REPUBLIC OF CROATIA 2017

INFORMATIVE INVENTORY REPORT

(1990 – 2015)

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CROATIAN AGENCY FOR ENVIRONMENT AND NATURE

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CROATIAN AGENCY FOR ENVIRONMENT AND NATURE

REPUBLIC OF CROATIA 2017

INFORMATIVE INVENTORY REPORT

(1990 – 2015)

under the Convention on Long-range Transboundary Air Pollution (CLRTAP) and National Emission Ceilings Directive (NECD 2016/2284/EU)

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INFORMATIVE INVENTORY REPORT
(1990 – 2015)

Submission to the Convention on Long-range Transboundary Air Pollution and National Emission Ceilings Directive (NECD 2016/2284/EU)

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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
MIA	- Ministry of Internal Affairs
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

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EXECUTIVE SUMMARY

ES1 INTRODUCTION

The Republic of Croatia 2017 Informative Inventory Report (1990 – 2015) provides a detail description of the methodologies used for the compilation of the Croatian air emission inventory submission under the Convention on Long-range Transboundary Air Pollution of the United Nations Economic Commission for Europe (UNECE/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).

As a party to the UNECE/LRTAP Convention, and the EU MS, Croatia is obligated to annually report data on emissions of air pollutants covered in the LRTAP Convention, its seven Protocols and new NEC Directive. These 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, HCB and PCBs).

The Croatian Agency for Environment and Nature[1] (CAEN) is competent authority for Informative Inventory Report with the Ministry of Environment and Energy[2] (MEE) supervision. Executive institution with care of preparing the air pollution emission inventory, NFR formats, and IIR, including maintenance of databases (CollectER and COPERT) is EKONERG Ltd. from Zagreb.

Data on air pollution emissions, presented in this report are prepared on the standard methods and procedures according to the *EMEP/EEA Air Pollutant Emission Inventory Guidebook "Technical Guidance to Prepare National Emission Inventories" (2009, 2013 and 2016)*, the *EMEP/CORINAIR Good Practice Guidance, Good practice for CLRTAP emission inventories* and other available technical guidance.

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[1] The Croatian Environment Agency (CEA) in 2015 changed the name into the Croatian Agency for Environment and Nature (CAEN)

[2] The Ministry of Environment and Nature Protection (MENP) in 2016 changed the name into the The Ministry of Environment and Energy (MEE) in accordance to Law on the Organisation and Scope of Ministries and other central state administration bodies (Official Gazette, no. 93/16 and 104/16)

This report follows Recommended structure for the Informative Inventory Report (IIR) set in Annex II of the 2014 Reporting Guidelines for Estimating and Reporting Emission Data under LRTAP Convention. Reported emissions and projections follow latest version of the templates "NFR14[3]" The Croatian IIR 2017 covers all year in the period from 1990 to 2015. The complete set of tables in the NFR format, are submitted separately in digital form only, and the NFR for 2015 is presented in the Appendix 4 of this report.

The key information on the activities required to create the Croatian inventory are national energy balance, statistical yearbooks and annual statistical reports, the national database for road vehicles, the Environmental Pollution Registry (EPR) database, the Database on Volatile Organic Compound (VOC) emissions and the data of individual plants of large polluters of the environment. For large point sources emissions are taken from EPR base at CAEN.

A key category analysis is carried out for the year 2015 showing the relevant sources for air pollution in Croatia along with the overview of large point sources emissions in 2015 (Chapter 2).

With the purpose of inventory, a schedule of activities for data quality control and quality assurance that covers the basic procedures and steps in preparing the inventory and IIR is prepared and presented in Appendix 1.

Data of four main pollutants (SO_2, NOx, NMVOC, NH_3) show that emissions in 2015 are below the emission ceilings and also projections for 2020 laid down in the Gothenburg Protocol and new NEC Directive (Table 1.1-2).

Details on projections are presented in Chapter 6. Following figures show trends of the relative emissions of the main pollutants along with their projections for the "with measures scenario," (figure ES2-1) and for the "with additional measures scenario" (Figure ES2-2) and corresponding target value laid down in the Gothenburg Protocol and new NEC Directive.

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[3] the Nomenclature for Reporting (NFR) format which should ensure the transparency of the inventories amoung Parties

ES2 EMISSION TRENDS 1990–2015 AND PROJECTIONS FOR 2020

Emissions of all relevant air pollutants show a general downward trend in the period from 1990 to 2015 with exception for HCB emissions. The NOx emissions were reduced by 49.8%, SO_2 by 91.1%, NH_3 by 37.4%, NMVOC by 60%, CO by 61.2%, $PM_{2.5}$ by 46.6%, PM_{10} by 42.4%, TSP by 29.1%, BC by 38.2%, heavy metals: Pb by 98.7%, Cd by 25.4%, Hg by 58.4%, As by 94.7%, Cr by 60.2%, Cu by 12.4%, Ni by 75.6%, Se by 30.6% and Zn by 10.3%. The PCDD/PCDF emission was reduced by 53%, PCBs by 12% and PAHs by 65.2%. The HCB emission increaded by 4.7% since 1990 (Table 1.1-5).

Emission of four main pollutants (SO_2, NOx, NMVOC, NH_3) show that emissions in 2015 are below the emission ceilings laid down in the Gothenburg Protocol and newNEC Directive (Table 1.1-2).

Details on projections are presented in Chapter 6. Following figures show trends of the relative emissions of the main pollutants along with their projections for the "with measures scenario," (figure ES2-1) and for the "with additional measures scenario" (Figure ES2-2) and corresponding target value laid down in the Gothenburg Protocol and new NEC Directive.

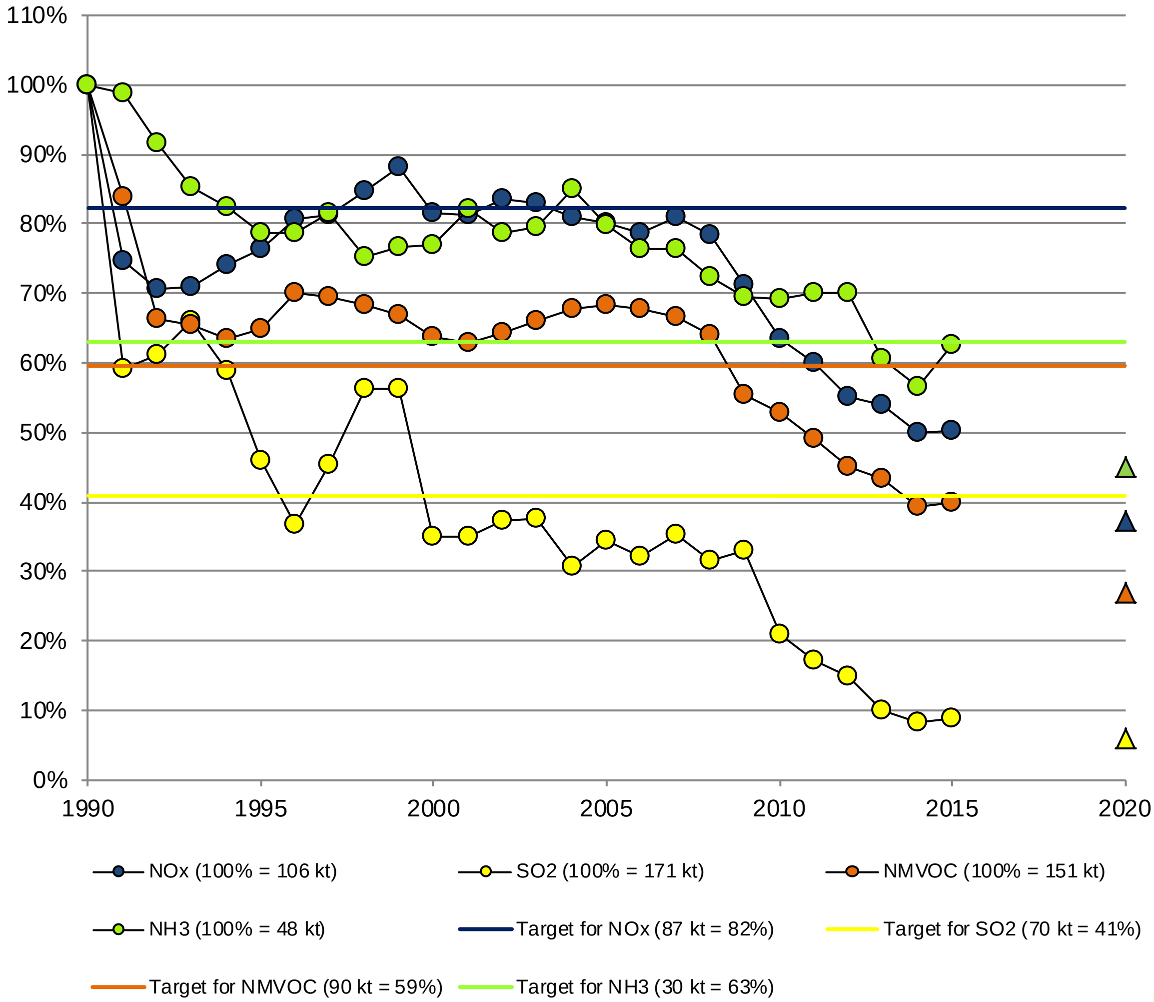

Figure ES2-1 Relative total emission for main pollutants in the Republic of Croatia for 1990 - 2015 and projections for with measures scenario for 2020

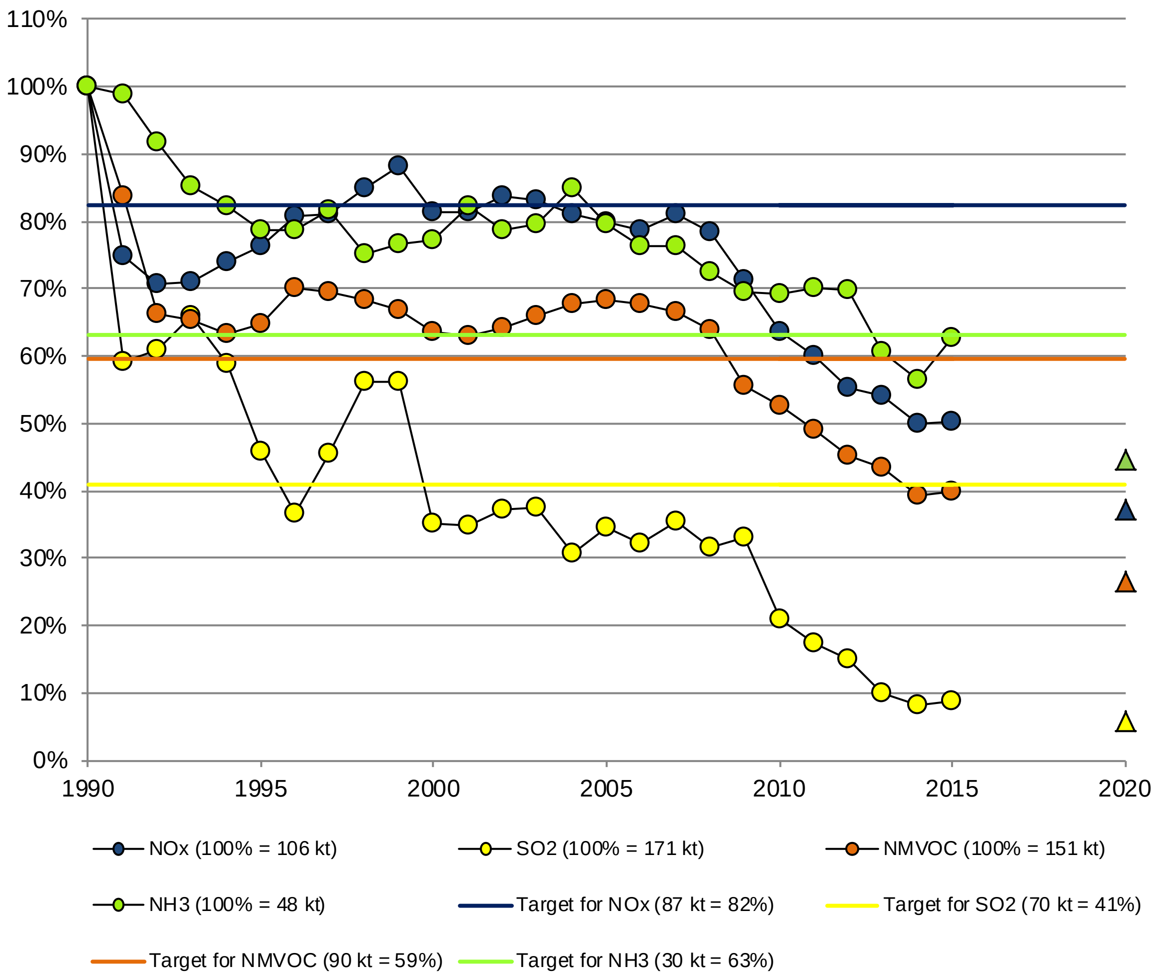

Figure ES2-2 Relative total emission for main pollutants in the Republic of Croatia for 1990 - 2015 and projections for with additional measures scenario for 2020

ES3 SECTORAL EMISSIONS IN 2015

- **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 98.5%, NOx with 93.6%, NMHOS with 50.3%, NH_3 with 10.4%, TSP with 53.7%, $PM_{2,5}$ with 91.6%, PM_{10} with 72.9%, BC with 96.1%, CO with 99.7%, Pb with 88.8%, Cd with 88.1%, Hg with 82.7%, As with 94.1%, Cr with 96.2%, Cu with 99.3%, Ni with 98,6%, Se with 44.2%, Zn with 99.6%, PCDD / PCDF with 88.3%, PAU with 98.3% i HCB with 97.9%.

- **Industrial processes and product use**: mineral industry, chemical industry, metal industries, other industries and other solvent use are the main sources of PCBs, NMVOC, Pb, Cd, Hg, TSP, PM_{10}, $PM_{2.5}$, As and Se emissions. To the total PCBs emissions industrial processes and product use contributes with 99%, to NMVOC emission with 34%, TSP with 39%, PM_{10} with 18.6%, Pb with 12.4%, Cd with 11.9%, Hg with 15.2%, Se with 55.8%, Pb with 11.1%, $PM_{2,5}$ with 6.8% As with 5.9%, NH_3 with 8.4% i BC with 3.9%.

- **Agriculture** is the main source of emissions of NH_3 (79.2%), NMVOC (12.2%) and NOx (2.1%). Manure management contributes with 56.1% and use of mineral N-fertilizers with 23.1% to NH_3 emission.

- **Waste**: the main source of PCDD/PCDF (9.7%), NMVOC (3.5%), NH_3 (2.1%), Hg (2.1%) and HCB (2.1%) emissions.

- **Natural emissions**; the emissions originating from forest fires is reported 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 2015. 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 2015.

Table ES3-1 Emissions of the substances which cause acidification, eutrophication and photochemical pollution in the Republic of Croatia, 2015

Emissions 2015, t/yr	SO_2	NOx	NMVOC	CO	NH_3
Combustion in energy transformation industry	7,162.7	6,614.4	328.5	993.4	9.9
Non-industrial combustion plants	1,136.7	6,904.1	17,842.7	134,903.6	2,429.8
Combustion in manufacturing industry	2,924.2	5,426.3	1,044.7	9,523.2	47.1
Production processes	3,417.2	1,189.9	5,400.1	20,733.4	2,536.0
Extraction and distribution of fossil fuels and geothermal energy	0	0	2,485.9	0	0
Solvent and other product use	0	15	16,131.3	449.5	34
Road transport	21.6	23,117.5	6,488.2	36,651.1	512.7
Other mobile source and machinery	264.8	7,491.1	1,323.2	12,763.0	2.6
Waste treatment and disposal	214.9	54.5	2,144.9	262.6	623.3
Agriculture	0	2,288.1	7,392	0	23,569.5
TOTAL	**15,142.1**	**53,100.6**	**60,581.1**	**216,279.7**	**29,764.8**
Other source and sinks (not included in national total)	401.9	1,929.2	1,868.4	18,314.4	121.3
Emissions in relation to population, kg/citizen	3.6	12.6	14.4	51.4	7.1
Emissions in relation to area, kg/km^2	0.3	0.9	1.1	3.8	0.5
Emissions in relation to GDP, g/EUR	0.3	1.2	1.4	4.9	0.7
Share, %	**SO2**	**NOx**	**NMVOC**	**CO**	**NH3**
Combustion in energy transformation industry	47.3	12.5	0.5	0.5	3.3E-02
Non-industrial combustion plants	7.5	13.0	29.5	62.4	8.2
Combustion in manufacturing industry	19.3	10.2	1.7	4.4	0.2
Production processes	22.6	2.2	8.9	9.6	8.5
Extraction and distribution of fossil fuels and geothermal energy	0	0	4.1	0	0
Solvent and other product use	0	2.8E-02	26.6	2.1E-01	0
Road transport	0.1	43.5	10.7	16.9	1.7
Other mobile source and machinery	1.7	14.1	2.2	5.9	8.9E-03
Waste treatment and disposal	1.4E+00	1.0E-01	3.5	1.21E-01	2.1
Agriculture	0	4.3	12	0	79.2
TOTAL	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**
Other source and sinks (not included in national total)	2.7	3.6	3.1	8.5	0.4

Table ES3-2 Particulate matter emissions in the Republic of Croatia, 2015

Emissions 2015, t/yr	**TSP**	**$PM_{2.5}$**	**PM_{10}**	**BC**
Combustion in energy transformation industry	467.0	151.3	267.1	9.9
Non-industrial combustion plants	16,846.6	15,650.6	16,038.4	2,124.6
Combustion in manufacturing industry	391.8	359.3	374.2	80.8
Production processes	15,365.0	1,266.6	5,034.9	33.3
Extraction and distribution of fossil fuels and geothermal energy	0	0	0	0
Solvent and other product use	276.3	250.8	266.1	99.1
Road transport	2,139.8	1,545.4	1,906.8	865.0
Other mobile source and machinery	455.8	453.1	454.4	145.3
Waste treatment and disposal	26.4	25.8	26.0	5.6
Agriculture	2,849.2	327.7	2,273.7	0.0
TOTAL	**38,817.9**	**20,030.7**	**26,641.6**	**3,363.6**
Other source and sinks (not included in national total)	21.4	21.2	21.4	9.2
Emissions in relation to population, kg/citizen	9.2	4.8	6.3	0.8
Emissions in relation to area, kg/km^2	0.7	0.4	0.5	0.1
Emissions in relation to GDP, g/EUR	0.9	0.5	0.6	0.1
Share, %	**TSP**	**$PM_{2.5}$**	**PM_{10}**	**BC**
Combustion in energy transformation industry	1.2	0.8	1.0	0.3
Non-industrial combustion plants	43.4	78.1	60.2	63.2
Combustion in manufacturing industry	1.0	1.8	1.4	2.4
Production processes	39.6	6.3	18.9	1.0
Extraction and distribution of fossil fuels and geothermal energy	0	0	0	0
Solvent and other product use	0.7	1.3	1.0	2.9
Road transport	5.5	7.7	7.2	25.7
Other mobile source and machinery	1.2	2.3	1.7	4.3
Waste treatment and disposal	0.068	0.129	0.098	0.167
Agriculture	7.3	1.6	8.5	0.0
TOTAL	**100.0**	**100.0**	**100.0**	**100.0**
Other source and sinks (not included in national total)	0.1	0.1	0.1	0.3

Table ES3-3 Heavy metals emissions in the Republic of Croatia, 2015

Emissions 2015, t/yr	**Pb**	**Hg**	**Cd**	**As**	**Cr**	**Cu**	**Ni**	**Se**	**Zn**
Combustion in energy transformation industry	265.1	182.3	28.7	117.5	247.0	209.1	5,304.1	21.9	721.8
Non-industrial combustion plants	1,332.1	46.9	648.5	12.9	1,124.9	296.2	99.2	25.5	25,081.1
Combustion in manufacturing industry	336.1	118.9	40.0	68.2	148.2	179.2	241.8	59.1	1,961.0
Production processes	962.4	47.5	93.7	252.7	242.6	79.4	591.7	200.3	689.9
Extraction and distribution of fossil fuels and geothermal energy	0	0	0	0	0	0	0	0	0
Solvent and other product use	0	65.6	44.0	0	0	44.0	22.0	0	22.0
Road transport	4,057.0	10.855	20.7	0.3	328.7	6,238.4	63.0	6.1	5,751.0
Other mobile source and machinery	158.2	1.5	3.3	1.7	16.9	533.8	59.2	6.9	372.8
Waste treatment and disposal	5.7	10.4	1.4	0.5	3.7	7.5	5.2	0.1	35.7
Agriculture	0	0	0	0	0	0	0	0	0
TOTAL	**7,116.5**	**483.9**	**880.4**	**453.9**	**2,112.0**	**7,587.6**	**6,386.1**	**319.9**	**34,635.2**
Other source and sinks (not included in national total)	0.53	0.55	0.04	0.19	0.91	2.24	1.53	0.61	123.55
Emissions in relation to population, kg/citizen	1.7	0.1	0.2	0.1	0.5	1.8	1.5	0.1	8.2
Emissions in relation to area, kg/km^2	0.1	0.0	0.0	0.0	0.0	0.1	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	0.8
Share, %	**Pb**	**Hg**	**Cd**	**As**	**Cr**	**Cu**	**Ni**	**Se**	**Zn**
Combustion in energy transformation industry	3.7	37.7	3.3	25.9	11.7	2.8	83.1	6.8	2.1
Non-industrial combustion plants	18.7	9.7	73.7	2.8	53.3	3.9	1.6	8.0	72.4
Combustion in manufacturing industry	4.7	24.6	4.5	15.0	7.0	2.4	3.8	18.5	5.7
Production processes	13.5	9.8	10.6	55.7	11.5	1.0	9.3	62.6	2.0
Extraction and distribution of fossil fuels and geothermal energy	0	0	0	0	0	0	0	0	0
Solvent and other product use	0	13.6	5.0	0	0	0.6	0.3	0	0.1
Road transport	57.0	2.2432	2.3	0.06033	15.6	82.2	1.0	1.9	16.6
Other mobile source and machinery	2.2	0.3	0.4	0.37664	0.8	7.0	0.9	2.2	1.1
Waste treatment and disposal	0.1	2.1	0.2	0.10	0.17	0.10	0.08	0.03	0.10
Agriculture	0	0	0	0	0	0	0	0	0
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	0	0	0	0	0	0	0	0

Table ES3-4 Persistent organic pollutants emissions in the Republic of Croatia, 2015

Emissions 2015, kg/yr for PAH, HCB, PCB; g I-TEQ/yr for PCDD/PCDF	**PAH**	**PCDD/ PCDF**	**HCB**	**PCB**
Combustion in energy transformation industry	2.0	0.2	1.4E-02	3.7
Non-industrial combustion plants	7521.5	16.8	0.24	0.0
Combustion in manufacturing industry	388.6	0.5	1.7E-02	0.5
Production processes	73.076282	0.5	0	0.4
Extraction and distribution of fossil fuels and geothermal energy	0	0	0	0
Solvent and other product use	67.8	0.001	0	420.4
Road transport	142.5	1.0	NA	NE
Other mobile source and machinery	45.6	0.3	0.003	0.002
Waste treatment and disposal	0.0037	2.1	0.005985	0.003
Agriculture	0	0	0	0
TOTAL	**8241.0**	**21.5**	**0.28**	**425.0**
Other source and sinks (not included in national total)	84.5	0.0061	0.0001198	5.702E-05
Emissions in relation to population, kg/citizen	2.0	0.005	6.759E-05	0.1
Emissions in relation to area, kg/km^2	0.1	0.0004	5.021E-06	0.008
Emissions in relation to GDP, g/EUR	0.2	0.000	6.477E-06	0.010
Share, %	**PAH**	**PCDD/ PCDF**	**HCB**	**PCB**
Combustion in energy transformation industry	2.5E-02	1.2	4.8	0.9
Non-industrial combustion plants	91.3	78.4	85.9	0.0
Combustion in manufacturing industry	4.7	2.2	6.1	0.1
Production processes	0.9	2.1	0.0	0.1
Extraction and distribution of fossil fuels and geothermal energy	0	0	0	0
Solvent and other product use	0.8	0.004	0	98.9
Road transport	1.7	4.8	-	-
Other mobile source and machinery	0.6	1.6	1.2	0.001
Waste treatment and disposal	0	9.7	2	0.001
Agriculture	0	0	0	0
TOTAL	**100.0**	**100.0**	**100.0**	**100.0**
Other source and sinks (not included in national total)	1.0	0.03	0	0

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 1990–2015, for the present submission. The overview of changes between total pollutants emissions for 2014 submitted in 2016 and in this year submission along with comparison with total pollutants emissions for 2015, and explanations for changes are present in table ES4-1. In addition, in Appendix 8. the influence of recalculations made 1990 - 2014 in respect to each of pollutant and by SNAP97 sector are presented.

Table ES4-1 Recalculations and explanations for changes between submitted total pollutants emissions for year 2014 in IIR 2016 and in IIR 2017

Pollutant	2016 submission	2017 submission		Unit	Explanations for changes between the 2016 and 2017 submissions
	IIR 2016	IIR 2017			
	2014	2014	2015		

NOx	55.2	52.9	53.1	kt	Small changes stems from methodology improvement in sectors:
					- 1.A.1.a Public electricity and heat production:
					  - In 2014 wrong emission was entered for TE Rijeka
					- 1.A.2 Stationary combustion in manufacturing industries and construction: In 2014 Recalculation was performed due to harmonisation of data with NIR and Industry analysis balance
					- 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), 1.A.3.a.i (ii) International aviation cruise (civil), 1.A.3.a.ii (ii) Domestic aviation cruise (civil): Correction in source due to change of activity data from EUROSTAT to national energy balance 2014
					- 1.A.3.b Road transportation:
					  • Correction in source due to change of activity data from EUROSTAT to national energy balance 2014
					  - In 2014 error regarding double counting in one part of vehicle database corrected
					  - Density of CNG was corrected for the period from 2011-2014

Pollutant	2016 submission	2017 submission		Unit	Explanations for changes between the 2016 and 2017 submissions
	IIR 2016	IIR 2017			
	2014	2014	2015		
					- 1.A.3.c Railways Correction in source due to change of activity data from EUROSTAT to national energy balance 2014 - 1.A.3.d Navigation: Correction in source due to change of activity data from EUROSTAT to national energy balance 2014 - 1.A.2.g.vii Off-road mobile sources and machinery in Industry: error in value of fuel diesel used in 2014, - 1.B.2.c Fugitive emission from venting and flaring: changes due to the methodology improvement, - 3.B.1.a Cattle dairy: small changes due to updated number of animals produced annually on dairy cattle category for the years 2013-2014 - 3.D.1.a Inorganic N-fertilizers (includes application of urea): updated value for mineral N-fertilizers for year 2014 Small changes stems from alignment with the data presented in the Croatian NIR 2017 in sector: 2.C.1.1 Electric furnace steel plant

NMVOC	60.4	59.4	60.6	kt	Small changes stems from methodology improvement in sectors:
					- 1.A.1.a Public electricity and heat production:
					  - In 2014 wrong emission was entered for TE Rijeka
					- 1.A.2 Stationary combustion in manufacturing industries and construction: In 2014 Recalculation was performed due to harmonisation of data with NIR and Industry analysis balance
					- 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), 1.A.3.a.i (ii) International aviation cruise (civil), 1.A.3.a.ii (ii) Domestic aviation cruise (civil): Correction in source due to change of activity data from EUROSTAT to national energy balance 2014
					- 1.A.3.b Road transportation:
					  • Correction in source due to change of activity data from EUROSTAT to national energy balance 2014
					  - In 2014 error regarding double counting in one part of vehicle database corrected
					  - Density of CNG was corrected for the period from 2011-2014
					- 1.A.3.c Railways: Correction in source due to change of activity data from EUROSTAT to national energy balance 2014
					- 1.A.3.d Navigation: Correction in source due to change of activity data from EUROSTAT to national energy balance 2014

Pollutant	**2016 submission**	**2017 submission**		**Unit**	**Explanations for changes between the 2016 and 2017 submissions**
	IIR 2016	**IIR 2017**			
	2014	**2014**	**2015**		
					- 1.A.3.b.i, 1.A.3.b.ii, 1.A.3.b.iii, 1.A.3.b.iv: Changes in historical trend due to the insignificant manual error in the calculation - 1.A.2.g.vii Off-road mobile sources and machinery in Industry: error in value of fuel diesel used in 2014,, - 1.B.2.a.i Oil – Exploration, production, transport due to new set of activity data - 1.B.2.a.v Distribution of petroleum products: recalculated trend due to the move to Tier 2 EMEP/EEA methodology. Improvement was conducted within the project "Improvement of the air pollutants emissions calculation in accordance with LRTAP Convention- Tier 2", the project assignment " Improvement of the air pollutants emissions calculation for the sector 1.B.2 Fugitive emissions from fossil fuels (ii. NFR 1.B.2.b Distribution of petroleum products (gasoline) - 1.B.2.c. Fugitive emission from venting and flaring: changes due to the methodology improvement in sectors Flaring in oil refinery and Flaring in gas and oil extraction - 3.B.1.a Cattle dairy: small changes due to updated number of animals produced annually on dairy cattle category for the years 2013-2014 - NFR 3.B.1.a Cattle dairy and 3.B.3 Fattening pigs: In addition, emissions were recalculated for the entire 1990-2014 period due to implementation of rounding of activity data following NAPA to AAP animal number conversion and extrapolation procedures. This resulted in a insignificant change of emission. - 3.D.1.a Inorganic N-fertilizers (includes urea): updated value for mineral N-fertilizers for year 2014 Due to replacement of FAO activity data on harvested area of crops with national sources (CBS) and updating the AD on crop yield with new CBS values, emissions were recalculated as follows: Crop area: Sorghum (1999-2001, 2004, 2014), cow peas, dry (1996, 1997, 2000, 2005), lentils (1999-2005, 2007), vetches (1998, 2002-2006, 2008-2009, 2012). Crop yield: Sorghum (1998-2004), cow peas, dry (1996-1998, 2000, 2005), lentils (1998-2000, 2002-2005), vetches (2002-2005, 2008, 2010). Small change stems from alignment with the data presented in the Croatian NIR 2017 in sectors: - 2.C.1.1 Electric furnace steel plant - 5.A Biological treatment of waste – solid waste disposal on land

Pollutant	2016 submission	2017 submission		Unit	Explanations for changes between the 2016 and 2017 submissions
	IIR 2016	IIR 2017			
	2014	2014	2015		
					- Small changes stems from correction of activity data for 2014 in sector 2.D.3.i, 2.G Other solvent and product use (SNAP 060412-3, 060412-4).
SO_2	15.6	14.0	15.1	kt	Significant changes stems from methodology improvement in sectors: - 1.A.1.a Public electricity and heat production: In 2014 wrong emission was entered for TE Rijeka - 1.A.2 Stationary combustion in manufacturing industries and construction: In 2014 Recalculation was performed due to harmonisation of data with NIR and Industry analysis balance - 1.A.2.g.vii Off-road mobile sources and machinery in Industry: error in value of fuel diesel used in 2014, - 1.A.3.b Road transportation: • Correction in source due to change of activity data from EUROSTAT to national energy balance 2014 - In 2014 error regarding double counting in one part of vehicle database corrected - Density of CNG was corrected for the period from 2011-2014 - 1.A.2.g.vii Off-road mobile sources and machinery in Industry: error in value of fuel diesel used in 2014, - 1.A.3.b Road transportation: in 2014 error regarding double counting in one part of vehicle database corrected - 1.A.3.a Aviation, 1.A.3.c Railways, 1.A.3.d Navigation: Changes in sulphur content in gass fuel and revision on data Small changes stems from alignment with the data presented in the Croatian NIR 2017 in sector: 2.C.1.1 Electric furnace steel plant
NH_3	25.5	26.8	29.8	kt	Small changes stems from methodology improvement in sectors: - 1.A.1.a Public electricity and heat production: In 2014 wrong emission was entered for TE Rijeka - 1.A.2 Stationary combustion in manufacturing industries and construction: In 2014 Recalculation was performed due to harmonisation of data with NIR and Industry analysis balance - 1.A.2.g.vii Off-road mobile sources and machinery in Industry: error in value of fuel diesel used in 2014, - 1.A.3.b Road transportation: • Correction in source due to change of activity data from EUROSTAT to national energy balance 2014 - In 2014 error regarding double counting in one part of vehicle database corrected - Density of CNG was corrected for the period from 2011-

