostataka na polju	As	6,9704E-06	4,6255E-06	50,0	100,0	111,80	0,00093	0,00000	0,00000	0,00005	0,00004	0,00006
5 C Waste incineration	5 C Termička obrada otpada	As	0,000032	0	50,0	100,0	111,80	0,00000	0,00000	0,00000	-0,00002	0,00000	0,00002
5 C 1 b v Cremation	5 C 1 b v Kremiranje	As	1,9925E-05	8,7648E-05	50,0	100,0	111,80	0,01768	0,00001	0,00001	0,00100	0,00072	0,00124
5 E Other waste (Building and car fires)	5 E Ostali otpad (Požari na građevinama i vozilima)	As	0,00255698	0,00127643	30,0	700,0	700,64	1,61353	0,00013	0,00015	0,09054	0,00630	0,09076
TOTAL			8,59	0,55	% Uncertainty in total inventory			210,44			Trend uncertainty:		26,23

NFR Source		Pollutant	Emissions 1990	Emissions 2018	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total emissions in year 2013	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into the trend in total national emissions
	NFR Izvor	Onečišćujuća tvar	Emisija 1990	Emisija 2018	Nesigurnost podatka o aktivnosti	Nesigurnost faktora emisije	Ukupna nesigurnost	Ukupna nesigurnost kao % ukupne emisije u promatranoj godini t	Tip A osjetljivost	Tip B osjetljivost	Nesigurnost trenda emisije izražena preko nesigurnosti faktora emisije	Nesigurnost trenda emisije izražena preko nesigurnosti podatka o aktivnosti	Nesigurnost trenda emisije izražena preko ukupne emisije
			kt	kt	%	%	%	%	%	%	%	%	%
1 A 1 Energy Industries	1 A 1 Termoelektrane, javne toplane i kotlovnice	Cr	1,91682979	0,12812764	3,0	100,0	100,04	6,35152	-0,11415	0,02427	-11,41519	0,10298	11,41565
1 A 2 Manufacturing Industries and Construction	1 A 2 Izgaranje u industriji	Cr	0,32434905	0,1578959	3,0	100,0	100,04	7,82718	0,00642	0,02991	0,64155	0,12691	0,65398
1 A 3 b Road Transport	1 A 3 b Cestovni promet	Cr	0,20798266	0,34362335	3,0	200,0	200,02	34,05657	0,05001	0,06510	10,00273	0,27619	10,00654
1 A 3 Other mobile source and machinery	1 A 3 Ostali pokretni izvori i strojevi	Cr	0,00867266	0,00341995	3,0	400,0	400,01	0,67785	0,00002	0,00065	0,00789	0,00275	0,00835
1 A 4 a Commercial, institutional combustion	1 A 4 a Izgaranje u sektoru opće potrošnje	Cr	0,08068901	0,02574715	5,0	400,0	400,03	5,10343	-0,00097	0,00488	-0,38665	0,03449	0,38818
1 A 4 b Residential combustion , 1 A 4 c Combustion in Agriculture/Forestry/ Fishing	1 A 4 b Izgaranje u sektoru kućanstva, 1 A 4 c Izgaranje u Poljoprivredi/šumarstvu/ribarstvu	Cr	1,05364526	1,06128276	3,0	400,0	400,01	210,35007	0,12449	0,20106	49,79575	0,85301	49,80305
1 B Extraction and distribution of fossil fuels	1 B Ekstrakcija i distribucija fosilnih goriva	Cr	0,10541263	0,00558714	10,0	400,0	400,12	1,10771	-0,00658	0,00106	-2,63019	0,01497	2,63023
1 B 2 a iv Refining / storage	1 B 2 a iv Rafiniranje / skladištenje	Cr	0,42285767	0,18724794	3,0	400,0	400,01	37,11322	0,00484	0,03547	1,93642	0,15050	1,94226
2 A 3 Glass production	2 A 3 Proizvodnja stakla	Cr	0,0633627	0,06489661	3,0	400,0	400,01	12,86274	0,00770	0,01229	3,08159	0,05216	3,08203
2 C Metal production	2 C Industrija metala	Cr	1,0807925	0,0135775	7,5	400,0	400,07	2,69151	-0,07556	0,00257	-30,22277	0,02728	30,22279
2 G Other product use	2 G Ostala uporaba proizvoda	Cr	0,0110604	0,0254124	10,0	400,0	400,12	5,03826	0,00401	0,00481	1,60522	0,06808	1,60667
3 F Field burning of agricultural residues	3 F Spaljivanje poljoprivrednih ostataka na polju	Cr	8,713E-05	5,7818E-05	50,0	100,0	111,80	0,00320	0,00000	0,00001	0,00046	0,00077	0,00090
5 C Waste incineration	5 C Termička obrada otpada	Cr	0,000355	0,000000	50,0	100,0	111,80	0,00000	-0,00003	0,00000	-0,00257	0,00000	0,00257
5 C 1 b v Cremation	5 C 1 b v Kremiranje	Cr	1,9852E-05	8,7326E-05	50,0	100,0	111,80	0,00484	0,00002	0,00002	0,00151	0,00117	0,00191
5 E Other waste (Building and car fires)	5 E Ostali otpad (Požari na građevinama i vozilima)	Cr	0,00244325	0,00121999	30,0	700,0	700,64	0,42354	0,00005	0,00023	0,03791	0,00981	0,03915
TOTAL			5,28	2,02	% Uncertainty in total inventory			217,05			Trend uncertainty:		60,40

NFR Source		Pollutant	Emissions 1990	Emissions 2018	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total emissions in year 2013	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into the trend in total national emissions
	NFR Izvor	Onečišćujuća tvar	Emisija 1990	Emisija 2018	Nesigurnost podatka o aktivnosti	Nesigurnost faktora emisije	Ukupna nesigurnost	Ukupna nesigurnost kao % ukupne emisije u promatranoj godini t	Tip A osjetljivost	Tip B osjetljivost	Nesigurnost trenda emisije izražena preko nesigurnosti faktora emisije	Nesigurnost trenda emisije izražena preko nesigurnosti podatka o aktivnosti	Nesigurnost trenda emisije izražena preko ukupne emisije
			kt	kt	%	%	%	%	%	%	%	%	%
1 A 1 Energy Industries	1 A 1 Termoelektrane, javne toplane i kotlovnice	Cu	0,874229739	0,246293026	3,0	100,0	100,04	2,60233	-0,11343	0,03274	-11,34259	0,13892	11,34344
1 A 2 Manufacturing Industries and Construction	1 A 2 Izgaranje u industriji	Cu	0,579885731	0,358188017	3,0	100,0	100,04	3,78461	-0,04939	0,04762	-4,93859	0,20203	4,94273
1 A 3 b Road Transport	1 A 3 b Cestovni promet	Cu	4,501496163	7,320598133	3,0	200,0	200,02	154,64660	0,21860	0,97323	43,72045	4,12906	43,91500
1 A 3 Other mobile source and machinery	1 A 3 Ostali pokretni izvori i strojevi	Cu	0,109282553	0,070514336	3,0	400,0	400,01	2,97896	-0,00891	0,00937	-3,56500	0,03977	3,56523
1 A 4 a Commercial, institutional combustion	1 A 4 a Izgaranje u sektoru opće potrošnje	Cu	0,036236108	0,007347701	5,0	400,0	400,03	0,31043	-0,00509	0,00098	-2,03479	0,00691	2,03480
1 A 4 b Residential combustion , 1 A 4 c Combustion in Agriculture/Forestry/ Fishing	1 A 4 b Izgaranje u sektoru kućanstva, 1 A 4 c Izgaranje u Poljoprivredi/šumarstvu/ribarstvu	Cu	0,724620507	0,585562066	3,0	400,0	400,01	24,73774	-0,04338	0,07785	-17,35015	0,33028	17,35330
1 B Extraction and distribution of fossil fuels	1 B Ekstrakcija i distribucija fosilnih goriva	Cu	0,032060436	0,002761865	10,0	400,0	400,12	0,11671	-0,00500	0,00037	-1,99915	0,00519	1,99916
1 B 2 a iv Refining / storage	1 B 2 a iv Rafiniranje / skladištenje	Cu	0,179394163	0,081354593	3,0	400,0	400,01	3,43692	-0,01920	0,01082	-7,68046	0,04589	7,68059
2 A 3 Glass production	2 A 3 Proizvodnja stakla	Cu	0,00192843	0,001975114	3,0	400,0	400,01	0,08344	-0,00006	0,00026	-0,02406	0,00111	0,02408
2 C Metal production	2 C Industrija metala	Cu	0,08251068	0,0027155	7,5	400,0	400,07	0,11474	-0,01345	0,00036	-5,37822	0,00383	5,37822
2 G Other product use	2 G Ostala uporaba proizvoda	Cu	0,3800874	0,788303741	10,0	400,0	400,12	33,31227	0,04117	0,10480	16,46893	1,48210	16,53548
3 F Field burning of agricultural residues	3 F Spaljivanje poljoprivrednih ostataka na polju	Cu	7,95063E-05	5,27591E-05	50,0	100,0	111,80	0,00062	-0,00001	0,00001	-0,00063	0,00050	0,00080
5 C Waste incineration	5 C Termička obrada otpada	Cu	0,014470	0,000000	50,0	100,0	111,80	0,00000	-0,00242	0,00000	-0,24215	0,00000	0,24215
5 C 1 b v Cremation	5 C 1 b v Kremiranje	Cu	1,81975E-05	8,00492E-05	50,0	100,0	111,80	0,00095	0,00001	0,00001	0,00076	0,00075	0,00107
5 E Other waste (Building and car fires)	5 E Ostali otpad (Požari na građevinama i vozilima)	Cu	0,00567462	0,00283709	30,0	700,0	700,64	0,20993	-0,00057	0,00038	-0,40072	0,01600	0,40104
TOTAL			7,52	9,47	% Uncertainty in total inventory			160,25			Trend uncertainty:		52,58

NFR Source		Pollutant	Emissions 1990	Emissions 2018	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total emissions in year 2013	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into the trend in total national emissions
	NFR Izvor	Onečišćujuća tvar	Emisija 1990	Emisija 2018	Nesigurnost podatka o aktivnosti	Nesigurnost faktora emisije	Ukupna nesigurnost	Ukupna nesigurnost kao % ukupne emisije u promatranoj godini t	Tip A osjetljivost	Tip B osjetljivost	Nesigurnost trenda emisije izražena preko nesigurnosti faktora emisije	Nesigurnost trenda emisije izražena preko nesigurnosti podatka o aktivnosti	Nesigurnost trenda emisije izražena preko ukupne emisije
			kt	kt	%	%	%	%	%	%	%	%	%
1 A 1 Energy Industries	1 A 1 Termoelektrane, javne toplane i kotlovnice	Ni	11,6433713	2,10180289	3,0	100,0	100,04	60,67120	-0,01595	0,12369	-1,59526	0,52476	1,67935
1 A 2 Manufacturing Industries and Construction	1 A 2 Izgaranje u industriji	Ni	0,2572225	0,14870096	3,0	100,0	100,04	4,29244	0,00566	0,00875	0,56626	0,03713	0,56748
1 A 3 b Road Transport	1 A 3 b Cestovni promet	Ni	0,04198947	0,06182444	3,0	200,0	200,02	3,56808	0,00313	0,00364	0,62684	0,01544	0,62703
1 A 3 Other mobile source and machinery	1 A 3 Ostali pokretni izvori i strojevi	Ni	0,11016182	0,0455844	3,0	400,0	400,01	5,26119	0,00136	0,00268	0,54410	0,01138	0,54422
1 A 4 a Commercial, institutional combustion	1 A 4 a Izgaranje u sektoru opće potrošnje	Ni	0,86880829	0,19958114	5,0	400,0	400,03	23,03608	0,00132	0,01174	0,52659	0,08305	0,53310
1 A 4 b Residential combustion , 1 A 4 c Combustion in Agriculture/Forestry/ Fishing	1 A 4 b Izgaranje u sektoru kućanstva, 1 A 4 c Izgaranje u Poljoprivredi/šumarstvu/ribarstvu	Ni	0,36966944	0,16785018	3,0	400,0	400,01	19,37266	0,00544	0,00988	2,17582	0,04191	2,17622
1 B Extraction and distribution of fossil fuels	1 B Ekstrakcija i distribucija fosilnih goriva	Ni	0,07931627	0,00669669	10,0	400,0	400,12	0,77313	-0,00056	0,00039	-0,22315	0,00557	0,22322
1 B 2 a iv Refining / storage	1 B 2 a iv Rafiniranje / skladištenje	Ni	0,78164599	0,41893575	3,0	400,0	400,01	48,35205	0,01526	0,02465	6,10596	0,10460	6,10685
2 A 3 Glass production	2 A 3 Proizvodnja stakla	Ni	0,1349901	0,138258	3,0	400,0	400,01	15,95724	0,00652	0,00814	2,60620	0,03452	2,60643
2 C Metal production	2 C Industrija metala	Ni	2,6514066	0,0950425	7,5	400,0	400,07	10,97108	-0,02619	0,00559	-10,47578	0,05932	10,47595
2 G Other product use	2 G Ostala uporaba proizvoda	Ni	0,0539157	0,08138387	10,0	400,0	400,12	9,39570	0,00414	0,00479	1,65681	0,06773	1,65820
3 F Field burning of agricultural residues	3 F Spaljivanje poljoprivrednih ostataka na polju	Ni	5,6635E-05	3,7582E-05	50,0	100,0	111,80	0,00121	0,00000	0,00000	0,00015	0,00016	0,00022
5 C Waste incineration	5 C Termička obrada otpada	Ni	0,000315	0,000000	50,0	100,0	111,80	0,00000	0,00000	0,00000	-0,00038	0,00000	0,00038
5 C 1 b v Cremation	5 C 1 b v Kremiranje	Ni	2,5371E-05	0,00011161	50,0	100,0	111,80	0,00360	0,00001	0,00001	0,00063	0,00046	0,00078
TOTAL			16,99	3,47	% Uncertainty in total inventory			86,30			Trend uncertainty:		12,86

NFR Source		Pollutant	Emissions 1990	Emissions 2018	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total emissions in year 2013	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into the trend in total national emissions
	NFR Izvor	Onečišćujuća tvar	Emisija 1990	Emisija 2018	Nesigurnost podatka o aktivnosti	Nesigurnost faktora emisije	Ukupna nesigurnost	Ukupna nesigurnost kao % ukupne emisije u promatranoj godini t	Tip A osjetljivost	Tip B osjetljivost	Nesigurnost trenda emisije izražena preko nesigurnosti faktora emisije	Nesigurnost trenda emisije izražena preko nesigurnosti podatka o aktivnosti	Nesigurnost trenda emisije izražena preko ukupne emisije
			kt	kt	%	%	%	%	%	%	%	%	%
1 A 1 Energy Industries	1 A 1 Termoelektrane, javne toplane i kotlovnice	Se	0,07919249	0,02567233	3,0	100,0	100,04	6,95273	0,08760	0,05713	8,75962	0,24239	8,76298
1 A 2 Manufacturing Industries and Construction	1 A 2 Izgaranje u industriji	Se	0,07508923	0,06598015	3,0	100,0	100,04	17,86914	0,00944	0,14683	0,94427	0,62296	1,13125
1 A 3 b Road Transport	1 A 3 b Cestovni promet	Se	0,00537606	0,00809315	3,0	200,0	200,02	4,38219	0,00817	0,01801	1,63485	0,07641	1,63664
1 A 3 Other mobile source and machinery	1 A 3 Ostali pokretni izvori i strojevi	Se	0,00498067	0,00474831	3,0	400,0	400,01	5,14170	0,00145	0,01057	0,58189	0,04483	0,58362
1 A 4 a Commercial, institutional combustion	1 A 4 a Izgaranje u sektoru opće potrošnje	Se	0,00247402	0,00090172	5,0	400,0	400,03	0,97647	0,00252	0,00201	1,00775	0,01419	1,00785
1 A 4 b Residential combustion , 1 A 4 c Combustion in Agriculture/Forestry/ Fishing	1 A 4 b Izgaranje u sektoru kućanstva, 1 A 4 c Izgaranje u Poljoprivredi/šumarstvu/ribarstvu	Se	0,03241907	0,02506127	3,0	400,0	400,01	27,13753	0,00354	0,05577	1,41442	0,23662	1,43407
1 B Extraction and distribution of fossil fuels	1 B Ekstrakcija i distribucija fosilnih goriva	Se	0,01143806	0,00130471	10,0	400,0	400,12	1,41320	0,01802	0,00290	7,20711	0,04106	7,20723
1 B 2 a iv Refining / storage	1 B 2 a iv Rafiniranje / skladištenje	Se	0,01793942	0,011776	3,0	400,0	400,01	12,75161	0,00661	0,02621	2,64434	0,11119	2,64668
2 A 3 Glass production	2 A 3 Proizvodnja stakla	Se	0,220392	0,22572735	3,0	400,0	400,01	244,42830	0,09865	0,50234	39,45974	2,13125	39,51725
3 F Field burning of agricultural residues	3 F Spaljivanje poljoprivrednih ostataka na polju	Se	2,1783E-05	1,4455E-05	50,0	100,0	111,80	0,00437	0,00001	0,00003	0,00077	0,00227	0,00240
5 C 1 b v Cremation	5 C 1 b v Kremiranje	Se	2,8958E-05	0,00012738	50,0	100,0	111,80	0,03855	0,00023	0,00028	0,02305	0,02005	0,03055
TOTAL			0,45	0,37	% Uncertainty in total inventory			247,10			Trend uncertainty:		41,29

NFR Source		Pollutant	Emissions 1990	Emissions 2018	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total emissions in year 2013	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into the trend in total national emissions
	NFR Izvor	Onečišćujuća tvar	Emisija 1990	Emisija 2018	Nesigurnost podatka o aktivnosti	Nesigurnost faktora emisije	Ukupna nesigurnost	Ukupna nesigurnost kao % ukupne emisije u promatranoj godini t	Tip A osjetljivost	Tip B osjetljivost	Nesigurnost trenda emisije izražena preko nesigurnosti faktora emisije	Nesigurnost trenda emisije izražena preko nesigurnosti podatka o aktivnosti	Nesigurnost trenda emisije izražena preko ukupne emisije
			kt	kt	%	%	%	%	%	%	%	%	%
1 A 1 Energy Industries	1 A 1 Termoelektrane, javne toplane i kotlovnice	Zn	2,73092892	2,00029991	3,0	100,0	100,04	6,27070	0,01009	0,05443	1,00929	0,23092	1,03537
1 A 2 Manufacturing Industries and Construction	1 A 2 Izgaranje u industriji	Zn	5,62896532	2,16761182	3,0	100,0	100,04	6,79520	0,07391	0,05898	7,39127	0,25024	7,39550
1 A 3 b Road Transport	1 A 3 b Cestovni promet	Zn	1,67948085	2,75047588	3,0	200,0	200,02	17,23900	0,03514	0,07484	7,02822	0,31753	7,03539
1 A 3 Other mobile source and machinery	1 A 3 Ostali pokretni izvori i strojevi	Zn	0,16562434	0,10972308	3,0	400,0	400,01	1,37529	0,00093	0,00299	0,37116	0,01267	0,37138
1 A 4 a Commercial, institutional combustion	1 A 4 a Izgaranje u sektoru opće potrošnje	Zn	0,30460203	0,25197113	5,0	400,0	400,03	3,15842	0,00034	0,00686	0,13648	0,04848	0,14483
1 A 4 b Residential combustion , 1 A 4 c Combustion in Agriculture/Forestry/ Fishing	1 A 4 b Izgaranje u sektoru kućanstva, 1 A 4 c Izgaranje u Poljoprivredi/šumarstvu/ribarstvu	Zn	22,9264254	23,4870564	3,0	400,0	400,01	294,39218	0,09676	0,63910	38,70370	2,71145	38,79856
1 B Extraction and distribution of fossil fuels	1 B Ekstrakcija i distribucija fosilnih goriva	Zn	0,15842718	0,02185102	10,0	400,0	400,12	0,27396	0,00315	0,00059	1,25952	0,00841	1,25954
1 B 2 a iv Refining / storage	1 B 2 a iv Rafiniranje / skladištenje	Zn	0,15376643	0,07383838	3,0	400,0	400,01	0,92551	0,00162	0,00201	0,64965	0,00852	0,64971
2 A 3 Glass production	2 A 3 Proizvodnja stakla	Zn	0,1019313	0,1043989	3,0	400,0	400,01	1,30856	0,00043	0,00284	0,17287	0,01205	0,17329
2 C Metal production	2 C Industrija metala	Zn	2,68198038	0,48879	7,5	400,0	400,07	6,12751	0,05004	0,01330	20,01448	0,14107	20,01498
2 G Other product use	2 G Ostala uporaba proizvoda	Zn	0,2169857	0,45605387	10,0	400,0	400,12	5,71791	0,00728	0,01241	2,91274	0,17550	2,91802
3 F Field burning of agricultural residues	3 F Spaljivanje poljoprivrednih ostataka na polju	Zn	0,00060991	0,00040473	50,0	100,0	111,80	0,00142	0,00000	0,00001	0,00034	0,00078	0,00085
5 C Waste incineration	5 C Termička obrada otpada	Zn	0,000525	0,000000	50,0	100,0	111,80	0,00000	0,00001	0,00000	0,00124	0,00000	0,00124
5 C 1 b v Cremation	5 C 1 b v Kremiranje	Zn	0,00023442	0,00103117	50,0	100,0	111,80	0,00361	0,00002	0,00003	0,00225	0,00198	0,00300
TOTAL			36,75	31,91	% Uncertainty in total inventory			**295,19**			Trend uncertainty:		**44,97**

NFR Source		Pollutant	Emissions 1990	Emissions 2018	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total emissions in year 2013	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into the trend in total national emissions
	NFR Izvor	Onečišćujuća tvar	Emisija 1990	Emisija 2018	Nesigurnost podatka o aktivnosti	Nesigurnost faktora emisije	Ukupna nesigurnost	Ukupna nesigurnost kao % ukupne emisije u promatranoj godini t	Tip A osjetljivost	Tip B osjetljivost	Nesigurnost trenda emisije izražena preko nesigurnosti faktora emisije	Nesigurnost trenda emisije izražena preko nesigurnosti podatka o aktivnosti	Nesigurnost trenda emisije izražena preko ukupne emisije
			kg	kg	%	%	%	%	%	%	%	%	%
1 A 1 Energy Industries	1 A 1 Termoelektrane, javne toplane i kotlovnice	PCB	1,083	2,133	3,0	100,0	100,04	0,51818	0,00250	0,00442	0,25040	0,01874	0,25110
1 A 2 Manufacturing Industries and Construction	1 A 2 Izgaranje u industriji	PCB	2,12	0,51267719	3,0	100,0	100,04	0,12456	-0,00269	0,00106	-0,26866	0,00451	0,26870
1 A 3 b Road Transport	1 A 3 b Cestovni promet	PCB	0,00011097	0,00018895	3,0	400,0	400,01	0,00018	0,00000	0,00000	0,00008	0,00000	0,00008
1 A 3 Other mobile source and machinery	1 A 3 Ostali pokretni izvori i strojevi	PCB	4,0E-02	2,8E-03	3,0	400,0	400,01	0,00270	-0,00006	0,00001	-0,02589	0,00002	0,02589
1 A 4 a Commercial, institutional combustion	1 A 4 a Izgaranje u sektoru opće potrošnje	PCB	0,15	2,3E-04	5,0	400,0	400,03	0,00022	-0,00027	0,00000	-0,10729	0,00000	0,10729
1 A 4 b Residential combustion , 1 A 4 c Combustion in Agriculture/Forestry/ Fishing	1 A 4 b Izgaranje u sektoru kućanstva, 1 A 4 c Izgaranje u Poljoprivredi/šumarstvu/ribarstvu	PCB	0,75	0,02	3,0	400,0	400,01	0,01583	-0,00130	0,00003	-0,51954	0,00014	0,51954
2 C Metal production	2 C Industrija metala	PCB	0,85	0,34	7,5	400	400,07	0,32978	-0,00079	0,00070	-0,31692	0,00746	0,31700
2 K Consumption of POPs and heavy metals (e.g. electrical and scientific equipment)	2 K Uporaba POO i teških metala (npr. električna i znanstvaena oprema)	PCB	477,80	408,78	50	400	403,11	400,16917	0,00258	0,84669	1,03264	59,87019	59,87910
5 C Waste incineration	5 C Termička obrada otpada	PCB	0,002800	0,000000	50,0	100	111,80	0,00000	0,00000	0,00000	-0,00049	0,00000	0,00049
5 C 1 b v Cremation	5 C 1 b v Kremiranje	PCB	6,0E-04	2,6E-03	50,0	100	111,80	0,00072	0,00000	0,00001	0,00044	0,00039	0,00059
TOTAL			482,80	411,79	% Uncertainty in total inventory			400,17			Trend uncertainty:		59,88

12.8. Appendix 8. Influence of recalculations 1990 – 2017 in respect to pollutant and SNAP97 sector

Pollutant	SO_2											
SNAP sector	01	02	03	04	05	06	07	08	09	10	11	TOTAL
1990	0%	0%	-5%	-2%	-	0%	0%	0%	0%	-	0%	-1.1%
1991	0%	0%	-4%	-2%	-	0%	1%	0%	0%	-	0%	-0.7%
1992	0%	0%	6%	0%	-	0%	1%	0%	0%	-	0%	0.8%
1993	0%	0%	-2%	0%	-	0%	1%	0%	0%	-	0%	-0.2%
1994	0%	0%	-2%	0%	-	0%	3%	0%	0%	-	0%	-0.2%
1995	0%	0%	-3%	0%	-	0%	1%	0%	0%	-	0%	-0.5%
1996	0%	0%	-6%	0%	-	0%	4%	0%	0%	-	0%	-0.5%
1997	0%	0%	-1%	0%	-	0%	4%	0%	0%	-	0%	0.1%
1998	0%	0%	-4%	0%	-	0%	0%	0%	0%	-	0%	-0.5%
1999	0%	0%	-6%	0%	-	0%	0%	0%	0%	-	0%	-0.6%
2000	0%	0%	-4%	0%	-	0%	0%	0%	0%	-	0%	-0.7%
2001	0%	0%	0%	0%	-	0%	0%	0%	0%	-	0%	0.0%
2002	0%	0%	0%	0%	-	0%	-1%	0%	0%	-	0%	0.0%
2003	0%	0%	0%	0%	-	0%	0%	0%	0%	-	0%	0.0%
2004	0%	0%	0%	0%	-	0%	0%	0%	0%	-	0%	0.0%
2005	0%	0%	0%	0%	-	0%	-2%	0%	0%	-	0%	-0.1%
2006	0%	0%	0%	0%	-	0%	0%	0%	0%	-	0%	0.0%
2007	0%	0%	0%	0%	-	0%	0%	0%	0%	-	0%	0.0%
2008	0%	0%	0%	0%	-	0%	0%	0%	0%	-	0%	0.0%
2009	0%	0%	0%	0%	-	0%	-1%	0%	0%	-	0%	0.0%
2010	0%	0%	0%	0%	-	0%	0%	0%	0%	-	0%	0.0%
2011	0%	0%	0%	0%	-	0%	-1%	0%	0%	-	0%	0.0%
2012	-4%	0%	0%	0%	-	0%	-7%	0%	0%	-	0%	-2.6%
2013	0%	0%	0%	0%	-	0%	3%	0%	0%	-	0%	0.0%
2014	0%	0%	0%	0%	-	0%	-4%	0%	0%	-	0%	0.0%
2015	0%	0%	0%	0%	-	0%	-3%	0%	0%	-	0%	0.1%
2016	0%	0%	1%	0%	-	0%	0%	0%	0%	-	0%	0.1%
2017	0%	0%	5%	0%	-	0%	0%	1%	0%	-	-15%	0.9%