Pollutant	2016 sub-mission	2017 submission		Unit	Explanations for changes between the 2016 and 2017 submissions
	IIR 2016	IIR 2017			
	2014	2014	2015		
					2014 - 1.A.4.b.i Residential: inclusion of the trend of consumption of pellets and inclusion of two technologies: pellets combustion in furnaces and boilers and combustion of biomass in the advanced / eco labelled furnaces and boilers (Tier 2 FE, FR 2013) - 3.B.1.a Cattle dairy: small changes due to updated number of animals produced annually on dairy cattle category for the years 2013-2014 - NFR 3.B.1.a Cattle dairy and 3.B.3 Fattening pigs: In addition, emissions were recalculated for the entire 1990-2014 period due to implementation of rounding of activity data following NAPA to AAP animal number conversion and extrapolation procedures. This resulted in a insignificant change of emission. - 3.D.1.a Inorganic N-fertilizers (includes urea): updated value for mineral N-fertilizers for year 2014 Due to replacement of FAO activity data on harvested area of crops with national sources (CBS) and updating the AD on crop yield with new CBS values, emissions were recalculated as follows: Crop area: Sorghum (1999-2001, 2004, 2014), cow peas, dry (1996, 1997, 2000, 2005), lentils (1999-2005, 2007), vetches (1998, 2002-2006, 2008-2009, 2012). Crop yield: Sorghum (1998-2004), cow peas, dry (1996-1998, 2000, 2005), lentils (1998-2000, 2002-2005), vetches (2002-2005, 2008, 2010).
$PM_{2.5}$	19.2	19.3	20.0	kt	Small changes stems from methodology improvement in sectors: - 1.A.2 Stationary combustion in manufacturing industries and construction: In 2014 Recalculation was performed due to harmonisation of data with NIR and Industry analysis balance - 1.A.2.g.vii Off-road mobile sources and machinery in Industry: error in value of fuel diesel used in 2014, - 1.A.3.b Road transportation: • Correction in source due to change of activity data from EUROSTAT to national energy balance 2014 - In 2014 error regarding double counting in one part of vehicle database corrected - Density of CNG was corrected for the period from 2011-2014 - 3.B.1.a Cattle dairy: small changes due to updated number of animals produced annually on dairy cattle category for the years 2013-2014 - NFR 3.B.1.a Cattle dairy and 3.B.3 Fattening pigs: In

Pollutant	2016 sub-mission	2017 submission		Unit	Explanations for changes between the 2016 and 2017 submissions
	IIR 2016	IIR 2017			
	2014	2014	2015		
					addition, emissions were recalculated for the entire 1990-2014 period due to implementation of rounding of activity data following NAPA to AAP animal number conversion and extrapolation procedures. This resulted in a insignificant change of emission. - 3.D.1.a Inorganic N-fertilizers (includes urea): updated value for mineral N-fertilizers for year 2014 Due to replacement of FAO activity data on harvested area of crops with national sources (CBS) and updating the AD on crop yield with new CBS values, emissions were recalculated as follows: Crop area: Sorghum (1999-2001, 2004, 2014), cow peas, dry (1996, 1997, 2000, 2005), lentils (1999-2005, 2007), vetches (1998, 2002-2006, 2008-2009, 2012). Crop yield: Sorghum (1998-2004), cow peas, dry (1996-1998, 2000, 2005), lentils (1998-2000, 2002-2005), vetches (2002-2005, 2008, 2010). Small changes stems from alignment with the data presented in the Croatian NIR 2017 in sectors: - 2.A.1 Cement production - 2.A.2 Lime production - 2.A.3 Glass production - 2.C.1.1 Electric furnace steel plant - 5.A Biological treatment of waste – solid waste disposal on land Small changes stems from correction of activity data for 2014 in sector 5.E Other waste.
PM_{10}	25.7	25.8	26.6	kt	Small changes stems from methodology improvement in sectors as set out under the $PM_{2.5}$ - 1.A.2 Stationary combustion in manufacturing industries and construction: In 2014 Recalculation was performed due to harmonisation of data with NIR and Industry analysis balance - 1.A.2.g.vii Off-road mobile sources and machinery in Industry: error in value of fuel diesel used in 2014 - 1.A.3.b Road transportation: • Correction in source due to change of activity data from EUROSTAT to national energy balance 2014 - In 2014 error regarding double counting in one part of vehicle database corrected - Density of CNG was corrected for the period from 2011-2014 - 3.B.1.a Cattle dairy: small changes due to updated number of animals produced annually on dairy cattle category for the years 2013-2014

Pollutant	2016 submission	2017 submission		Unit	Explanations for changes between the 2016 and 2017 submissions
	IIR 2016	IIR 2017			
	2014	2014	2015		
					- NFR 3.B.1.a Cattle dairy and 3.B.3 Fattening pigs: In addition, emissions were recalculated for the entire 1990-2014 period due to implementation of rounding of activity data following NAPA to AAP animal number conversion and extrapolation procedures. This resulted in a insignificant change of emission. - 3.D.1.a Inorganic N-fertilizers (includes urea): updated value for mineral N-fertilizers for year 2014 Due to replacement of FAO activity data on harvested area of crops with national sources (CBS) and updating the AD on crop yield with new CBS values, emissions were recalculated as follows: Crop area: Sorghum (1999-2001, 2004, 2014), cow peas, dry (1996, 1997, 2000, 2005), lentils (1999-2005, 2007), vetches (1998, 2002-2006, 2008-2009, 2012). Crop yield: Sorghum (1998-2004), cow peas, dry (1996-1998, 2000, 2005), lentils (1998-2000, 2002-2005), vetches (2002-2005, 2008, 2010). Small changes stems from alignment with the data presented in the Croatian NIR 2017 in sectors: - 2.A.1 Cement production - 2.A.2 Lime production - 2.A.3 Glass production - 2.C.1.1 Electric furnace steel plant - 5.A Biological treatment of waste – solid waste disposal on land Small changes stems from correction of activity data for 2014 in sector 5.E Other waste.
TSP	37.6	37.7	38.8	kt	Smallchanges stems from methodology improvement in sectors as set out under the $PM_{2.5}$ - 1.A.2 Stationary combustion in manufacturing industries and construction: In 2014 Recalculation was performed due to harmonisation of data with NIR and Industry analysis balance - 1.A.2.g.vii Off-road mobile sources and machinery in Industry: error in value of fuel diesel used in 2014 - 1.A.3.b Road transportation: • Correction in source due to change of activity data from EUROSTAT to national energy balance 2014 - In 2014 error regarding double counting in one part of vehicle database corrected - Density of CNG was corrected for the period from 2011-2014 - 3.B.1.a Cattle dairy: small changes due to updated number of animals produced annually on dairy cattle

<table>
<tr><th rowspan="3">Pollutant</th><th>2016 sub-mission</th><th colspan="2">2017 submission</th><th rowspan="3">Unit</th><th rowspan="3">Explanations for changes between the 2016 and 2017 submissions</th></tr>
<tr><th>IIR 2016</th><th colspan="2">IIR 2017</th></tr>
<tr><th>2014</th><th>2014</th><th>2015</th></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td>category for the years 2013-2014
- NFR 3.B.1.a Cattle dairy and 3.B.3 Fattening pigs: In addition, emissions were recalculated for the entire 1990-2014 period due to implementation of rounding of activity data following NAPA to AAP animal number conversion and extrapolation procedures. This resulted in a insignificant change of emission.
- 3.D.1.a Inorganic N-fertilizers (includes urea): updated value for mineral N-fertilizers for year 2014 Due to replacement of FAO activity data on harvested area of crops with national sources (CBS) and updating the AD on crop yield with new CBS values, emissions were recalculated as follows:
Crop area: Sorghum (1999-2001, 2004, 2014), cow peas, dry (1996, 1997, 2000, 2005), lentils (1999-2005, 2007), vetches (1998, 2002-2006, 2008-2009, 2012).
Crop yield: Sorghum (1998-2004), cow peas, dry (1996-1998, 2000, 2005), lentils (1998-2000, 2002-2005), vetches (2002-2005, 2008, 2010).
Small changes stems from alignment with the data presented in the Croatian NIR 2017 in sectors:
- 2.A.1 Cement production
- 2.A.2 Lime production
- 2.A.3 Glass production
- 2.C.1.1 Electric furnace steel plant
- 5.A Biological treatment of waste – solid waste disposal on land
Small changes stems from correction of activity data for 2014 in sector 5.E Other waste.</td></tr>
<tr><td>BC</td><td>3.2</td><td>3.1</td><td>3.4</td><td>kt</td><td>Small changes stems from the inventory supplement with BC emission calculation for following NFR categories:
- 1.A.2 Stationary combustion in manufacturing industries and construction: In 2014 Recalculation was performed due to harmonisation of data with NIR and Industry analysis balance
- 1.A.2.g.vii Off-road mobile sources and machinery in Industry: error in value of fuel diesel used in 2014
- 1.A.3.b Road transportation:
• Correction in source due to change of activity data from EUROSTAT to national energy balance 2014
- In 2014 error regarding double counting in one part of vehicle database corrected
- Density of CNG was corrected for the period from 2011-2014
Small changes stems from alignment with the data presented in</td></tr>
</table>

<table>
<tr><th rowspan="3">Pollutant</th><th>2016 sub-mission</th><th colspan="2">2017 submission</th><th rowspan="3">Unit</th><th rowspan="3">Explanations for changes between the 2016 and 2017 submissions</th></tr>
<tr><th>IIR 2016</th><th colspan="2">IIR 2017</th></tr>
<tr><th>2014</th><th>2014</th><th>2015</th></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td>the Croatian NIR 2017 in sectors:
- 2.A.1 Cement production
- 2.A.2 Lime production
- 2.A.3 Glass production
- 2.C.1.1 Electric furnace steel plant</td></tr>
<tr><td>CO</td><td>203.0</td><td>202.2</td><td>216.3</td><td>kt</td><td>Small changes stems from methodology improvement in sectors:
- 1.A.1.a Public electricity and heat production: In 2014 error in direct emission emission for TE Rijeka
- 1.A.2 Stationary combustion in manufacturing industries and construction: In 2014 Recalculation was performed due to harmonisation of data with NIR and Industry analysis balance
- 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), 1.A.3.a.i (ii) International aviation cruise (civil), 1.A.3.a.ii (ii) Domestic aviation cruise (civil): Correction in source due to change of activity data from EUROSTAT to national energy balance 2014
- 1.A.3.b Road transportation:
• Correction in source due to change of activity data from EUROSTAT to national energy balance 2014
- In 2014 error regarding double counting in one part of vehicle database corrected
- Density of CNG was corrected for the period from 2011-2014
- 1.A.3.c Railways: Correction in source due to change of activity data from EUROSTAT to national energy balance 2014
- 1.A.3.d Navigation: Correction in source due to change of activity data from EUROSTAT to national energy balance 2014
- 1.A.2.g.vii Off-road mobile sources and machinery in Industry: error in value of fuel diesel used in 2014
Small changes stems from alignment with the data presented in the Croatian NIR 2017 in sector:
2.C.1.1 Electric furnace steel plant</td></tr>
<tr><td>Pb</td><td>7.0</td><td>7.1</td><td>7.1</td><td>t</td><td>Small changes stems from methodology improvement in sectors:
- 1.A.1.a Public electricity and heat production: In 2014 error in direct emission emission for TE Rijeka
- 1.A.2 Stationary combustion in manufacturing industries and construction: In 2014 Recalculation was performed due to harmonisation of data with NIR and Industry analysis balance
- 1.A.2.g.vii Off-road mobile sources and machinery in Industry: error in value of fuel diesel used in 2014</td></tr>
</table>

Pollutant	2016 sub-mission	2017 submission		Unit	Explanations for changes between the 2016 and 2017 submissions
	IIR 2016	IIR 2017			
	2014	2014	2015		
					- 1.A.3.b Road transportation: • Correction in source due to change of activity data from EUROSTAT to national energy balance 2014 - In 2014 error regarding double counting in one part of vehicle database corrected - Density of CNG was corrected for the period from 2011-2014 Small changes stems from correction of activity data for 2014 in sector 5.E Other waste. Small changes stems from alignment with the data presented in the Croatian NIR 2017 in sectors: - 2.A.3 Glass production 2.C.1.1 Electric furnace steel plant
Cd	0.8	0.8	0.9	t	Changes stems from methodology improvement in sectors: - 1.A.1.a Public electricity and heat production: In 2014 error in direct emission for TE Rijeka - 1.A.2 Stationary combustion in manufacturing industries and construction: In 2014 Recalculation was performed due to harmonisation of data with NIR and Industry analysis balance - 1.A.2.g.vii Off-road mobile sources and machinery in Industry: error in value of fuel diesel used in 2014 - 1.A.3.b Road transportation: • Correction in source due to change of activity data from EUROSTAT to national energy balance 2014 - In 2014 error regarding double counting in one part of vehicle database corrected - Density of CNG was corrected for the period from 2011-2014 Small changes stems from correction of activity data for 2014 in sector 5.E Other waste. Small changes stems from alignment with the data presented in the Croatian NIR 2017 in sectors: - 2.A.3 Glass production 2.C.1.1 Electric furnace steel plant
Hg	0.5	0.5	0.5	t	Small changes stems from methodology improvement in sectors: - 1.A.2 Stationary combustion in manufacturing industries and construction: In 2014 Recalculation was performed due to harmonisation of data with NIR and Industry analysis balance - 1.A.3.b Road transportation: • Correction in source due to change of activity data from EUROSTAT to national energy balance 2014 - In 2014 error regarding double counting in one part of vehicle database corrected

<table>
<tr><th rowspan="3">Pollutant</th><th>2016 sub-mission</th><th colspan="2">2017 submission</th><th rowspan="3">Unit</th><th rowspan="3">Explanations for changes between the 2016 and 2017 submissions</th></tr>
<tr><th>IIR 2016</th><th colspan="2">IIR 2017</th></tr>
<tr><th>2014</th><th>2014</th><th>2015</th></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td>- Density of CNG was corrected for the period from 2011-2014
Small changes stems from correction of activity data for 2014 in sector 5.E Other waste.
Small changes stems from alignment with the data presented in the Croatian NIR 2017 in sectors:
- 2.A.3 Glass production
2.C.1.1 Electric furnace steel plant</td></tr>
<tr><td>As</td><td>0.3</td><td>0.3</td><td>0.5</td><td>t</td><td>Small changes stems from methodology improvement in sectors:
- 1.A.2 Stationary combustion in manufacturing industries and construction: In 2014 Recalculation was performed due to harmonisation of data with NIR and Industry analysis balance
- 1.A.3.b Road transportation:
• Correction in source due to change of activity data from EUROSTAT to national energy balance 2014
- In 2014 error regarding double counting in one part of vehicle database corrected
- Density of CNG was corrected for the period from 2011-2014
Small changes stems from correction of activity data for 2014 in sector 5.E Other waste.
Small changes stems from alignment with the data presented in the Croatian NIR 2017 in sectors:
- 2.A.3 Glass production
2.C.1.1 Electric furnace steel plant</td></tr>
<tr><td>Cr</td><td>1.9</td><td>2.0</td><td>2.1</td><td>t</td><td>Small changes stems from methodology improvement in sectors:
- 1.A.2 Stationary combustion in manufacturing industries and construction: In 2014 Recalculation was performed due to harmonisation of data with NIR and Industry analysis balance
- 1.A.2.g.vii Off-road mobile sources and machinery in Industry: error in value of fuel diesel used in 2014
- 1.A.3.b Road transportation:
• Correction in source due to change of activity data from EUROSTAT to national energy balance 2014
- In 2014 error regarding double counting in one part of vehicle database corrected
- Density of CNG was corrected for the period from 2011-2014
Small changes stems from correction of activity data for 2014 in sector 5.E Other waste.
Small changes stems from alignment with the data presented in the Croatian NIR 2017 in sectors:
- 2.A.3 Glass production</td></tr>
</table>

Pollutant	2016 sub-mission	2017 submission		Unit	Explanations for changes between the 2016 and 2017 submissions
	IIR 2016	IIR 2017			
	2014	2014	2015		
					2.C.1.1 Electric furnace steel plant
Cu	7.4	7.2	7.6	t	Small changes stems from methodology improvement in sectors: - 1.A.2 Stationary combustion in manufacturing industries and construction: In 2014 Recalculation was performed due to harmonisation of data with NIR and Industry analysis balance - 1.A.2.g.vii Off-road mobile sources and machinery in Industry: error in value of fuel diesel used in 2014 - 1.A.3.b Road transportation: • Correction in source due to change of activity data from EUROSTAT to national energy balance 2014 - In 2014 error regarding double counting in one part of vehicle database corrected - Density of CNG was corrected for the period from 2011-2014 Small changes stems from correction of activity data for 2014 in sector 5.E Other waste. Small changes stems from alignment with the data presented in the Croatian NIR 2017 in sectors: - 2.A.3 Glass production 2.C.1.1 Electric furnace steel plant
Ni	6.9	6.6	6.4	t	Small changes stems from methodology improvement in sectors: - 1.A.2 Stationary combustion in manufacturing industries and construction: In 2014 Recalculation was performed due to harmonisation of data with NIR and Industry analysis balance - 1.A.2.g.vii Off-road mobile sources and machinery in Industry: error in value of fuel diesel used in 2014 - 1.A.3.b Road transportation: • Correction in source due to change of activity data from EUROSTAT to national energy balance 2014 - In 2014 error regarding double counting in one part of vehicle database corrected - Density of CNG was corrected for the period from 2011-2014 Small changes stems from alignment with the data presented in the Croatian NIR 2017 in sectors: - 2.A.3 Glass production 2.C.1.1 Electric furnace steel plant
Se	0.3	0.4	0.3	t	Small changes stems from methodology improvement in sectors: - 1.A.2 Stationary combustion in manufacturing industries and construction: In 2014 Recalculation was performed due to harmonisation of data with NIR and Industry analysis balance - 1.A.2.g.vii Off-road mobile sources and machinery in

<table>
<tr><th rowspan="3">Pollutant</th><th>2016 sub-mission</th><th colspan="2">2017 submission</th><th rowspan="3">Unit</th><th rowspan="3">Explanations for changes between the 2016 and 2017 submissions</th></tr>
<tr><th>IIR 2016</th><th colspan="2">IIR 2017</th></tr>
<tr><th>2014</th><th>2014</th><th>2015</th></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td>Industry: error in value of fuel diesel used in 2014
- 1.A.3.b Road transportation:
• Correction in source due to change of activity data from EUROSTAT to national energy balance 2014
- In 2014 error regarding double counting in one part of vehicle database corrected
- Density of CNG was corrected for the period from 2011-2014
Small changes stems from alignment with the data presented in the Croatian NIR 2017 in sector:
- 2.A.3 Glass production</td></tr>
<tr><td>Zn</td><td>31.3</td><td>31.6</td><td>34.6</td><td>t</td><td>Small changes stems from methodology improvement in sectors:
- 1.A.2 Stationary combustion in manufacturing industries and construction: In 2014 Recalculation was performed due to harmonisation of data with NIR and Industry analysis balance
- 1.A.2.g.vii Off-road mobile sources and machinery in Industry: error in value of fuel diesel used in 2014
- 1.A.3.b Road transportation:
• Correction in source due to change of activity data from EUROSTAT to national energy balance 2014
- In 2014 error regarding double counting in one part of vehicle database corrected
- Density of CNG was corrected for the period from 2011-2014
Small changes stems from alignment with the data presented in the Croatian NIR 2017 in sectors:
- 2.A.3 Glass production
- 2.C.1.1 Electric furnace steel plant</td></tr>
<tr><td>PCDD / PCDF</td><td>19.9</td><td>20.9</td><td>21.5</td><td>g I-Teq</td><td>Small changes stems from methodology improvement in sectors:
- 1.A.2 Stationary combustion in manufacturing industries and construction: In 2014 Recalculation was performed due to harmonisation of data with NIR and Industry analysis balance
- 1.A.3.b Road transportation:
• Correction in source due to change of activity data from EUROSTAT to national energy balance 2014
- In 2014 error regarding double counting in one part of vehicle database corrected
- Density of CNG was corrected for the period from 2011-2014
- 1.A.4.b.ii, 1.A.4.b.ii, 1.A.2.g.vii Off-road mobile sources and machinery: error in value of fuel used in 2014,
- correction of activity data for 2014 in sector 5.E Other waste.</td></tr>
</table>

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<tr><th rowspan="3">Pollutant</th><th>2016 sub-mission</th><th colspan="2">2017 submission</th><th rowspan="3">Unit</th><th rowspan="3">Explanations for changes between the 2016 and 2017 submissions</th></tr>
<tr><th>IIR 2016</th><th colspan="2">IIR 2017</th></tr>
<tr><th>2014</th><th>2014</th><th>2015</th></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td>Small changes stems from alignment with the data presented in the Croatian NIR 2017 in sector:
- 2.C.1.1 Electric furnace steel plant</td></tr>
<tr><td>Total 4 PAHs</td><td>8.0</td><td>8.0</td><td>8.2</td><td>t</td><td>Small changes stems from methodology improvement in sectors:
- 1.A.2 Stationary combustion in manufacturing industries and construction: In 2014 Recalculation was performed due to harmonisation of data with NIR and Industry analysis balance
- 1.A.2.g.vii Off-road mobile sources and machinery in Industry: error in value of fuel diesel used in 2014
- 1.A.3.b Road transportation:
• Correction in source due to change of activity data from EUROSTAT to national energy balance 2014
- In 2014 error regarding double counting in one part of vehicle database corrected
- Density of CNG was corrected for the period from 2011-2014
- 1.A.3.c Railways inclusion of Tier 1 FE according to GB2013,
- 1.A.3.d Navigation: the inclusion of Tier 1 emission factors according to GB2013 and supplement data on the amount of fuel oil
- 1.A.3.b Road transportation: in 2014 error regarding double counting in one part of vehicle database corrected
- 1.A.4.b.ii, 1.A.4.b.ii, 1.A.2.g.vii Off-road mobile sources and machinery: error in value of fuel used in 2014
Small changes stems from alignment with the data presented in the Croatian NIR 2017 in sector:
- 2.C.1.1 Electric furnace steel plant</td></tr>
<tr><td>benzo (a) pyrene</td><td>2.7</td><td>2.7</td><td>2.8</td><td>t</td><td>Small changes changes stems from methodology improvement in sectors as set out under the Total 4 PAHs
- 1.A.2 Stationary combustion in manufacturing industries and construction: In 2014 Recalculation was performed due to harmonisation of data with NIR and Industry analysis balance
- 1.A.2.g.vii Off-road mobile sources and machinery in Industry: error in value of fuel diesel used in 2014
- 1.A.3.b Road transportation:
• Correction in source due to change of activity data from EUROSTAT to national energy balance 2014
- In 2014 error regarding double counting in one part of vehicle database corrected
- Density of CNG was corrected for the period from 2011-2014</td></tr>
</table>

Pollutant	**2016 sub-mission**	**2017 submission**		**Unit**	**Explanations for changes between the 2016 and 2017 submissions**
	IIR 2016	**IIR 2017**			
	2014	**2014**	**2015**		
benzo (b) fluoranthene	2.7	2.7	2.8	t	Small changes changes stems from methodology improvement in sectors as set out under the Total 4 PAHs - 1.A.2 Stationary combustion in manufacturing industries and construction: In 2014 Recalculation was performed due to harmonisation of data with NIR and Industry analysis balance - 1.A.2.g.vii Off-road mobile sources and machinery in Industry: error in value of fuel diesel used in 2014 - 1.A.3.b Road transportation: • Correction in source due to change of activity data from EUROSTAT to national energy balance 2014 - In 2014 error regarding double counting in one part of vehicle database corrected - Density of CNG was corrected for the period from 2011-2014
benzo (k) fluoranthene	1.0	1.0	1.1	t	Small changes changes stems from methodology improvement in sectors as set out under the Total 4 PAHs - 1.A.2. Stationary combustion in manufacturing industries and construction: In 2014 Recalculation was performed due to harmonisation of data with NIR and Industry analysis balance - 1.A.3.b Road transportation: • Correction in source due to change of activity data from EUROSTAT to national energy balance 2014 - In 2014 error regarding double counting in one part of vehicle database corrected - Density of CNG was corrected for the period from 2011-2014
indeno (1, 2, 3-cd) pyrene	1.5	1.5	1.5	t	Small changes changes stems from methodology improvement in sectors as set out under the Total 4 PAHs - 1.A.2 Stationary combustion in manufacturing industries and construction: In 2014 Recalculation was performed due to harmonisation of data with NIR and Industry analysis balance - 1.A.3.b Road transportation: • Correction in source due to change of activity data from EUROSTAT to national energy balance 2014 - In 2014 error regarding double counting in one part of vehicle database corrected - Density of CNG was corrected for the period from 2011-2014
HCB	0.3	0.3	0.3	kg	No changes.
PCBs	428.6	428.7	425.0	kg	Small changes stems from alignment with the data presented in the Croatian NIR 2017 in sector: - 2.C.1.1 Electric furnace steel plant

ES5 IMPROVEMENTS AND OTHER ACTIVITY

The Croatian IIR 2017 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 2017

NFR sector, Name	NFR sub-sector, Name	Description of improvements and other activity made
1 A Energy – fuel combustion	1.A.2. Stationary combustion in manufacturing industries and construction	- In 2014 Recalculation was performed due to harmonisation of data with NIR and Industry analysis balance
1.A Energy – fuel combustion	1.A.3.b Road transport	– The application of newer version (11.3) of the COPERT model is implemented in IIR 2017. This version include Euro VI standards for heavy duty vehicles. – Correction in source due to change of activity data from EUROSTAT to national energy balance 2014 – In 2014 error regarding double counting in one part of vehicle database corrected – Density of CNG was corrected for the period from 2011-2014
1 A Energy – fuel combustion	1.A.4.a.i Commercial/institutional	Recalculation of whole historical trend is done due to new trend of activity data for biomass consumption in residential sector from 1990 to 2013
1 A Energy – fuel combustion	1.A.4.b.i Residential	Recalculation of whole historical trend is done due to new trend of activity data for biomass consumption in residential sector from 1990 to 2013
1.B Fugitive emissions	1.B.2.a.v Distribution of petroleum products	Recalculation of whole historical trend is done due to the methodology improvement, move to Tier 2. Improvement was conducted within the project "Improvement of the air pollutants emissions calculation in accordance with LRTAP Convention- Tier 2", the project assignment "Improvement of the air pollutants emissions calculation for the sector 1.B.2 Fugitive emissions from fossil fuels (ii. NFR 1.B.2.b Distribution of petroleum products (gasoline)), 2016.
1.B Fugitive emissions	1.B.2.c Flares	Recalculation was performed for the historical trend due to improvement of the methodology and move on to Tier 2 along with the inclusion of the recommended emission factors from GB2016.
2 Industrial processes and product use	2.A.1 Cement production	Recalculation was performed for the period 2010 – 2014 due to alignment with the data presented in the Croatian NIR 2017.

NFR sector, Name	NFR sub-sector, Name	Description of improvements and other activity made
2 Industrial processes and product use	2.A.2 Lime production	Recalculation was performed for the periods 1990 - 1992, 1994 - 1998 and 2000 - 2014 due to alignment with the data presented in the Croatian NIR 2017.
2 Industrial processes and product use	2.A.3 Glass production	Recalculation was performed for 2014 due to alignment with the data presented in the Croatian NIR 2017.
2 Industrial processes and product use	2.C.1.1 Electric furnace steel plant	Recalculation was performed for the years 1992, 1994, 1995, 1997 – 2009, 2011 – 2014 due to alignment with the data presented in the Croatian NIR 2017.
2 Industrial processes and product use	2.D.3.c Asphalt roofing	Recalculation was performed for 2012 due to the correction of activity data.
2 Industrial processes and product use	2.D.3.i, 2.G Other solvent and product use	Recalculation was performed for 2013 and 2014 due to the correction of activity data for Cooling lubricant (SNAP 060412-3) and Lubricant (SNAP 060412-4).
3 Agriculture	3.B Manure management	Recalculation was performed for the years 2013-2014 due to updated activity data for Cattle Dairy (years 2013-2014) . -3.B.1.a. In addition, emissions were recalculated for the entire 1990-2014 period due to implementation of rounding of activity data following NAPA to AAP animal number conversion and extrapolation procedures. This resulted in a insignificant change of emission for NFR 3.B.1.a Cattle dairy and 3.B.3 Fattening pigs.
3 Agriculture	3.D.1.a Inorganic N-fertilizers (includes also urea application)	A recalculation of emissions in 2014 was conducted due to new information on the activity data: total amount of mineral N-fertilizer. In addition, due to replacement of FAO activity data on harvested area of crops with national sources (CBS) and updating the AD on crop yield with new CBS values, emissions were recalculated as follows: Crop area: Sorghum (1999-2001, 2004, 2014), cow peas, dry (1996, 1997, 2000, 2005), lentils (1999-2005, 2007), vetches (1998, 2002-2006, 2008-2009, 2012). Crop yield: Sorghum (1998-2004), cow peas, dry (1996-1998, 2000, 2005), lentils (1998-2000, 2002-2005), vetches (2002-2005, 2008, 2010).
3 Agriculture	3.B Manure management	Recalculation was performed for the years 2013-2014 due to updated activity data for Cattle Dairy (years 2013-2014) .
3 Agriculture	3.D.1.a Inorganic N-fertilizers (includes also urea application)	A recalculation of emissions in 2014 was conducted due to new information on the activity data: total amount of mineral N-fertilizer.

NFR sector, Name	NFR sub-sector, Name	Description of improvements and other activity made
5 Waste	5.A Biological treatment of waste - Solid waste disposal on land	Recalculation was performed for the period 2010 – 2014 due to alignment with the activity data on disposed municipal and industrial waste presented in the Croatian NIR 2017.
5 Waste	5.E Other waste	Recalculation of categories included into NFR code 5.E for 2014 were made, due to correction of activity data for these categories.

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	On short term basis it is planned to divide total consumption of fuel to appropriate branches for the whole period from 1990 to 2000
1.A Energy – fuel combustion	1.A.3.b Road transport	The application of COPERT 5 software programme is planned for next submission. Also, during the processing of "raw" data (Ministry of interior vehicle data base in text form), it was noted that some vehicles are missing, so clarification of data was requested from the Ministry of Interior. Interior Ministry drew attention to the different categorization of vehicles in 2014. Consequently the model for the processing of "raw" vehicle data was amended and it was found that the model should be applied to the whole historical trend, because some vehicles due to insufficiently described categorization were not counting. The above improvement will be carried out in one of the following submissions. In 2014 Croatia reported annual mileage of each vehicle type to Odyssee database. It is planned to incorporate those data in COPERT 5 model

NFR sector, Name	NFR sub-sector, Name	Improvements planned
2 Industrial processes and product use	2.D.3.i, 2.G Other solvent and product use	The plan is to recalculate the trend (entire reporting period) for categories Cooling lubricant (SNAP 060412-3) and Lubricant (SNAP 060412-4) to align with the data presented in the Croatian NIR. In the NIR 2017, separation of aggregated data have been performed for the period 1990 – 1998 according to estimation on share in total quantity that should be further investigated. Trend analysis should be carried out so the recalculations will be included in the next the next submission.
3 Agriculture	3.F Field burning of agricultural residues	Although the activity of burning of agricultural residues in the open field is forbidden according to Croatian low, according to IIASA statement such activities are carried out on Croatia territory (in possession of satellite images that confirmed the statement) and in view of mentioned, it is necessary to carry out national analysis. A plan is to calculate relevant emissions from this source category, when the activity data will be available and confirm.
5 Waste	5.E Other waste	The plan is to harmonize emission factor for PMs with GB2016 due to differences between those ones in GB2009. Also, the plan is to collect required activity data for emission calculation from activities: sludge spreading compost and production from waste. The data will be aligned with the data presented in the Croatian NIR. In order to realize the plan, Croatia will make efforts to collect data on amounts of organic domestic waste produced for compost production, and sludge production and the fraction that is dried by spreading for sludge spreading if possible for one of the next inventories.

I INTRODUCTION

1.1 BACKGROUND INFORMATION FOR INVENTORY PREPARATION

The Republic of Croatia became a Party to the 1979 Geneva Convention on Long-range Transboundary Air Pollution (CLRTAP, OG-IT 12/93) and to the Protocol on Long-term Financing of the Cooperative Programme for Monitoring and evaluation of the Long-range Transmission of Air Pollutants in Europe on 8 October 1991 (OG-IT 12/93). The Republic of Croatia has also ratified following protocols under the LRTAP Convention: Protocol on Further Reduction of Sulphur Emissions in 1998 (OG-IT 17/98 and corr. 3/99), Protocol on Heavy Metals (OG-IT 05/07 and 9/07), Protocol on Persistent Organic Pollutants (OG-IT 05/07 and 9/07), Protocol concerning the Control of Emissions of Nitrogen Oxides or their Transboundary Fluxes (OG-IT 10/07 and 2/08), Protocol concerning the Control of Emissions of Volatile Organic Compounds or their Transboundary Fluxes (OG-IT 10/07 and 2/08), including the Protocol to Abate Acidification, Eutrophication and Ground-level Ozone 1999 ("Gothenburg Protocol") (OG-IT 4/08 and 07/08).

As a Party to the UNECE/LRTAP Convention and its Protocols, Croatia submitted the first national inventory and IIR in the 1998 for emissions in 1996.

Table 1.1-1 shows status of ratification[4] of international treaties under the CLRTAP.

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 by Croatia
Convention on Long-range Transboundary Air Pollution	1979	1983	51	1992
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
Protocol on the Reduction of Sulphur Emissions or their Transboundary Fluxes by at least 30 per cent	1985	1987	25	-
Protocol on Further Reduction of Sulphur Emissions	1994	1998	28	1998

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

Treaty	Signed by the Parties	In force since	Number of Parties	Ratified by Croatia
Protocol concerning the Control of Emissions of Nitrogen Oxides or their Transboundary Fluxes	1988	1991	35	2007
Protocol concerning the Control of Emissions of Volatile Organic Compounds or their Transboundary Fluxes	1991	1997	24	2007
Protocol on Persistent Organic Pollutants/revised in 2009	1998	2003	33	2007
Protocol on Heavy Metals/revised in 2012	1998	2003	33	2007
Protocol to Abate Acidification, Eutrophication and Ground-level Ozone ("Gothenburg Protocol")/revised 2012	1999	2005	25	2008

The Gothenburg Protocol sets upper limits for Croatia for the total emissions in 2010 and in years after 2010 for each of four main pollutants. These reduction commitments are equal to emission quotas set in the NEC Directive (Table 1.1-2).

The Revised Gothenburg Protocol (C.N.155.2013.TREATIES-XXVII.1.h) defines the emission reduction commitments for SO_2, NOx, NH_3, VOC and $PM_{2.5}$ responsible for acidification, eutrophication and ground-level ozone pollution which leads to significant negative impacts on human health and the environment, for 2020 and beyond (Table 1.1-3). These commitments are expressed as a percentage reduction from the 2005 emission level and are equal to those defined in the new NEC Directive for period from 2020 to 2029.

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/Directive 2001/81/EC	1. July 2013				

** kt (kilotonne)*

The Gothenburg Protocol was implemented in European legislation with the Directive 2001/81/EC of the European Parliament and the Council on National Emission Ceilings for certain pollutants (hereinafter Directive 2001/81/EC). The Directive 2001/81/EC sets upper limits pollutant-specific and legally binding emission ceilings for each of four pollutants responsible for acidification, eutrophication and ground-level ozone pollution (sulphur dioxide, nitrogen oxides, volatile organic compounds and ammonia) and for each EU MS, which had be attained by 2010 and for Croatia by the date of its accession to the Union, which was on 1 July 2013. The Directive 2001/81/EC was amended accordingly to Directive 2013/17/EU[5].

On 31 December 2016 new NEC Directive entered into force. The new NEC Directive repeals and replaces Directive 2001/81/EC, from the date of its transposition (30 June 2018) ensuring that the emission ceilings for 2010 set in that Directive 2001/81/EC shall apply until 2020.

New NEC Directive, like revised Gothenburg Protocol, sets national reduction commitments for the SO_2, NOx, NH_3, VOC and $PM_{2.5}$. New NEC Directive also transposes the reduction commitments for 2020 taken by the EU and its Member States under the revised Gothenburg Protocol and sets more ambitious reduction commitments beyond 2030 (Table 1.1-3).

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 %

The Protocol on Persistent Organic Pollutants (hereinafter Protocol on POPs) came into force for Croatia on 6 December 2008. In accordance with paragraph 5 (a) of Article 3 (basic obligations), "Each Party shall reduce its total annual emissions of each substance listed in Annex III from the level of the emission in a reference year set in accordance with that Annex by taking effective measure, appropriate in its particular circumstances“. The reference year for the Republic of Croatia on the issue of POPs is 1990. Accordingly, in the Table 1.1-4 is an overview of the level of allowances that is for certain POPs to which it is necessary to reduce emissions if they exceed the current level.

[5] Directive 2013/17/EU of the Council of the European Union of 13 May 2013 adapting certain directives in the field of environment, by reason of the accession of the Republic of Croatia (OJ L 158, 10.6.2013, p. 193).

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

Pollutant	Emission level in 1990*
Polycyclic aromatic hydrocarbons (PAHs)**	23.7 t
Dioxins and furans (PCDD/PCDF)	45.6 g I-Teq
Hexachlorobenzene (HCB)	0.27 kg
Polychlorinated biphenyls (PCBs)	483.1 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[6], on emission data reporting under the Convention and the Protocols in force, Croatia is obliged to report on air emissions in line with Emission Reporting Guidelines[7] and methodology described in EMEP/CORINAIR Emission Inventory Guidebook 2007[8]. Specifically, the application of annual emissions under the CLRTAP consists of the preparation of NFR formats (emission inventor) and Informative Inventory Report (IIR).

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, 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

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[6] Decision 2002/10 on emission data reporting under the Convention and the Protocols in force, ECE.EB.AIR/77/Add.1, 2002
[7] Emission Reporting Guidelines, ECE/EB.AIR/80, 2003
[8] EMEP/CORINAIR Emission Inventory Guidebook 2007

Chapter 10 an overview of Croatia projections for the following pollutants are presented NOx, SO_2, NMVOC, NH_3 and $PM_{2.5}$.

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 and the reduction of the uncertainty. Adjustments 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 of Croatian from 1990 to 2015 are reported in the Table 1.1-5 by pollutant. The table also provides an share of change in periods from 1990 – 2015 and 2014 - 2015 by pollutant.

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

Pollutant	Unit	1990	1995	2000	2005	2010	2011	2012	2013	2014	2015	Share of change from 1990-2015	Share of change fron 2014-2015	Emission ceiling in 2010 and up to 2020
NOx	**kt**	105.7	80.6	86.2	84.6	67.2	63.5	58.4	57.1	52.9	53.1	-49.8%	0.4%	**87**
NMVOC	**kt**	151.4	98.2	96.4	103.5	79.8	74.2	68.3	65.6	59.4	60.6	-60.0%	2.0%	**90**
SO2	**kt**	170.8	78.2	59.8	59.0	35.5	29.5	25.4	17.1	14.0	15.1	-91.1%	7.8%	**70**
NH3	**kt**	47.6	37.4	36.7	37.9	32.9	33.4	33.2	28.8	26.8	29.8	-37.4%	11.0%	**30**
PM2.5	**kt**	37.5	35.1	32.7	40.4	30.7	27.7	25.7	23.4	19.3	20.0	-46.6%	3.6%	-
PM10	**kt**	46.3	41.7	39.6	50.1	38.6	35.4	33.0	29.8	25.8	26.6	-42.4%	3.2%	-
TSP	**kt**	54.7	49.6	49.3	69.0	53.3	50.4	46.5	40.7	37.7	38.8	-29.1%	2.9%	-
BC	**kt**	5.4	5.0	4.8	5.9	4.7	4.3	4.0	3.7	3.1	3.4	-38.2%	6.8%	-
CO	**kt**	556.9	445.4	451.2	416.5	300.1	272.6	254.7	231.9	202.2	216.3	-61.2%	7.0%	-
Pb	**t**	538.6	328.8	276.7	52.5	8.0	7.8	7.2	7.3	7.1	7.1	-98.7%	0.2%	-
Cd	**t**	1.2	0.8	0.9	1.1	1.0	0.9	0.9	0.9	0.8	0.9	-25.4%	7.6%	-
Hg	**t**	1.2	0.3	0.5	0.6	0.6	0.5	0.5	0.5	0.5	0.5	-58.4%	-3.1%	-
As	**t**	8.6	1.2	1.0	1.1	0.8	0.6	0.6	0.4	0.3	0.5	-94.7%	35.0%	-
Cr	**t**	5.3	3.6	3.1	3.7	2.6	2.6	2.4	2.1	2.0	2.1	-60.2%	8.3%	-
Cu	**t**	8.7	5.4	6.8	7.6	7.7	7.5	7.4	7.6	7.2	7.6	-12.4%	4.7%	-
Ni	**t**	26.2	20.3	16.7	20.4	14.6	12.2	10.4	7.5	6.6	6.4	-75.6%	-3.2%	-
Se	**t**	0.5	0.3	0.3	0.4	0.4	0.3	0.3	0.3	0.4	0.3	-30.6%	-9.1%	-
Zn	**t**	38.6	31.8	30.4	36.7	36.5	35.2	34.8	34.6	31.6	34.6	-10.3%	9.6%	-
PCDD/ PCDF	**g I-Teq**	45.6	39.5	37.8	45.4	31.9	29.2	28.4	24.8	20.9	21.5	-53.0%	2.7%	-
PAHs	**t**	23.7	16.7	14.9	18.5	13.7	12.2	11.2	10.3	8.0	8.2	-65.2%	2.5%	-
HCB	**kg**	0.27	0.26	0.26	0.31	0.30	0.29	0.29	0.29	0.26	0.28	4.7%	11.0%	-
PCBs	**kg**	483.1	468.3	441.4	435.7	433.7	433.0	430.9	430.3	428.7	425.0	-12.0%	-0.9%	-

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. From institutional point of view, the Ministry of Environment and Eenergy (MEE) is a National Focal Point for LRTAP Convention, while inventory preparation is under responsibility of the Croatian Agency for Environment and Nature (CAEN).

The Croatian Agency for Environment and Nature selects executive institution for annual inventory preparation according to the requirements of LRTAP Convention by public tendering, EKONERG – Energy Research and Environmental Protection Institute has been selected as executive institution for preparation of this IIR.

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

- The Ministry of Environment and Energy[9] with assistance of Energy Institute Hrvoje Požar that prepares the national annual energy balance;
- The Central Bureau of Statistics that, on the basis of the statistic survey programme, collects data on the amounts of raw materials and products relating to activities defined by the National Classification of Business Activities;
- The Ministry of Interior keeps data on number of registered road vehicles and off-road vehicles.
- The Croatian Agency for Environment and Nature that collects data from emission point sources in the Environmental Pollution Register (EPR) [10])

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[9] Ministry of Economy, Labour and Entrepreneurship - since December 2011 Ministry of Economy – since 19 October 2016 Ministry of Environment and Energy

- The Ministry of Agriculture[11]
- The EUROCONTROL 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.

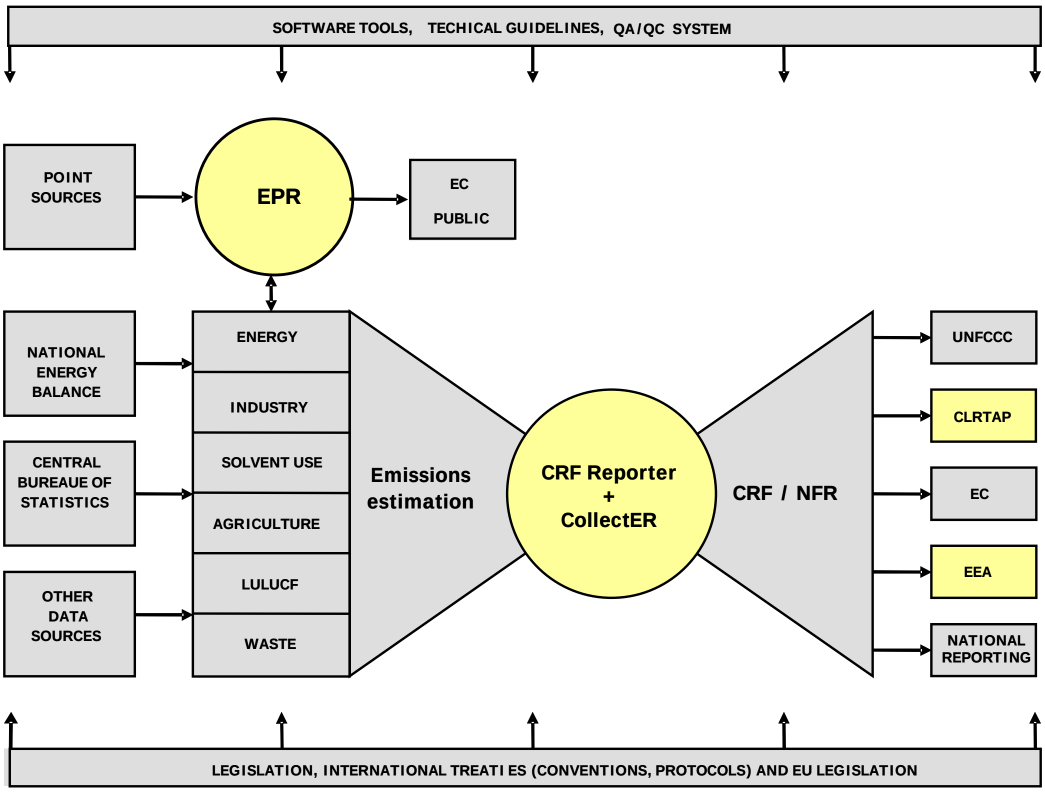


Figure 1.2-1 National emission inventory system

[10] 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)*

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

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.

1) PLANNING

Planning phase includes activities related to organizational and technical aspects of inventory preparation such as: selection of executive institution, preparation of timetable according to EMEP reporting programme, preparation a schedule of activities for data quality control and quality assurance (Schedule of activities, Appendix 1), review of existing/updated reporting guidelines and guidebooks, updating of emission factors and analysis of recommendations for inventory improvement from previous submissions or gave by expert review teams if such exists.

In accordance with ECE/EB.AIR/125, Guidelines for Reporting Emissions and Projections Data under the Convention on Long-range Transboundary Air Pollution, TFEIP, March 2014 reporting guidance covers deadlines for submission of data, as follows:

- *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[12] /CEIP[13] web page – www.ceip.at/.

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

2) 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, collection and processing of activity data, emission calculation and recalculations if necessary according to EMEP/EEA and EMEP/CORINAIR methodology, filling the database and preparation of report and tables.

3) REPORTING AND ARCHIVING

After inventory preparation phase, activity data and emission factors should be properly archived, emission inventory report and NFR tables should be submitted and QA/QC procedures and activities should be documented. In addition, the Croatian Agency for Environment and Nature (CAEN) should start with initial activities related to inventory review process and facilitate public access to inventory data.

[12] EMEP European Monitoring and Evaluation Programme
[13] CEIP: The EMEP Centre on Emission Inventories and Projections

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, the CAEN sent questionnaires directly to some of the Large Point Sources asking for activity data, which they use for emissions calculations in order to check consistency of data provided by different sources (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 – 2015)
		Environmental Pollution Register - the Croatian Agency for Environment and Nature
		National electricity 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 – 2015) Industry analysis balance - Energy Institute Hrvoje Požar (2000 – 2015)
		Environmental Pollution Register - the Croatian Agency for Environment and Nature
		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 – 2015)
	Number of vehicles	Vehicle data base – the Ministry of Interior
	Annual mileage	Statistical yearbook – the Central Bureau of Statistics Odyssee database

NFR Sector	Activity data	Source
	Min. and max temperature for big towns	Statistical yearbook – the Central Bureau of Statistics
	Sulphur content in fuel	Major national fuel producer
	Number of flights and fuel amount by cycle and routes	EUROCONTROL data (2005 – 2013)
1 A 4 Residential – public – commercial sector	Fuel sold	Energy balance - The Ministry of Environment and Energy with assistance of Energy Institute Hrvoje Požar (1990 – 2015)
	Sulphur content in fuel	Major national fuel producer
1 B Fugitive Emissions from fuel	Amount of fuel treated, stored, distributed	Energy balance - The Ministry of Environment and Energy with assistance of Energy Institute Hrvoje Požar (1990 – 2015)
	Production and processed data	the Croatian Agency for Environment and Nature (survey request: oil refineries)
	Emission data	Environmental Pollution Register - the Croatian Agency for Environment and Nature
2 Industrial Processes and Product Use	Production data	Annual Report on Industrial Production – PRODCOM - the Central Bureau of Statistics
		Environmental Pollution Register - the Croatian Agency for Environment and Nature
		the Croatian Agency for Environment and Nature (survey requests: steel producers, fertilizers producers)
		Database on Volatile Organic Compound emissions (VOC database) – the Croatian Agency for Environment and Nature
	Fuel sold for no energy consumption	Energy balance - The Ministry of Environment and Energy with assistance of Energy Institute Hrvoje Požar (1990 – 2015)
3 Agriculture	Number of animals Amount of N-fertilizers sold	Statistical yearbook - the Central Bureau of Statistics Croatian Agricultural Agency Report on fertilizer production - IFA data bank - the International Fertilizer Association
		the Croatian Agency for Environment and Nature (survey requests: fertilizers producers)
5 Waste	Amount of waste	Environmental Pollution Register - Croatian Agency for Environment and Nature
		Ministry of Agriculture
	Statistical data related to living conditions in households	Censuses for 1981, 1991, 2001, 2011 - the Central Bureau of Statistics
	The amount of treated wastewater	Statistical Reports - Central Bureau of Statistics
	Number of car and house fires	Ministry of Interior

NFR Sector	Activity data	Source
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 4 (v11.3) that contains activity data on vehicle fleet and procedures for emissions calculation from road transport.

Pollutant emissions are reporting in defined NFR14 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/CORINAIR 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[14]/EEA Air Pollutant Emission Inventory Guidebook "Technical Guidance to Prepare National Emission Inventories" (2009, 2013, 2016)
- 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)
- 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 contained in the CollectER database are largely 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

[14] 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 the Convention

emission factor. Emission factors used are default or plant specific emission factors (calculated from direct emissions observed plants reported in Croatian EPR base). The use of country-specific emission factors, if available, is recommended but these cases should be based on well-documented research. 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 GB2013.
- 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 GB2013.
- 1.B.2.a.iv, 1.B.2.b: Tier 2 EMEP/EEA methodology, along with the recommended Tier 2 emission factors from GB2016.
- 1.B.2.a.i, 1.B.2.a.v, 1.B.2.c: Tier 1 EMEP/EEA methodology, along with the recommended Tier 1 emission factors from GB2013.
- 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 GB2013
- 1.A.3.b (i-vi) Road transport: COPERT 4 (v11.3) model
- 1.A.3.c, 1.A.3.d, 1.B.1: Tier 1 method. Emission factors: GB2013.

2 INDUSTRIAL PROCESSES AND PRODUCT USE

- 2.A.1, 2.A.2.: Tier 2 EMEP/EEA methodology, along with abated Tier 2 emission factors from GB2013.
- 2.A.3, 2.D.3.d, 2.D.3.f, 2.K: Tier 1 EMEP/EEA methodology, along with Tier 1 emission factors from GB2013.
- 2.A.5.a, 2.A.5.b, 2.D.3.b, 2.D.3.c, 2.I : Tier 1 EMEP/EEA methodology, along with Tier 1 emission factors from GB2013.

- 2.B.1, 2.B.2, 2.B.10.a (sulphuric acid, NPK fertilizers and urea), 2.D.3.a, 2.D.3.i, 2.G: Tier 2 method. Emission factors: plant specific (DE – direct emissions from EPR), and/or EMEP/EEA emission factors from GB2013.
- 2.C, 2.D.3.g, 2.H: Tier 2 EMEP/EEA methodology, along with Tier 2 emission factors from GB2013.
- 2.D.3.e, 2.D.3.h: Tier 1 methodology. Emission factors are CORINAIR default.

3 AGRICULTURE

- 3.B: Tier 2 EMEP/EEA methodology, along with Tier 2 emission factors from GB2013 and national specifics.
- 3.D.1.a: Tier 1 EMEP/EEA methodology, along with Tier 1 emission factors from GB2013 for NOx, NMVOC, and PMs emission calculation, and Tier 2 EMEP/EEA methodology, along with Tier 2 emission factors from GB2013 for NH_3 emission calculation.

5 WASTE

- 5.A, 5.C.1.b.iii, 5.C.1.b.v: Tier 1 EMEP/EEA methodology, along with Tier 1 emission factors from GB2016.
- 5D1, 5D2, 5D3: Tier 2 EMEP/EEA methodology for NMVOC from GB2016.
- 5D3: Tier 1 EMEP/EEA methodology for NH_3 from GB2016.
- 5.C.1.b.i: Tier 1 EMEP/EEA methodology, along with Tier 1 emission factors from GB2016.
- 5.E: Tier 2 EMEP/EEA methodology. Emission factors are Tier 2 from GB2009.

11 NATURAL SOURCES

- 11.B Forest fires: MEP/EEA methodology, along with Tier 1 emission factors from GB2016.

1.5 KEY SOURCE CATEGORIES

Table 1.5-1 Key source categories in 2015 for the Croatian Emission Inventory

Pollutant	Key categories (Sorted from high to low from left to right)												Total (%)
SOx	1A1a	1B2aiv	1A1b	1A2f									80.9
	-33.1%	-21.1%	-14.2%	-12.5%									
NOx	1A3bi	1A3biii	1A4bi	1A1a	1A2f	1A4cii	1A3bii	3Da1					80.3
	-21.2%	-17.4%	-9.8%	-9.3%	-7.9%	-5.9%	-4.7%	-4.3%					
NH3	3Da1	3B1a	3B3	3B1b	1A4bi	2B10a							85.8
	-23.1%	-17.5%	-16.7%	-12.5%	-8.1%	-7.9%							
NMVOC	1A4bi	2D3i	2H2	2D3d	2D3e	1A3bi	3B1a	3B1b	1B2av	5A	2D3a	1A3biv	82
	-29.0%	-7.4%	-7.3%	-6.0%	-5.9%	-4.9%	-4.6%	-3.6%	-3.6%	-3.5%	-3.5%	-2.7%	
CO	1A4bi	1A3bi	1B2aiv										84.6
	-62.2%	-12.9%	-9.5%										
TSP	1A4bi	2D3b	2A5a	3Da1	2B10a								82.4
	-43.2%	-27.6%	-6.4%	-2.7%	-2.5%								
PM10	1A4bi	2D3b	2A5a	3Da1	1A3bi	1A3bvi							81.7
	-59.9%	-8.6%	-4.6%	-4.0%	-2.6%	-2.1%							
PM2.5	1A4bi	1A3bi											81.2
	-77.8%	-3.5%											
Pb	1A3bi	1A4bi	1A3bvi	2A3	2C1								84.3
	-43.8%	-18.6%	-10.7%	-5.7%	-5.4%								
Hg	1A1a	1A2f	1A4bi	2K	1B2aiv								85.5
	-36.7%	-23.2%	-8.8%	-8.7%	-8.1%								
Cd	1A4bi	2D3i	1A2f										80.6
	-71.8%	-5.0%	-3.8%										
PCDD/ PCDF	1A4bi	5C1biii											88
	-78.3%	-9.7%											
PAH	1A4bi												91.2
	-91.2%												
HCB	1A4bi												85.6
	-85.6%												

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

Table 1.5-1 (cont.) Key source categories in 2015 for the Croatian Emission Inventory

Pollutant	Key categories (Sorted from high to low from left to right)												Total (%)
As	1B2aiv	1A1a	1A2f	2A3									89.8
	45.2%	21.1%	13.5%	10.0%									
Cr	1A4bi	1A3bvi	1B2aiv	1A1a									82.0
	53.0%	13.4%	8.2%	7.4%									
Cu	1A3bvi	1A3bvi											163.1
	81.5%	81.5%											
Ni	1A1b	1A1a											83.1
	73.2%	9.8%											
Se	2A3	1A2f	1A4bi										85.0
	59.5%	17.8%	7.7%										
Zn	1A4bi	1A3bi	1A3bvi										85.6
	71.9%	7.0%	6.7%										
benzo(a) pyrene	1A4bi												92.4
	92.4%												
benzo(b) fluoranthe	1A4bi												90.8
	90.8%												
benzo(k) fluoranthe	1A4bi												90.3
	90.3%												
Indeno (1,2,3-cd)	1A4bi												94.4
	94.4%												
PCBs	2K												98.9
	98.9%												
BC	1A4bi	1A3bi	1A3bii										81.2
	62.2%	14.7%	4.3%										

Data source: EKONERG Ltd, 2016

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, the CAEN 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, Emission reporting template - NFR tables for all years from 1990 to 2015 (Appendix I), preparation of IIR (Informative Inventory Report) and archiving. Also, before submitting reporting tables, the RepDab tool is run. If needed, data revise. 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 (Official Gazette No. 87/15). According to that Ordinance the competent authorities (CA), 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 there are dips or peaks in pollutants emissions trends than data are compared with fuel consumed or possible new removal technology installation (also a part of EPR system). If there are dips or peaks in trends of fuel consumptions or in productivity then the national circumstances are checked or those issues are checked in direct contact with individual plant. Last notation is also the part of yearly process of data collection. For energy sector particularly for public electricity and heat production, the fuel consumptions are also compared with fuel sold from National Energy Balance.

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.

Croatian Agency for Environment and Nature (CAEN) is responsible for inventory preparationt and Ministry of Environmen and Energy is responsible for final approval according Regulation on emission quotas for certain pollutants in the air in the Republic of Croatia (OG 108/13 and 19/17) and pursuant to the aforesaid, the CAEN responsibility is also to carry out verification and peer reviews of: activity data quality, calculated emissions, and prepared report before the submission to the LRTAP Convention.

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 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 was concentrated on SO_2, NOx, NMVOC, NH_3, plus PM_{10} and $PM_{2.5}$ for the time series years 1990 – 2012 reflecting current priorities from EMEP Steering Body and the Task Force on Emission Inventories and Projections (TFEIP). HMs and POPs have been reviewed to the extent possible.

The long term plan - list of Parties to be reviewed - was approved by the EMEP Steering Body is presented in Table 1.6-1.

Table 1.6-1 The long term plan for Stage 3 in depth reviews (2013 – 2017)

2013	Bulgaria, France, Italy, Latvia, Lithuania, Norway, Poland, Portugal, Romania, Sweden
2014	**Belgium, Croatia, Cyprus, Denmark, Greece, Germany, Hungary, Spain**
2015	Azerbaijan, Belarus, Czech Rep., Ireland, Rep. of Moldova, The Netherlands, Slovakia, Slovenia, Ukraine
2016	Estonia, Georgia, Iceland, Luxembourg, FYR. of Macedonia, Russian Fed.#, Serbia, Switzerland, Turkey, United Kingdom
2017	Armenia*, Austria, Bosnia & Herzegovina**, Malta**, EU, Kazakhstan**, Lichtenstein, Monaco, Montenegro**
2018	Albania**, Finland, Kyrgyzstan**

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

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 2015, and on uncertainties for activity rates and emission factors for NFR sectors. Estimated emissions for 1990 and 2015, the uncertainty introduced into the trend 1990-2015, and the uncertainty in total national emissions 2015 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 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)[15]. 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 2015 are equal.

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

The Guidebook recommends that inputs (direct emissions[16], 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.

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

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

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.

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 - 2009 (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 2016 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 2016 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
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

NFR SECTOR AGGREGATION	%	DATA SOURCE
2D3b, 2D3c, 2D3d, 2D3g, 2D3h	30	National statistical data and comparisons with other datasets and other countries
2K, 2D3e, 2D3f	50	National population statistical data and comparisons with other datasets and other countries
2D3a, 2D3i, 2G	10	National statistical data in combination with Tier 2 methodology from EMEP/EEA 2016 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
3D1a	5	Facilities data in combination with Tier 2 methodology from EMEP/EEA 2016 guidebook
5A, 5C	5	National data from the Environmental pollution registry under Croatian Agency for Environment and Nature
5D1, 5D2	30	National statistical data
5D3	30	National statistical data from 1991, 2001 and 2011 Census under Croatian bureau of Statistic in combination with extrapolation method
5E	5	National base of accidental fire under Ministry of interior

Uncertainty ranges for emission factors

The applied uncertainties are for most emission factors, default values referring to EMEP/EEA Guidebook - 2009. 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 Road transport	20	20	20	20	100	100	100	100	400	400	400
1.A.3 Other transport	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

NFR SECTORS	EMISSION FACTORS UNCERTAINTY RATES, %										
	SO_2	NO_2	NMVOC	CO	TSP	PM_{10}	$PM_{2.5}$	BC	PAH	HCB	PCDD /PCDF
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
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 2009, 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 Road transport	400	400	400	400	400	400	400	400	400	400	400
1.A.3 Other transport	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
5.D.1	400	400	400	400	400	400	400	400	400	400	400
5.D.3	100	100	100	100	100	100	100	100	100	1000	100

Data source: EMEP/EEA 2009, 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 Commercial / institutional	78.0	78.0	78.0	78.0
1.A.4.b.i Residential	76.0	76.0	76.0	76.0
1.A.4.b.ii Residential: Household and gardening (mobile)	50.0*	50.0*	50.0*	50.0
1.A.4.c.i Agriculture/Forestry/Fishing: Stationary	39.0	39.0	39.0	39.0
1.A.4.c.ii Agriculture/Forestry/Fishing: Off-road vehicles and other machinery	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 2015 and the trend uncertainties 1990-2015 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 the Republic of Croatia and total emissions by pollutant in 2015

Pollutant	Total emission in 2015	Unit	Emission uncertainty	Trend	Trend uncertainty
			%	%	%
SO_2	15.14	kt	11.96	-91.13	0.92
NO_2	53.10	kt	14.36	-49.77	2.27
NMVOC	60.58	kt	20.35	-69.99	4.70
CO	216.28	kt	33.35	-61.17	6.29
TSP	38.82	kt	37.87	-29.09	14.30
PM_{10}	26.64	kt	47.37	-42.42	5.14
$PM_{2.5}$	20.03	kt	60.52	-46.60	3.52
BC	3.36	kt	55.76	-38.18	10.14
PAH	8.24	t	365.61	-65.21	23.22
HCB	0.28	kg	342.46	4.74	29.98
PCDD/PCDF	21.45	g I-TEQ	314.24	-53.00	15.26
NH_3	29.76	kt	102.11	-37.40	18.46
As	0.45	t	184.16	-94.72	20.77
Cd	0.88	t	291.07	-25.41	88.91
Cr	2.11	t	219.68	-60.23	64.03
Cu	7.59	t	167.69	-12.41	26.77
Hg	0.48	t	77.64	-58.45	102.06
Ni	6.38	t	87.34	-75.64	8.95
Pb	7.11	t	139.51	-98.68	1.31
Se	0.32	t	241.48	-30.57	33.80
Zn	34.60	t	292.40	-10.29	53.09
PCBs	424.96	kg	398.75	-12.04	61.53

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 2015 varies between [53.1*(1-p/100), 53.1*(1+p/100)], where "p" is emission uncertainty (14,36%). With the same approach the 95% probability range for trend is between [-49.77%-t, -49.77%+t], where "t" is trend uncertainty (2.27%).