Pollutant	NOx											
SNAP sector	01	02	03	04	05	06	07	08	09	10	11	TOTAL
1990	0%	-1%	-3%	0%	-	0%	-2%	0%	-6%	0%	0%	-1.3%
1991	0%	-1%	-2%	0%	-	0%	-2%	0%	-6%	-1%	0%	-1.1%
1992	0%	-1%	3%	0%	-	0%	-2%	0%	-6%	-4%	0%	-0.8%
1993	0%	-1%	-1%	0%	-	0%	0%	0%	-6%	-5%	0%	-0.7%
1994	0%	-1%	-1%	0%	-	0%	1%	0%	-6%	-4%	0%	-0.3%
1995	0%	-1%	-1%	0%	-	0%	0%	0%	-7%	-5%	0%	-0.8%
1996	0%	-1%	-1%	0%	-	0%	1%	0%	-7%	-5%	0%	-0.2%
1997	0%	-1%	9%	0%	-	0%	1%	0%	-7%	-4%	0%	0.9%
1998	0%	-1%	-3%	0%	-	0%	-1%	0%	-7%	-4%	0%	-1.3%
1999	0%	-1%	-2%	0%	-	0%	-1%	0%	-6%	-3%	0%	-1.0%
2000	0%	-1%	-3%	0%	-	0%	-2%	0%	-7%	-3%	0%	-1.4%
2001	0%	-1%	0%	0%	-	0%	-1%	0%	-6%	-3%	0%	-0.8%
2002	0%	-1%	0%	0%	-	0%	-2%	0%	-6%	-2%	0%	-1.0%
2003	0%	-1%	0%	0%	-	0%	-2%	0%	-6%	-1%	0%	-0.9%
2004	0%	-1%	0%	0%	-	0%	-3%	0%	-6%	-2%	0%	-1.4%
2005	0%	-1%	0%	0%	-	0%	-5%	0%	-6%	-1%	0%	-2.0%
2006	0%	-2%	0%	0%	-	0%	-4%	0%	-6%	4%	0%	-1.1%
2007	0%	-3%	0%	0%	-	0%	-3%	0%	-6%	2%	0%	-1.2%
2008	0%	-4%	0%	0%	-	0%	-4%	0%	-6%	17%	0%	0.0%
2009	0%	-5%	0%	0%	-	0%	-4%	0%	-6%	-6%	0%	-2.5%
2010	0%	-6%	0%	0%	-	0%	-4%	0%	-5%	3%	0%	-1.8%
2011	0%	-6%	0%	0%	-	0%	-4%	0%	-5%	4%	0%	-1.6%
2012	0%	-8%	0%	0%	-	0%	-7%	0%	-6%	-1%	0%	-3.3%
2013	0%	-9%	-1%	1%	-	0%	-7%	0%	-6%	-4%	0%	-4.0%
2014	0%	-10%	0%	0%	-	0%	-4%	0%	-6%	-3%	0%	-3.1%
2015	0%	-10%	0%	0%	-	0%	-5%	0%	-6%	-2%	0%	-3.5%
2016	0%	-11%	1%	0%	-	0%	-2%	0%	-7%	-8%	0%	-3.0%
2017	1%	-12%	8%	0%	-	0%	0%	0%	-6%	2%	-15%	-0.2%

Pollutant	NMVOC											
SNAP sector	01	02	03	04	05	06	07	08	09	10	11	TOTAL
1990	0%	3%	-7%	0%	0%	-3%	0%	0%	-77%	-26%	0%	-3.8%
1991	0%	1%	-4%	0%	0%	-3%	-1%	0%	-77%	-25%	0%	-4.3%
1992	0%	1%	-1%	0%	0%	-3%	-2%	-1%	-76%	-22%	0%	-4.5%
1993	0%	1%	-3%	0%	0%	-2%	0%	0%	-76%	-22%	0%	-3.9%
1994	0%	2%	-3%	0%	0%	-1%	0%	-2%	-76%	-22%	0%	-4.0%
1995	0%	2%	-3%	0%	0%	0%	-1%	0%	-76%	-21%	0%	-3.1%
1996	0%	2%	-3%	0%	0%	-1%	0%	0%	-77%	-23%	0%	-3.2%
1997	0%	2%	0%	0%	0%	-2%	0%	0%	-76%	-23%	0%	-3.8%
1998	0%	2%	-6%	0%	0%	-2%	-1%	0%	-76%	-22%	0%	-4.0%
1999	0%	2%	-4%	0%	0%	-1%	-1%	0%	-76%	-21%	0%	-3.9%
2000	0%	2%	-1%	0%	0%	-3%	-2%	0%	-74%	-9%	0%	-3.0%
2001	0%	2%	0%	0%	0%	-2%	-1%	0%	-74%	-10%	0%	-2.9%
2002	0%	3%	0%	0%	0%	-2%	-1%	0%	-74%	-8%	0%	-2.8%
2003	0%	3%	0%	0%	0%	-1%	-1%	0%	-75%	-5%	0%	-2.2%
2004	0%	3%	0%	0%	0%	4%	-1%	0%	-74%	-5%	0%	-0.4%
2005	0%	3%	0%	0%	0%	1%	-3%	0%	-75%	-2%	0%	-1.4%
2006	0%	5%	0%	0%	0%	3%	0%	0%	-75%	0%	0%	-0.1%
2007	0%	6%	0%	0%	0%	1%	3%	0%	-76%	1%	0%	0.0%
2008	0%	8%	8%	0%	0%	2%	4%	0%	-75%	-1%	0%	0.5%
2009	0%	10%	6%	0%	0%	5%	5%	0%	-74%	2%	0%	2.0%
2010	0%	12%	0%	0%	0%	4%	6%	0%	-70%	4%	0%	3.4%
2011	0%	15%	0%	0%	0%	5%	7%	0%	-70%	6%	0%	4.1%
2012	0%	18%	0%	0%	0%	4%	12%	0%	-68%	5%	0%	4.9%
2013	0%	21%	0%	0%	0%	4%	9%	0%	-68%	5%	0%	5.3%
2014	0%	25%	0%	-0.02%	0%	3%	10%	0%	-64%	4%	0%	5.7%
2015	0%	27%	0%	-0.02%	0%	3%	7%	0%	-64%	3%	0%	6.4%
2016	0%	33%	1%	-0.02%	0%	5%	7%	0%	-60%	3%	0%	8.0%
2017	0%	38%	2%	-0.02%	0%	12%	7%	0%	-57%	6%	-15%	11.9%

Pollutant	CO											
SNAP sector	01	02	03	04	05	06	07	08	09	10	11	TOTAL
1990	0%	0%	-9%	0%	-	0%	0%	-1%	-18%	100%	0%	-0.6%
1991	0%	0%	-6%	0%	-	0%	0%	0%	-17%	100%	0%	-0.3%
1992	0%	0%	-2%	0%	-	0%	-1%	-3%	-18%	100%	0%	-0.5%
1993	0%	0%	-3%	0%	-	0%	0%	0%	-18%	100%	0%	-0.1%
1994	0%	0%	-4%	0%	-	0%	0%	-3%	-19%	100%	0%	0.0%
1995	0%	0%	-5%	0%	-	0%	0%	0%	-21%	100%	0%	-0.1%
1996	0%	0%	-6%	0%	-	0%	1%	0%	-20%	100%	0%	0.1%
1997	0%	0%	-3%	0%	-	0%	1%	0%	-20%	100%	0%	0.2%
1998	0%	0%	-6%	0%	-	0%	1%	0%	-20%	100%	0%	0.3%
1999	0%	0%	-6%	0%	-	0%	1%	0%	-20%	100%	0%	0.3%
2000	0%	0%	0%	0%	-	0%	1%	0%	-20%	100%	0%	0.5%
2001	0%	0%	0%	0%	-	0%	1%	0%	-19%	100%	0%	0.2%
2002	0%	0%	0%	0%	-	0%	1%	0%	-18%	100%	0%	0.3%
2003	0%	0%	0%	0%	-	0%	1%	0%	-18%	100%	0%	0.4%
2004	0%	0%	0%	0%	-	0%	1%	0%	-18%	100%	0%	0.3%
2005	0%	0%	0%	0%	-	0%	-2%	0%	-18%	100%	0%	-0.5%
2006	0%	2%	0%	0%	-	0%	5%	0%	-17%	100%	0%	2.4%
2007	0%	5%	0%	0%	-	0%	6%	0%	-17%	100%	0%	3.7%
2008	0%	8%	2%	0%	-	0%	6%	0%	-17%	100%	0%	5.5%
2009	0%	11%	2%	0%	-	0%	6%	0%	-18%	100%	0%	7.1%
2010	0%	14%	0%	0%	-	0%	7%	0%	-17%	100%	0%	9.3%
2011	0%	17%	0%	0%	-	0%	8%	0%	-17%	100%	0%	12.0%
2012	3%	21%	0%	0%	-	0%	6%	0%	-19%	100%	0%	13.8%
2013	0%	26%	1%	0%	-	0%	4%	0%	-19%	100%	0%	16.5%
2014	0%	32%	0%	0%	-	0%	5%	0%	-18%	100%	0%	19.6%
2015	0%	35%	1%	0%	-	0%	3%	0%	-19%	100%	0%	22.1%
2016	0%	42%	1%	0%	-	0%	4%	0%	-20%	100%	0%	25.7%
2017	1%	48%	1%	0%	-	0%	3%	0%	-18%	100%	-15%	28.4%

Pollutant	NH_3											
SNAP sector	01	02	03	04	05	06	07	08	09	10	11	TOTAL
1990	0%	0%	0%	0%	-	0%	80%	0%	0%	-6%	0%	-4.8%
1991	0%	0%	0%	0%	-	0%	85%	0%	0%	-9%	0%	-7.2%
1992	0%	0%	0%	0%	-	0%	1%	0%	0%	-10%	0%	-8.4%
1993	0%	0%	0%	0%	-	0%	1%	0%	0%	-10%	0%	-8.5%
1994	0%	0%	0%	0%	-	0%	3%	0%	0%	-11%	0%	-8.8%
1995	0%	0%	0%	0%	-	0%	3%	0%	0%	-12%	0%	-9.4%
1996	0%	0%	0%	0%	-	0%	4%	0%	0%	-10%	0%	-8.7%
1997	0%	0%	0%	0%	-	0%	4%	0%	0%	-12%	0%	-9.3%
1998	0%	0%	0%	1%	-	0%	4%	0%	0%	-11%	0%	-8.8%
1999	0%	0%	2%	0%	-	0%	-7%	0%	0%	-11%	0%	-9.3%
2000	0%	0%	0%	0%	-	0%	-7%	0%	0%	-9%	0%	-7.7%
2001	0%	0%	0%	0%	-	0%	-6%	0%	0%	-9%	0%	-8.0%
2002	0%	0%	0%	0%	-	0%	-6%	0%	0%	-9%	0%	-7.3%
2003	0%	0%	0%	0%	-	0%	-6%	0%	0%	-10%	0%	-8.4%
2004	0%	0%	0%	0%	-	0%	-3%	0%	0%	-12%	0%	-9.8%
2005	0%	1%	0%	0%	-	0%	-2%	0%	0%	-6%	0%	-4.8%
2006	0%	3%	0%	0%	-	0%	-5%	0%	0%	-6%	0%	-5.2%
2007	0%	5%	24%	0%	-	0%	-6%	0%	0%	7%	0%	6.6%
2008	0%	7%	16%	0%	-	0%	-5%	0%	0%	-14%	0%	-11.6%
2009	0%	9%	0%	0%	-	0%	-5%	0%	0%	-6%	0%	-4.7%
2010	0%	11%	0%	0%	-	0%	-7%	0%	0%	-6%	0%	-4.1%
2011	0%	14%	0%	0%	-	0%	-8%	0%	0%	-9%	0%	-6.9%
2012	0%	16%	0%	0%	-	0%	-7%	0%	0%	-14%	0%	-10.6%
2013	0%	20%	0%	0%	-	0%	-9%	0%	0%	-13%	0%	-10.0%
2014	0%	22%	0%	0%	-	0%	-8%	0%	1%	-17%	0%	-13.2%
2015	0%	26%	0%	0%	-	0%	-8%	0%	0%	-18%	0%	-14.0%
2016	0%	30%	0%	0%	-	0%	-8%	0%	1%	-10%	-15%	-6.5%
2017	0%	0%	0%	0%	-	0%	80%	0%	0%	-6%	0%	-4.8%

Pollutant	TSP										
SNAP sector	01	02	03	04	05	06	07	08	09	10	11	TOTAL
1990	0%	3%	-9%	-2%	0%	0%	2%	0%	0%	0%	-	1.0%
1991	0%	1%	-6%	-1%	0%	0%	-4%	0%	0%	0%	-	0.3%
1992	0%	2%	-1%	1%	0%	0%	-4%	0%	0%	-2%	-	0.6%
1993	0%	2%	-3%	1%	0%	0%	6%	0%	0%	-2%	-	1.0%
1994	1%	2%	-4%	0%	0%	0%	7%	0%	0%	-2%	-	1.0%
1995	1%	2%	-5%	0%	0%	0%	4%	0%	0%	-2%	-	1.0%
1996	1%	2%	-7%	0%	0%	0%	7%	0%	0%	-2%	-	1.1%
1997	0%	2%	-2%	0%	0%	0%	6%	0%	0%	-1%	-	1.2%
1998	0%	2%	-7%	0%	0%	0%	3%	0%	0%	-1%	-	1.1%
1999	0%	2%	-10%	0%	0%	0%	4%	0%	0%	-1%	-	1.2%
2000	0%	3%	0%	0%	-	0%	3%	0%	0%	-2%	-	1.4%
2001	0%	3%	0%	0%	-	0%	2%	0%	0%	-1%	-	1.5%
2002	0%	3%	0%	0%	-	0%	2%	0%	0%	-1%	-	1.4%
2003	0%	3%	0%	0%	-	0%	4%	0%	0%	-1%	-	1.5%
2004	0%	3%	0%	0%	-	3%	2%	0%	0%	-1%	-	1.5%
2005	0%	3%	0%	0%	-	3%	1%	0%	0%	-1%	-	1.6%
2006	0%	6%	0%	0%	-	5%	-2%	0%	0%	0%	-	3%
2007	0%	10%	0%	0%	-	5%	3%	0%	0%	0%	-	5%
2008	0%	15%	12%	0%	-	6%	3%	0%	0%	0%	-	6.4%
2009	0%	20%	9%	0%	-	9%	5%	0%	0%	0%	-	9.0%
2010	0%	25%	0%	0%	-	5%	7%	0%	0%	0%	-	12.4%
2011	0%	32%	0%	0%	-	4%	11%	0%	0%	-1%	-	15.0%
2012	-1%	39%	0%	0%	-	4%	12%	0%	0%	0%	-	18.4%
2013	0%	49%	1%	0%	-	3%	14%	0%	0%	0%	-	23.4%
2014	0%	61%	0%	0%	-	0%	12%	0%	0%	0%	-	24.9%
2015	0%	72%	0%	0%	-	0%	14%	0%	0%	-1%	-	29.7%
2016	0%	91%	5%	0%	-	0%	17%	0%	0%	-1%	-	34.5%
2017	0%	113%	4%	0%	-	0%	16%	0%	0%	0%	-	37.4%

Pollutant	$PM_{2.5}$											
SNAP sector	01	02	03	04	05	06	07	08	09	10	11	TOTAL
1990	0%	3%	-9%	-3%	0%	0%	-4%	0%	0%	0%	-	1.4%
1991	0%	1%	-6%	-2%	0%	0%	-7%	0%	0%	-1%	-	0.6%
1992	0%	1%	-1%	1%	0%	0%	-7%	0%	0%	-4%	-	0.9%
1993	0%	2%	-3%	1%	0%	0%	-2%	0%	0%	-5%	-	1.1%
1994	0%	2%	-4%	0%	0%	0%	0%	0%	0%	-4%	-	1.2%
1995	0%	2%	-5%	0%	0%	0%	-1%	0%	0%	-4%	-	1.2%
1996	0%	2%	-6%	0%	0%	0%	2%	0%	0%	-5%	-	1.5%
1997	0%	2%	-1%	0%	0%	0%	1%	0%	0%	-5%	-	1.6%
1998	0%	2%	-6%	0%	0%	0%	-3%	0%	0%	-4%	-	1.4%
1999	0%	2%	-9%	0%	0%	0%	-3%	0%	0%	-3%	-	1.5%
2000	0%	2%	0%	0%	-	0%	-4%	0%	0%	-4%	-	1.7%
2001	0%	3%	0%	0%	-	0%	-4%	0%	0%	-3%	-	1.8%
2002	0%	3%	0%	0%	-	0%	-5%	0%	0%	-3%	-	1.8%
2003	0%	3%	0%	0%	-	0%	-3%	0%	0%	-2%	-	2.1%
2004	0%	3%	0%	0%	-	0%	-5%	0%	0%	-3%	-	2.1%
2005	0%	3%	0%	0%	-	0%	-6%	0%	0%	-1%	-	2.1%
2006	0%	6%	0%	0%	-	0%	-11%	0%	0%	-1%	-	4.3%
2007	0%	10%	0%	0%	-	0%	-5%	0%	0%	0%	-	7.5%
2008	0%	15%	12%	0%	-	0%	-6%	0%	0%	0%	-	11.1%
2009	0%	19%	9%	0%	-	0%	-4%	0%	0%	0%	-	15.1%
2010	0%	25%	0%	0%	-	0%	-1%	0%	0%	0%	-	19.9%
2011	0%	32%	0%	0%	-	0%	4%	0%	0%	-1%	-	25.3%
2012	-1%	39%	0%	0%	-	0%	3%	0%	0%	0%	-	31.2%
2013	0%	49%	1%	0%	-	0%	3%	0%	0%	0%	-	38.3%
2014	0%	61%	0%	0%	-	0%	3%	0%	0%	0%	-	46.2%
2015	0%	72%	0%	0%	-	0%	4%	0%	0%	-2%	-	55.0%
2016	0%	91%	2%	0%	-	0%	7%	0%	0%	-2%	-	66.3%
2017	0%	113%	2%	0%	-	0%	4%	0%	0%	0%	-	77.0%

Pollutant	PM_{10}											
SNAP sector	01	02	03	04	05	06	07	08	09	10	11	TOTAL
1990	0%	3%	-9%	-2%	0%	0%	-3%	0%	0%	0%	-	1.0%
1991	0%	1%	-6%	-2%	0%	0%	-7%	0%	0%	0%	-	0.4%
1992	0%	1%	-1%	0%	0%	0%	-7%	0%	0%	-1%	-	0.7%
1993	0%	2%	-3%	0%	0%	0%	-1%	0%	0%	-1%	-	0.9%
1994	0%	2%	-4%	0%	0%	0%	1%	0%	0%	-1%	-	1.0%
1995	0%	2%	-5%	0%	0%	0%	-1%	0%	0%	-1%	-	1.0%
1996	0%	2%	-7%	0%	0%	0%	2%	0%	0%	-1%	-	1.2%
1997	0%	2%	-2%	0%	0%	0%	1%	0%	0%	-1%	-	1.3%
1998	0%	2%	-7%	0%	0%	0%	-2%	0%	0%	-1%	-	1.1%
1999	0%	2%	-10%	0%	0%	0%	-2%	0%	0%	-1%	-	1.2%
2000	0%	2%	0%	0%	-	0%	-3%	0%	0%	-1%	-	1.4%
2001	0%	3%	0%	0%	-	0%	-3%	0%	0%	-1%	-	1.5%
2002	0%	3%	0%	0%	-	0%	-4%	0%	0%	-1%	-	1.5%
2003	0%	3%	0%	0%	-	0%	-2%	0%	0%	0%	-	1.7%
2004	0%	3%	0%	0%	-	0%	-4%	0%	0%	-1%	-	1.7%
2005	0%	3%	0%	0%	-	0%	-4%	0%	0%	0%	-	1.8%
2006	0%	6%	0%	0%	-	0%	-9%	0%	0%	0%	-	3.5%
2007	0%	10%	0%	0%	-	0%	-4%	0%	0%	0%	-	5.9%
2008	0%	15%	12%	0%	-	0%	-4%	0%	0%	0%	-	8.4%
2009	0%	20%	9%	0%	-	0%	-3%	0%	0%	0%	-	11.6%
2010	0%	25%	0%	0%	-	0%	0%	0%	0%	0%	-	15.7%
2011	0%	32%	0%	0%	-	0%	4%	0%	0%	0%	-	19.6%
2012	-1%	39%	0%	0%	-	0%	3%	0%	0%	0%	-	24.0%
2013	0%	49%	1%	0%	-	0%	4%	0%	0%	0%	-	29.3%
2014	0%	61%	0%	0%	-	0%	4%	0%	0%	0%	-	33.4%
2015	0%	72%	0%	0%	-	0%	4%	0%	0%	0%	-	39.8%
2016	0%	91%	4%	0%	-	0%	7%	0%	0%	0%	-	46.8%
2017	0%	113%	3%	0%	-	0%	5%	0%	0%	0%	-	52.3%

Pollutant	Cd											
SNAP sector	01	02	03	04	05	06	07	08	09	10	11	TOTAL
1990	0%	0%	-4%	0%	-	0%	-71%	0%	57%	100%	-	-0.9%
1991	-3%	-5%	-2%	0%	-	0%	-68%	0%	51%	100%	-	-4.0%
1992	0%	0%	-1%	0%	-	0%	-71%	0%	38%	100%	-	-0.6%
1993	0%	0%	-1%	0%	-	0%	-72%	0%	54%	100%	-	-0.6%
1994	0%	0%	-1%	0%	-	0%	-73%	0%	50%	100%	-	-0.8%
1995	0%	0%	-2%	0%	-	0%	-72%	0%	55%	100%	-	-0.8%
1996	0%	0%	-2%	0%	-	0%	-69%	0%	50%	100%	-	-0.8%
1997	0%	0%	-2%	0%	-	0%	-67%	0%	49%	100%	-	-0.9%
1998	0%	0%	-1%	0%	-	0%	-70%	0%	49%	100%	-	-1.0%
1999	0%	0%	-2%	0%	-	0%	-70%	0%	50%	100%	-	-1.1%
2000	0%	0%	1%	0%	-	0%	-68%	0%	49%	100%	-	-0.8%
2001	0%	0%	0%	0%	-	0%	-69%	0%	45%	100%	-	-0.9%
2002	0%	0%	0%	0%	-	0%	-70%	0%	45%	100%	-	-1.0%
2003	0%	0%	0%	0%	-	0%	-71%	0%	46%	100%	-	-1.0%
2004	0%	0%	0%	0%	-	0%	-69%	0%	46%	100%	-	-1.0%
2005	0%	0%	0%	0%	-	0%	-70%	0%	45%	100%	-	-1.1%
2006	0%	0%	0%	0%	-	0%	-70%	0%	42%	100%	-	-1.2%
2007	0%	0%	0%	0%	-	0%	-71%	0%	45%	100%	-	-1.4%
2008	0%	0%	9%	0%	-	0%	-71%	0%	46%	100%	-	-0.7%
2009	0%	0%	7%	0%	-	0%	-71%	0%	50%	100%	-	-0.9%
2010	0%	0%	0%	0%	-	0%	-71%	0%	41%	100%	-	-1.4%
2011	0%	0%	0%	0%	-	0%	-71%	0%	47%	100%	-	-1.4%
2012	0%	0%	0%	-1%	-	0%	-73%	0%	49%	100%	-	-1.5%
2013	0%	0%	0%	10%	-	0%	-73%	0%	56%	100%	-	-0.4%
2014	0%	0%	0%	-5%	-	0%	-72%	0%	67%	100%	-	-2.2%
2015	0%	0%	0%	-5%	-	0%	-73%	0%	75%	100%	-	-2.1%
2016	0%	0%	0%	-6%	-	0%	-74%	0%	80%	100%	-	-2.1%
2017	0%	0%	2%	-7%	-	0%	-74%	0%	68%	100%	-	-2.4%

Pollutant	Hg										
SNAP sector	01	02	03	04	05	06	07	08	09	10	11	TOTAL
1990	0%	0%	-2%	0%	0%	-36%	1%	0%	5%	100%	-	-2.5%
1991	0%	0%	-2%	0%	0%	-36%	1%	0%	3%	100%	-	-2.3%
1992	0%	0%	-1%	0%	0%	-36%	1%	0%	3%	100%	-	-2.2%
1993	0%	0%	-1%	0%	0%	-36%	1%	0%	3%	100%	-	-7.7%
1994	0%	0%	-1%	0%	0%	-36%	2%	0%	3%	100%	-	-8.4%
1995	0%	0%	-1%	0%	0%	-36%	1%	0%	3%	100%	-	-8.5%
1996	0%	0%	-1%	0%	0%	-36%	2%	0%	3%	100%	-	-8.4%
1997	0%	0%	-1%	0%	0%	-36%	2%	0%	3%	100%	-	-7.4%
1998	0%	0%	-2%	0%	0%	-36%	1%	0%	3%	100%	-	-7.2%
1999	0%	0%	-1%	0%	0%	-36%	1%	0%	3%	100%	-	-6.5%
2000	0%	0%	0%	0%	0%	-36%	1%	0%	3%	100%	-	-4.9%
2001	0%	0%	0%	0%	0%	-36%	1%	0%	3%	100%	-	-4.7%
2002	0%	0%	0%	0%	0%	-36%	1%	0%	3%	100%	-	-4.3%
2003	0%	0%	0%	0%	0%	-36%	1%	0%	3%	100%	-	-4.1%
2004	0%	0%	0%	0%	0%	-36%	1%	0%	2%	100%	-	-4.0%
2005	0%	0%	0%	0%	0%	-36%	1%	0%	2%	100%	-	-3.9%
2006	0%	0%	0%	0%	0%	-36%	1%	0%	2%	100%	-	-4.1%
2007	0%	0%	0%	0%	0%	-36%	1%	0%	2%	100%	-	-3.9%
2008	0%	0%	0%	0%	0%	-36%	1%	0%	2%	100%	-	-4.0%
2009	0%	0%	0%	0%	0%	-36%	0%	0%	2%	100%	-	-4.5%
2010	0%	0%	0%	0%	0%	-36%	1%	0%	2%	100%	-	-4.4%
2011	0%	0%	0%	0%	0%	-36%	1%	0%	2%	100%	-	-4.5%
2012	0%	0%	0%	0%	0%	-36%	0%	0%	2%	100%	-	-4.6%
2013	0%	0%	0%	4%	0%	-36%	-1%	0%	2%	100%	-	-4.3%
2014	0%	0%	0%	-3%	0%	-36%	-1%	0%	3%	100%	-	-4.9%
2015	0%	0%	0%	-2%	0%	-36%	0%	0%	3%	100%	-	-4.9%
2016	0%	0%	1%	-2%	0%	-36%	1%	0%	3%	100%	-	-4.6%
2017	0%	0%	4%	-3%	0%	-36%	1%	0%	2%	100%	-	-4.3%

Pollutant	Pb											
SNAP sector	01	02	03	04	05	06	07	08	09	10	11	TOTAL
1990	0%	0%	-8%	0%	-	0%	-4%	-2%	-5%	100%	-	-3.0%
1991	0%	0%	-5%	0%	-	0%	-8%	-1%	-4%	100%	-	-7.4%
1992	0%	0%	-2%	0%	-	0%	-15%	-7%	-3%	100%	-	-14.3%
1993	0%	0%	-3%	0%	-	0%	-12%	0%	-4%	100%	-	-11.5%
1994	0%	0%	-3%	0%	-	0%	-12%	-4%	-4%	100%	-	-12.0%
1995	0%	0%	-4%	0%	-	0%	-21%	-1%	-5%	100%	-	-20.1%
1996	0%	0%	-5%	0%	-	0%	-24%	0%	-4%	100%	-	-23.4%
1997	0%	0%	-4%	0%	-	0%	-32%	0%	-4%	100%	-	-30.8%
1998	0%	0%	-4%	0%	-	0%	-36%	0%	-3%	100%	-	-35.2%
1999	0%	0%	-5%	0%	-	0%	-39%	0%	-4%	100%	-	-37.9%
2000	0%	0%	1%	0%	-	0%	-49%	0%	-3%	100%	-	-47.6%
2001	0%	0%	0%	0%	-	0%	-56%	0%	-3%	100%	-	-54.4%
2002	0%	0%	0%	0%	-	0%	-61%	0%	-3%	100%	-	-57.1%
2003	0%	0%	0%	0%	-	0%	-68%	0%	-4%	100%	-	-56.5%
2004	0%	0%	0%	0%	-	0%	-77%	0%	-3%	100%	-	-66.5%
2005	0%	0%	0%	0%	-	0%	-85%	0%	-3%	100%	-	-75.5%
2006	0%	0%	0%	0%	-	0%	0%	0%	-3%	100%	-	-0.1%
2007	0%	0%	0%	0%	-	0%	0%	0%	-3%	100%	-	-0.2%
2008	0%	0%	3%	0%	-	0%	-1%	0%	-3%	100%	-	-0.4%
2009	0%	0%	3%	0%	-	0%	-2%	0%	-3%	100%	-	-0.9%
2010	0%	0%	0%	0%	-	0%	-2%	0%	-5%	100%	-	-1.0%
2011	0%	0%	0%	0%	-	0%	-2%	0%	-5%	100%	-	-1.3%
2012	-3%	0%	0%	-2%	-	0%	-5%	0%	-4%	100%	-	-3.0%
2013	0%	0%	0%	14%	-	0%	-3%	0%	-6%	100%	-	0.1%
2014	0%	0%	0%	-6%	-	0%	-1%	0%	-7%	100%	-	-1.6%
2015	0%	0%	0%	-7%	-	0%	-1%	0%	-7%	100%	-	-1.2%
2016	0%	0%	0%	-8%	-	0%	0%	0%	-8%	100%	-	-0.7%
2017	0%	0%	3%	-10%	-	0%	3%	0%	-14%	100%	-	0.7%