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 2009 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 2009 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
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;

Notation key	Meaning	Purpose
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.a	NH_3, PCB, HCB	FEs are not available in EMEP/EEA GB
1.A.3.b.i 1.A.3.b.ii 1.A.3.b.iii 1.A.3.b.iv	HCB, PCBs	FEs are not available in EMEP/EEA GB neither in COPER 4 model
1.A.3.b.vi	Hg, As, PCDD/F, PAHs, HCB, PCBs	FEs are not available in EMEP/EEA GB
1.A.3.b.vii	BC, PCDD/F, PAHs, HCB, PCBs	FEs are not available in EMEP/EEA GB
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.a.iv	HCB, PCBs	FEs are not available in EMEP/EEA GB
1.B.2.c	NH3, PMs, HMs, POPs	FEs are not available in EMEP/EEA GB
2.B.1	NMVOC, SO_2, $PM_{2.5}$	FEs are not available in EMEP/EEA GB

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.a	NH_3, PCB, HCB	FEs are not available in EMEP/EEA GB
2.B.2	NH_3, $PM_{2.5}$	FEs are not available in EMEP/EEA GB
5.C.1.b.i	NH_3	FEs are not available in EMEP/EEA GB
5.C.1.b.iii	NH_3, PMs, Se, Zn	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)
1.A.3.d.i.(ii)	All relevant	1.A.3.d.i(i)	(1990 - 2015)
1.A.4.a.ii	All relevant	1.A.4.b.ii and 1.A.4.c.ii	(1990 - 2015)
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 - 2015)
1.A.5.a	All relevant	1.A.4.a.i	(1990 - 2015)
1.A.5.b	All relevant	1.A.4.a.i and 1.A.3.b (i-iv)	(1990 - 2015)
2.A.1	All relevant for fuel combustion except for PMs	1.A.2.f	(1990 - 2015)
2.A.2	All relevant for fuel combustion except for PMs	1.A.2.f	(1990 - 2015)
2.A.3	All relevant for fuel combustion except for PMs	1.A.2.f	(1990 - 2015)
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 - 2015)
2.B.10.b	TSP, PM_{10}, $PM_{2.5}$	2.B.10.a	(1990 - 2015)
2.C.1	NH_3	1.A.2.f	(1990 - 2000)
		1.A.2.a	(2001 - 2015)
2.C.2	All relevant for fuel combustion	1.A.2.b	(1990 - 2003)

NFR14 code	Substance(s)	Included in NFR code	
2.C.3	All relevant for fuel combustion	1.A.2.b	(1990 - 1991)
2.G	All relevant	2.D.3.a	(1990 - 2015)
3.D.a	NOx, NH_3, and other relevant	3.B source categories	(1990 – 2015)
3.D.b	PMs	3.D.a.1	(1990 – 2015)
3.D.c	PMs	3.B source categories, 3.D.a.1	(1990 – 2015)
3.D.e	PMs	3.D.a.1	(1990 – 2015)
5.C.1.b.i	All relevant	1.A.2.f	(2009 – 2015)
5.C.1.b.ii	All relevant	5.C.1.b.i	(1990 – 2008)

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 - 2015)
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 - 2015)
1.B.1.c	NO	-	(1990 - 2015)
1.B.3	NO	-	(1990 - 2015)
2.B.10.a	NOx, CO, NMVOC, SO_2, NH_3, PM_{10}, TSP, $PM_{2.5}$	**Processes in inorganic chemical industry** - production of: sulfuric 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

NFR14 code	Substance(s) reported	Sub-source description	
		Processes in inorganic chemical industry - production of: sulfuric 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: sulfuric 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: sulfuric 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: sulfuric 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: sulfuric 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), Polystyrene (SNAP 040511) and	2001 and 2002

NFR14 code	Substance(s) reported	Sub-source description	
		Formaldehyde (SNAP 040517)	
		Processes in inorganic chemical industry - production of: sulfuric 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: sulfuric acid (SNAP 040401), NPK fertilizers (SNAP 040407), urea (SNAP 040408), **and processes in organic chemical industry** - production of: Formaldehyde (SNAP 040517)	2012 2013 2014
2.C.7.c	NO	**-**	(1990 - 2015)
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 - 2015)
2.H.3	NO	-	(1990 - 2015)
2.G	NMVOC	Use of pesticide, including fungicide	(1990 – 2015)
3.D.a.2.c	NO	-	(1990 - 2015)
5.C.1.b.vi	NO	-	(1990 - 2015)
5.D.3	NH_3	Latrines	(1990 - 2015)
5.E	All relevant	Car fire, industrial building fire, apartment building fire, undetached house fire, detached house fire	(1990 - 2015)

II 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 2015, 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*. 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[17]

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)-

[17] *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.

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 2015 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 2015

Pollutant	NFR Code	Key source during 2015 NFR name	Emission in 2015	% of total emission in 2015	% change from 1990 to 2015
NO_x	1A3biii	Road transport: Heavy duty vehicles and buses	9.23	17.39%	-7.95%
	1A3bi	Road transport: Passenger cars	11.24	21.17%	-53.94%
	1A1a	Public electricity and heat production	4.92	9.27%	-60.54%
	1A2f	Stationary combustion in manufacturing industries and construction: Non-metallic minerals	4.18	7.87%	-77.86%
	1A4cii	Agriculture/Forestry/Fishing: Off-road vehicles and other machinery	3.11	5.86%	-60.61%
	3Da1	Inorganic N-fertilizers (includes also urea application)	2.28	4.30%	-18.32%
	1A3bii	Road transport: Light duty vehicles	2.48	4.66%	-7.32%
	1A4bi	Residential: Stationary	5.18	9.76%	18.03%
		Total for key sources	**42.63**	**80.3%**	
NMVOC	1A4bi	Residential: Stationary	17.56	28.98%	-23.57%
	2H2	Food and beverages industry	4.42	7.30%	-80.22%
	2D3i	Other solvent use	4.49	7.40%	-70.24%
	2D3e	Degreasing	3.57	5.90%	-12.02%
	1A3bi	Road transport: Passenger cars	2.95	4.86%	-87.94%
	2D3d	Coating applications	3.64	6.01%	-33.70%
	1B2av	Distribution of oil products	2.20	3.64%	-37.98%
	3B1a	Manure management - Dairy cattle	2.79	4.60%	-42.92%
	5A	Biological treatment of waste - Solid waste disposal on land	2.12	3.50%	130.66%
	3B1b	Manure management - Non-dairy cattle	2.20	3.63%	46.68%
	2D3a	Domestic solvent use including fungicides	2.11	3.48%	-81.04%
	1A3biv	Road transport: Mopeds & motorcycles	1.61	2.65%	-0.25%
		Total for key sources	**43.74**	**82.0%**	

Pollutant	NFR Code	Key source during 2015 NFR name	Emission in 2015	% of total emission in 2015	% change from 1990 to 2015
SO_2	1A1a	Public electricity and heat production	5.01	33.1%	-93.5%
	1B2aiv	Fugitive emissions oil: Refining / storage	3.19	21.1%	77.3%
	1A1b	Petroleum refining	2.15	14.2%	-90.4%
	1A2f	Stationary combustion in manufacturing industries and construction: Non-metallic minerals	1.90	12.5%	-94.7%
		Total for key sources	**12.25**	**80.9%**	
NH_3	3B3	Manure management - Swine	4.97	16.69%	-37.68%
	3Da1	Inorganic N-fertilizers (includes also urea application)	6.87	23.08%	-1.91%
	3B1a	Manure management - Dairy cattle	5.22	17.55%	-59.55%
	3B1b	Manure management - Non-dairy cattle	3.71	12.47%	-14.23%
	2B10a	Chemical industry: Other	2.36	7.91%	-32.37%
	1A4bi	Residential: Stationary	2.42	8.14%	-20.00%
		Total for key sources	**25.55**	**85.8%**	
$PM_{2.5}$	1A4bi	Residential: Stationary	15.58	77.76%	-45.15%
	1A3bi	Road transport: Passenger cars	0.70	3.49%	298.64%
		Total for key sources	**16.27**	**81.2%**	
PM_{10}	1A4bi	Residential: Stationary	15.96	59.92%	-45.19%
	2D3b	Road paving with asphalt	2.29	8.60%	281.15%
	2A5a	Quarrying and mining of minerals other than coal	1.21	4.56%	-10.09%
	3Da1	Inorganic N-fertilizers (includes also urea application)	1.06	3.99%	-44.71%
	1A3bi	Road transport: Passenger cars	0.70	2.63%	298.64%
	1A3bvi	Road transport: Automobile tyre and brake wear	0.55	2.05%	60.90%
		Total for key sources	**21.78**	**81.7%**	
TSP	1A4bi	Residential: Stationary	16.77	43.20%	-45.32%
	2D3b	Road paving with asphalt	10.69	27.55%	281.15%
	3Da1	Inorganic N-fertilizers (includes also urea application)	1.06	2.74%	-44.71%
	2B10a	Chemical industry: Other	0.98	2.51%	34.01%
	2A5a	Quarrying and mining of minerals other than coal	2.48	6.38%	-10.09%
		Total for key sources	**31.98**	**82.4%**	**-29.1%**
CO	1A4bi	Residential: Stationary	134.43	62.2%	-29.7%
	1A3bi	Road transport: Passenger cars	28.00	12.9%	-87.3%
	1B2aiv	Fugitive emissions oil: Refining / storage	20.48	9.5%	-59.1%
		Total for key sources	**182.91**	**84.6%**	

Pollutant	NFR Code	Key source during 2015 NFR name	Emission in 2015	% of total emission in 2015	% change from 1990 to 2015
Pb	1A3bi	Road transport: Passenger cars	3.12	43.8%	-99.3%
	1A4bi	Residential: Stationary	1.33	18.6%	-25.7%
	1A3bvi	Road transport: Automobile tyre and brake wear	0.76	10.7%	56.3%
	2A3	Glass production	0.40	5.7%	-13.7%
	2C1	Iron and steel production	0.39	5.4%	-99.5%
		Total for key sources	**6.00**	**84.3%**	
Cd	1A4bi	Residential: Stationary	0.63	71.8%	13.2%
	2D3i	Other solvent use	0.04	5.0%	-32.5%
	1A2f	Stationary combustion in manufacturing industries and construction: Non-metallic minerals	0.03	3.8%	-61.1%
		Total for key sources	**0.71**	**80.6%**	
Hg	1A1a	Public electricity and heat production	0.18	36.7%	198.0%
	1A2f	Stationary combustion in manufacturing industries and construction: Non-metallic minerals	0.11	23.2%	-7.2%
	2K	Consumption of POPs and heavy metals (e.g. electrical and scientific equipment)	0.04	8.7%	-12.0%
	1B2aiv	Fugitive emissions oil: Refining / storage	0.04	8.1%	-56.1%
	1A4bi	Residential: Stationary	0.04	8.8%	-26.6%
		Total for key sources	**0.37**	**76.7%**	
PCDD/ PCDF	1A4bi	Residential: Stationary	16.8	78.3%	-49.2%
	5C1biii	Clinical waste incineration	2.1	9.7%	-63.0%
		Total for key sources	**18.9**	**88.0%**	
PAH	1A4bi	Residential: Stationary	7.52	91.2%	-58.8%
		Total for key sources	**7.52**	**91.2%**	
As	1B2aiv	Fugitive emissions oil: Refining / storage	0.21	45.2%	1044.4%
	1A1a	Public electricity and heat production	0.10	21.1%	-86.4%
	1A2f	Stationary combustion in manufacturing industries and construction: Non-metallic minerals	0.06	13.5%	-43.1%
	2A3	Glass production	0.05	10.0%	-13.7%
		Total for key sources	**0.41**	**89.8%**	
Cr	1A4bi	Residential: Stationary	1.12	53.04%	9.12%
	1A3bvi	Road transport: Automobile tyre and brake wear	0.28	13.38%	55.98%
	1B2aiv	Fugitive emissions oil: Refining / storage	0.17	8.19%	-59.08%
	1A1a	Public electricity and heat production	0.16	7.41%	-90.99%
		Total for key sources	**1.73**	**82.0%**	

Pollutant	NFR Code	Key source during 2015 NFR name	Emission in 2015	% of total emission in 2015	% change from 1990 to 2015
Cu	1A3bvi	Road transport: Automobile tyre and brake wear	6.19	81.5%	55.9%
		Total for key sources	**6.19**	**81.5%**	
Ni	1A1b	Petroleum refining	4.68	73.2%	-71.4%
	1A1a	Public electricity and heat production	0.63	9.8%	-88.6%
		Total for key sources	**5.30**	**83.1%**	
Se	2A3	Glass production	0.19	59.5%	-13.7%
	1A2f	Stationary combustion in manufacturing industries and construction: Non-metallic minerals	0.06	17.8%	-26.4%
	1A4bi	Residential: Stationary	0.02	7.7%	-17.8%
		Total for key sources	**0.27**	**85.0%**	
Zn	1A4bi	Residential: Stationary	24.92	71.9%	9.8%
	1A3bi	Road transport: Passenger cars	2.42	7.0%	49.1%
	1A3bvi	Road transport: Automobile tyre and brake wear	2.31	6.7%	62.1%
		Total for key sources	**29.66**	**85.6%**	
benzo(a) pyrene	1A4bi	Residential: Stationary	2.55	92.4%	-59.2%
		Total for key sources	**2.55**	**92.4%**	
benzo(b) fluoranthene	1A4bi	Residential: Stationary	2.56	90.8%	-58.3%
		Total for key sources	**2.56**	**90.8%**	
benzo(k) fluoranthene	1A4bi	Residential: Stationary	0.95	90.3%	6.4%
		Total for key sources	**0.95**	**90.3%**	
Indeno (1,2,3-cd) pyrene	1A4bi	Residential: Stationary	1.45	94.4%	-58.3%
		Total for key sources	**1.45**	**94.4%**	
PCBs	2K	Consumption of POPs and heavy metals (e.g. electrical and scientific equipment)	420.36	98.9%	-12.0%
		Total for key sources	**420.36**	**98.9%**	
HCB	1A4bi	Residential: Stationary	0.24	85.6%	13.8%
		Total for key sources	**0.24**	**85.6%**	
BC	1A4bi	Residential: Stationary	2.09	62.21%	-34.76%
	1A3bi	Road transport: Passenger cars	0.49	14.70%	483.85%
	1A3bii	Road transport: Light duty vehicles	0.14	4.25%	-32.27%
		Total for key sources	**2.73**	**81.2%**	

2.3 EMISSIONS OF LARGE POINT SOURCES (LPS) IN 2015

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/CORINAIR methodology. Emissions from two refineries in Croatia is presented in a way that the total emissions from both refineries are allocated in 65:35 shares in favour of the refinery with higher emissions in accordance with the EPR. The table also shows total emissions of LCPs, total national emissions and the share of LCPs in total national emissions in 2015.

Table 2.3-1 Pollutant emissions from large point source (LPS) and LPS share in the Republic of Croatia national total emissions, 2015

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	**Gg**	**Gg**	**Gg**	**Gg**	**Gg**	**Gg**	**Gg**	**Gg**	**Mg**	**Mg**	**Mg**	**g I-Teq**	**Mg**	**kg**	**kg**
HEP, TPP PLOMIN 1	1.86	0.03	2.90	0.00	0.04	0.08	0.15	0.08	0.08	1.9E-03	6.9E-02	8.6E-02	1.9E-05	5.34E-03	1.46
HEP, TPP PLOMIN 2	1.55	0.04	0.24	0.00	0.03	0.06	0.13	0.07	0.12	3.0E-03	1.1E-01	1.3E-01	7.3E-05	8.18E-03	2.24
HEP, TPP RIJEKA	0.07	0.00	0.43	0.00	0.00	0.01	0.02	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00
HEP, TPP SISAK	0.08	0.01	0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HEP, CHP ZAGREB (EL-TO)	0.48	0.02	0.25	0.00	0.00	0.01	0.02	0.02	0.01	5.3E-05	6.1E-04	3.0E-03	3.2E-04	0.00	0.00
HEP, CHP ZAGREB (TE-TO)	0.42	0.03	1.02	0.00	0.01	0.02	0.03	0.06	0.02	1.7E-04	8.5E-04	5.6E-03	9.9E-04	0.00	0.00
HEP, CHP OSIJEK	0.10	0.01	0.07	0.00	0.00	0.00	0.01	0.00	0.00	2.0E-05	2.1E-04	1.0E-03	9.6E-05	0.00	0.00
HEP, KTPP Jertovec	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.6E-08	1.0E-05	3.7E-05	5.4E-07	0.00	0.00
PETROKEMIJA	1.23	0.03	0.06	2.22	0.40	0.49	0.98	0.01	0.00	3.2E-03	2.5E-03	4.5E-04	4.8E-05	0.00	0.00
INA D.D. SISAK OIL REFINERY	0.63	0.31	1.92	0.03	0.07	0.16	0.21	7.41	0.08	1.7E-02	1.5E-02	8.5E-03	7.4E-04	0.00	0.00
INA D.D. RIJEKA OIL REFINERY	1.18	0.57	3.56	0.05	0.14	0.29	0.40	13.77	0.14	3.1E-02	2.7E-02	1.6E-02	1.4E-03	0.00	0.00
NAŠICECEMENT	0.57	0.16	0.46	0.00	0.05	0.09	0.01	1.70	0.05	4.3E-03	2.6E-02	2.2E-03	2.5E-04	2.46E-03	5.51E-02
CEMEX HRVATSKA (DALMACIJACEMENT)	1.80	0.11	0.03	0.00	0.09	0.18	0.02	2.32	0.13	1.1E-02	6.7E-02	5.6E-03	6.3E-04	6.26E-03	1.40E-01
HOLCIM HRVATSKA Ltd	0.54	0.02	0.09	0.00	0.03	0.05	0.01	0.36	0.03	2.4E-03	1.5E-02	1.2E-03	1.4E-04	1.39E-03	3.12E-02
ISTRACEMENT, CALUCEM Group	0.26	0.00	0.29	0.00	0.01	0.02	0.00	1.98	0.01	9.0E-04	5.5E-03	4.6E-04	5.2E-05	5.15E-04	1.15E-02
ROCKWOOL ADRIATIC	0.06	0.02	0.28	0.09	0.03	0.03	0.04	0.02	0.05	7.1E-04	2.9E-03	7.5E-02	0.05	2.28E-04	6.26E-02
Vetropack Straža d.d.	0.29	0.00	0.37	0.00	0.00	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SLADORANA D.D. ŽUPANJA	0.02	0.18	0.01	0.00	0.00	0.00	0.00	1.99E-04	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SUGAR FACTORY OSIJEK	0.10	-	0.66	0.00	0.00	0.05	0.00	5.51E-02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LCP TOTAL	**11.25**	**1.52**	**12.67**	**2.40**	**0.90**	**1.53**	**2.02**	**27.89**	**0.72**	**0.07**	**0.34**	**0.34**	**0.06**	**0.02**	**4.01**
NATIONAL TOTAL	**53.10**	**60.58**	**15.14**	**29.76**	**20.03**	**26.64**	**38.82**	**216.28**	**7.12**	**0.88**	**0.48**	**21.45**	**8.24**	**0.28**	**424.96**
SHARE LCP IN NATIONAL TOTAL	**21.19%**	**2.51%**	**83.67%**	**8.07%**	**4.51%**	**5.75%**	**5.20%**	**12.89%**	**10.17%**	**8.50%**	**69.69%**	**1.58%**	**0.72%**	**8.58%**	**0.94%**

III 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 - 2015. 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.

3.1 SULPHUR DIOXIDE (SO_2)

The total sulphur dioxide (SO_2) emission in 2015 was amounted to 15.1 kt that is 7.8 % higher than in 2014 (Table 3.1-1). Moreover, the SO_2 emission in 2015 was decrease by 91.1 % compared with 1990 (Figure 3.1-1). One-half of (47.3 %) the sulphur dioxide emissions in 2015 derive from the energy sector public electricity and heat production, 19.7% originates from fuel combustion in manufacturing industry and construction, 22.5% from fugitive emissions from activities in the Refining/storage sector, 8.3 % from small combustion (stationary and mobile). The 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. Also, the war for the 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).

Since 1990, emissions from the public electricity and heat production sector have declined by 92.8 %, from the manufacturing industry and construction by 91.9 %, from transport sector by 98.3 %, from small combustion by 94.9 %. Sulphur emissions from industrial processes and product use sector, have also decreased, by 86.6 % compared to 1990, and are now around 22 tonnes, 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 41.1 % 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.

It can be seen that the SO_2 emissions in 2015 was lower than the reduction commitment of 70 kt set under the Gothenburg Protocol and the NEC Directive.

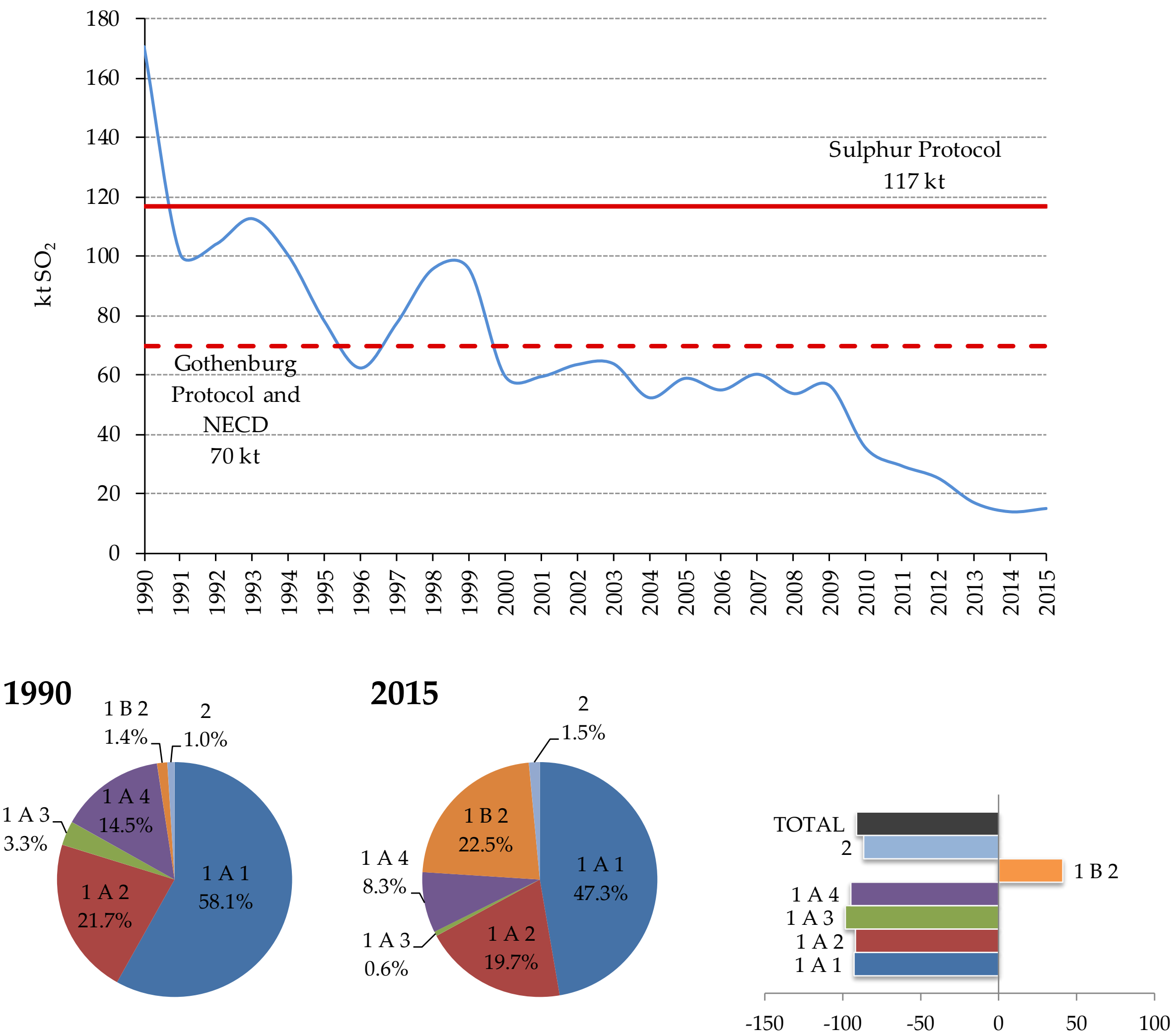


Figure 3.1-1 The SO_2 emissions (kt/yr) and percentage share by sector and variation in SO_2 emissions

Table 3.1-1 The SO_2 emissions by SNAP nomenclature in the period 1990-2015

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	99.2	22.6	35.6	3.5	NA	NA	4.4	4.7	0.61	NA	170.8
1991	59.8	13.3	18.9	2.4	NA	NA	3.0	3.1	0.40	NA	100.9
1992	73.3	7.7	14.4	1.9	NA	NA	4.4	2.1	0.35	NA	104.2
1993	75.0	10.1	17.8	2.2	NA	NA	4.8	2.5	0.44	NA	112.8
1994	66.3	7.4	18.4	2.3	NA	NA	3.5	2.0	0.45	NA	100.3
1995	53.2	4.6	13.1	2.3	NA	NA	2.9	1.6	0.48	NA	78.2
1996	39.2	4.3	9.1	1.9	NA	NA	4.9	2.6	0.46	NA	62.5
1997	52.9	6.1	10.2	2.2	NA	NA	4.0	1.8	0.46	NA	77.5
1998	69.2	4.9	12.9	2.8	NA	NA	4.2	2.1	0.45	NA	96.4
1999	69.5	6.5	10.2	3.2	NA	NA	4.6	2.0	0.49	NA	96.5
2000	32.9	6.2	9.6	4.3	NA	NA	5.2	2.7	0.46	NA	61.3
2001	33.6	5.2	10.5	3.7	NA	NA	3.9	2.2	0.43	NA	59.6
2002	33.5	7.0	11.7	3.9	NA	NA	4.4	2.7	0.43	NA	63.6
2003	35.3	6.5	9.5	3.7	NA	NA	5.7	2.9	0.44	NA	64.0
2004	25.3	5.9	9.0	4.1	NA	NA	5.2	2.6	0.46	NA	52.5
2005	32.5	5.7	9.5	4.1	NA	NA	4.3	2.5	0.44	NA	59.0
2006	29.3	4.9	9.8	3.7	NA	NA	4.2	2.7	0.42	NA	55.1
2007	38.3	3.7	8.5	4.2	NA	NA	3.1	2.0	0.46	NA	60.4
2008	32.0	3.4	8.1	3.8	NA	NA	2.9	3.3	0.39	NA	53.9
2009	36.7	3.8	6.5	3.7	NA	NA	2.4	3.0	0.43	NA	56.6
2010	19.7	3.6	5.6	2.6	NA	NA	1.9	1.7	0.38	NA	35.5
2011	17.2	3.1	3.8	3.8	NA	NA	0.5	0.8	0.31	NA	29.5
2012	14.5	2.9	3.4	3.9	NA	NA	0.0	0.4	0.26	NA	25.4
2013	8.9	1.5	3.0	3.2	NA	NA	0.0	0.3	0.27	NA	17.1
2014	6.1	1.1	2.7	3.7	NA	NA	0.0	0.3	0.21	NA	14.0
2015	7.2	1.1	2.9	3.4	NA	NA	0.0	0.3	0.21	NA	15.1
2015 vs 1990	-92.8%	-95.0%	-91.8%	-1.9%	NA	NA	-99.5%	-94.4%	-65.0%	NA	-91.1%
2015 vs 2014	17.8%	2.1%	9.5%	-7.0%	NA	NA	6.3%	-2.6%	0.0%	NA	7.8%

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 2015 amounted to 53.1 kt, which is a decline by 52.6 % since 1990 and increase by 0.4 % compare to 2014 (Table 3.2-1). Emissions from the energy sector in 2015 were about 49.7 kt and account for about 93.6 % of the total NOx emission. Transport sector (NFR 1.A.3) was the main contributor in energy sector in 2015, with contribution of 48.7 % 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 37 %, 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. Also, the war for the 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 which still exists in Croatia (Figure 3.2-1).

About 18.9 % of the NOx emissions in 2015 derive from small combustion sources (NFR 1.A.4 mobile and stationary), 13.2 % originates from fuel combustion in manufacturing industry and construction (NFR 1.A.2) and 12.5 % from the energy sector public electricity and heat production (NFR 1.A.1). All mentioned sectors have recorded a decline since 1990, the sector 1.A.4 by 37 %, 1.A.2 by 70.2 % and 1.A.1 by 63.3 %. In the period between 2015 and 2014, two key sectors have recorded decline of emission: 1.A.1 by 5.5 %, 1.A.2 by 4.7 % while other key sectors recorded an increase: 1.A.3 by 1.6 %, 1.A.4 by 3.5 %, and 3.D by 8.7 %. The crop production and agricultural soils is also source of NOx emissions in Croatia, with 4.3 % of contribution to national NOx total in 2015. Those NO emissions occurs from soil microbial processes, and has decreased by about 18.3 % between 1990 and 2015 mostly due to decrease in N-fertilizer usage in crop production. The industrial processes and product use sector is not a significant source of NOx emission in Croatia. In 2015 it contributed with 2.1 % and in 1990 with 2.8 % to national NOx total. The emission in the sector has declined by about 60.5 % between 1990 and 2015, mostly due to stopping the production of aluminium, paper and pulp (Kraft process) and carbon black production and also due to decline in productions. Compare to previous year, this sector has recorded an increase by about 1 % which is an indicator of the economic recovery.

The NOx emission in 2015 was lower than the reduction commitment of 87 kt set under the Gothenburg Protocol and the NEC Directive.