Pollutant	PCDD/PCDF										
SNAP sector	01	02	03	04	05	06	07	08	09	10	11	TOTAL
1990	0%	2%	-13%	-14%	-	0%	5%	0%	0%	100%	-	1.0%
1991	0%	1%	-9%	-13%	-	0%	5%	0%	0%	100%	-	0.8%
1992	0%	1%	-4%	0%	-	0%	5%	0%	0%	100%	-	1.1%
1993	0%	1%	-6%	0%	-	0%	6%	0%	0%	100%	-	1.4%
1994	0%	1%	-7%	0%	-	0%	6%	0%	0%	100%	-	1.5%
1995	0%	1%	-9%	0%	-	0%	5%	0%	0%	100%	-	1.5%
1996	1%	1%	-12%	0%	-	0%	6%	0%	0%	100%	-	1.6%
1997	1%	2%	-10%	0%	-	0%	7%	0%	0%	100%	-	1.8%
1998	1%	2%	-13%	0%	-	0%	4%	0%	0%	100%	-	1.9%
1999	3%	2%	-20%	0%	-	0%	5%	0%	0%	100%	-	1.7%
2000	1%	2%	2%	0%	-	0%	2%	0%	0%	100%	-	2.1%
2001	1%	2%	0%	0%	-	0%	3%	0%	0%	100%	-	2.1%
2002	1%	2%	0%	0%	-	0%	3%	0%	0%	100%	-	2.3%
2003	1%	2%	0%	0%	-	0%	3%	0%	0%	100%	-	2.1%
2004	1%	2%	0%	0%	-	0%	4%	0%	0%	100%	-	2.5%
2005	0%	2%	0%	0%	-	0%	3%	0%	0%	100%	-	2.3%
2006	1%	5%	0%	0%	-	0%	3%	0%	0%	100%	-	4.7%
2007	0%	9%	0%	0%	-	0%	3%	0%	0%	100%	-	6.8%
2008	0%	13%	10%	0%	-	0%	3%	0%	0%	100%	-	10.0%
2009	0%	17%	7%	0%	-	0%	2%	0%	0%	100%	-	12.9%
2010	0%	22%	0%	0%	-	0%	4%	0%	0%	100%	-	18.6%
2011	0%	28%	0%	0%	-	0%	4%	0%	0%	100%	-	22.9%
2012	0%	35%	0%	-42%	-	0%	0%	0%	0%	100%	-	26.9%
2013	0%	44%	2%	65%	-	0%	0%	0%	0%	100%	-	35.1%
2014	0%	55%	0%	-16%	-	0%	-1%	0%	0%	100%	-	40.8%
2015	0%	66%	0%	-18%	-	0%	-1%	0%	0%	100%	-	49.1%
2016	0%	82%	0%	-85%	-	0%	4%	0%	0%	100%	-	59.9%
2017	0%	103%	0%	-78%	-	0%	0%	0%	0%	100%	-	78.8%

Pollutant	PCB										
SNAP sector	01	02	03	04	05	06	07	08	09	10	11	TOTAL
1990	0%	0%	-13%	0%	-	0%	100%	0%	0%	-	-	0%
1991	0%	0%	-10%	0%	-	0%	100%	0%	0%	-	-	0%
1992	0%	0%	-5%	0%	-	0%	100%	0%	0%	-	-	0%
1993	0%	0%	-7%	0%	-	0%	100%	0%	0%	-	-	0%
1994	0%	0%	-7%	0%	-	0%	100%	0%	0%	-	-	0%
1995	0%	0%	-10%	0%	-	0%	100%	0%	0%	-	-	0%
1996	0%	0%	-14%	0%	-	0%	100%	0%	0%	-	-	0%
1997	0%	0%	-12%	0%	-	0%	100%	0%	0%	-	-	0%
1998	0%	0%	-15%	0%	-	0%	100%	0%	0%	-	-	0%
1999	0%	0%	-20%	0%	-	0%	100%	0%	0%	-	-	0%
2000	0%	0%	1%	0%	-	0%	100%	0%	0%	-	-	0%
2001	0%	0%	0%	0%	-	0%	100%	0%	0%	-	-	0%
2002	0%	0%	0%	0%	-	0%	100%	0%	0%	-	-	0%
2003	0%	0%	0%	0%	-	0%	100%	0%	0%	-	-	0%
2004	0%	0%	0%	0%	-	0%	100%	0%	0%	-	-	0%
2005	0%	0%	0%	0%	-	0%	100%	0%	0%	-	-	0%
2006	0%	0%	0%	0%	-	0%	100%	0%	0%	-	-	0%
2007	0%	1%	0%	0%	-	0%	100%	0%	0%	-	-	0%
2008	0%	1%	0%	0%	-	0%	100%	0%	0%	-	-	0%
2009	0%	1%	0%	0%	-	0%	100%	0%	0%	-	-	0%
2010	0%	1%	0%	0%	-	0%	100%	0%	0%	-	-	0%
2011	0%	1%	0%	0%	-	0.0%	100%	0%	0%	-	-	0.0002%
2012	0%	2%	0%	-82%	-	0.0%	100%	0%	0%	-	-	-0.0027%
2013	0%	3%	2%	70%	-	0.0%	100%	0%	0%	-	-	0.0289%
2014	0%	4%	0%	-16%	-	0.0%	100%	0%	0%	-	-	-0.0161%
2015	0%	6%	0%	-18%	-	0.0%	100%	0%	0%	-	-	-0.016%
2016	0%	6%	0%	-100%	-	0.0%	100%	0%	0%	-	-	-0.014%
2017	0%	5%	2%	-88%	-	0.0%	100%	0%	0%	-	-	-0.015%

Pollutant	PAHs										
SNAP sector	01	02	03	04	05	06	07	08	09	10	11	TOTAL
1990	0%	0%	-11%	-63%	-	0%	6%	0%	0%	100%	-	-7.81%
1991	0%	0%	-8%	-74%	-	0%	6%	0%	0%	100%	-	-5.29%
1992	0%	0%	-2%	0%	-	0%	6%	0%	0%	100%	-	-0.14%
1993	0%	0%	-5%	0%	-	0%	8%	0%	0%	100%	-	-0.26%
1994	0%	0%	-6%	0%	-	0%	8%	0%	0%	100%	-	-0.33%
1995	0%	0%	-7%	0%	-	0%	6%	0%	0%	100%	-	-0.41%
1996	0%	0%	-9%	0%	-	0%	8%	0%	0%	100%	-	-0.44%
1997	0%	0%	-4%	0%	-	0%	9%	0%	0%	100%	-	-0.16%
1998	0%	0%	-12%	0%	-	0%	6%	0%	0%	100%	-	-0.54%
1999	0%	0%	-15%	0%	-	0%	6%	0%	0%	100%	-	-0.56%
2000	0%	0%	-1%	0%	-	0%	6%	0%	0%	100%	-	-0.01%
2001	0%	0%	0%	0%	-	0%	6%	0%	0%	100%	-	0.04%
2002	0%	0%	0%	0%	-	0%	7%	0%	0%	100%	-	0.05%
2003	0%	0%	0%	0%	-	368%	6%	0%	0%	100%	-	0.20%
2004	0%	0%	0%	0%	-	2814%	6%	0%	0%	100%	-	1.38%
2005	0%	0%	0%	0%	-	1897%	6%	0%	0%	100%	-	0.79%
2006	0%	5%	0%	0%	-	3802%	5%	0%	0%	100%	-	5.92%
2007	0%	10%	0.0%	0%	-	2823%	5%	0%	0%	100%	-	10.83%
2008	0%	16%	3.0%	0%	-	3290%	5%	0%	0%	100%	-	16.85%
2009	0%	23%	2.4%	0%	-	3299%	4%	0%	0%	100%	-	23.45%
2010	0%	30%	0.0%	0%	-	1822%	4%	0%	0%	100%	-	29.54%
2011	0%	40%	0.0%	0%	-	1929%	4%	0%	0%	100%	-	38.44%
2012	0%	51%	0.0%	-40%	-	1028%	0%	0%	0%	100%	-	48.38%
2013	0%	64%	1.6%	65%	-	1084%	1%	0%	0%	100%	-	61.00%
2014	0%	82%	0.1%	-16%	-	242%	0%	0%	0%	100%	-	74.90%
2015	0%	100%	0.0%	-18%	-	0%	1%	0%	0%	100%	-	92.22%
2016	0%	127%	0.3%	-84%	-	0%	2%	0%	0%	100%	-	116.50%
2017	0%	161%	0.3%	-77%	-	0%	0%	0%	0%	100%	-	143.8%

Pollutant	As											
SNAP sector	01	02	03	04	05	06	07	08	09	10	11	TOTAL
1990	0%	0%	-8%	0%	-	0%	1%	0%	3%	100%	-	-0.1%
1991	0%	0%	-5%	0%	-	0%	1%	0%	3%	100%	-	-0.1%
1992	0%	0%	-2%	0%	-	0%	1%	0%	2%	100%	-	-0.1%
1993	0%	0%	-3%	0%	-	0%	1%	0%	3%	100%	-	-0.2%
1994	0%	0%	-3%	0%	-	0%	2%	0%	2%	100%	-	-0.1%
1995	0%	0%	-4%	0%	-	0%	1%	0%	2%	100%	-	-0.2%
1996	0%	0%	-5%	0%	-	0%	2%	0%	2%	100%	-	-0.2%
1997	0%	0%	-4%	0%	-	0%	2%	0%	2%	100%	-	-0.2%
1998	0%	0%	-3%	0%	-	0%	1%	0%	2%	100%	-	-0.2%
1999	0%	0%	-3%	0%	-	0%	1%	0%	2%	100%	-	-0.2%
2000	0%	0%	0%	0%	-	0%	1%	0%	2%	100%	-	0.0%
2001	0%	0%	0%	0%	-	0%	1%	0%	2%	100%	-	0.0%
2002	0%	0%	0%	0%	-	0%	1%	0%	2%	100%	-	0.0%
2003	0%	0%	0%	0%	-	0%	1%	0%	2%	100%	-	0.0%
2004	0%	0%	0%	0%	-	1%	1%	0%	2%	100%	-	0.0%
2005	0%	0%	0%	0%	-	1%	1%	0%	2%	100%	-	0.0%
2006	0%	0%	0%	0%	-	2%	1%	0%	2%	100%	-	0.0%
2007	0%	0%	0%	0%	-	2%	1%	0%	2%	100%	-	0.0%
2008	0%	0%	0%	0%	-	3%	1%	0%	2%	100%	-	0.0%
2009	0%	0%	0%	0%	-	8%	1%	0%	3%	100%	-	0.0%
2010	0%	0%	0%	0%	-	12%	1%	0%	1%	100%	-	0.0%
2011	0%	0%	0%	0%	-	12%	1%	0%	2%	100%	-	0.0%
2012	0%	0%	0%	0%	-	101%	1%	0%	2%	100%	-	0.0%
2013	0%	0%	0%	0%	-	1%	0%	0%	2%	100%	-	0.2%
2014	0%	0%	0%	0%	-	0%	0%	0%	3%	100%	-	0.0%
2015	0%	0%	0%	0%	-	0%	0%	0%	3%	100%	-	-0.1%
2016	0%	0%	1%	0%	-	0%	1%	0%	4%	100%	-	0.2%
2017	0%	0%	4%	0%	-	0%	1%	0%	2%	100%	-	0.5%

Pollutant	Cr											
SNAP sector	01	02	03	04	05	06	07	08	09	10	11	TOTAL
1990	0%	0%	-8%	0%	-	0%	2%	0%	78%	100%	-	-0.3%
1991	0%	3%	-5%	0%	-	0%	3%	0%	76%	100%	-	0.9%
1992	0%	0%	-2%	0%	-	0%	2%	0%	59%	100%	-	0.1%
1993	0%	0%	-2%	0%	-	0%	1%	0%	78%	100%	-	0.1%
1994	0%	0%	-3%	0%	-	0%	1%	0%	73%	100%	-	0.0%
1995	0%	0%	-4%	0%	-	0%	0%	0%	74%	100%	-	0.0%
1996	0%	0%	-5%	0%	-	0%	2%	0%	71%	100%	-	0.0%
1997	0%	0%	-4%	0%	-	0%	3%	0%	69%	100%	-	0.1%
1998	0%	0%	-3%	0%	-	0%	0%	0%	66%	100%	-	-0.1%
1999	0%	0%	-4%	0%	-	0%	0%	0%	66%	100%	-	-0.1%
2000	0%	0%	1%	0%	-	0%	0%	0%	64%	100%	-	0.2%
2001	0%	0%	0%	0%	-	0%	1%	0%	62%	100%	-	0.2%
2002	0%	0%	0%	0%	-	0%	2%	0%	65%	100%	-	0.3%
2003	0%	0%	0%	0%	-	0%	1%	0%	68%	100%	-	0.2%
2004	0%	0%	0%	0%	-	1%	1%	0%	72%	100%	-	0.2%
2005	0%	0%	0%	0%	-	1%	1%	0%	71%	100%	-	0.2%
2006	0%	0%	0%	0%	-	2%	0%	0%	69%	100%	-	0.1%
2007	0%	0%	0%	0%	-	2%	-1%	0%	74%	100%	-	0.0%
2008	0%	0%	5%	0%	-	4%	-1%	0%	73%	100%	-	0.3%
2009	0%	0%	4%	0%	-	8%	-2%	0%	77%	100%	-	0.2%
2010	0%	0%	0%	0%	-	12%	-2%	0%	60%	100%	-	-0.1%
2011	0%	0%	0%	0%	-	12%	-2%	0%	65%	100%	-	-0.1%
2012	0%	0%	0%	0%	-	103%	-5%	0%	69%	100%	-	-0.6%
2013	0%	0%	0%	1%	-	1%	-5%	0%	71%	100%	-	-0.3%
2014	0%	0%	0%	-1%	-	0%	-4%	0%	83%	100%	-	-0.6%
2015	0%	0%	0%	-1%	-	0%	-5%	0%	86%	100%	-	-0.6%
2016	0%	0%	1%	-1%	-	0%	-4%	0%	89%	100%	-	-0.6%
2017	0%	0%	3%	-1%	-	0%	-3%	0%	74%	100%	-	-0.3%