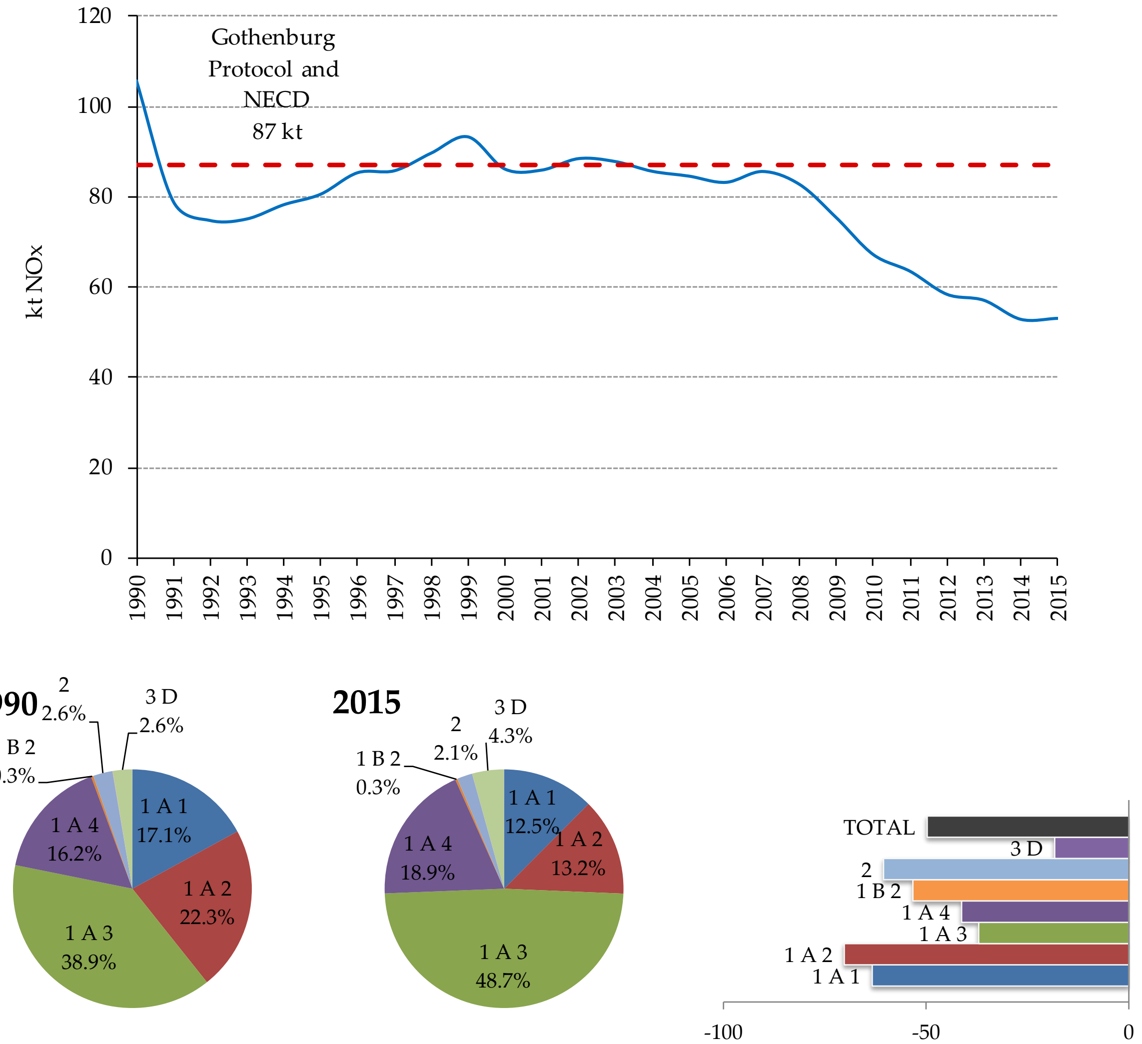


Figure 3.2-1 The NOx emissions (kt/yr) and percentage share by sector and variation in NOx emissions

Table 3.2-1 The NOx emissions by SNAP nomenclature in the period 1990-2015

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	18.0	9.2	18.9	3.0	NA	2.18E-02	37.1	16.5	7.7E-02	2.8	105.7
1991	13.5	7.8	13.1	2.6	NA	2.02E-02	26.6	12.5	5.9E-02	2.9	79.0
1992	15.9	8.3	11.1	3.0	NA	2.24E-02	25.4	7.8	5.1E-02	3.3	74.8
1993	16.4	8.9	11.0	2.5	NA	2.03E-02	26.7	7.1	6.1E-02	2.4	75.2

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**
1994	15.5	7.6	11.5	2.6	NA	8.74E-03	28.6	9.8	5.7E-02	2.5	78.3
1995	18.2	8.2	10.9	2.8	NA	2.13E-02	28.6	9.3	6.4E-02	2.5	80.6
1996	17.3	10.0	11.2	2.7	NA	2.04E-02	30.8	10.7	5.8E-02	2.6	85.4
1997	16.2	9.6	10.9	2.8	NA	2.01E-02	32.9	10.1	6.0E-02	3.2	85.8
1998	19.1	8.1	12.4	2.5	NA	2.15E-02	33.4	11.8	6.1E-02	2.5	89.9
1999	20.5	9.5	11.5	2.7	NA	2.49E-02	34.7	11.7	6.7E-02	2.8	93.5
2000	14.1	8.4	11.3	2.9	NA	2.44E-02	32.6	13.9	6.6E-02	3.1	86.4
2001	13.1	8.3	12.2	2.3	NA	3.18E-02	31.7	14.8	6.6E-02	3.4	85.9
2002	14.7	8.5	12.0	2.4	NA	3.30E-02	33.4	14.2	6.2E-02	3.1	88.5
2003	13.7	9.3	11.1	2.7	NA	3.43E-02	33.5	14.5	6.3E-02	3.0	87.8
2004	11.3	8.9	12.5	3.0	NA	2.57E-02	33.3	13.5	6.1E-02	3.1	85.7
2005	11.8	8.9	12.5	2.7	NA	2.63E-02	31.7	13.8	6.1E-02	3.2	84.6
2006	10.8	8.1	13.1	2.6	NA	2.60E-02	31.6	14.0	6.4E-02	2.9	83.2
2007	12.9	7.4	14.1	2.8	NA	2.63E-02	31.5	13.7	6.9E-02	3.3	85.6
2008	10.9	7.6	13.0	2.7	NA	2.77E-02	30.4	14.9	6.4E-02	3.2	82.7
2009	10.7	7.7	11.8	1.7	NA	2.04E-02	27.9	12.8	6.6E-02	2.8	75.4
2010	8.7	8.1	8.2	1.8	NA	2.39E-02	26.5	11.3	3.7E-02	2.6	67.2
2011	9.1	7.7	6.8	1.4	NA	2.10E-02	24.9	10.6	4.5E-02	3.0	63.5
2012	7.9	7.3	6.9	1.3	NA	2.01E-02	22.6	9.6	4.6E-02	2.8	58.4
2013	7.7	7.0	5.9	1.1	NA	1.73E-02	24.2	8.8	4.4E-02	2.3	57.1
2014	7.0	6.2	5.6	1.2	NA	1.51E-02	22.5	8.2	5.0E-02	2.1	52.9
2015	6.6	6.9	5.4	1.2	NA	1.47E-02	23.1	7.5	5.4E-02	2.3	53.1
2015 vs 1990	-63.3%	-25.1%	-71.2%	-60.6%	NA	-32.5%	-37.7%	-54.7%	-29.2%	-19.1%	-49.8%
2015 vs 2014	-5.5%	10.5%	-3.5%	0.5%	NA	-2.6%	2.9%	-8.5%	8.8%	8.7%	0.4%

3.3 AMMONIA (NH_3)

Ammonia contributes to acid deposition and eutrophication. It also reacts rapidly with atmospherically-formed sulfuric 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 the often inefficient conversion of feed nitrogen into animal product.

The NH_3 emission in 2015 amounted to 29.8 kt. Emission has decrease by 37.4 % since 1990 and increase since year before by 11 % (Table 3.3-1). About 70.2 % of NH_3 emissions in Croatia originate from the agriculture sector, in which source category manure management account for about 56.1 % and the rest of the sector´s emissions (23.1 %) originate from mineral N-fertilizers application. Sectors with a smaller share in NH_3 emissions in 2015 but also a key sources are the industrial processes sector (about 8.4 %), and small combustion sector (about 8.2 %). Other sectors contribute with less influence like latrines (about 2.1 %), and transport sector (about 1.7 %) in which passenger cars are the dominant source. Sources of ammonia emission in industrial processes sector in Croatia are production of: ammonia, nitric acid and mineral N-fertilizers.

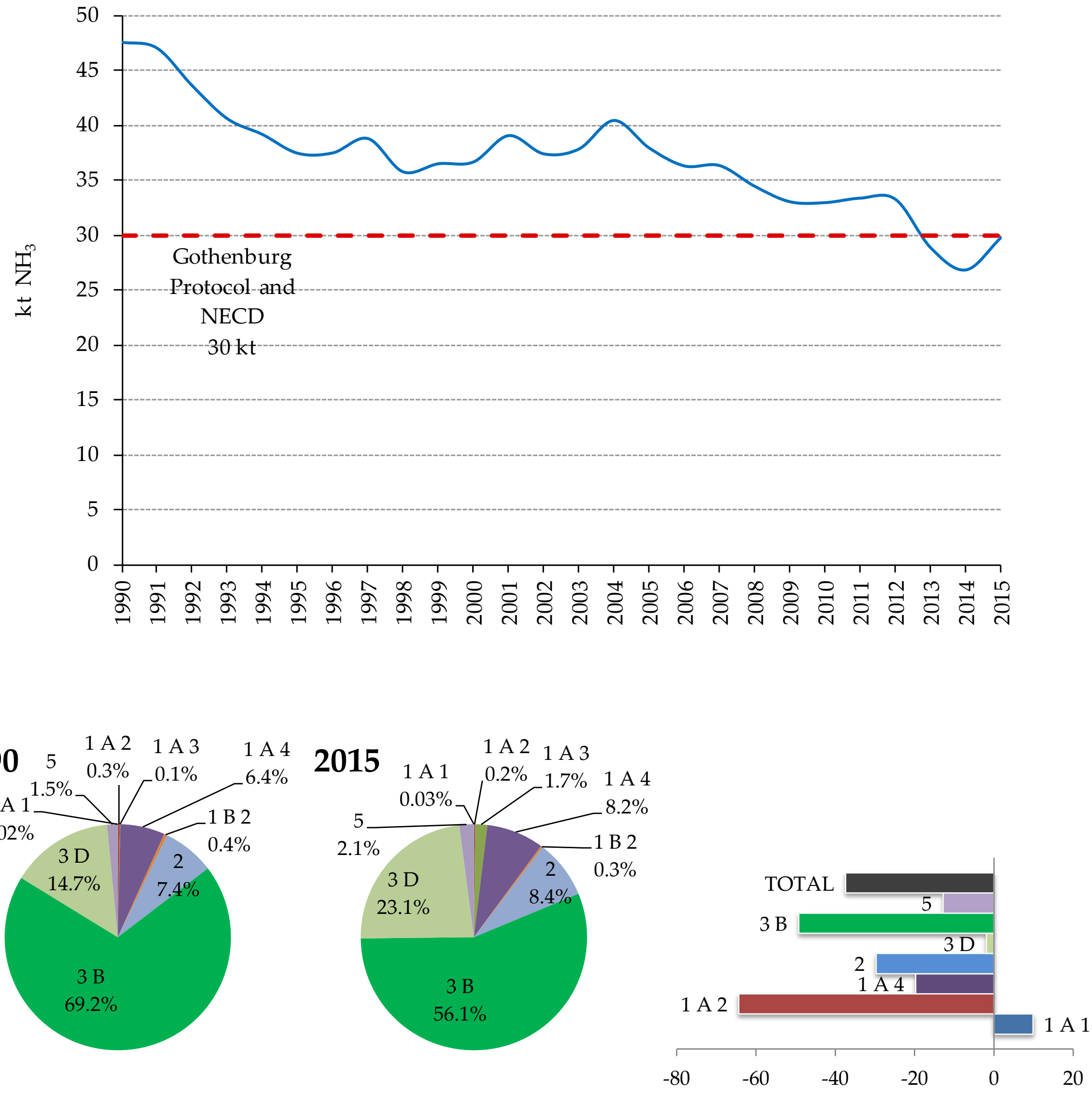


Figure 3.3-1 The NH_3 emissions (kt/yr) and percentage share by sector and variation in NH_3 emissions

The overall trend of the NH_3 emission from livestock is decreasing and dependent on the number of animals (49% reduction from animal sources in 2015 compared to 1990), and with the numbers of most of the animal categories in continuous decline since 1990. The decline in period 1991

- 1995 is a result of the war for the Croatian independence, while the reason for decline in the years after 2008 is due to economic recession. NH_3 emission from agricultural soils varies in correlation with the total amount of N - mineral fertilizers applied in the period 1990 – 2015 (decrease of ~2 % in 2015 compared to 1990). Most dominant in the total NH_3 emission from agricultural soils in Croatia is the N-urea fertilizer (40% in 2015, 29% in 1990), followed by calcium ammonium nitrate (27% in 2015, 29% in 1990) and complex NPK fertilizers (17% in 2015, 27% in 1990). Other types of fertilizers contribute with less than 1% of the total NH_3 emission due to fertilizer application in 2015. The increase in the NH_3 emission can be also observed in transport sector with road traffic domination (by about 17 times compared to 1990) due to its formation in vehicles' catalytic converters.

The ammonia emission in 2015 (Figure 3.3-1) was below the value of 30 kt set under the Gothenburg Protocol and the NEC Directive.

Table 3.3-1 The NH_3 emission by SNAP nomenclature in the period 1990-2015

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	9.0E-03	3.03	0.13	3.69	NA	5.0E-02	0.03	3.1E-03	0.71	39.9	47.6
1991	5.5E-03	3.58	0.13	3.62	NA	4.7E-02	0.02	2.3E-03	0.71	38.9	47.0
1992	6.3E-03	3.13	0.11	4.59	NA	5.2E-02	0.02	1.4E-03	0.71	35.0	43.6
1993	9.1E-03	3.30	0.11	3.25	NA	4.7E-02	0.04	1.7E-03	0.71	33.1	40.6
1994	5.6E-03	2.99	0.08	3.61	NA	2.0E-02	0.04	1.7E-03	0.70	31.7	39.2
1995	4.2E-03	3.16	0.09	3.67	NA	4.9E-02	0.06	1.7E-03	0.70	29.7	37.4
1996	4.9E-03	3.53	0.09	3.64	NA	4.7E-02	0.09	1.8E-03	0.69	29.4	37.5
1997	7.1E-03	3.24	0.12	3.69	NA	4.6E-02	0.15	1.7E-03	0.69	30.8	38.8
1998	6.7E-03	3.25	0.11	4.15	NA	5.0E-02	0.23	2.0E-03	0.69	27.3	35.8
1999	6.5E-03	3.19	0.08	3.03	NA	5.7E-02	0.29	2.1E-03	0.68	29.1	36.5
2000	1.0E-02	2.84	0.08	3.56	NA	5.6E-02	0.36	2.4E-03	0.68	29.1	36.7
2001	9.4E-03	3.13	0.07	2.75	NA	7.3E-02	0.34	2.6E-03	0.67	32.0	39.1
2002	1.2E-02	2.99	0.08	2.91	NA	7.6E-02	0.37	2.5E-03	0.67	30.3	37.4
2003	1.1E-02	3.44	0.09	3.60	NA	7.9E-02	0.39	2.7E-03	0.67	29.5	37.8
2004	1.1E-02	3.36	0.10	4.58	NA	5.9E-02	0.39	2.9E-03	0.66	31.3	40.4
2005	1.1E-02	3.56	0.08	3.77	NA	6.1E-02	0.42	3.1E-03	0.66	29.3	37.9
2006	1.0E-02	3.17	0.10	2.55	NA	6.0E-02	0.45	3.3E-03	0.66	29.3	36.3
2007	1.2E-02	2.97	0.09	2.72	NA	6.1E-02	0.63	3.4E-03	0.65	29.2	36.3
2008	1.2E-02	2.88	0.07	2.16	NA	6.4E-02	0.61	3.8E-03	0.65	28.0	34.4
2009	9.5E-03	2.91	0.08	1.69	NA	4.7E-02	0.62	3.4E-03	0.65	27.0	33.0
2010	1.2E-02	3.02	0.09	2.61	NA	5.5E-02	0.58	3.1E-03	0.64	25.9	32.9
2011	1.3E-02	2.84	0.08	2.61	NA	4.8E-02	0.56	3.0E-03	0.64	26.6	33.4
2012	1.1E-02	2.73	0.09	2.81	NA	4.6E-02	0.57	2.8E-03	0.63	26.4	33.2

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**
2013	1.1E-02	2.61	0.08	1.90	NA	4.0E-02	0.55	2.7E-03	0.63	23.0	28.8
2014	9.8E-03	2.19	0.06	1.55	NA	3.5E-02	0.51	2.7E-03	0.63	21.8	26.8
2015	9.9E-03	2.43	0.05	2.54	NA	3.4E-02	0.51	2.6E-03	0.62	23.6	29.8
2015 vs 1990	7.6%	-28.1%	-61.6%	-31.3%	NA	-32.5%	1584.5%	-6.8%	-12.8%	-46.0%	-42.2%
2015 vs 2014	-1.4%	0.0%	0.0%	63.2%	NA	-2.6%	-3.3%	1.9%	-0.6%	-1.4%	2.5%

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 22.0% in 1990 to 34.1% in 2015 and for NH_3 from 26.8% in 1990 to 51.8 % in 2015 (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 51.2 % in 1990 to 14 % in 2015). 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.

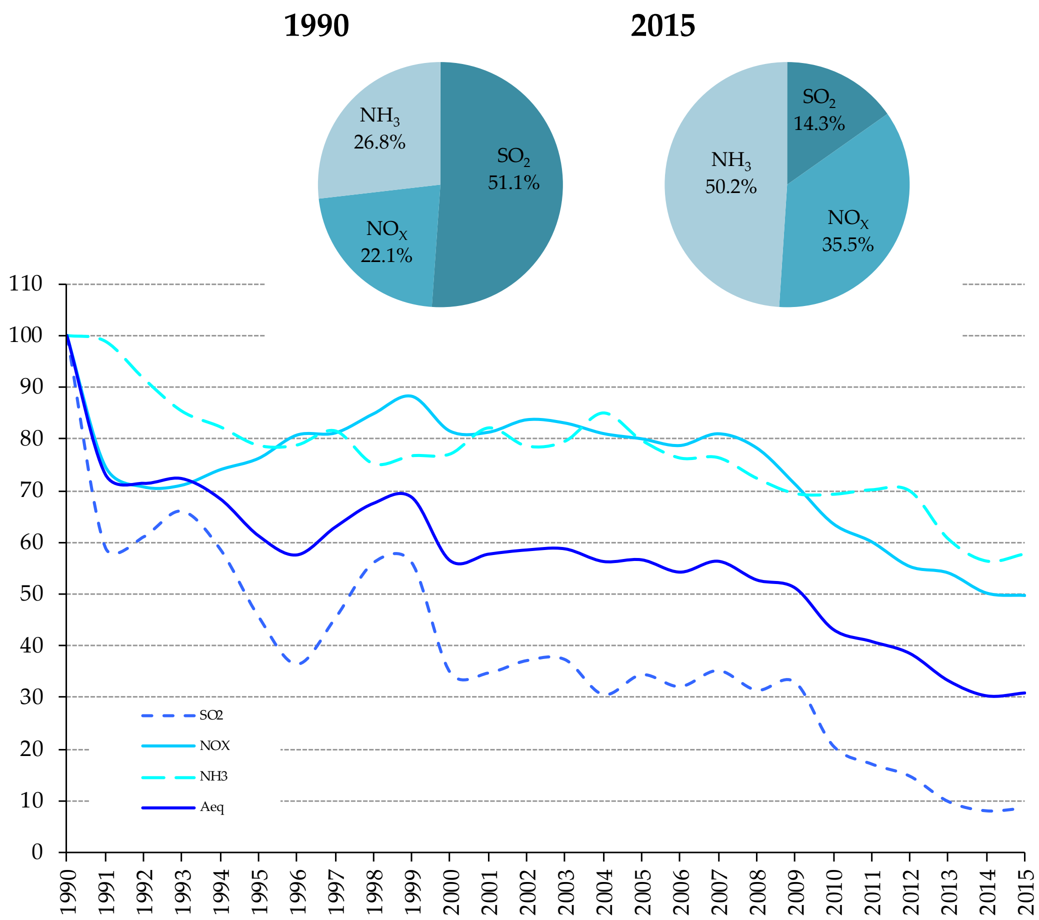


Figure 3.4-1 Relative emission of substances (without nature) that contribute to acidification and eutrophication for 1990-2015 (1990 = 100%)

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	51.2	22.0	26.8	10.4
1991	41.4	22.4	36.2	7.6
1992	43.8	21.8	34.4	7.4
1993	46.8	21.6	31.6	7.5
1994	44.0	23.8	32.2	7.1
1995	38.2	27.3	34.4	6.4
1996	32.5	30.8	36.7	6.0
1997	36.9	28.3	34.7	6.6
1998	42.6	27.6	29.8	7.0
1999	41.9	28.2	29.9	7.2
2000	31.7	31.7	36.5	5.9
2001	30.9	31.0	38.1	6.0

YEAR	SO_2 % Aeq	NO_x % Aeq	NH_3 % Aeq	Aeq(**) kt
2002	32.6	31.4	36.0	6.1
2003	32.6	31.1	36.3	6.1
2004	27.9	31.6	40.4	5.9
2005	31.2	31.1	37.7	5.9
2006	30.4	31.9	37.7	5.7
2007	32.1	31.6	36.3	5.9
2008	30.6	32.6	36.8	5.5
2009	33.1	30.6	36.3	5.3
2010	24.7	32.4	43.0	4.5
2011	21.7	32.3	46.0	4.3
2012	19.8	31.5	48.6	4.0
2013	15.4	35.7	48.9	3.5
2014	13.9	36.3	49.8	3.2
2015	14.0	34.1	51.8	3.4

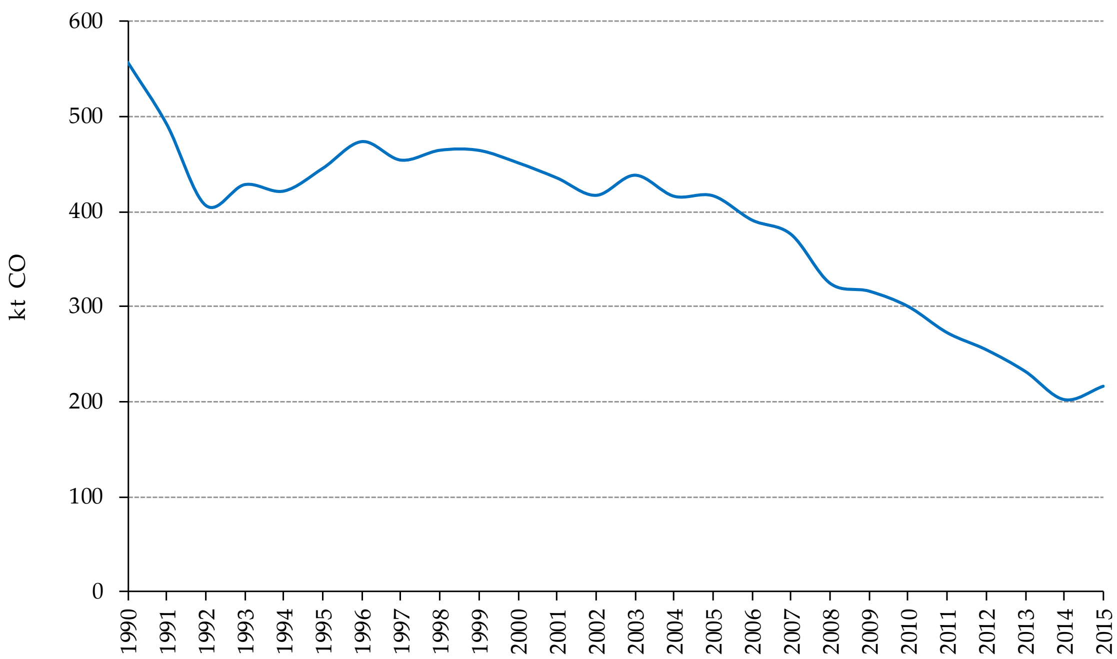
(*) Emissions concern only anthropogenic one (without nature)
(**) Acid equivalent: indicator of acid equivalent calculate on the base of potential fixation of H+ ion: 0.0313 for SO_2, 0.0217 for NOx and 0.0588 for NH_3

3.5 CARBON MONOXIDE EMISSION (CO)

In IIR 2017, the new data for consumed biomass for the period from 1990 to 2013 were included in inventory (source: revised national energy balances from 1990 to 2013) and has increasing trend by approximately 30 PJ. As an outcome of this revision, CO emission trend is different from that submitted one in IIR 2016.

Main source in carbon monoxide emission is the incomplete fossil fuel combustion in energy sectors both, stationary and mobile. Emission of CO has decreased from 556.9 kt in 1990 to 216.3 kt in 2015, which was a reduction by 61.2 % (Figure 3.5-1 and Table 3.5-1). Moreover, CO emissions have increased by 7 % compared to 2014. About 99.7 % of the CO emissions in 2015 come from the energy sector, of which 65.7 % comes from small combustion sector (with domination of residential sector), 17.8 % from transport sector (with domination of road transport), 9.6 % from Refining / storage sector, and about 6.2 % from fuel combustion in manufacturing industry and construction.

The war for the 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 83.9 % regarding transport sector), due to the introduction of catalytic converters and renewing of the vehicle fleet. Also, 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 have contributed to the reduction of CO emissions. Other sectors also have a significant reduction trend since 1990. The increase in CO emissions by 29.2 % has occurred in general consumption sector (residential, services, forestry/agriculture/fishing). The industrial processes and product use sector has recorded a great reduction by 98.3 % since 1990, due to stopping the production of aluminium, paper and pulp (Kraft process) and carbon black production and also due to decline in productions. Emissions from Refining /storage sector have also decrease by 58.9 % since 1990, mostly due to decline in activity regarding 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). Also, reduction since 2008 is a partly result of gradual replacement of certain percentage of traditional domestic stoves and manual single hous boilers with advanced/ecolabelled stoves and boilers and pellete stoves and boilers (see Table 4.5-1 and Figure 4.5-2).



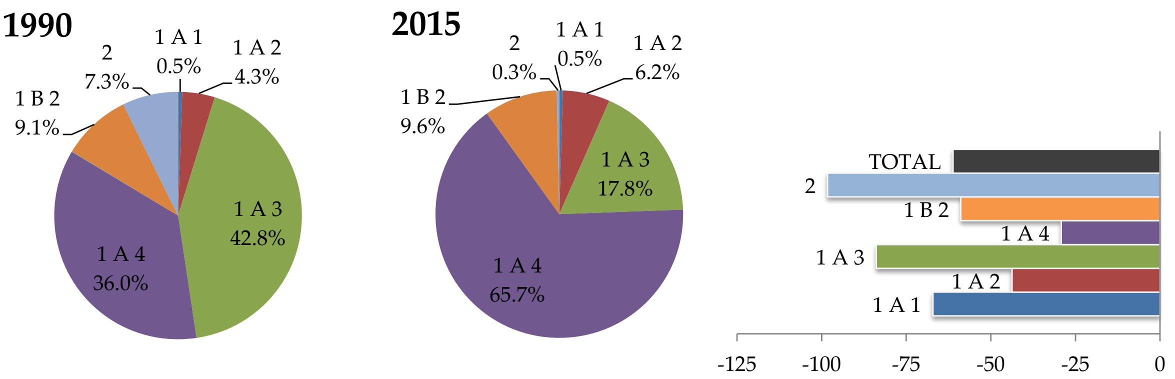


Figure 3.5-1 The CO emissions (kt/yr) and percentage share by sector and variation in CO emissions

Table 3.5-1 The CO emissions by SNAP nomenclature in the period 1990-2015

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	3.02	192.9	20.8	90.2	NA	0.67	236.6	12.4	0.39	NA	556.9
1991	2.20	213.3	14.3	60.3	NA	0.62	179.0	21.7	0.29	NA	491.7
1992	2.28	179.9	10.8	41.1	NA	0.68	156.2	15.2	0.25	NA	406.4
1993	2.65	189.3	9.8	54.4	NA	0.62	153.8	17.5	0.30	NA	428.4
1994	2.55	170.4	10.0	54.6	NA	0.27	166.7	16.8	0.28	NA	421.5
1995	2.63	179.6	9.7	61.8	NA	0.65	173.3	17.5	0.32	NA	445.4
1996	2.52	201.0	9.5	54.3	NA	0.62	186.0	19.2	0.29	NA	473.5
1997	2.37	184.7	10.3	51.7	NA	0.62	186.6	17.5	0.29	NA	454.0
1998	2.55	185.9	10.2	59.4	NA	0.66	188.8	16.6	0.30	NA	464.4
1999	2.63	183.1	9.8	61.3	NA	0.76	186.5	19.9	0.33	NA	464.3
2000	2.19	162.6	9.8	84.2	NA	0.75	171.7	19.6	0.32	NA	451.2
2001	1.71	178.0	10.4	71.6	NA	0.97	153.3	18.9	0.31	NA	435.3
2002	1.65	170.8	9.9	75.6	NA	1.01	141.3	16.5	0.30	NA	417.0
2003	1.96	196.9	9.4	77.0	NA	1.05	133.8	17.7	0.31	NA	438.2
2004	1.86	191.5	10.7	70.6	NA	0.79	121.8	18.6	0.30	NA	416.0
2005	1.48	203.2	10.9	71.8	NA	0.81	111.1	16.9	0.30	NA	416.5
2006	1.82	180.6	11.4	83.7	NA	0.79	94.9	17.5	0.31	NA	391.0
2007	2.39	167.9	12.2	88.5	NA	0.80	86.1	17.7	0.34	NA	375.9
2008	1.67	163.1	11.6	50.9	NA	0.85	77.3	18.8	0.31	NA	324.5
2009	1.45	164.1	9.9	52.0	NA	0.62	70.3	17.4	0.33	NA	316.2
2010	1.35	170.6	10.2	40.3	NA	0.73	62.0	14.9	0.17	NA	300.1
2011	1.45	159.9	8.7	32.8	NA	0.64	54.3	14.5	0.21	NA	272.6
2012	1.29	153.2	9.0	35.4	NA	0.61	41.6	13.4	0.22	NA	254.7
2013	1.20	145.9	9.1	22.1	NA	0.53	39.9	13.0	0.21	NA	231.9
2014	1.06	121.8	9.0	21.9	NA	0.46	34.8	13.0	0.24	NA	202.2
2015	0.99	134.9	9.5	20.7	NA	0.45	36.7	12.8	0.26	NA	216.3
2014 vs 1990	-67.1%	-30.1%	-54.2%	-77.0%	NA	-32.5%	-84.5%	2.7%	-32.8%	NA	-61.2%
2015 vs 2014	-6.0%	10.8%	6.1%	-5.4%	NA	-2.6%	5.4%	-1.9%	10.3%	NA	7.0%

3.6 NON-METHANE VOLATILE ORGANIC COMPOUNDS (NMVOC)

In IIR 2017, the new data for consumed biomass for the period from 1990 to 2013 were included in inventory (source: revised national energy balances from 1990 to 2013) and has increasing trend by approximately 30 PJ. As an outcome of this revision, NMVOC emission trend is different from that submitted one in IIR 2016. Besides that, NMVOC emission trend raised due to the methodology improvement in sector 1.B.

The NMVOCs are important because they are precursors in formation of troposphere ozone. Some of them may have undesirable ecotoxicological properties, for example benzene and xylene.

Production and use of products containing solvent, road transport, refineries and combustion of wood in households have domination in NMVOCs emissions in Croatia. Road transport leads to the greatest emissions in the transport sector, but road transport has also shown the greatest reduction in NMVOC emission due to new exhaust emission requirements. Environmental requirements for reduction of NMVOC emission from products containing solvents have also contributed to lower NMVOC emission.