Pollutant	Cu											
SNAP sector	01	02	03	04	05	06	07	08	09	10	11	TOTAL
1990	0%	0%	-9%	0%	-	0%	-23%	0%	9%	100%	-	-15.8%
1991	0%	0%	-6%	0%	-	0%	14%	0%	7%	100%	-	7.6%
1992	0%	0%	-2%	0%	-	0%	12%	0%	6%	100%	-	6.9%
1993	0%	0%	-3%	0%	-	0%	11%	0%	8%	100%	-	6.8%
1994	0%	0%	-3%	0%	-	0%	11%	0%	7%	100%	-	5.9%
1995	0%	0%	-5%	0%	-	0%	10%	0%	8%	100%	-	5.7%
1996	0%	0%	-6%	0%	-	0%	13%	0%	7%	100%	-	7.6%
1997	0%	0%	-5%	0%	-	0%	14%	0%	7%	100%	-	8.8%
1998	0%	0%	-5%	0%	-	0%	10%	0%	6%	100%	-	6.3%
1999	0%	0%	-5%	0%	-	0%	10%	0%	6%	100%	-	6.6%
2000	0%	0%	0%	0%	-	0%	11%	0%	6%	100%	-	7.6%
2001	0%	0%	0%	0%	-	0%	14%	0%	5%	100%	-	8.6%
2002	0%	0%	0%	0%	-	0%	15%	0%	5%	100%	-	6.7%
2003	0%	0%	0%	0%	-	0%	14%	0%	7%	100%	-	5.5%
2004	0%	0%	0%	0%	-	0%	15%	0%	6%	100%	-	7.7%
2005	0%	0%	0%	0%	-	0%	15%	0%	6%	100%	-	9.2%
2006	0%	0%	0%	0%	-	0%	13%	0%	6%	100%	-	8.6%
2007	0%	0%	0%	0%	-	0%	12%	0%	6%	100%	-	8.2%
2008	0%	0%	1%	0%	-	0%	12%	0%	7%	100%	-	8.5%
2009	0%	0%	1%	0%	-	0%	11%	0%	7%	100%	-	8.1%
2010	0%	0%	0%	0%	-	0%	11%	0%	8%	100%	-	8.5%
2011	0%	0%	0%	0%	-	0%	11%	0%	9%	100%	-	8.1%
2012	0%	0%	0%	0%	-	0%	7%	0%	8%	100%	-	5.4%
2013	0%	0%	0%	1%	-	0%	7%	0%	11%	100%	-	5.2%
2014	0%	0%	0%	-1%	-	0%	8%	0%	13%	100%	-	6.5%
2015	0%	0%	0%	-1%	-	0%	8%	0%	14%	100%	-	5.9%
2016	0%	0%	0%	0%	-	0%	8%	0%	15%	100%	-	5.9%
2017	0%	0%	3%	-1%	-	0%	9%	0%	20%	100%	-	7.3%

Pollutant	Ni											
SNAP sector	01	02	03	04	05	06	07	08	09	10	11	TOTAL
1990	0%	0%	-9%	0%	-	0%	-61%	0%	73%	100%	-	-0.5%
1991	0%	0%	-7%	0%	-	0%	8%	0%	70%	100%	-	0.0%
1992	0%	0%	-3%	0%	-	0%	1%	0%	72%	100%	-	0.0%
1993	0%	0%	-3%	0%	-	0%	-3%	0%	72%	100%	-	0.0%
1994	0%	0%	-3%	0%	-	0%	-5%	0%	73%	100%	-	0.0%
1995	0%	0%	-5%	0%	-	0%	-3%	0%	75%	100%	-	0.0%
1996	0%	0%	-7%	0%	-	0%	5%	0%	75%	100%	-	0.0%
1997	0%	0%	-5%	0%	-	0%	10%	0%	72%	100%	-	0.0%
1998	0%	0%	-1%	0%	-	0%	2%	0%	71%	100%	-	0.0%
1999	0%	0%	-1%	0%	-	0%	2%	0%	71%	100%	-	0.0%
2000	0%	0%	0%	0%	-	0%	7%	0%	70%	100%	-	0.1%
2001	0%	0%	0%	0%	-	0%	7%	0%	67%	100%	-	0.1%
2002	0%	0%	0%	0%	-	0%	6%	0%	68%	100%	-	0.1%
2003	0%	0%	0%	0%	-	0%	3%	0%	72%	100%	-	0.0%
2004	0%	0%	0%	0%	-	2%	6%	0%	71%	100%	-	0.1%
2005	0%	0%	0%	0%	-	2%	6%	0%	71%	100%	-	0.1%
2006	0%	0%	0%	0%	-	4%	3%	0%	69%	100%	-	0.1%
2007	0%	0%	0%	0%	-	5%	1%	0%	70%	100%	-	0.1%
2008	0%	0%	0%	0%	-	7%	3%	0%	70%	100%	-	0.1%
2009	0%	0%	0%	0%	-	11%	1%	0%	71%	100%	-	0.1%
2010	0%	0%	0%	0%	-	7%	1%	0%	70%	100%	-	0.1%
2011	0%	0%	0%	0%	-	7%	0%	0%	71%	100%	-	0.1%
2012	-3%	0%	0%	0%	-	5%	-5%	0%	73%	100%	-	-2.5%
2013	0%	0%	0%	5%	-	3%	-6%	0%	74%	100%	-	0.7%
2014	0%	0%	0%	-3%	-	0%	-3%	0%	73%	100%	-	-0.5%
2015	0%	0%	0%	-3%	-	0%	-6%	0%	75%	100%	-	-0.4%
2016	0%	0%	1%	-3%	-	0%	-6%	0%	76%	100%	-	-0.4%
2017	0%	0%	4%	-3%	-	0%	-7%	0%	74%	100%	-	-0.4%

Pollutant	Se											
SNAP sector	01	02	03	04	05	06	07	08	09	10	11	TOTAL
1990	0%	0%	-5%	0%	-	-	-64%	0%	7047%	100%	-	-2.3%
1991	0%	0%	-3%	0%	-	-	52%	0%	4291%	100%	-	0.4%
1992	0%	0%	-1%	0%	-	-	40%	0%	3301%	100%	-	0.8%
1993	0%	0%	-1%	0%	-	-	34%	0%	3162%	100%	-	0.9%
1994	0%	0%	-1%	0%	-	-	31%	0%	2931%	100%	-	0.7%
1995	0%	0%	-2%	0%	-	-	35%	0%	3598%	100%	-	0.9%
1996	0%	0%	-3%	0%	-	-	46%	0%	2965%	100%	-	0.9%
1997	0%	0%	-1%	0%	-	-	55%	0%	2775%	100%	-	1.3%
1998	0%	0%	-2%	0%	-	-	42%	0%	3016%	100%	-	0.9%
1999	0%	0%	-2%	0%	-	-	43%	0%	3311%	100%	-	1.0%
2000	0%	0%	0%	0%	-	-	49%	0%	3518%	100%	-	1.6%
2001	0%	0%	0%	0%	-	-	53%	0%	3278%	100%	-	1.4%
2002	0%	0%	0%	0%	-	-	50%	0%	2792%	100%	-	1.3%
2003	0%	0%	0%	0%	-	-	44%	0%	2804%	100%	-	1.2%
2004	0%	0%	0%	0%	-	-	49%	0%	2630%	100%	-	1.2%
2005	0%	0%	0%	0%	-	-	49%	0%	2438%	100%	-	1.2%
2006	0%	0%	0%	0%	-	-	44%	0%	2366%	100%	-	1.1%
2007	0%	0%	0%	0%	-	-	40%	0%	2397%	100%	-	1.2%
2008	0%	0%	0%	0%	-	-	43%	0%	2212%	100%	-	1.2%
2009	0%	0%	0%	0%	-	-	41%	0%	2423%	100%	-	1.3%
2010	0%	0%	0%	0%	-	-	41%	0%	1117%	100%	-	1.0%
2011	0%	0%	0%	0%	-	-	40%	0%	1409%	100%	-	1.0%
2012	0%	0%	0%	0%	-	-	32%	0%	1591%	100%	-	1.0%
2013	0%	0%	0%	0%	-	-	30%	0%	1468%	100%	-	0.9%
2014	0%	0%	0%	0%	-	-	34%	0%	1482%	100%	-	1.0%
2015	0%	0%	0%	0%	-	-	30%	0%	1641%	100%	-	1.1%
2016	0%	0%	1%	0%	-	-	29%	0%	1976%	100%	-	1.2%
2017	0%	0%	-5%	0%	-	-	-64%	0%	7047%	100%	-	-2.3%

Pollutant	Zn										
SNAP sector	01	02	03	04	05	06	07	08	09	10	11	TOTAL
1990	0%	0%	-7%	0%	-	0%	-55%	0%	-28%	100%	-	-6.2%
1991	0%	0%	-4%	0%	-	0%	-53%	0%	-27%	100%	-	-4.4%
1992	0%	0%	-1%	0%	-	0%	-54%	0%	-28%	100%	-	-4.6%
1993	0%	0%	-2%	0%	-	0%	-54%	0%	-28%	100%	-	-4.8%
1994	0%	0%	-2%	0%	-	0%	-54%	0%	-29%	100%	-	-5.5%
1995	0%	0%	-3%	0%	-	0%	-55%	0%	-30%	100%	-	-5.8%
1996	0%	0%	-4%	0%	-	0%	-53%	0%	-30%	100%	-	-5.5%
1997	0%	0%	-1%	0%	-	0%	-52%	0%	-28%	100%	-	-6.0%
1998	0%	0%	-4%	0%	-	0%	-54%	0%	-27%	100%	-	-6.8%
1999	0%	0%	-5%	0%	-	0%	-53%	0%	-26%	100%	-	-7.3%
2000	0%	0%	1%	0%	-	0%	-53%	0%	-26%	100%	-	-7.5%
2001	0%	0%	0%	0%	-	0%	-55%	0%	-24%	100%	-	-7.1%
2002	0%	0%	0%	0%	-	0%	-54%	0%	-26%	100%	-	-7.3%
2003	0%	0%	0%	0%	-	0%	-54%	0%	-28%	100%	-	-6.9%
2004	0%	0%	0%	0%	-	0%	-54%	0%	-28%	100%	-	-7.4%
2005	0%	0%	0%	0%	-	0%	-53%	0%	-28%	100%	-	-7.5%
2006	0%	0%	0%	0%	-	0%	-54%	0%	-26%	100%	-	-8.4%
2007	0%	0%	0%	0%	-	0%	-54%	0%	-27%	100%	-	-9.2%
2008	0%	0%	9%	0%	-	0%	-54%	0%	-27%	100%	-	-8.5%
2009	0%	0%	7%	0%	-	0%	-54%	0%	-28%	100%	-	-8.6%
2010	0%	0%	0%	0%	-	0%	-54%	0%	-26%	100%	-	-8.4%
2011	0%	0%	0%	0%	-	0%	-54%	0%	-27%	100%	-	-8.4%
2012	0%	0%	0%	-8%	-	0%	-56%	0%	-29%	100%	-	-8.8%
2013	0%	0%	0%	39%	-	0%	-55%	0%	-29%	100%	-	-8.3%
2014	0%	0%	0%	-13%	-	0%	-55%	0%	-27%	100%	-	-9.7%
2015	0%	0%	0%	-14%	-	0%	-55%	0%	-29%	100%	-	-9.3%
2016	0%	0%	0%	-31%	-	0%	-55%	0%	-30%	100%	-	-9.7%
2017	0%	0%	2%	-34%	-	0%	-55%	0%	-27%	100%	-	-10.2%

Pollutant	HCB										
SNAP sector	01	02	03	04	05	06	07	08	09	10	11	TOTAL
1990	0%	0%	-3%	-	-	-	100%	0%	0%	100%	-	2486.5%
1991	0%	0%	-2%	-	-	-	100%	0%	0%	100%	-	2056.7%
1992	0%	0%	-1%	-	-	-	100%	0%	0%	100%	-	2893.5%
1993	0%	0%	-1%	-	-	-	100%	0%	0%	100%	-	2862.6%
1994	0%	0%	-1%	-	-	-	100%	0%	0%	100%	-	3444.3%
1995	0%	0%	-1%	-	-	-	100%	0%	0%	100%	-	2326.2%
1996	0%	0%	-2%	-	-	-	100%	0%	0%	100%	-	1884.6%
1997	0%	0%	-1%	-	-	-	100%	0%	0%	100%	-	1747.0%
1998	0%	0%	-1%	-	-	-	100%	0%	0%	100%	-	1831.4%
1999	0%	0%	-2%	-	-	-	100%	0%	0%	100%	-	1646.0%
2000	0%	0%	1%	-	-	-	100%	0%	0%	100%	-	670.1%
2001	0%	0%	0%	-	-	-	100%	0%	0%	100%	-	632.5%
2002	0%	0%	0%	-	-	-	100%	0%	0%	100%	-	400.4%
2003	0%	0%	0%	-	-	-	100%	0%	0%	100%	-	225.0%
2004	0%	0%	0%	-	-	-	100%	0%	0%	100%	-	182.8%
2005	0%	0%	0%	-	-	-	100%	0%	0%	100%	-	44.8%
2006	0%	0%	0%	-	-	-	100%	0%	0%	100%	-	47.4%
2007	0%	0%	0%	-	-	-	100%	0%	0%	100%	-	48.3%
2008	0%	0%	9%	-	-	-	100%	0%	0%	100%	-	50.3%
2009	0%	0%	8%	-	-	-	100%	0%	0%	100%	-	48.9%
2010	0%	0%	0%	-	-	-	100%	0%	0%	100%	-	185.2%
2011	0%	0%	0%	-	-	-	100%	0%	0%	100%	-	187.7%
2012	0%	0%	0%	-	-	-	100%	0%	0%	100%	-	185.3%
2013	0%	0%	0%	-	-	-	100%	0%	0%	100%	-	188.0%
2014	0%	0%	0%	-	-	-	100%	0%	0%	100%	-	135.9%
2015	0%	0%	0%	-	-	-	100%	0%	0%	100%	-	44.9%
2016	0%	0%	1%	-	-	-	100%	0%	0%	100%	-	58.8%
2017	0%	0%	3%	-	-	-	100%	0%	0%	100%	-	63.5%

Pollutant	BC										
SNAP sector	01	02	03	04	05	06	07	08	09	10	11	total
1990	0%	-1%	-3%	10%	-	0%	1%	0%	0%	100%	-	-0.7%
1991	0%	-1%	-2%	9%	-	0%	0%	0%	0%	100%	-	-0.6%
1992	0%	-1%	3%	0%	-	0%	1%	0%	0%	100%	-	-0.3%
1993	0%	-1%	-1%	0%	-	0%	5%	0%	0%	100%	-	0.0%
1994	0%	-1%	-1%	0%	-	0%	8%	0%	0%	100%	-	0.5%
1995	0%	-1%	-1%	0%	-	0%	8%	0%	0%	100%	-	0.6%
1996	0%	-1%	-2%	0%	-	0%	12%	0%	0%	100%	-	1.0%
1997	0%	-1%	8%	0%	-	0%	11%	0%	0%	100%	-	1.6%
1998	0%	-1%	-2%	0%	-	0%	5%	0%	0%	100%	-	0.2%
1999	0%	-1%	-2%	0%	-	0%	5%	0%	0%	100%	-	0.2%
2000	0%	-1%	-1%	0%	-	0%	4%	0%	0%	100%	-	0.1%
2001	0%	-1%	0%	0%	-	0%	5%	0%	0%	100%	-	0.4%
2002	0%	-1%	0%	0%	-	0%	83%	0%	0%	100%	-	9.7%
2003	0%	-1%	0%	0%	-	0%	4%	0%	0%	100%	-	0.3%
2004	0%	-1%	0%	0%	-	0%	2%	0%	0%	100%	-	-0.3%
2005	0%	-1%	0%	0%	-	0%	1%	0%	0%	100%	-	-0.5%
2006	0%	2%	0%	0%	-	0%	-6%	0%	0%	100%	-	-0.3%
2007	0%	5%	0%	0%	-	0%	0%	0%	0%	100%	-	2.9%
2008	0%	9%	11%	0%	-	0%	-1%	0%	0%	100%	-	5.1%
2009	0%	12%	8%	0%	-	0%	0%	0%	0%	100%	-	7.8%
2010	0%	17%	0%	0%	-	0%	3%	0%	0%	100%	-	11.2%
2011	0%	21%	0%	0%	-	0%	8%	0%	0%	100%	-	15.5%
2012	-1%	27%	0%	0%	-	0%	6%	0%	0%	100%	-	18.6%
2013	0%	33%	0%	0%	-	0%	4%	0%	0%	100%	-	22.2%
2014	0%	41%	0%	0%	-	0%	4%	0%	0%	100%	-	26.6%
2015	0%	47%	0%	0%	-	0%	4%	0%	0%	100%	-	31.4%
2016	0%	57%	0%	0%	-	0%	7%	0%	0%	100%	-	38.1%
2017	0%	68%	0%	0%	-	0%	6%	0%	0%	100%	-	42.6%

12.9. Appendix 9. Inclusion/exclusion of the condensable component from PM_{10} and $PM_{2.5}$ emission factors

Table A9-1 Inclusion/exclusion of the condensable component from PM_{10} and $PM_{2.5}$ emission factors by NFR source category

NFR	Source / sector name	PM emissions: the condensable component is		EF reference and comments
		included	excluded	
1A1a	Public electricity and heat production	no	yes	The emission factors used for TSP, PM10 and PM2.5, that are calculating from direct emission for large point sources (LPS) and yearly taken from EPR base, exclude the condensable component. Method used for PM10 emission measurement is gravimetric method and samples for it, need to be dry. Gravimetric method is in Croatian law, reference method for determination of mass concentration of floating particles, described with HRN EN 12341 standard for PM10 fraction. For non LCP sources, the emission factors used for TSP, PM10 and PM2.5 are default ones from GB2019 and these PM factors represent filterable PM emissions and are based on an defined ash content.
1A1b	Petroleum refining	no	yes	The emission factors used for TSP, PM10 and PM2.5 are default ones from GB2019 and these PM factors represent filterable PM emissions only (excluding any condensable fraction)
1A1c	Manufacture of solid fuels and other energy industries	unclear	unclear	The emission factors used for TSP, PM10 and PM2.5 are default ones from GB2019 and the basis of these emission factors could not be determined in the reference.
1A2a	Stationary combustion in manufacturing industries and construction: Iron and steel	unclear	unclear	The emission factors used for TSP, PM10 and PM2.5 are default ones from GB2019 and these emission factors have been reviewed and it is unclear whether they represent filterable PM or total PM (filterable and condensable) emissions.
1A2b	Stationary combustion in manufacturing industries and construction: Non-ferrous metals	unclear	unclear	The emission factors used for TSP, PM10 and PM2.5 are default ones from GB2019 and these emission factors have been reviewed and it is unclear whether they represent filterable PM or total PM (filterable and condensable) emissions.
1A2c	Stationary combustion in manufacturing industries and construction: Chemicals	unclear	unclear	The emission factors used for TSP, PM10 and PM2.5 are default ones from GB2019 and these emission factors have been reviewed and it is unclear whether they represent filterable PM or total PM (filterable and condensable) emissions.
1A2d	Stationary combustion in manufacturing industries and construction: Pulp, Paper and Print	unclear	unclear	The emission factors used for TSP, PM10 and PM2.5 are default ones from GB2019 and these emission factors have been reviewed and it is unclear whether they represent filterable PM or total PM (filterable and condensable) emissions.

NFR	Source / sector name	PM emissions: the condensable component is		EF reference and comments
		included	excluded	
1A2e	Stationary combustion in manufacturing industries and construction: Food processing, beverages and tobacco	unclear	unclear	The emission factors used for TSP, PM10 and PM2.5 are default ones from GB2019 and these emission factors have been reviewed and it is unclear whether they represent filterable PM or total PM (filterable and condensable) emissions.
1A2f	Stationary combustion in manufacturing industries and construction: Non-metallic minerals	unclear	unclear	The emission factors used for TSP, PM10 and PM2.5 are default ones from GB2019 and these emission factors have been reviewed and it is unclear whether they represent filterable PM or total PM (filterable and condensable) emissions.
1A2gvii	Mobile Combustion in manufacturing industries and construction: (please specify in the IIR)	yes	no	The emission factors used for TSP, PM10 and PM2.5 are default ones from GB2019 and these emission factors represent total PM emissions (filterable and condensable fractions).
1A2gvii i	Stationary combustion in manufacturing industries and construction: Other (please specify in the IIR)	unclear	unclear	The emission factors used for TSP, PM10 and PM2.5 are default ones from GB2019 and these emission factors have been reviewed and it is unclear whether they represent filterable PM or total PM (filterable and condensable) emissions.
1A3ai(i)	International aviation LTO (civil)	unclear	unclear	The emission factors used for TSP, PM10 and PM2.5 are default ones from GB2013 and there is no information on inclusion or exclusion of the condensable component in PM emission factors.
1A3aii(i)	Domestic aviation LTO (civil)	unclear	unclear	The emission factors used for TSP, PM10 and PM2.5 are default ones from GB2013 and there is no information on inclusion or exclusion of the condensable component in PM emission factors.
1A3bi	Road transport: Passenger cars	yes	no	The emission factors used for TSP, PM10 and PM2.5 are default ones from COPERT IV that is Tier 3 approach accordin to GB2019. According to GB2019, PM mass emission factors are considered to include both filterable and condensable material. The mass of particles collected on a filter kept below 52°C during diluted exhaust sampling. This corresponds to total (filterable and condensable) PM2.5. Coarse exhaust PM (i.e. >2.5µm diameter) is considered to be negligible, hence PM=PM2.5.
1A3bii	Road transport: Light duty vehicles	yes	no	
1A3biii	Road transport: Heavy duty vehicles and buses	yes	no	
1A3biv	Road transport: Mopeds & motorcycles	yes	no	
1A3bv	Road transport: Gasoline evaporation	NA	NA	This activity does not result with TSP, PM10 and PM2.5 emissions.
1A3bvi	Road transport: Automobile tyre and brake wear	unclear	unclear	The emission factors used for TSP, PM10 and PM2.5 are default ones from GB2019 and there is no information on inclusion or exclusion of the condensable component in PM emission factors.

NFR	Source / sector name	PM emissions: the condensable component is		EF reference and comments
		included	excluded	
1A3bvii	Road transport: Automobile road abrasion	unclear	unclear	The emission factors used for TSP, PM10 and PM2.5 are default ones from GB2019 and there is no information on inclusion or exclusion of the condensable component in PM emission factors.
1A3c	Railways	unclear	unclear	The emission factors used for TSP, PM10 and PM2.5 are default ones from GB2019 and there is no information on inclusion or exclusion of the condensable component in PM emission factors.
1A3di(ii)	International inland waterways	unclear	unclear	The emission factors used for TSP, PM10 and PM2.5 are default ones from GB2019 and there is no information on inclusion or exclusion of the condensable component in PM emission factors.
1A3dii	National navigation (shipping)	unclear	unclear	The emission factors used for TSP, PM10 and PM2.5 are default ones from GB2019 and there is no information on inclusion or exclusion of the condensable component in PM emission factors.
1A3ei	Pipeline transport	NA	NA	This activity does not result with TSP, PM10 and PM2.5 emissions.
1A3eii	Other (please specify in the IIR)	NA	NA	This activity does not result with TSP, PM10 and PM2.5 emissions.
1A4ai	Commercial/institutional: Stationary	unclear	unclear	The emission factors used for TSP, PM10 and PM2.5 are default ones from GB2019 and these emission factors have been reviewed and it is unclear whether they represent filterable PM or total PM (filterable and condensable) emissions.
1A4aii	Commercial/institutional: Mobile	IE	IE	IE: 1A4aii
1A4bi	Residential: Stationary	unclear	unclear	The emission factors used for TSP, PM10 and PM2.5 are default ones from GB2019 and these emission factors have been reviewed and it is unclear whether they represent filterable PM or total PM (filterable and condensable) emissions.
1A4bii	Residential: Household and gardening (mobile)	yes	no	The emission factors used for TSP, PM10 and PM2.5 are default ones from GB2019 and these emission factors represent total PM emissions (filterable and condensable fractions).
1A4ci	Agriculture/Forestry/Fishing: Stationary	unclear	unclear	The emission factors used for TSP, PM10 and PM2.5 are default ones from GB2019 and these emission factors have been reviewed and it is unclear whether they represent filterable PM or total PM (filterable and condensable) emissions.
1A4cii	Agriculture/Forestry/Fishing: Off-road vehicles and other machinery	yes	no	The emission factors used for TSP, PM10 and PM2.5 are default ones from GB2019 and these emission factors represent total PM emissions (filterable and condensable fractions).

NFR	Source / sector name	PM emissions: the condensable component is		EF reference and comments
		included	excluded	
1A4ciii	Agriculture/Forestry/ Fishing: National fishing	IE	IE	IE: 1A3dii
1A5a	Other stationary (including military)	IE	IE	IE: 1A4a
1A5b	Other, Mobile (including military, land based and recreational boats)	IE	IE	IE: 1A4a, 1A3b(i-iv)
1B1a	Fugitive emission from solid fuels: Coal mining and handling	unclear	unclear	The emission factors used for TSP, PM10 and PM2.5 are default ones from GB2019 and there is no information on inclusion or exclusion of the condensable component in PM emission factors.
1B1b	Fugitive emission from solid fuels: Solid fuel transformation	unclear	unclear	The emission factors used for TSP, PM10 and PM2.5 are default ones from GB2019 and there is no information on inclusion or exclusion of the condensable component in PM emission factors.
1B1c	Other fugitive emissions from solid fuels	NO	NO	This activity does not exist in Croatia.
1B2ai	Fugitive emissions oil: Exploration, production, transport	unclear	unclear	The emission factors used for TSP, PM10 and PM2.5 are default ones from GB2019 and there is no information on inclusion or exclusion of the condensable component in PM emission factors.
1B2aiv	Fugitive emissions oil: Refining / storage	unclear	unclear	The emission factors used for TSP, PM10 and PM2.5 are default ones from GB2019 and there is no information on inclusion or exclusion of the condensable component in PM emission factors.
1B2av	Distribution of oil products	NA	NA	This activity does not result with TSP, PM10 and PM2.5 emissions.
1B2b	Fugitive emissions from natural gas (exploration, production, processing, transmission, storage, distribution and other)	NA	NA	This activity does not result with TSP, PM10 and PM2.5 emissions.
1B2c	Venting and flaring (oil, gas, combined oil and gas)	unclear	unclear	The emission factors used for TSP, PM10 and PM2.5 are default ones from GB2019 and there is no information on inclusion or exclusion of the condensable component in PM emission factors.
1B2d	Other fugitive emissions from energy production	NO	NO	This activity does not exist in Croatia.
2A1	Cement production	unclear	unclear	The emission factors used for TSP, PM10 and PM2.5 are default ones from GB2019 and there is no information on inclusion or exclusion of the condensable component in PM emission factors.