The NMVOCs emission in 2015 amounted to 60.6 kt. Emissions of NMVOCs in 2015 have sharply declined, by 60 % since 1990, and by 9.5 % compared to year before (Figure 3.6-1). The decline since 1990 is strong in the industrial processes and product use sector (by 68.8 %) and in transport sector (with road transport domination) (by 80.4 %). In 2015, emissions of NMVOCs from almost all sectors recording increase in comparison to 1990 (Table 3.6-1). The sector with constant increasing trend in NMVOC emissions since 1990 is the waste sector, due to increasing activities regarding solid waste disposal on land. The sharply decreasing trend since 1990 has occurred mainly due to reduced emissions from products containing solvent partly as a result of implementation of best available techniques (BAT) in the industrial processes and product use sector, also due to reducing the production activities and continuous decreasing population trend. The road transport sector has also contributed to this decreasing trend of NMVOC emission due to increased use of the energy-efficient cars, the introduction of new exhaust requirements. Fugitive NMVOC emissions from oil and natural gas products have also recorded a decline by 45.2 % since 1990. Also, the war for the 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 2008 is a partly result of gradual replacement of certain percentage of traditional domestic stoves and manual single hous boilers with advanced/ecolabelled stoves and boilers and pellete stoves and boilers (see Table 4.5-1 and Figure 4.5-2).

The NMVOC emission in 2015 (Figure 3.6-1) was below the value of 90 kt set under the Gothenburg Protocol and the NEC Directive.

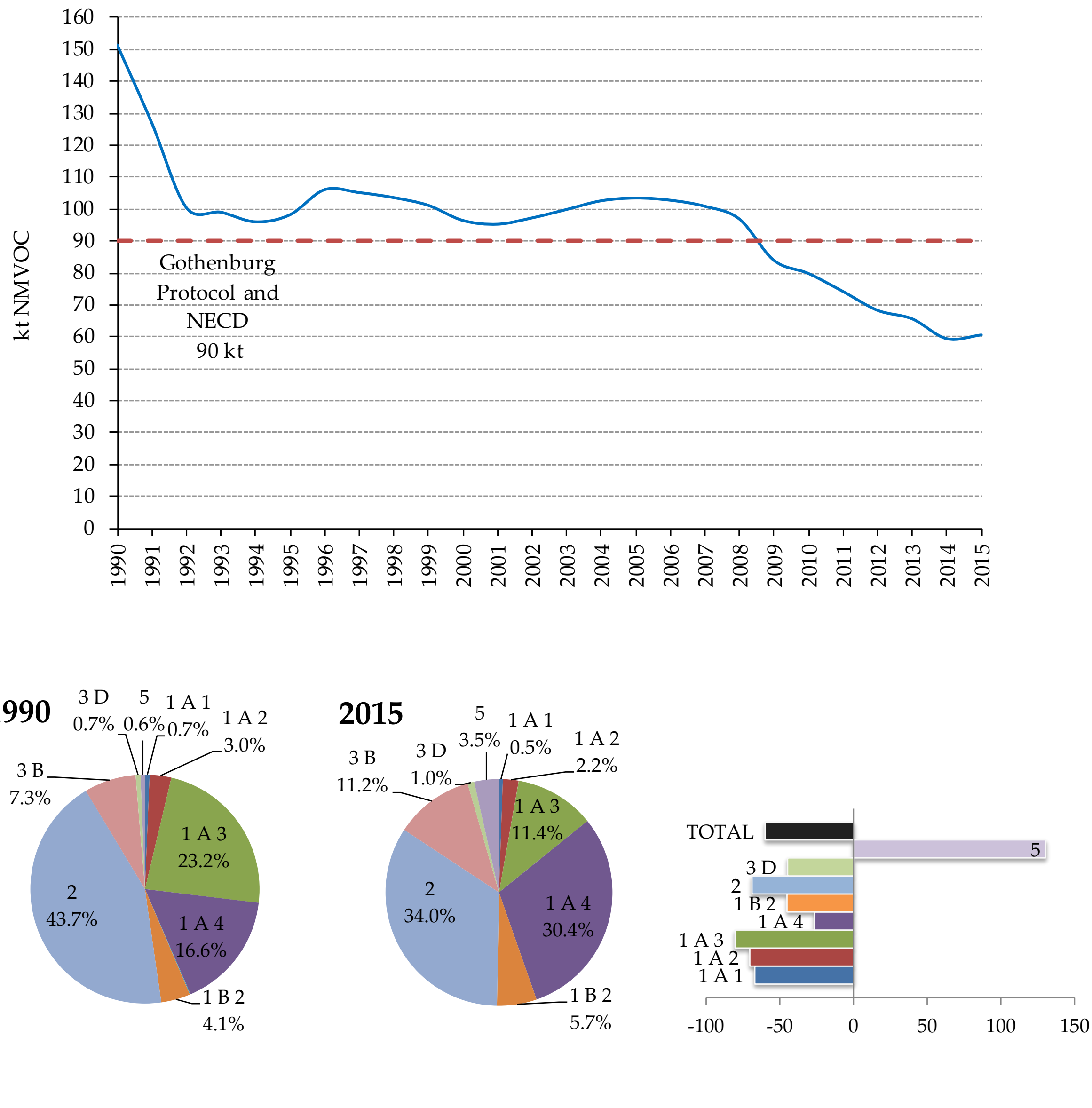


Figure3.6-1 The NMVOCs emissions (kt/yr) and percentage share by sector and variation in NMVOCs

Table 3.6-1 The NMVOC emissions by SNAP nomenclature in the period 1990-2015

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	23.4	3.6	25.6	4.2	42.7	34.6	3.2	0.97	12.1	151.4
1991	0.8	26.9	2.8	21.8	2.3	28.9	27.0	3.6	0.97	11.8	127.0
1992	0.8	23.1	2.2	13.8	2.8	19.7	23.9	3.3	0.99	9.8	100.5
1993	1.0	24.4	2.2	12.9	2.8	19.9	22.6	2.2	1.04	10.0	99.0
1994	0.9	22.0	2.0	9.9	3.0	20.3	24.7	2.5	1.09	9.6	96.0
1995	0.8	23.3	2.0	10.3	3.3	19.8	25.7	2.6	1.18	9.1	98.2
1996	0.8	26.1	2.0	11.6	3.4	21.3	28.0	2.8	1.26	8.7	106.1
1997	0.9	24.0	2.2	10.1	3.5	22.3	29.6	2.6	1.36	8.7	105.2
1998	0.8	24.2	2.2	9.7	3.6	20.9	29.7	2.7	1.47	8.5	103.6
1999	0.9	23.9	1.8	9.7	3.9	18.0	29.8	2.9	1.57	8.8	101.2
2000	0.8	21.2	1.7	9.3	3.7	18.2	28.5	3.1	1.52	8.4	96.5
2001	0.5	23.3	1.7	8.6	3.7	19.1	25.0	3.1	1.63	8.8	95.3
2002	0.5	22.4	1.7	9.1	3.7	23.7	23.3	2.7	1.73	8.4	97.2
2003	0.5	25.8	1.7	8.8	3.6	24.0	22.3	2.9	1.83	8.5	99.9
2004	0.5	25.2	1.9	9.4	3.7	28.1	20.3	2.7	1.93	8.8	102.6
2005	0.5	26.8	1.8	10.4	3.5	29.7	17.6	2.6	2.04	8.6	103.5
2006	0.5	23.8	1.9	9.8	3.5	33.0	16.6	2.6	2.30	8.7	102.8
2007	0.5	22.2	2.0	7.9	3.8	35.7	15.2	2.6	2.55	8.4	100.9
2008	0.5	21.6	1.7	7.4	3.4	34.8	14.0	2.7	2.74	8.2	96.9
2009	0.5	21.7	1.6	6.9	3.6	23.7	12.5	2.3	2.81	8.2	83.9
2010	0.5	22.6	1.7	6.8	3.3	21.9	10.9	1.9	2.52	7.8	79.8
2011	0.5	21.2	1.5	7.0	3.0	19.6	9.8	1.7	2.50	7.4	74.2
2012	0.4	20.3	1.6	6.2	2.7	18.3	7.6	1.5	2.21	7.5	68.3
2013	0.4	19.3	1.4	5.9	2.6	18.1	7.1	1.4	2.29	7.1	65.6
2014	0.3	16.1	1.2	6.5	2.3	16.1	6.3	1.4	2.13	7.1	59.4
2015	0.3	17.8	1.0	5.4	2.5	16.1	6.5	1.3	2.14	7.4	60.6
2015 vs 1990	-67.0%	-23.6%	-71.1%	-78.9%	-40.7%	-62.2%	-81.3%	-59.2%	121.6%	-39.0%	-60.0%
2015 vs 2014	5.3%	10.6%	-9.9%	-16.9%	8.6%	0.3%	2.3%	-4.8%	0.7%	4.2%	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[18]. 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 TSP emission trend for source category 2.A.1 cement production is lower then PM_{10}, and $PM_{2.5}$ trends. The reason for that is abatement tehnologies installed in all four cement production facilities in Croatia. Abatement tehnologies are ESP on main stacks and smaller 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)

In IIR 2017, the new data for consumed biomass for the period from 1990 to 2013 were included in inventory (source: revised national energy balances from 1990 to 2013) and has increasing trend by approximately 30 PJ. As an outcome of this revision, TSP emission trend is different from that submitted one in IIR 2016.

Emission of TSP is voluntary reported as an additional air pollutant. In 2015, total emissions of TSP amounted to 38.8 kt. The TSP emissions have decreased by 29.1 % since 1990, and increase by 2.9 % compared to 2014 (Figure 3.7.1-1 and Table 3.7.1-1). In 2015, more than one - half (73.7 %) of TSP emission has originated from energy sector. Small sources (with domination of biomass combustion in residential sector) are large contributor to TSP emissions (43.8 %), while transport sector, fugitive sectors, manufacturing industry and construction sector and public electricity and heat production have contributed with smaller extent: as follow 6.1 %, 1.4 %, 1.3 % and 1.2 %. Road transport has domination in TSP emissions within the transport sector, with equal participation of emissions that originate from fuel combustion and fugitive emissions from road wear and tire and brake wear. The

[18] 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

industrial processes and solvent use sector contributes to about 39 % of the total emission and it is the second largest source in TSP emission in Croatia. The agricultural sector is also a source of TSP in Croatia, with a contribution of 7.3 % of total national emissions in 2015. Crop production and agricultural soils contributes to 4.6 %, while manure management contributes to 2.7 % of the total emissions of TSP in 2015. Emissions from agriculture sector have decreased compared to 1990 (about 50%), due to a drop in the number of animals and reduced crop production. Combustion in industry and construction contributes to total national emissions by 1.3 % in 2015 and in the period of 1990 this sector has significantly reduced the emission of TSP to 84.8 % due to reduced consumption of solid fuels and biomass and the simultaneous increase in consumption and gaseous and liquid fuels.

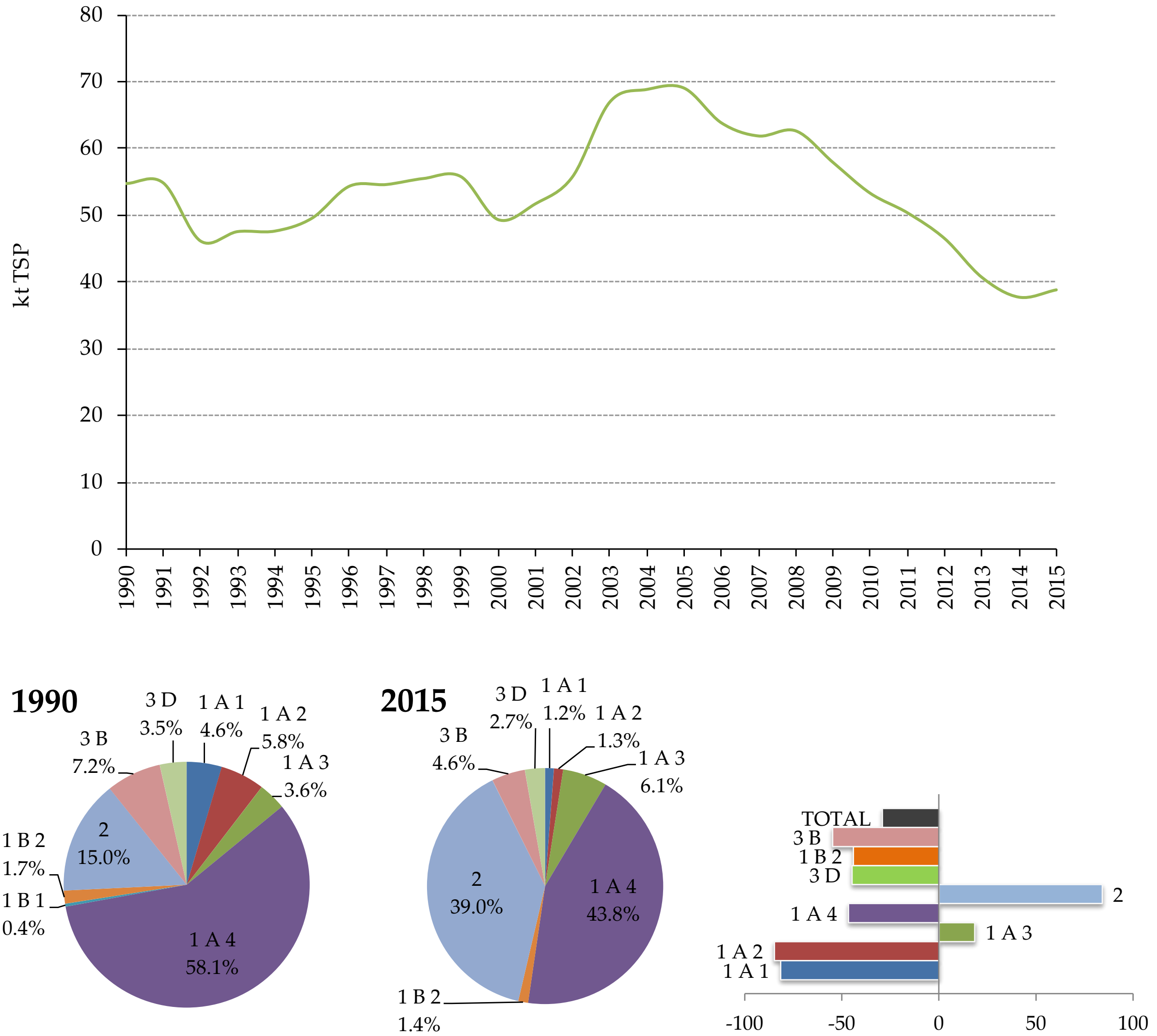


Figure 3.7.1-1: The TSP emissions (kt/yr) and percentage share by sector and variation in TSP emissions

The trend of TSP emissions has several dips and peak between 1990 and 2015. Great decline in the period from 1991 to 1994 was a result of the war for the 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 hous boilers with advanced/ecolabelled stoves and boilers and pellete stoves and boilers (see Table 4.5-1 and Figure 4.5-2).

Table 3.7.1-1 The TSP emissions by SNAP nomenclature in the period 1990-2015

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	2.5	31.0	2.6	8.9	1.5E-02	0.5	1.7	1.7	4.5E-02	5.9	54.7
1991	1.7	36.1	1.8	6.5	1.4E-02	0.3	1.4	1.2	4.0E-02	5.7	54.8
1992	2.3	31.1	1.3	4.5	1.1E-02	0.4	1.5	0.8	2.9E-02	4.3	46.1
1993	2.5	32.9	1.2	4.0	1.0E-02	0.4	1.6	0.6	3.7E-02	4.4	47.5
1994	2.1	29.7	1.1	7.7	9.2E-03	0.2	1.7	0.8	3.1E-02	4.3	47.6
1995	1.9	31.4	1.1	8.0	7.3E-03	0.4	1.9	0.7	2.6E-02	4.1	49.6
1996	1.8	35.2	1.0	9.3	5.9E-03	0.4	2.0	0.8	2.5E-02	3.8	54.3
1997	2.7	32.4	1.1	11.1	4.3E-03	0.4	2.2	0.7	2.9E-02	3.8	54.6
1998	3.4	32.6	1.0	11.1	4.5E-03	0.5	2.3	0.8	2.7E-02	3.8	55.5
1999	3.1	32.1	0.8	12.0	1.4E-03	0.5	2.4	0.8	3.2E-02	4.0	55.8
2000	1.2	28.6	0.8	11.4	NA	0.4	2.4	0.9	2.8E-02	3.6	49.4
2001	1.7	31.4	0.8	10.2	NA	0.5	2.5	0.9	3.4E-02	3.7	51.7
2002	1.4	30.2	0.8	15.6	NA	0.7	2.6	0.9	3.5E-02	3.6	55.8
2003	1.5	34.8	0.7	21.9	NA	0.7	2.8	0.9	3.6E-02	3.6	66.9
2004	0.8	33.9	0.8	25.3	NA	0.5	2.9	0.8	3.6E-02	3.8	68.8
2005	1.1	36.0	0.7	23.2	NA	0.5	3.0	0.8	3.8E-02	3.6	69.0
2006	1.0	31.4	0.7	22.4	NA	0.5	3.2	0.8	4.4E-02	3.7	63.8

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**
2007	1.7	28.6	0.8	22.8	NA	0.5	3.1	0.8	4.7E-02	3.6	61.9
2008	0.9	27.1	0.6	26.3	NA	0.5	2.9	0.9	4.4E-02	3.5	62.6
2009	1.5	26.5	0.6	21.9	NA	0.4	2.8	0.8	4.0E-02	3.5	57.9
2010	0.9	26.7	0.7	18.1	NA	0.5	2.5	0.7	2.5E-02	3.2	53.3
2011	0.7	24.2	0.6	18.6	NA	0.4	2.3	0.6	3.1E-02	3.0	50.4
2012	0.6	22.3	0.6	16.9	NA	0.3	2.1	0.6	2.4E-02	3.0	46.5
2013	0.3	20.3	0.6	13.7	NA	0.3	2.0	0.5	2.3E-02	2.9	40.7
2014	0.4	16.1	0.4	15.2	NA	0.3	2.0	0.5	3.1E-02	2.7	37.7
2015	0.5	16.8	0.4	15.4	NA	0.3	2.1	0.5	2.6E-02	2.8	38.8
2015 vs 1990	-81.5%	-45.6%	-84.9%	73.5%	NA	-39.9%	24.9%	-73.3%	-41.6%	-51.5%	-29.1%
2015 vs 2014	14.4%	4.5%	-12.5%	1.0%	NA	0.5%	7.2%	-7.1%	-15.5%	3.8%	2.9%

3.7.2 Particulate matter (PM_{10})

In IIR 2017, the new data for consumed biomass for the period from 1990 to 2013 were included in inventory (source: revised national energy balances from 1990 to 2013) and has increasing trend by approximately 30 PJ. As an outcome of this revision, PM_{10} emission trend is different from that submitted one in IIR 2016.

Total PM_{10} emission in 2015 has amounted to 26.6 kt. The emissions have decreased by 42.4 % since 1990 and have increased by 3.2 % compared to 2014 (Figure 3.7.2-1). The energy sector is the largest source of PM_{10} emission and accounts for about 72.9 % of the national total in 2015 (Table 3.7.2-1). Small combustion and mainly biomass combustion in residential sector are key sources of PM_{10} emission and account with 60.7 % to total emission in 2015. Transport sector which contributed with smaller extent (8 % in 2015) has recorded an increase by 17.3 % since 1990. Road transport has domination in PM_{10} emissions within the transport sector, with equal participation of emissions that originate from fuel combustion and fugitive emissions from road wear and tire and brake wear. The industrial processes and solvent use sector is the second largest source in PM_{10} emissions (18.6 % in national PM_{10} total emission). This sector is recorded a great increase (by 26.7 %) since 1990. The agriculture is also source of PM_{10} emissions in Croatia, with 8.5 % of contribution to national total in 2015. The manure management has contributed with 4.5 % to total PM_{10} emission in 2015, and the crop production and agricultural soils with 4 %. Emissions from agriculture sector have decrease since 1990 (for about 50 %), due to decline in number of animals and decline in crop production. Combustion in Industry and construction contributes to total national emissions by 1.8 % in 2015 and in the period since 1990 this sector has significantly reduced PM_{10} emission by 84.8 %, due to reduced consumption of solid fuels and biomass and the simultaneous increase in consumption of gaseous and liquid fuels.

The trend of PM_{10} emissions has several dips and peak between 1990 and 2015. Great decline in the period from 1991 to 1994 was a result of the war for the 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 hous boilers with advanced/ecolabelled stoves and boilers and pellete stoves and boilers (see Table 4.5-1 and Figure 4.5-2).

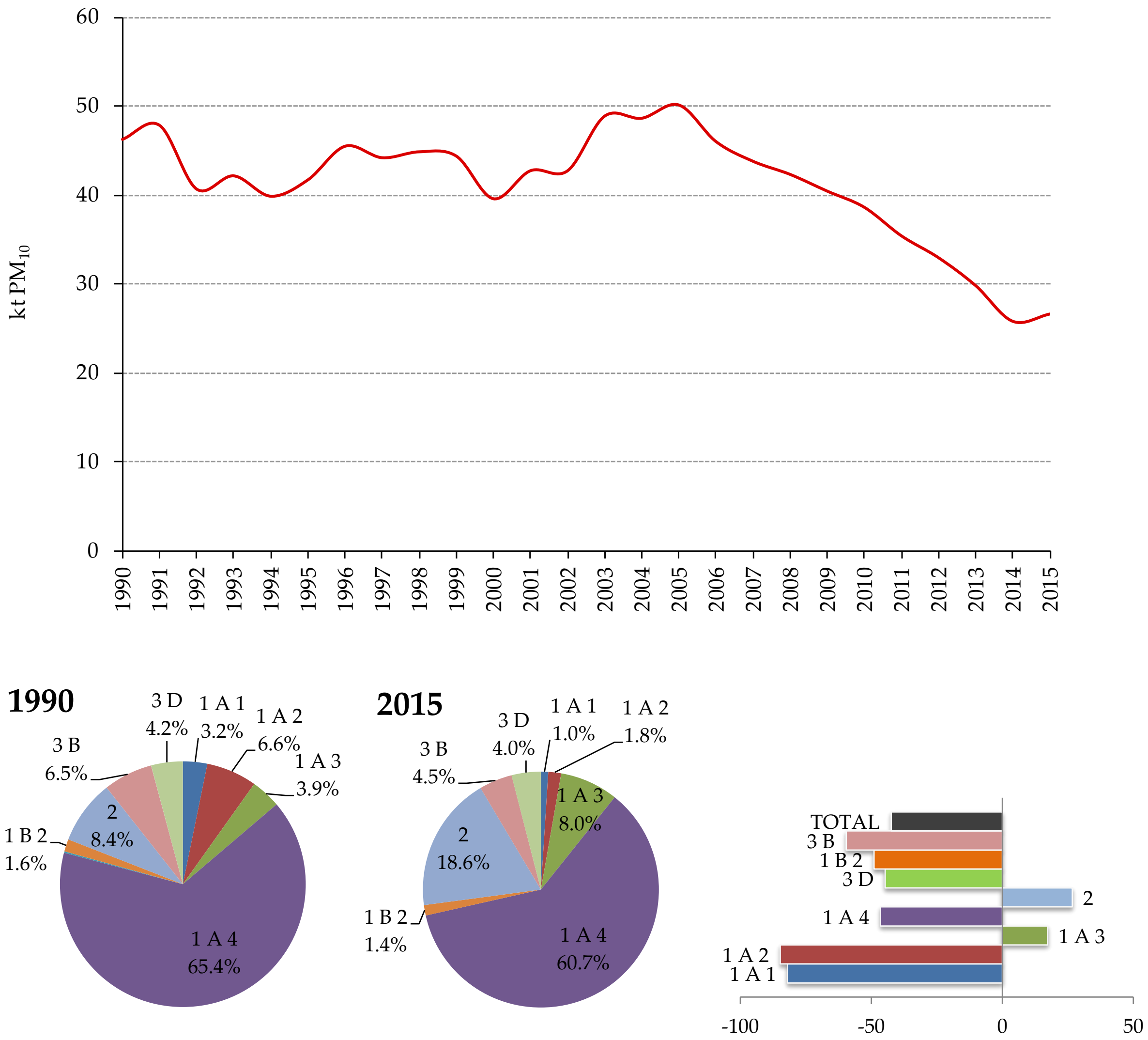


Figure 3.7.2-1 The PM10 emissions (kt/yr) and percentage share by sector and variation in PM10 emissions

Table 3.7.2-1 The PM10 emissions by SNAP nomenclature in the period 1990-2015

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	1.5	29.4	2.5	4.3	7.3E-03	0.4	1.5	1.7	4.5E-02	4.9	46.3
1991	1.0	34.4	1.8	3.1	6.5E-03	0.3	1.3	1.2	4.0E-02	4.8	47.8
1992	1.3	29.7	1.2	2.4	5.1E-03	0.4	1.3	0.8	2.9E-02	3.5	40.7
1993	1.4	31.3	1.1	2.3	4.8E-03	0.3	1.5	0.6	3.6E-02	3.6	42.2
1994	1.3	28.3	1.0	3.2	4.3E-03	0.2	1.5	0.8	3.1E-02	3.5	39.9
1995	1.2	29.9	1.0	3.3	3.5E-03	0.4	1.7	0.7	2.6E-02	3.3	41.7
1996	1.1	33.6	1.0	3.6	2.8E-03	0.4	1.8	0.8	2.4E-02	3.2	45.5
1997	2.0	30.9	1.0	3.9	2.0E-03	0.4	2.1	0.7	2.9E-02	3.2	44.2
1998	2.3	31.0	1.0	4.0	2.1E-03	0.5	2.1	0.8	2.7E-02	3.2	44.9

PM_{10}											
SNAP	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**Total**
Unit	**kt**	**kt**	**kt**	**kt**	**kt**	**kt**	**kt**	**kt**	**kt**	**kt**	**kt**
1999	1.8	30.6	0.8	4.4	6.4E-04	0.5	2.2	0.8	3.2E-02	3.3	44.4
2000	0.8	27.2	0.8	4.4	NA	0.4	2.2	0.9	2.8E-02	2.9	39.7
2001	1.1	30.0	0.7	4.2	NA	0.5	2.3	0.9	3.3E-02	3.1	42.7
2002	0.9	28.7	0.7	5.5	NA	0.6	2.4	0.9	3.5E-02	3.0	42.7
2003	0.9	33.1	0.7	7.0	NA	0.7	2.6	0.9	3.6E-02	3.0	48.9
2004	0.6	32.3	0.8	7.9	NA	0.5	2.7	0.8	3.6E-02	3.1	48.6
2005	0.6	34.3	0.6	7.5	NA	0.5	2.8	0.8	3.7E-02	3.0	50.1
2006	0.6	29.9	0.7	7.4	NA	0.5	3.0	0.8	4.4E-02	3.0	46.0
2007	1.0	27.2	0.7	7.7	NA	0.5	2.9	0.8	4.6E-02	3.0	43.8
2008	0.6	25.8	0.5	8.4	NA	0.5	2.7	0.9	4.4E-02	2.9	42.3
2009	0.8	25.3	0.6	7.2	NA	0.4	2.5	0.8	3.9E-02	2.9	40.4
2010	0.5	25.4	0.7	6.0	NA	0.4	2.3	0.6	2.5E-02	2.6	38.6
2011	0.4	23.0	0.5	5.9	NA	0.4	2.1	0.6	3.1E-02	2.4	35.4
2012	0.4	21.2	0.6	5.5	NA	0.3	1.9	0.6	2.4E-02	2.5	33.0
2013	0.2	19.3	0.6	4.7	NA	0.3	1.8	0.5	2.3E-02	2.4	29.8
2014	0.2	15.3	0.4	5.0	NA	0.3	1.8	0.5	3.1E-02	2.2	25.8
2015	0.3	16.0	0.4	5.0	NA	0.3	1.9	0.5	2.6E-02	2.3	26.6
2015 vs 1990	-82.0%	-45.4%	-84.9%	18.4%	NA	-38.9%	24.0%	-73.3%	-42.2%	-53.8%	-42.4%
2015 vs 2014	11.1%	4.5%	-12.5%	-0.1%	NA	0.0%	7.9%	-7.0%	-15.7%	2.5%	3.2%

3.7.3 Particulate matter ($PM_{2.5}$)

In IIR 2017, the new data for consumed biomass for the period from 1990 to 2013 were included in inventory (source: revised national energy balances from 1990 to 2013) and has increasing trend by approximately 30 PJ. As an outcome of this revision, $PM_{2.5}$ emission trend is different from that submitted one in IIR 2016.

Total $PM_{2.5}$ emission in 2015 has amounted to 20 kt. The emissions have decreased by 46.6 % since 1990 and increased by 3.6 % compared to 2014 (Figure 3.7.3-1). The energy sector is the largest source of PM_{10} emission and accounts for about 91.6 % of the national total in 2015 (Table 3.7.3-1).

Small combustion and mainly biomass combustion in residential sector are key sources of $PM_{2.5}$ emission and account with 78.8 % to total emission in 2015. This sector has also recorded an increase of 4.4 % comparing to 2014. Transport sector have contributed with smaller extent with 8.8 % and has recorded an increase by 12.5 % since 1990. Road transport has domination in $PM_{2.5}$ emissions within the transport sector, with equal participation of emissions that originate from fuel combustion and fugitive emissions from road wear and tire and brake wear. The industrial processes and solvent use sector is also large source in $PM_{2.5}$ emissions (6.8 % in 2015), which has recorded a decrease by 6.6 % since 1990. Combustion in industry and construction contributes to total national emissions with 2.3 % in 2015 and in the period of 1990 this sector has significantly reduced the emission of $PM_{2.5}$ (up to 84.6 %) due to reduced consumption of solid fuels and biomass and the simultaneous increase in consumption and gaseous and liquid fuels.

The trend of $PM_{2.5}$ emissions has several dips and peak between 1990 and 2015. Great decline in the period from 1991 to 1994 was a result of the war for the 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 hous boilers with advanced/ecolabelled stoves and boilers and pellete stoves and boilers (see Table 4.5-1 and Figure 4.5-2).