NFR	Source / sector name	PM emissions: the condensable component is		EF reference and comments
		included	excluded	
2A2	Lime production	unclear	unclear	The emission factors used for TSP, PM10 and PM2.5 are default ones from GB2019 and there is no information on inclusion or exclusion of the condensable component in PM emission factors.
2A3	Glass production	unclear	unclear	The emission factors used for TSP, PM10 and PM2.5 are default ones from GB2019 and there is no information on inclusion or exclusion of the condensable component in PM emission factors.
2A5a	Quarrying and mining of minerals other than coal	unclear	unclear	The emission factors used for TSP, PM10 and PM2.5 are default ones from GB2019 and there is no information on inclusion or exclusion of the condensable component in PM emission factors.
2A5b	Construction and demolition	unclear	unclear	The emission factors used for TSP, PM10 and PM2.5 are default ones from GB2019 and there is no information on inclusion or exclusion of the condensable component in PM emission factors.
2A5c	Storage, handling and transport of mineral products	IE	IE	IE: 2A1, 2A2, 2A3, 2A5a, 2A5b
2A6	Other mineral products (please specify in the IIR)	NO	NO	This activity does not exist in Croatia.
2B1	Ammonia production	NA/NE	NA/NE	There is no emission factor for PM2.5 in the GB2019, and this activity does not result with TSP and PM10 emissions.
2B2	Nitric acid production	NA/NE	NA/NE	There is no emission factor for PM2.5 in the GB2019, and this activity does not result with TSP and PM10 emissions.
2B3	Adipic acid production	NO	NO	This activity does not exist in Croatia.
2B5	Carbide production	NO	NO	This activity does not exist in Croatia.
2B6	Titanium dioxide production	NO	NO	This activity does not exist in Croatia.
2B7	Soda ash production	NO	NO	This activity does not exist in Croatia.
2B10a	Chemical industry: Other (please specify in the IIR)	NE	NE	There is no emission factor for TSP, PM10 and PM2.5 in the GB2019.
2B10b	Storage, handling and transport of chemical products (please specify in the IIR)	IE	IE	IE: 2B10a
2C1	Iron and steel production	no	yes	The emission factors used for TSP, PM10 and PM2.5 are default ones from GB2019 and these PM factors represent filterable PM emissions only (excluding any condensable fraction (European Commission, 2001)).
2C2	Ferroalloys production	no	yes	The emission factors used for TSP, PM10 and PM2.5 are default ones from GB2019 and these PM factors represent filterable PM

NFR	Source / sector name	PM emissions: the condensable component is		EF reference and comments
		included	excluded	
				emissions only (excluding any condensable fraction).
2C3	Aluminium production	no	yes	The emission factors used for TSP, PM10 and PM2.5 are default ones from GB2019 and these PM factors represent filterable PM emissions only (excluding any condensable fraction).
2C4	Magnesium production	NO	NO	This activity does not exist in Croatia.
2C5	Lead production	NO	NO	This activity does not exist in Croatia.
2C6	Zinc production	NO	NO	This activity does not exist in Croatia.
2C7a	Copper production	NO	NO	This activity does not exist in Croatia.
2C7b	Nickel production	NO	NO	This activity does not exist in Croatia.
2C7c	Other metal production (please specify in the IIR)	NO	NO	This activity does not exist in Croatia.
2C7d	Storage, handling and transport of metal products (please specify in the IIR)	NO	NO	This activity does not exist in Croatia.
2D3a	Domestic solvent use including fungicides	NA	NA	This activity does not result with TSP, PM10 and PM2.5 emissions.
2D3b	Road paving with asphalt	yes	no	The emission factors used for TSP, PM10 and PM2.5 are default ones from GB2019 and these PM factors represent filterable PM emissions with Nnote that US EPA (2004) includes condensable PM emission factors and factors for controlled plant.
2D3c	Asphalt roofing	unclear	unclear	The emission factors used for TSP, PM10 and PM2.5 are default ones from GB2019 and there is no information on inclusion or exclusion of the condensable component in PM emission factors.
2D3d	Coating applications	NA	NA	This activity does not result with TSP, PM10 and PM2.5 emissions.
2D3e	Degreasing	NE	NE	There is no emission factor for PM2.5 in the GB2019.
2D3f	Dry cleaning	NE	NE	There is no emission factor for PM2.5 in the GB2019.
2D3g	Chemical products	NA	NA	This activity does not result with TSP, PM10 and PM2.5 emissions.
2D3h	Printing	NE	NE	There is no emission factor for PM2.5 in the GB2019.
2D3i	Other solvent use (please specify in the IIR)	unclear	unclear	The emission factors used for TSP, PM10 and PM2.5 are default ones from GB2019 and there is no information on inclusion or exclusion of the condensable component in PM emission factors.
2G	Other product use (please specify in the IIR)	unclear	unclear	The emission factors used for TSP, PM10 and PM2.5 are default ones from GB2019 and there is no information on inclusion or exclusion of the condensable component in PM emission factors.

NFR	Source / sector name	PM emissions: the condensable component is		EF reference and comments
		included	excluded	
2H1	Pulp and paper industry	unclear	unclear	The emission factors used for TSP, PM10 and PM2.5 are default ones from GB2019 and there is no information on inclusion or exclusion of the condensable component in PM emission factors.
2H2	Food and beverages industry	NE	NE	There is no emission factor for TSP, PM10 and PM2.5 in the GB2019.
2H3	Other industrial processes (please specify in the IIR)	NO	NO	This activity does not exist in Croatia.
2I	Wood processing			There is no emission factor for PM10 and PM2.5 in the GB2019.
2J	Production of POPs	NO	NO	This activity does not exist in Croatia.
2K	Consumption of POPs and heavy metals (e.g. electrical and scientific equipment)	NA	NA	This activity does not result with TSP, PM10 and PM2.5 emissions.
2L	Other production, consumption, storage, transportation or handling of bulk products (please specify in the IIR)	NO	NO	This activity does not exist in Croatia.
3B1a	Manure management - Dairy cattle	unclear	unclear	The emission factors used for TSP, PM10 and PM2.5 are default ones from GB2019 and there is no information on inclusion or exclusion of the condensable component in PM emission factors.
3B1b	Manure management - Non-dairy cattle	unclear	unclear	The emission factors used for TSP, PM10 and PM2.5 are default ones from GB2019 and there is no information on inclusion or exclusion of the condensable component in PM emission factors.
3B2	Manure management - Sheep	unclear	unclear	The emission factors used for TSP, PM10 and PM2.5 are default ones from GB2019 and there is no information on inclusion or exclusion of the condensable component in PM emission factors.
3B3	Manure management - Swine	unclear	unclear	The emission factors used for TSP, PM10 and PM2.5 are default ones from GB2019 and there is no information on inclusion or exclusion of the condensable component in PM emission factors.
3B4a	Manure management - Buffalo	NO	NO	This activity does not exist in Croatia.
3B4d	Manure management - Goats	unclear	unclear	The emission factors used for TSP, PM10 and PM2.5 are default ones from GB2019 and there is no information on inclusion or exclusion of the condensable component in PM emission factors.
3B4e	Manure management - Horses	unclear	unclear	The emission factors used for TSP, PM10 and PM2.5 are default ones from GB2019 and there is no information on inclusion or

NFR	Source / sector name	PM emissions: the condensable component is		EF reference and comments
		included	excluded	
				exclusion of the condensable component in PM emission factors.
3B4f	Manure management - Mules and asses	unclear	unclear	The emission factors used for TSP, PM10 and PM2.5 are default ones from GB2019 and there is no information on inclusion or exclusion of the condensable component in PM emission factors.
3B4gi	Manure mangement - Laying hens	unclear	unclear	The emission factors used for TSP, PM10 and PM2.5 are default ones from GB2019 and there is no information on inclusion or exclusion of the condensable component in PM emission factors.
3B4gii	Manure mangement - Broilers	unclear	unclear	The emission factors used for TSP, PM10 and PM2.5 are default ones from GB2019 and there is no information on inclusion or exclusion of the condensable component in PM emission factors.
3B4giii	Manure mangement - Turkeys	unclear	unclear	The emission factors used for TSP, PM10 and PM2.5 are default ones from GB2019 and there is no information on inclusion or exclusion of the condensable component in PM emission factors.
3B4giv	Manure management - Other poultry	unclear	unclear	The emission factors used for TSP, PM10 and PM2.5 are default ones from GB2019 and there is no information on inclusion or exclusion of the condensable component in PM emission factors.
3B4h	Manure management - Other animals (please specify in IIR)	NO	NO	This activity does not exist in Croatia.
3Da1	Inorganic N-fertilizers (includes also urea application)	NA	NA	This activity does not result with TSP, PM10 and PM2.5 emissions.
3Da2a	Animal manure applied to soils	NA	NA	This activity does not result with TSP, PM10 and PM2.5 emissions.
3Da2b	Sewage sludge applied to soils	NA	NA	This activity does not result with TSP, PM10 and PM2.5 emissions.
3Da2c	Other organic fertilisers applied to soils (including compost)	NA	NA	This activity does not result with TSP, PM10 and PM2.5 emissions.
3Da3	Urine and dung deposited by grazing animals	NA	NA	This activity does not result with TSP, PM10 and PM2.5 emissions.
3Da4	Crop residues applied to soils	NA	NA	This activity does not result with TSP, PM10 and PM2.5 emissions.
3Db	Indirect emissions from managed soils	NA	NA	This activity does not result with TSP, PM10 and PM2.5 emissions.
3Dc	Farm-level agricultural operations including storage, handling and	yes	no	The emission factors used for TSP, PM10 and PM2.5 are default ones from GB2019 and there is no information that the processes which result in particulate emissions are largely low-temperature mechanical activities,

NFR	Source / sector name	PM emissions: the condensable component is		EF reference and comments
		included	excluded	
	transport of agricultural products			and emissions are unlikely to include substantial quantities of condensable particulate material.
3Dd	Off-farm storage, handling and transport of bulk agricultural products	NE	NE	There is no emission factor for PM10 and PM2.5 in the GB2019.
3De	Cultivated crops	NA	NA	This activity does not result with TSP, PM10 and PM2.5 emissions.
3Df	Use of pesticides	NA	NA	This activity does not result with TSP, PM10 and PM2.5 emissions.
3F	Field burning of agricultural residues	unclear	unclear	The emission factors used for TSP, PM10 and PM2.5 are default ones from GB2019 and there is no information on inclusion or exclusion of the condensable component in PM emission factors.
3I	Agriculture other (please specify in the IIR)	NO	NO	This activity does not exist in Croatia.
5A	Biological treatment of waste - Solid waste disposal on land	unclear	unclear	The emission factors used for TSP, PM10 and PM2.5 are default ones from GB2019 and there is no information on inclusion or exclusion of the condensable component in PM emission factors.
5B1	Biological treatment of waste - Composting	NE	NE	There is no emission factor for PM10 and PM2.5 in the GB2019.
5B2	Biological treatment of waste - Anaerobic digestion at biogas facilities	NA	NA	This activity does not result with TSP, PM10 and PM2.5 emissions.
5C1a	Municipal waste incineration	NO	NO	This activity does not exist in Croatia.
5C1bi	Industrial waste incineration	unclear	unclear	The emission factors used for TSP, PM10 and PM2.5 are default ones from GB2019 and there is no information on inclusion or exclusion of the condensable component in PM emission factors.
5C1bii	Hazardous waste incineration	NO	NO	This activity does not exist in Croatia.
5C1biii	Clinical waste incineration	unclear	unclear	The emission factors used for TSP, PM10 and PM2.5 are default ones from GB2019 and there is no information on inclusion or exclusion of the condensable component in PM emission factors.
5C1biv	Sewage sludge incineration	NO	NO	This activity does not exist in Croatia.
5C1bv	Cremation	unclear	unclear	The emission factors used for TSP, PM10 and PM2.5 are default ones from GB2019 and there is no information on inclusion or exclusion of the condensable component in PM emission factors.
5C1bvi	Other waste incineration (please specify in the IIR)	NO	NO	This activity does not exist in Croatia.

NFR	Source / sector name	PM emissions: the condensable component is		EF reference and comments
		included	excluded	
5C2	Open burning of waste	NO	NO	This activity does not exist in Croatia.
5D1	Domestic wastewater handling	NE	NE	There is no emission factor for PM10 and PM2.5 in the GB2019.
5D2	Industrial wastewater handling	NE	NE	There is no emission factor for PM10 and PM2.5 in the GB2019.
5D3	Other wastewater handling	NE	NE	There is no emission factor for PM10 and PM2.5 in the GB2019.
5E	Other waste (please specify in IIR)	NE	NE	There is no emission factor for PM10 and PM2.5 in the GB2019.
6A	Other (included in national total for entire territory) (please specify in IIR)	NO	NO	This activity does not exist in Croatia.

13. List of abbreviations

CAEN	- Croatian Agency for Environment and Nature
CLRTAP	- Convention on Long-Range Transboundary Air Pollution
CollectER	- Collect Emission Register
COPERT	- Computer Programme to Calculate Emissions from Road Transport
CORINAIR	- Core Inventory of Air Emissions in Europe
CRF	- Common Reporting Format (UNFCCC)
EEA	- European Environmental Agency
EMEP	- Protocol on Long-term Financing of the Cooperative Programme for Monitoring and Evaluation of the Long-range Transmission of Air Pollutants in Europe
ETC/ACC	- European Topic Centre on Air and Climate Change
GHG	- Greenhouse gas
IPCC	- Intergovernmental Panel on Climate Change
MPMEP	- Multi-Polluant Multi-Effect Protocol
NFR	- Nomenclature for Reporting
OG-IT	- Official Gazette – International Treaties
AE-DEM	- Air Emission – Data Exchange Mode
Report*ER*	- AE-DEM module for reporting
SNAP	- Selected Nomenclature for Air Pollution
UNECE	- United Nations Economic Commission for Europe
UNFCCC	- United Nations Framework Convention on Climate Change
EPR	- Environmental Pollution Register
IIR	- Informative Inventory Report (CLRTAP)
NEC Directive	- National Emission Ceiling Directive
LULUCF	- Land Use, Land-Use Change and Forestry
CBS	- Croatian Bureau of Statistics
St.Y.	- Statistical Yearbook
MI	- Ministry of Interior
MEE	- Ministry of Environment and Energy
MA	- Ministry of Agriculture
EIHP	- Energy Institute Hrvoje Požar
SO_2	- Sulphur oxides reported as SO_2
NOx	- Nitrogen oxides reported as NO_2
NH_3	- Ammonia
NMVOC	- Non-methane volatile organic compounds
VOC	- Volatile organic compounds
CO	- Carbon monoxide

TSP	- Total suspended particulate matter
PM_{10}	- Particulate matter with diameter less than 10 µm
$PM_{2.5}$	- Particulate matter with diameter less than 2.5 µm
As	- Arsenic
Cd	- Cadmium
Cr	- Chromium
Cu	- Copper
Hg	- Mercury
Ni	- Nickel
Pb	- Lead
Se	- Selenium
Zn	- Zinc
HCH	- Hexachlorocyclohexane
PAH	- Polyaromatic hydrocarbons
PCDD/PCDF	- Dioxins and furans
DE	- Direct emission – emission from stationary sources submitted in EPR
GDP	- gross domestic product
I-TEQ	- International Toxic Equivalent; The older International Toxic Equivalent (I-TEQ) scheme by the North Atlantic Treaty Organisation (NATO) initially set up in 1989 and later extended and updated
DIY	- do-it-yourself
GO	- Gas oil
HFO	- Heavy fuel oil
KER	- Kerosene
LPG	- Liquefied petroleum gas
LF	- Liquid fuel
NG	- Natural gas
SHB	- Single house boiler

14. List of tables

15. List of figures