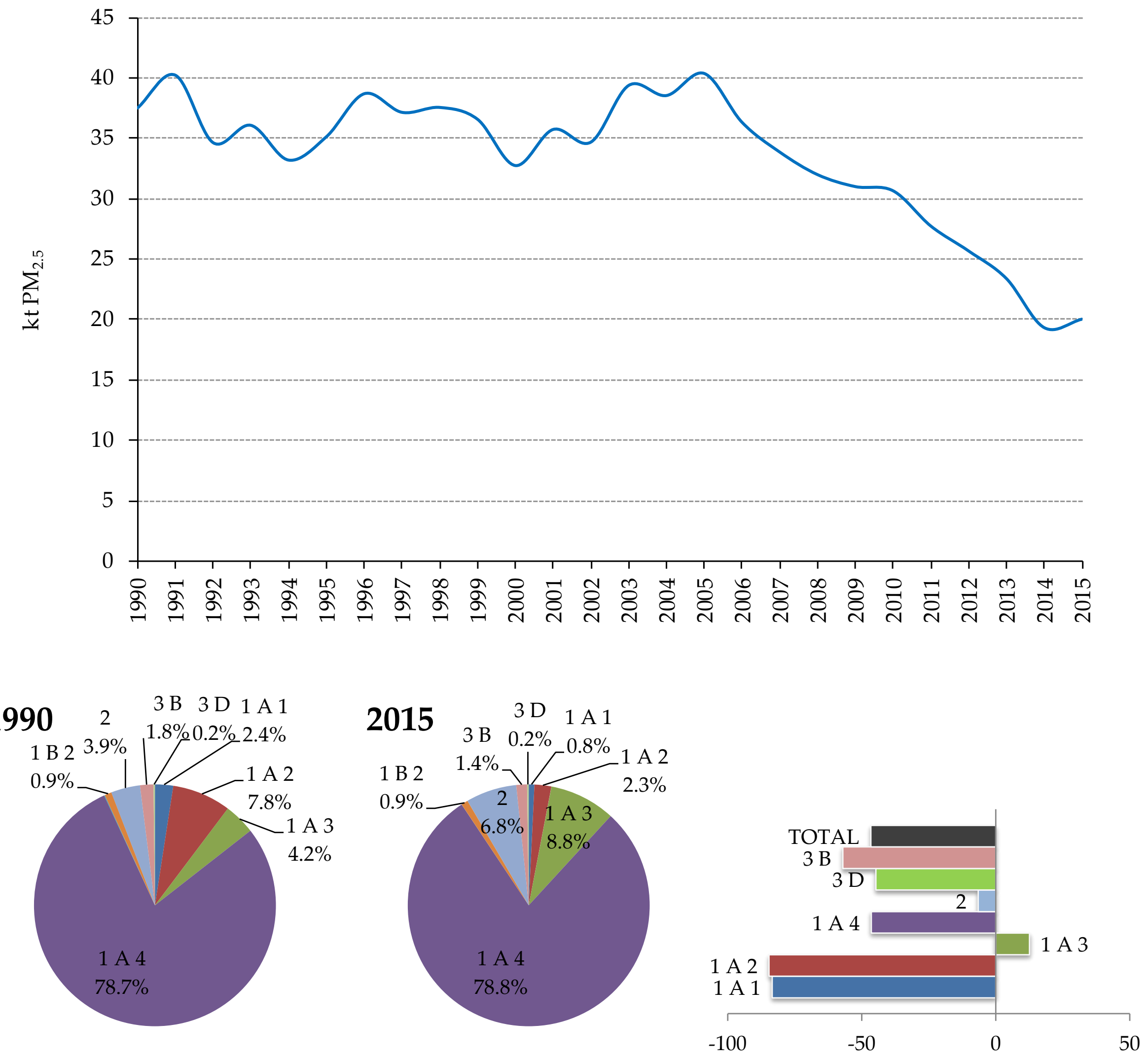


Figure 3.7.3-1 The $PM_{2.5}$ emissions (kt/yr) and percentage share by sector and variation in $PM_{2.5}$ emissions

Table 3.7.3-1 The $PM_{2.5}$ emissions by SNAP nomenclature in the period 1990-2015

$PM_{2.5}$											
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	0.9	28.7	2.4	1.4	8.7E-04	0.4	1.3	1.7	4.5E-02	0.7	37.5
1991	0.7	33.5	1.7	1.1	7.7E-04	0.3	1.1	1.2	4.0E-02	0.7	40.2
1992	0.8	28.9	1.2	0.8	6.0E-04	0.4	1.2	0.7	2.9E-02	0.6	34.6
1993	0.9	30.6	1.1	0.8	5.8E-04	0.3	1.3	0.6	3.6E-02	0.6	36.1
1994	0.8	27.6	1.0	1.0	5.2E-04	0.2	1.3	0.8	3.1E-02	0.6	33.2
1995	0.9	29.2	1.0	0.9	4.1E-04	0.4	1.5	0.7	2.6E-02	0.5	35.1
1996	0.7	32.7	1.0	1.0	3.3E-04	0.3	1.6	0.8	2.4E-02	0.5	38.7
1997	1.6	30.1	1.0	1.0	2.4E-04	0.4	1.8	0.7	2.8E-02	0.5	37.1
1998	1.7	30.3	1.0	1.0	2.5E-04	0.4	1.9	0.8	2.6E-02	0.5	37.6

$PM_{2.5}$											
SNAP	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**TOTAL**
Unit	**kt**	**kt**	**kt**	**kt**	**kt**	**kt**	**kt**	**kt**	**kt**	**kt**	**kt**
1999	1.1	29.8	0.7	1.2	7.7E-05	0.4	1.9	0.8	3.2E-02	0.5	36.6
2000	0.5	26.5	0.8	1.3	NA	0.4	1.9	0.9	2.8E-02	0.5	32.8
2001	0.7	29.2	0.7	1.2	NA	0.5	2.0	0.9	3.3E-02	0.5	35.7
2002	0.6	28.0	0.7	1.3	NA	0.6	2.1	0.9	3.5E-02	0.5	34.7
2003	0.6	32.3	0.7	1.6	NA	0.6	2.3	0.9	3.6E-02	0.5	39.4
2004	0.4	31.5	0.8	1.8	NA	0.4	2.4	0.8	3.6E-02	0.5	38.5
2005	0.4	33.5	0.6	1.7	NA	0.5	2.4	0.8	3.7E-02	0.5	40.4
2006	0.4	29.2	0.7	1.7	NA	0.5	2.6	0.8	4.3E-02	0.5	36.3
2007	0.6	26.6	0.7	1.8	NA	0.5	2.5	0.8	4.6E-02	0.4	33.9
2008	0.5	25.1	0.5	1.8	NA	0.5	2.3	0.9	4.4E-02	0.4	32.0
2009	0.4	24.6	0.6	1.6	NA	0.4	2.1	0.8	3.9E-02	0.4	31.0
2010	0.3	24.8	0.7	1.5	NA	0.4	2.0	0.6	2.5E-02	0.4	30.7
2011	0.2	22.5	0.5	1.4	NA	0.4	1.7	0.6	3.0E-02	0.3	27.7
2012	0.2	20.7	0.6	1.4	NA	0.3	1.6	0.6	2.3E-02	0.3	25.7
2013	0.1	18.9	0.5	1.2	NA	0.3	1.5	0.5	2.3E-02	0.3	23.4
2014	0.1	15.0	0.4	1.3	NA	0.3	1.4	0.5	3.1E-02	0.3	19.3
2015	0.2	15.7	0.4	1.3	NA	0.3	1.5	0.5	2.6E-02	0.3	20.0
2015 vs 1990	-83.4%	-45.4%	-84.7%	-9.5%	NA	7.2%	19.1%	-73.3%	-42.6%	-55.8%	-46.6%
2015 vs 2014	8.5%	4.5%	-12.6%	-1.6%	NA	0.8%	8.7%	-7.0%	-15.8%	1.0%	3.6%

3.7.4 Black carbon (BC)

In IIR 2017, the new data for consumed biomass for the period from 1990 to 2013 were included in inventory (source: revised national energy balances from 1990 to 2013) and has increasing trend by approximately 30 PJ. As an outcome of this revision, BC emission trend is different from that submitted one in IIR 2016.

The BC emission in 2015 has amounted to 3.4 kt (Figure 3.7.4-1) and has recorded a decrease by 38.2 % since 1990, and an increase by 6.8 % in comparison to 2014. The energy sector is the largest contributor of BC emissions and accounts for 96.1 % of the estimated BC emissions. The rest of the emissions (3.9 %) come from the industrial processes and product use sector. The major contributor to BC emission are small combustion sector (65.6 % of total national emissions in 2015) with domination of residential.

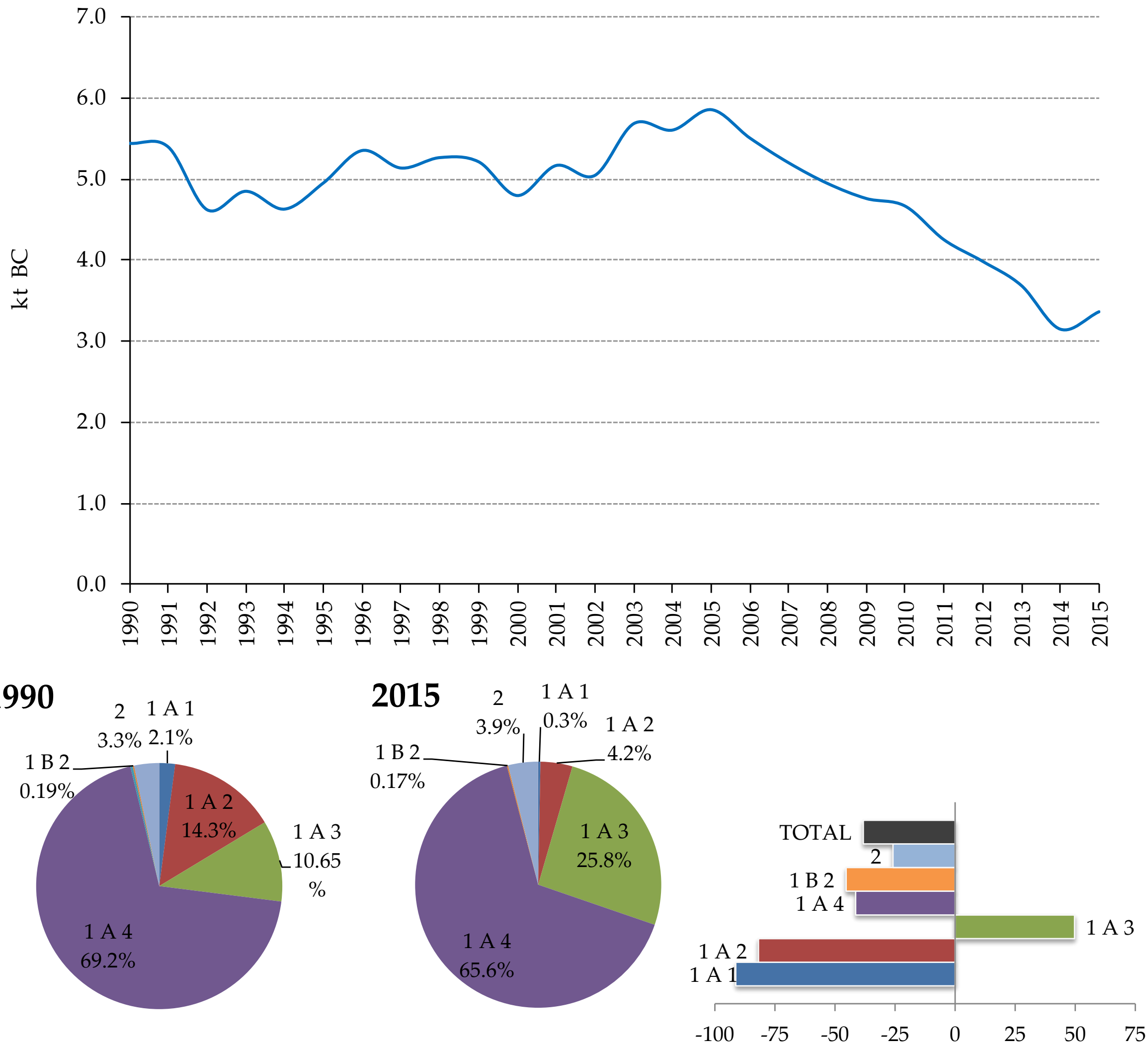


Figure 3.7.4-1 The BC emissions (kt/yr) and percentage share by sector and variation in BC emissions

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 the 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 hous boilers with advanced/ecolabelled stoves and boilers and pellete stoves and boilers (see Table 4.5-1 and Figure 4.5-2).

Table 3.7.4-1 The BC emissions by SNAP nomenclature in the period 1990-2015

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	0.11	3.31	0.45	0.049	NA	0.15	575	0.79	1.0E-02	NA	5.44
1991	0.10	3.80	0.34	0.038	NA	0.14	468	0.51	9.0E-03	NA	5.40
1992	0.11	3.32	0.26	0.030	NA	0.15	523	0.22	6.5E-03	NA	4.63
1993	0.11	3.51	0.27	0.026	NA	0.14	613	0.19	8.2E-03	NA	4.86
1994	0.17	3.16	0.23	0.029	NA	0.06	624	0.35	6.8E-03	NA	4.63
1995	0.20	3.34	0.25	0.019	NA	0.14	728	0.27	5.5E-03	NA	4.95
1996	0.16	3.75	0.25	0.021	NA	0.14	753	0.28	5.2E-03	NA	5.35
1997	0.14	3.45	0.25	0.026	NA	0.14	857	0.27	6.2E-03	NA	5.14
1998	0.17	3.43	0.27	0.025	NA	0.15	883	0.34	5.7E-03	NA	5.27
1999	0.17	3.40	0.20	0.029	NA	0.17	916	0.32	6.8E-03	NA	5.21
2000	0.074	3.02	0.19	0.028	NA	0.16	925	0.40	5.9E-03	NA	4.80
2001	0.051	3.30	0.18	0.025	NA	0.21	983	0.40	7.2E-03	NA	5.17
2002	0.045	3.16	0.18	0.033	NA	0.22	575	0.36	7.6E-03	NA	4.60
2003	0.049	3.64	0.18	0.043	NA	0.23	1159	0.38	7.9E-03	NA	5.68
2004	0.041	3.54	0.20	0.050	NA	0.17	1232	0.35	7.9E-03	NA	5.60
2005	0.040	3.74	0.18	0.047	NA	0.18	1306	0.36	8.2E-03	NA	5.86
2006	0.036	3.29	0.19	0.045	NA	0.18	1402	0.36	9.8E-03	NA	5.51
2007	0.039	3.04	0.19	0.046	NA	0.18	1352	0.34	1.0E-02	NA	5.20
2008	0.028	2.91	0.16	0.050	NA	0.19	1226	0.38	9.8E-03	NA	4.95
2009	0.032	2.89	0.18	0.042	NA	0.14	1167	0.30	8.7E-03	NA	4.76
2010	0.024	2.96	0.15	0.038	NA	0.16	1067	0.27	5.5E-03	NA	4.67
2011	0.024	2.73	0.13	0.038	NA	0.14	939	0.24	6.8E-03	NA	4.25
2012	0.017	2.57	0.13	0.035	NA	0.14	868	0.22	5.1E-03	NA	3.99
2013	0.010	2.40	0.12	0.031	NA	0.12	821	0.18	4.9E-03	NA	3.69
2014	0.009	1.96	0.09	0.034	NA	0.10	780	0.16	6.9E-03	NA	3.15
2015	0.010	2.12	0.08	0.033	NA	0.10	865	0.15	5.6E-03	NA	3.36
2015 vs 1990	-91.3%	-35.8%	-82.1%	-31.3%	NA	-32.5%	50.4%	-81.5%	-44.9%	NA	-38.2%
2015 vs 2014	4.3%	8.3%	-13.1%	-3.3%	NA	-2.6%	10.9%	-9.9%	-18.6%	NA	6.8%

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 2015 has amounted to 7.1 t. The Pb emission has decrease by 98.7 % since 1990 and has minor increase by 0.2 % in comparison to 2014. Key sources in Pb emission in 2015, were transport sector (58.6 %) with the dominance of road transport, small combustion sector (19.1 %) with the domination of residential sector and the industrial processes and product use sector (11.1 %) with the domination of glass production and production of steel in electric arc furnaces. Pb emissions from these activities originates from the lead content in the raw material of production process respectively in the fuel.

The trend of lead emissions has recorded several dips. The majority of Pb emission in in the nineties has come from road transport sector, from leaded motor gasoline usage. Between 1990 and 2015, Pb emissions from the transport sector have significantly decreased by 98.7% as a result of legislative efforts to remove lead from gasoline. 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 thrown out of 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). Also, the war for Croatian independence caused a reduction in fuel consumption and reduction in overall production in the industrial processes and product use sector (Figure 3.8.1-1).

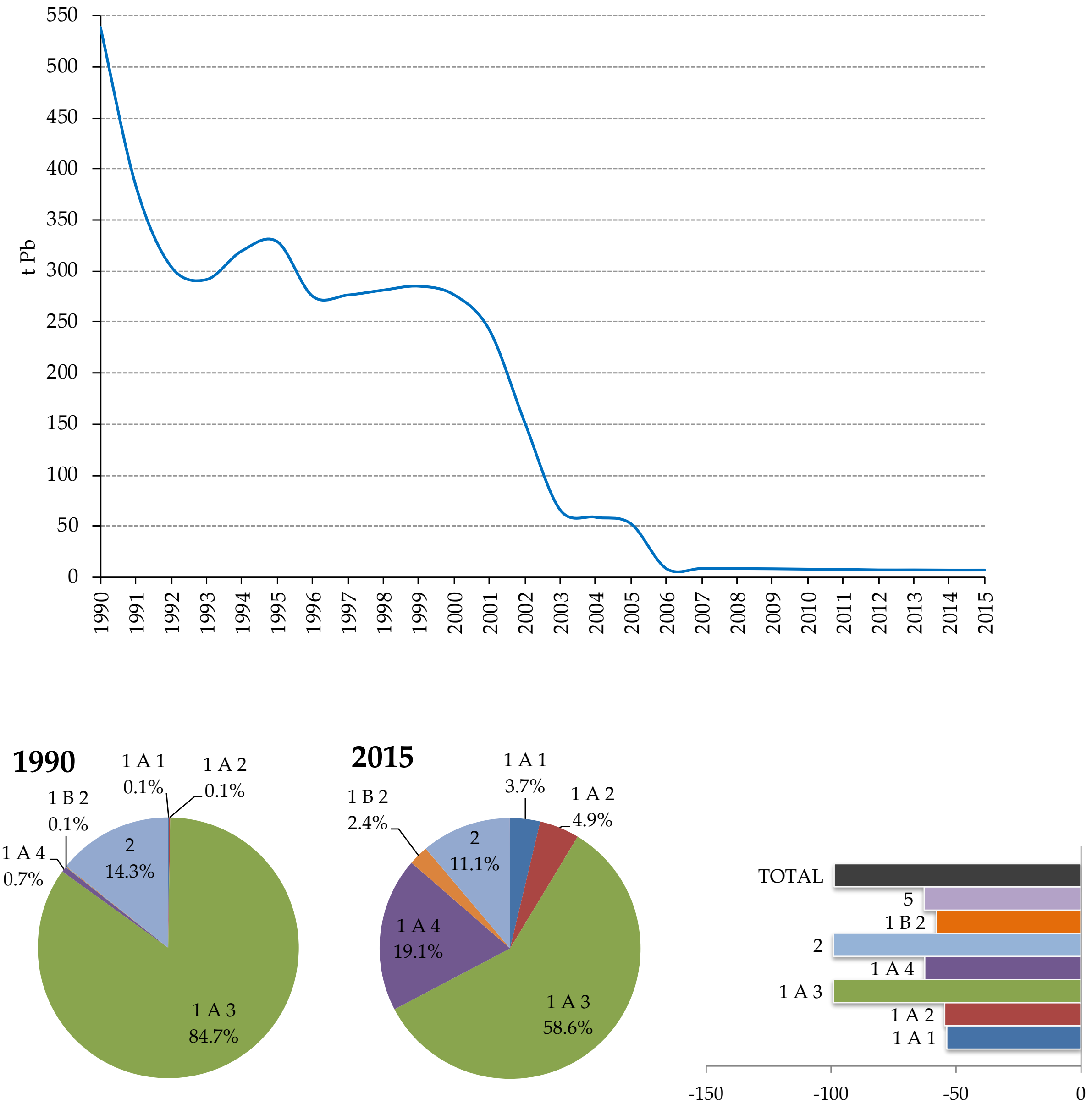


Figure 3.8.1-1 The Pb emissions (t/yr) and percentage share by sector and variation in Pb emissions

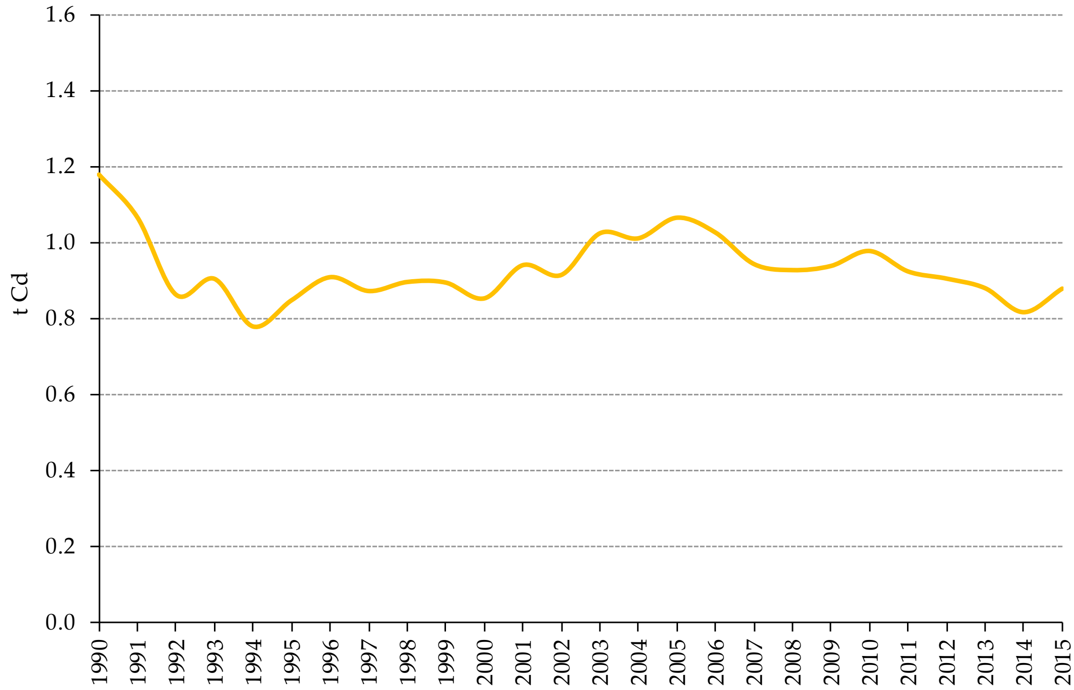
Table 3.8.1-1 The Pb emissions by SNAP nomenclature in the period 1990-2015

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	0.6	1.9	0.6	77.5	NA	NA	456.1	1.88	1.2E-02	NA	538.6
1991	0.5	1.8	0.4	29.5	NA	NA	344.8	6.73	1.1E-02	NA	383.6
1992	0.6	1.3	0.3	0.9	NA	NA	298.0	3.08	1.1E-02	NA	304.2
1993	0.5	1.4	0.3	0.9	NA	NA	282.6	5.99	1.2E-02	NA	291.7
1994	0.4	1.2	0.3	0.8	NA	NA	311.3	5.75	1.2E-02	NA	319.8
1995	0.4	1.3	0.3	0.7	NA	NA	320.5	5.61	1.2E-02	NA	328.8
1996	0.4	1.4	0.3	0.6	NA	NA	267.7	4.80	1.2E-02	NA	275.3
1997	0.5	1.3	0.3	0.6	NA	NA	270.0	3.69	1.3E-02	NA	276.5
1998	0.6	1.3	0.3	0.8	NA	NA	275.2	2.95	1.4E-02	NA	281.3
1999	0.7	1.3	0.3	0.8	NA	NA	278.6	3.48	1.5E-02	NA	285.2
2000	0.4	1.2	0.4	0.9	NA	NA	271.2	2.67	1.7E-02	NA	276.8
2001	0.5	1.2	0.4	0.8	NA	NA	237.2	1.97	1.8E-02	NA	242.2
2002	0.6	1.2	0.4	0.8	NA	NA	147.7	0.92	1.5E-02	NA	151.5
2003	0.7	1.4	0.4	0.8	NA	NA	62.3	0.38	1.3E-02	NA	66.0
2004	0.5	1.3	0.5	1.0	NA	NA	55.1	0.52	1.4E-02	NA	58.9
2005	0.6	1.4	0.5	1.0	NA	NA	48.6	0.41	1.3E-02	NA	52.5
2006	0.5	1.3	0.5	1.0	NA	NA	4.8	0.36	1.5E-02	NA	8.5
2007	0.6	1.2	0.4	1.0	NA	NA	5.0	0.37	1.6E-02	NA	8.7
2008	0.5	1.2	0.4	1.1	NA	NA	4.9	0.34	1.3E-02	NA	8.5
2009	0.5	1.3	0.4	1.0	NA	NA	4.9	0.34	1.4E-02	NA	8.3
2010	0.3	1.4	0.4	1.0	NA	NA	4.6	0.22	4.8E-03	NA	8.0
2011	0.4	1.3	0.3	0.9	NA	NA	4.6	0.22	5.4E-03	NA	7.8
2012	0.3	1.3	0.3	0.7	NA	NA	4.3	0.19	7.8E-03	NA	7.2
2013	0.3	1.3	0.4	0.8	NA	NA	4.3	0.19	4.9E-03	NA	7.3
2014	0.3	1.2	0.4	1.1	NA	NA	4.0	0.19	5.3E-03	NA	7.1
2015	0.3	1.3	0.3	1.0	NA	NA	4.1	0.16	5.7E-03	NA	7.1
2015 vs 1990	-53.6%	-30.1%	-47.7%	-98.8%	NA	NA	-99.1%	-91.6%	-53.7%	NA	-98.7%
2015 vs 2014	-1.8%	14.2%	-6.3%	-12.7%	NA	NA	1.1%	-15.0%	9.0%	NA	0.2%

3.8.2 Cadmium (Cd)

In IIR 2017, the new data for consumed biomass for the period from 1990 to 2013 were included in inventory (source: revised national energy balances from 1990 to 2013) and has increasing trend by approximately 30 PJ. As an outcome of this revision, Cd emission trend is different from that submitted one in IIR 2016.

The cadmium emission in 2015 was amounted to 0.88 t. The Cd emission has decrease by 25.4 % since 1990 and increase by 7.6 % in comparison to 2014 due to the grow in biomass comsumption (Figure 3.8.2-1 and Table 3.8.2-1). Majority of Cd emission originates from the fuel combustion in energy sector (84.2 % in 2015), with domination of small combustion sector (73.9 %). The sector, second in domination of Cd emissions in 2015, was production processes and products use with a contribution of 11.9 %. The Cd emission originates from Cd content in fuels (biomass, fuel oil, coal) and in raw materials at the entrance of the production process.



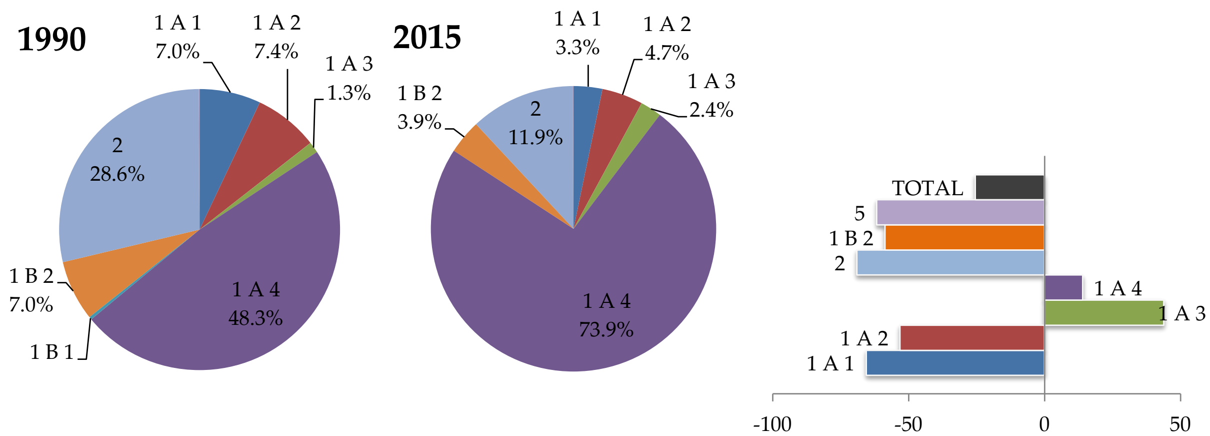


Figure 3.8.2-1 The Cd emissions (t/yr) and percentage share by sector and variation in Cd emissions

Total of Cd emissions has a decreasing trend in the period 1990 - 2015, as a result of reduced consumption of fuel oil and a simultaneous increase in natural gas consumption. Also, 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 41%), 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). Also, the war for Croatian independence caused a reduction in fuel consumption and production in production processes and product use sector.

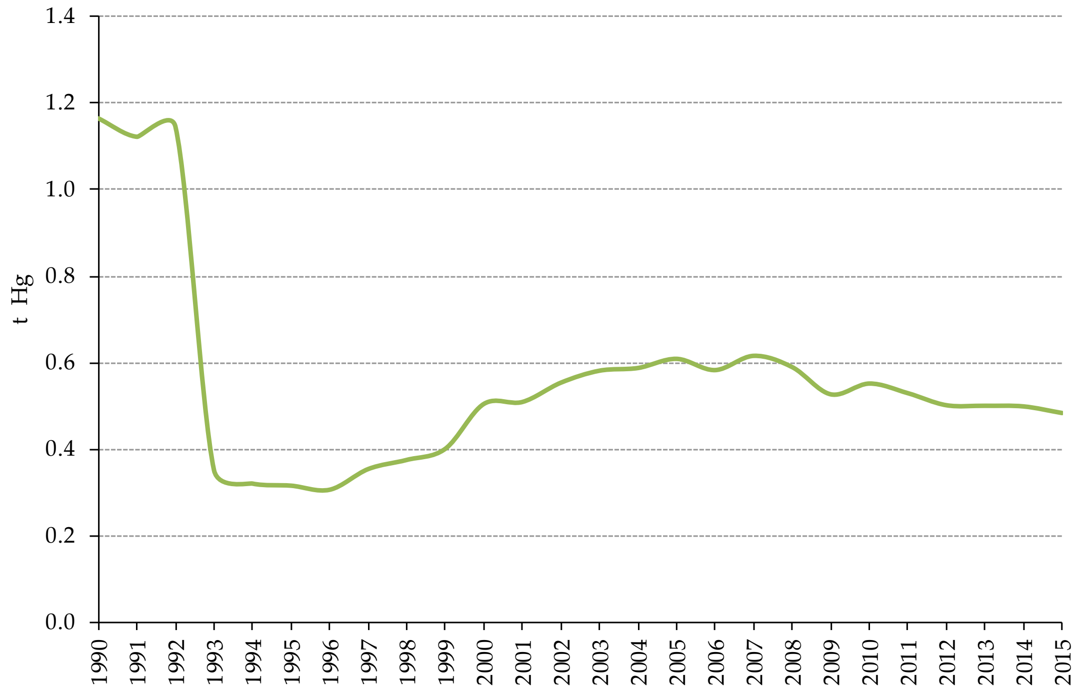
Table 3.8.2-1 The Cd emissions by SNAP nomenclature in the period 1990-2015

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	0.08	0.57	0.09	0.36	NA	6.5E-02	1.4E-02	4.7E-03	2.6E-03	NA	1.18
1991	0.06	0.67	0.07	0.19	NA	6.1E-02	1.0E-02	3.4E-03	2.2E-03	NA	1.07
1992	0.06	0.58	0.06	0.09	NA	6.7E-02	9.7E-03	2.0E-03	2.1E-03	NA	0.86
1993	0.07	0.61	0.05	0.09	NA	6.1E-02	1.0E-02	1.8E-03	2.3E-03	NA	0.91
1994	0.05	0.55	0.05	0.09	NA	2.6E-02	1.1E-02	2.4E-03	2.2E-03	NA	0.78
1995	0.05	0.59	0.05	0.09	NA	6.4E-02	1.2E-02	2.3E-03	2.4E-03	NA	0.85
1996	0.06	0.65	0.05	0.07	NA	6.1E-02	1.3E-02	2.6E-03	2.3E-03	NA	0.91
1997	0.06	0.60	0.06	0.07	NA	6.0E-02	1.4E-02	2.5E-03	2.3E-03	NA	0.87
1998	0.06	0.60	0.07	0.10	NA	6.5E-02	1.5E-02	2.8E-03	2.5E-03	NA	0.92
1999	0.06	0.59	0.07	0.10	NA	7.5E-02	1.6E-02	2.8E-03	2.6E-03	NA	0.91
2000	0.06	0.53	0.10	0.12	NA	7.3E-02	1.6E-02	3.3E-03	2.7E-03	NA	0.90
2001	0.04	0.58	0.10	0.11	NA	9.5E-02	1.6E-02	3.5E-03	2.8E-03	NA	0.94
2002	0.04	0.56	0.09	0.11	NA	9.9E-02	1.7E-02	3.4E-03	2.6E-03	NA	0.92
2003	0.05	0.64	0.10	0.11	NA	1.0E-01	1.8E-02	3.7E-03	2.5E-03	NA	1.03
2004	0.04	0.62	0.11	0.13	NA	7.7E-02	1.8E-02	3.5E-03	2.5E-03	NA	1.01
2005	0.05	0.66	0.12	0.13	NA	7.9E-02	1.9E-02	3.7E-03	2.5E-03	NA	1.07
2006	0.04	0.61	0.15	0.12	NA	7.8E-02	2.0E-02	4.0E-03	2.7E-03	NA	1.03
2007	0.05	0.59	0.07	0.13	NA	7.9E-02	2.2E-02	4.1E-03	2.9E-03	NA	0.95
2008	0.04	0.59	0.06	0.13	NA	8.3E-02	2.1E-02	4.7E-03	2.5E-03	NA	0.93
2009	0.05	0.62	0.07	0.12	NA	6.1E-02	2.1E-02	4.2E-03	2.7E-03	NA	0.94
2010	0.05	0.66	0.06	0.12	NA	7.2E-02	2.0E-02	3.8E-03	1.1E-03	NA	0.98
2011	0.04	0.65	0.05	0.10	NA	6.3E-02	2.0E-02	3.8E-03	1.3E-03	NA	0.93
2012	0.04	0.64	0.05	0.09	NA	6.0E-02	2.0E-02	3.5E-03	1.6E-03	NA	0.91
2013	0.03	0.64	0.05	0.08	NA	5.2E-02	2.0E-02	3.4E-03	1.2E-03	NA	0.88
2014	0.03	0.57	0.05	0.11	NA	4.5E-02	2.0E-02	3.4E-03	1.3E-03	NA	0.82
2015	0.03	0.65	0.04	0.09	NA	4.4E-02	2.1E-02	3.3E-03	1.4E-03	NA	0.88
2015 vs 1990	-65.5%	14.2%	-53.4%	-73.8%	NA	-32.5%	52.1%	-28.6%	-45.2%	NA	-25.4%
2015 vs 2014	-2.9%	14.3%	-12.9%	-11.4%	NA	-2.6%	5.3%	-1.4%	8.8%	NA	7.6%

3.8.3 Mercury (Hg)

The mercury emission in 2015 was amounted to 0.48 t (Figure 3.8.3-1 and Table 3.8.3-1). Emission has decreased by 58.4 % since 1990, and in comparison to 2014 has decreased for 3.1 %. The majority of mercury emissions in 2015, resulting from fuel combustion and processing in the energy sector (82.7 % in 2015), with the dominance of a few sectors: electricity and heat production (37.7 %), combustion in manufacturing industry and construction (24.6 %), small combustion (9.7 %) and fugitive emissions from liquid fuels (8.2 %). Apart from the energy sector and second in dominance by Hg emissions in 2015 was the production processes and products use sector with a contribution of 15.2 %. Mercury emissions originate from its content of in fuels (coal, natural gas) and in raw materials at the entrance of the production processes (steel and glass production).

In 1990, dominant source in Hg emission was fugitive emissions from fuels, in particularly, fugitive emission from production and processing of natural gas (67.9 % in 1990). In 1993, the process units for removal of mercury from natural gas were put into operation. With this 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 emissions have started to increase, due to entry in operation of the second of two thermal power plants on coal in Croatia.



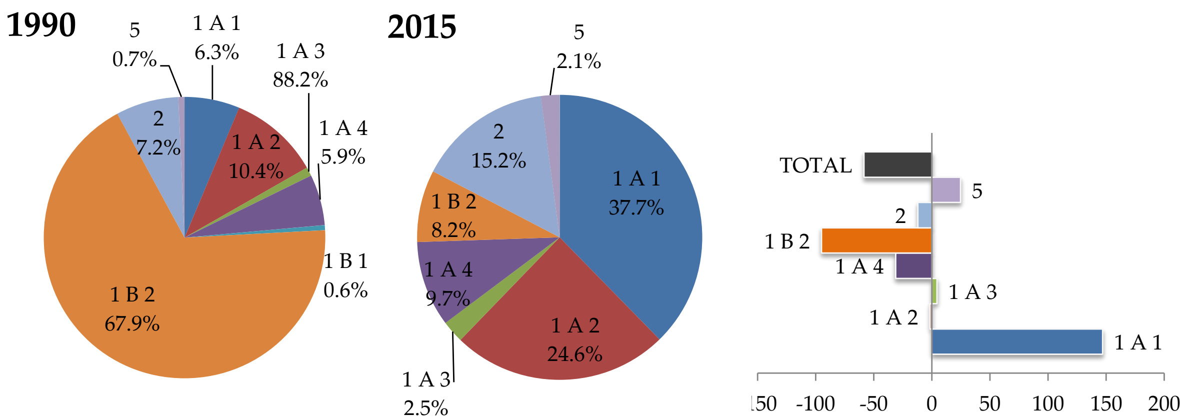


Figure 3.8.3-1 The Hg emissions (t/yr) and percentage share by sector and variation in Hg emissions

Table 3.8.3-1 The Hg emissions by SNAP nomenclature in the period 1990-2015

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	0.07	0.07	0.12	0.11	0.70	7.5E-02	8.5E-03	3.2E-03	8.4E-03	NA	1.16
1991	0.05	0.06	0.08	0.07	0.77	7.0E-02	6.4E-03	1.8E-03	8.9E-03	NA	1.12
1992	0.07	0.04	0.09	0.06	0.80	7.0E-02	5.9E-03	1.4E-03	9.6E-03	NA	1.15
1993	0.06	0.05	0.08	0.08	2.3E-03	7.2E-02	6.1E-03	1.3E-03	1.0E-02	NA	0.35
1994	0.02	0.04	0.09	0.07	2.0E-03	7.3E-02	6.6E-03	8.2E-04	1.1E-02	NA	0.32
1995	0.03	0.04	0.07	0.07	2.4E-03	7.3E-02	7.0E-03	1.1E-03	1.1E-02	NA	0.32

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**
1996	0.03	0.05	0.08	0.06	2.8E-03	7.0E-02	7.6E-03	1.5E-03	1.1E-02	NA	0.31
1997	0.06	0.05	0.09	0.06	2.0E-03	7.1E-02	8.4E-03	1.2E-03	1.1E-02	NA	0.35
1998	0.06	0.05	0.10	0.07	2.9E-03	7.0E-02	9.0E-03	1.1E-03	1.1E-02	NA	0.38
1999	0.06	0.05	0.12	0.08	2.0E-03	7.1E-02	9.5E-03	1.0E-03	1.1E-02	NA	0.40
2000	0.13	0.04	0.13	0.11	1.9E-03	6.8E-02	9.6E-03	1.0E-03	1.1E-02	NA	0.51
2001	0.13	0.05	0.15	0.09	2.1E-03	6.7E-02	9.6E-03	1.0E-03	1.2E-02	NA	0.51
2002	0.17	0.05	0.15	0.10	7.3E-04	6.7E-02	1.0E-02	1.2E-03	1.2E-02	NA	0.55
2003	0.19	0.05	0.15	0.10	7.5E-04	6.7E-02	1.1E-02	1.2E-03	1.2E-02	NA	0.58
2004	0.18	0.05	0.16	0.10	7.8E-04	6.7E-02	1.1E-02	1.1E-03	1.3E-02	NA	0.59
2005	0.19	0.05	0.16	0.11	7.6E-04	6.7E-02	1.1E-02	1.2E-03	1.3E-02	NA	0.61
2006	0.18	0.05	0.17	0.09	7.1E-04	6.7E-02	1.2E-02	1.3E-03	1.4E-02	NA	0.58
2007	0.19	0.05	0.17	0.11	7.1E-04	6.7E-02	1.2E-02	1.3E-03	1.5E-02	NA	0.62
2008	0.20	0.05	0.16	0.09	5.0E-05	6.7E-02	1.2E-02	1.5E-03	1.3E-02	NA	0.59
2009	0.14	0.05	0.14	0.10	4.2E-05	6.7E-02	1.2E-02	1.6E-03	1.4E-02	NA	0.53
2010	0.19	0.05	0.13	0.08	3.9E-05	6.7E-02	1.1E-02	1.4E-03	8.9E-03	NA	0.55
2011	0.20	0.05	0.12	0.07	4.1E-05	6.7E-02	1.1E-02	1.4E-03	9.1E-03	NA	0.53
2012	0.18	0.05	0.11	0.07	4.1E-05	6.7E-02	1.1E-02	1.3E-03	1.1E-02	NA	0.50
2013	0.20	0.05	0.12	0.05	4.1E-05	6.6E-02	1.1E-02	1.4E-03	9.0E-03	NA	0.50
2014	0.19	0.04	0.13	0.05	4.1E-05	6.6E-02	1.1E-02	1.5E-03	9.5E-03	NA	0.50
2015	0.18	0.05	0.12	0.05	4.1E-05	6.6E-02	1.1E-02	1.5E-03	1.0E-02	NA	0.48
2015 vs 1990	146.9%	-31.1%	-1.7%	-55.1%	-100.0%	-12.0%	27.0%	-55.2%	23.0%	NA	-58.4%
2015 vs 2014	-4.9%	8.9%	-6.5%	-3.8%	0.0%	-0.8%	1.9%	-2.9%	9.4%	NA	-3.1%

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 as a result of tire and brake wear, zinc is mostly emitted as a result 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 2015 was estimated to 0.45 t (Figure 3.9.1-1 and Table 3.9.1-1). Emission has decreased by 94.7 % since 1990 and increase by 35 % since 2014. The energy sector is a significant source of arsenic in 2015 (89.5 %), and the key sources were: fugitive emissions from liquid fuels (45.3 %), electricity and heat production sector (25.9 %), and manufacturing industry and construction sector (15 %). Apart from the energy sector, non-energy sector - industry production and product use has contributed by 10.4 % in As emission in 2015. (glass production and steel production with less extent). Arsenic emissions originate from the As content in raw materials and in fuels.

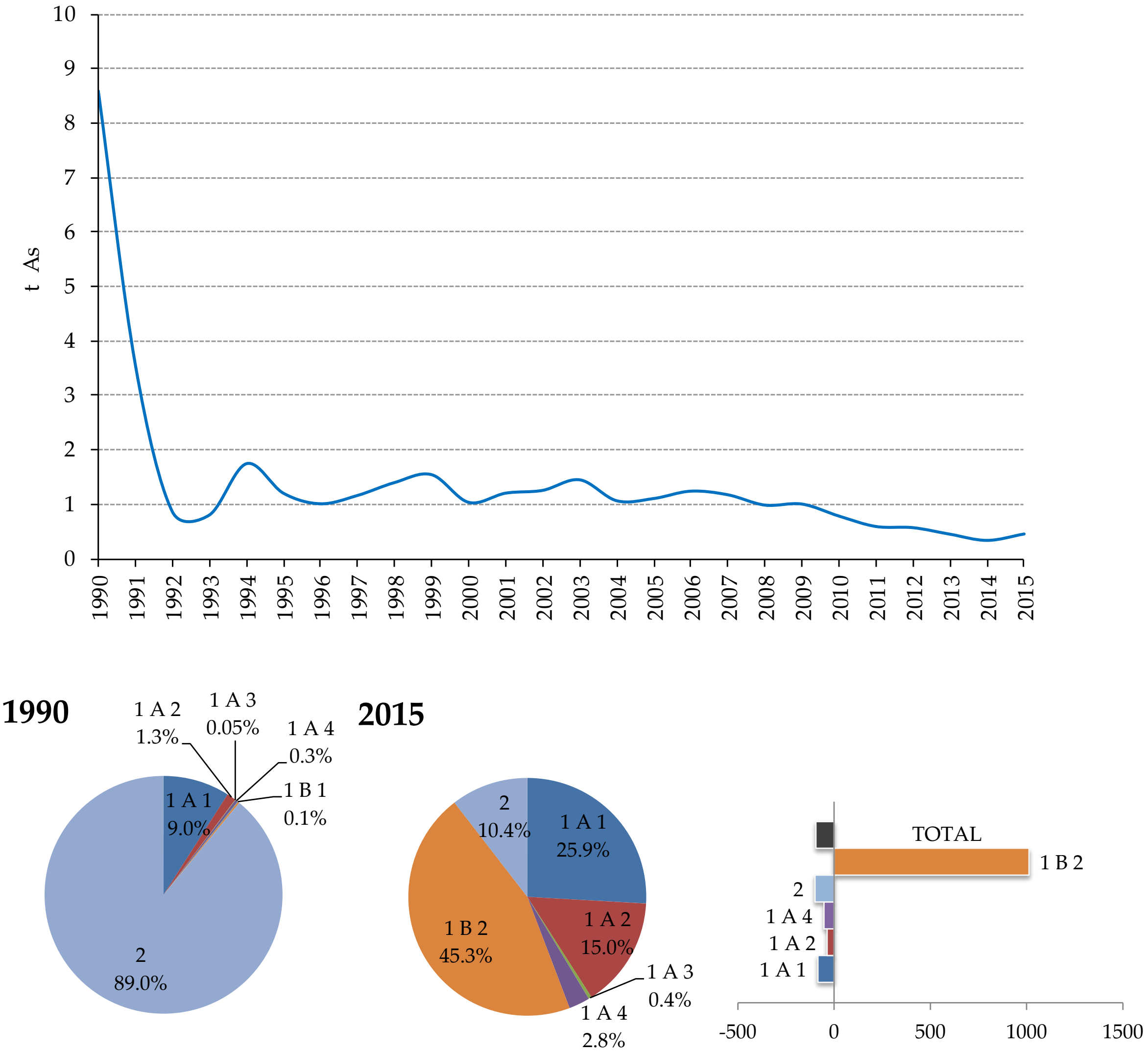


Figure 3.9.1-1 The As emissions (t/yr) and percentage share by sector and variation in As emissions

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 emissions. Stopping the process was a result of the war for the Croatian independence (1991 – 1995). The war has also caused a decrease in fuel consumption and other production activities in industrial processes and product use sector.

Table 3.9.1-1 The As emissions by SNAP nomenclature in the period 1990-2015

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	2.8E-02	0.11	7.67	NA	NA	2.6E-04	3.9E-03	6.0E-04	NA	8.59
1991	0.57	2.1E-02	0.07	2.89	NA	NA	2.0E-04	3.3E-03	4.6E-04	NA	3.56
1992	0.74	1.3E-02	0.06	0.04	NA	NA	1.8E-04	7.6E-03	4.2E-04	NA	0.86
1993	0.68	1.5E-02	0.05	0.05	NA	NA	1.8E-04	8.4E-03	4.9E-04	NA	0.80
1994	1.27	1.2E-02	0.06	0.40	NA	NA	2.0E-04	1.3E-03	4.8E-04	NA	1.75
1995	0.74	1.3E-02	0.05	0.40	NA	NA	2.1E-04	5.2E-03	5.6E-04	NA	1.20
1996	0.60	1.5E-02	0.05	0.33	NA	NA	2.3E-04	1.2E-02	5.1E-04	NA	1.01
1997	0.74	1.4E-02	0.06	0.34	NA	NA	2.5E-04	8.7E-03	5.2E-04	NA	1.16
1998	0.94	1.4E-02	0.07	0.38	NA	NA	2.7E-04	3.3E-03	5.5E-04	NA	1.42
1999	0.99	1.4E-02	0.08	0.47	NA	NA	2.8E-04	2.6E-03	5.9E-04	NA	1.56
2000	0.48	1.3E-02	0.12	0.47	NA	NA	2.9E-04	2.0E-03	6.1E-04	NA	1.08
2001	0.59	1.3E-02	0.13	0.47	NA	NA	2.8E-04	3.4E-03	5.8E-04	NA	1.20
2002	0.60	1.3E-02	0.12	0.52	NA	NA	2.9E-04	6.1E-03	5.3E-04	NA	1.26
2003	0.83	1.5E-02	0.12	0.47	NA	NA	3.0E-04	5.8E-03	5.3E-04	NA	1.45
2004	0.46	1.4E-02	0.14	0.45	NA	NA	3.0E-04	1.2E-03	5.0E-04	NA	1.06
2005	0.54	1.5E-02	0.15	0.39	NA	NA	3.0E-04	1.3E-03	5.0E-04	NA	1.11
2006	0.56	1.4E-02	0.18	0.48	NA	NA	3.1E-04	1.4E-03	5.1E-04	NA	1.24
2007	0.59	1.3E-02	0.10	0.46	NA	NA	3.3E-04	1.4E-03	5.5E-04	NA	1.17
2008	0.55	1.3E-02	0.10	0.32	NA	NA	3.1E-04	2.7E-03	5.1E-04	NA	0.98
2009	0.57	1.4E-02	0.09	0.33	NA	NA	3.1E-04	2.2E-03	5.5E-04	NA	1.00
2010	0.22	1.5E-02	0.08	0.47	NA	NA	3.0E-04	2.8E-03	3.0E-04	NA	0.78
2011	0.25	1.4E-02	0.06	0.26	NA	NA	3.0E-04	2.7E-03	3.6E-04	NA	0.59
2012	0.19	1.4E-02	0.06	0.30	NA	NA	2.8E-04	2.7E-03	3.9E-04	NA	0.57
2013	0.12	1.3E-02	0.07	0.24	NA	NA	2.8E-04	1.6E-03	3.7E-04	NA	0.45
2014	0.10	1.2E-02	0.07	0.15	NA	NA	2.7E-04	1.7E-03	4.0E-04	NA	0.34
2015	0.12	1.3E-02	0.07	0.25	NA	NA	2.7E-04	1.7E-03	4.7E-04	NA	0.45
2015vs 1990	-84.9%	-53.1%	-36.5%	-96.7%	NA	NA	3.5%	-56.5%	-22.7%	NA	-94.7%
2015 vs 2014	15.5%	10.0%	-6.1%	71.2%	NA	NA	0.7%	-2.1%	15.8%	NA	35.0%

3.9.2 Chromium (Cr)

In IIR 2017, the new data for consumed biomass for the period from 1990 to 2013 were included in inventory (source: revised national energy balances from 1990 to 2013) and has increasing trend by approximately 30 PJ. As an outcome of this revision, Cr emission trend is different from that submitted one in IIR 2016.

The chromium emission in 2015 was amounted to 2.11 t (Figure 3.9.2-1 and Table 3.9.2-1). Emission of Cr has decreased by 60.2 % since 1990 mostly due to reducing the consumption of heavy fuel oil in stationary energy sector and simultaneously increasing consumption of natural gas. Also, the great reduction in Cr emission (by 93.9%) in comparison to 1990, was happened in industrial processes and product use 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 war for the Croatian independence (1991 – 1995).

About 11.7 % of Cr emissions in 2015 originated from the public electricity and heat production sector whereas the impact of this sector in the nineties was significantly higher (87.8 % in 1990). The annual Cr emissions from this source show long-term trend fluctuations between 1990 and 2015 which mostly depends on the type of fuel. Higher consumption of biomass, solid fuel and heavy fuel oil leads to higher Cr emissions.

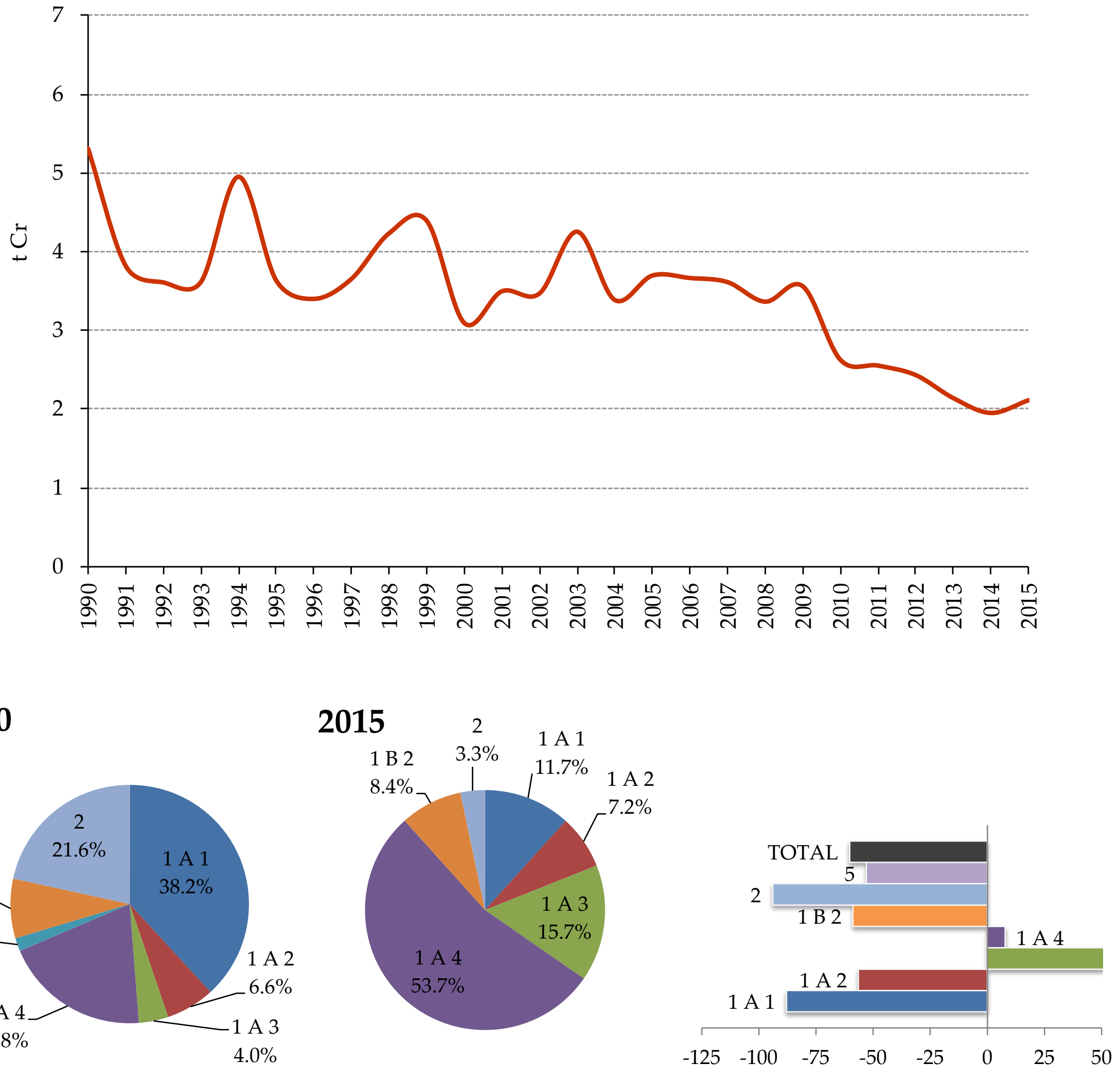


Figure 3.9.2-1 The Cr emissions (t/yr) and percentage share by sector and variation in Cr emissions

Table 3.9.2-1 The Cr emissions by SNAP nomenclature in the period 1990-2015

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	2.03	1.04	0.34	1.7	NA	NA	0.20	2.6E-02	5.3E-03	NA	5.3
1991	1.49	1.19	0.24	0.72	NA	NA	0.15	1.9E-02	3.8E-03	NA	3.8
1992	1.88	1.02	0.19	0.34	NA	NA	0.15	1.6E-02	3.6E-03	NA	3.6
1993	1.76	1.08	0.17	0.42	NA	NA	0.16	1.6E-02	4.1E-03	NA	3.6
1994	3.25	0.97	0.17	0.37	NA	NA	0.17	1.3E-02	4.1E-03	NA	5.0
1995	1.91	1.02	0.16	0.33	NA	NA	0.18	1.5E-02	4.9E-03	NA	3.6
1996	1.60	1.15	0.16	0.27	NA	NA	0.20	2.3E-02	4.4E-03	NA	3.4
1997	1.91	1.05	0.18	0.27	NA	NA	0.22	1.9E-02	4.5E-03	NA	3.7
1998	2.41	1.06	0.22	0.34	NA	NA	0.23	1.6E-02	5.0E-03	NA	4.3

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**
1999	2.53	1.04	0.21	0.38	NA	NA	0.25	1.6E-02	5.4E-03	NA	4.4
2000	1.22	0.92	0.30	0.50	NA	NA	0.25	1.7E-02	5.8E-03	NA	3.2
2001	1.49	1.02	0.30	0.44	NA	NA	0.22	2.0E-02	5.6E-03	NA	3.5
2002	1.50	0.97	0.27	0.45	NA	NA	0.25	2.2E-02	4.8E-03	NA	3.5
2003	2.08	1.12	0.30	0.46	NA	NA	0.27	2.3E-02	4.4E-03	NA	4.3
2004	1.16	1.09	0.33	0.50	NA	NA	0.28	1.8E-02	4.1E-03	NA	3.4
2005	1.35	1.16	0.36	0.52	NA	NA	0.29	1.9E-02	4.1E-03	NA	3.7
2006	1.39	1.06	0.44	0.44	NA	NA	0.31	2.0E-02	4.1E-03	NA	3.7
2007	1.48	1.02	0.24	0.51	NA	NA	0.33	2.1E-02	4.4E-03	NA	3.6
2008	1.34	1.03	0.22	0.42	NA	NA	0.33	2.5E-02	4.0E-03	NA	3.4
2009	1.43	1.07	0.21	0.50	NA	NA	0.33	2.1E-02	4.5E-03	NA	3.6
2010	0.54	1.15	0.20	0.40	NA	NA	0.32	2.1E-02	2.1E-03	NA	2.6
2011	0.60	1.12	0.16	0.34	NA	NA	0.31	2.0E-02	2.6E-03	NA	2.6
2012	0.46	1.12	0.17	0.35	NA	NA	0.31	1.9E-02	3.1E-03	NA	2.4
2013	0.26	1.11	0.17	0.25	NA	NA	0.32	1.7E-02	2.8E-03	NA	2.1
2014	0.21	0.98	0.16	0.26	NA	NA	0.31	1.7E-02	3.0E-03	NA	2.0
2015	0.25	1.12	0.15	0.24	NA	NA	0.33	1.7E-02	3.7E-03	NA	2.1
2015 vs 1990	-87.8%	8.1%	-56.9%	-85.4%	NA	NA	61.0%	-34.7%	-30.5%	NA	-60.2%
2015 vs 2014	17.1%	14.6%	-9.1%	-8.0%	NA	NA	5.6%	-1.4%	21.2%	NA	8.3%

3.9.3 Copper (Cu)

Domination in the copper emission in Croatia has the transport sector. The Cu emissions in 2015 have amounted to 7.56 t (Figure and Table 3.9.3-1). Transport sector (mostly automobile tire and brake wear) has contributed with 83.1 % in total of Cu emission. Emission of Cu has decrease by 13 % since 1990. Great decline happened in 1991, as a consequence of war for the Croatian independence (1991 – 1995). After decline period, the Cu emission has long-term increase period, mostly due to constant increas of road vehicle population and annual mileage, what leads to higher automobile tire and brake wear. The economic crisis has slowed the growing trend in recent years.

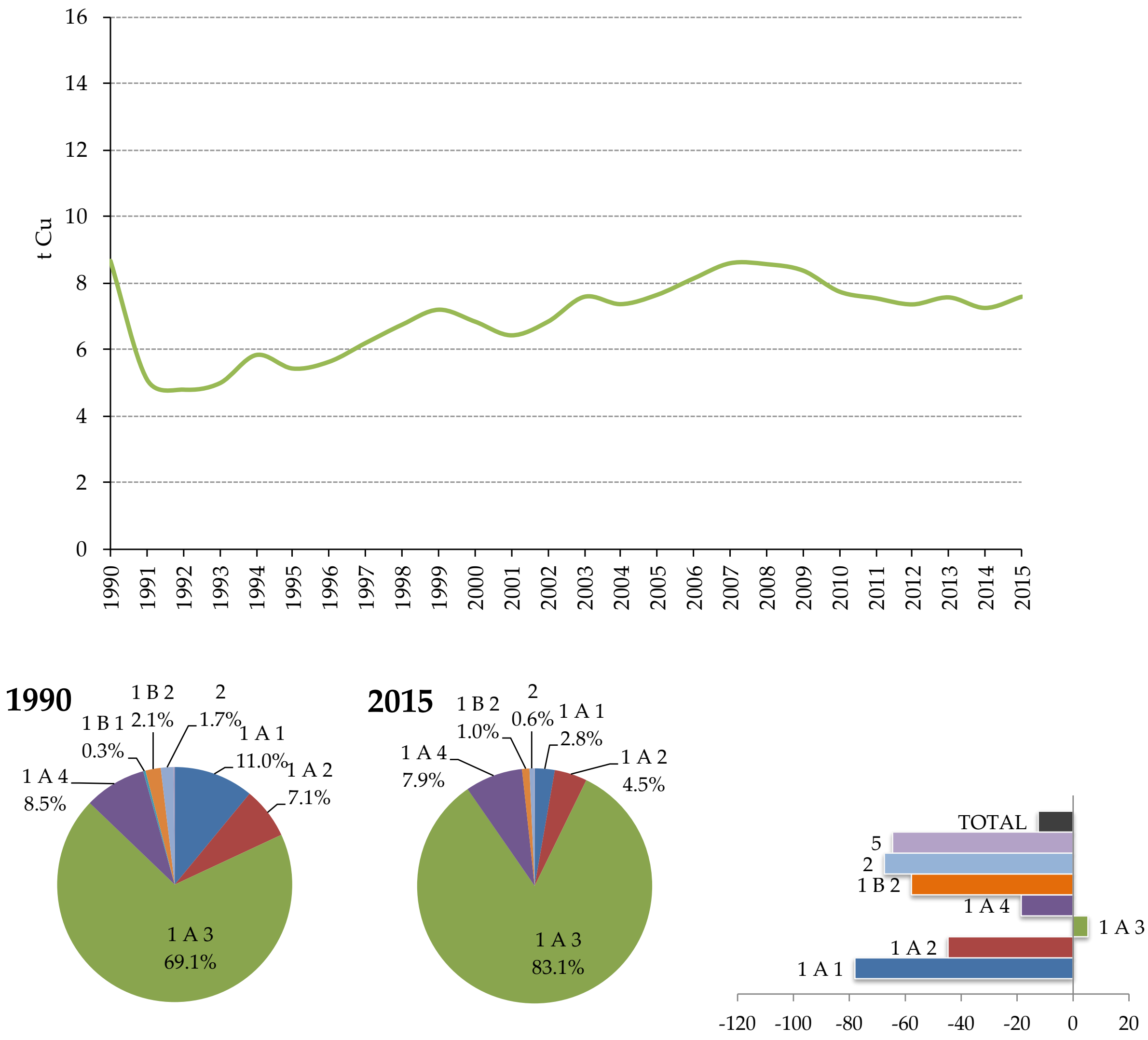


Figure 3.9.3-1 The Cu emissions (t/yr) and percentage share by sector and variation in Cu emissions

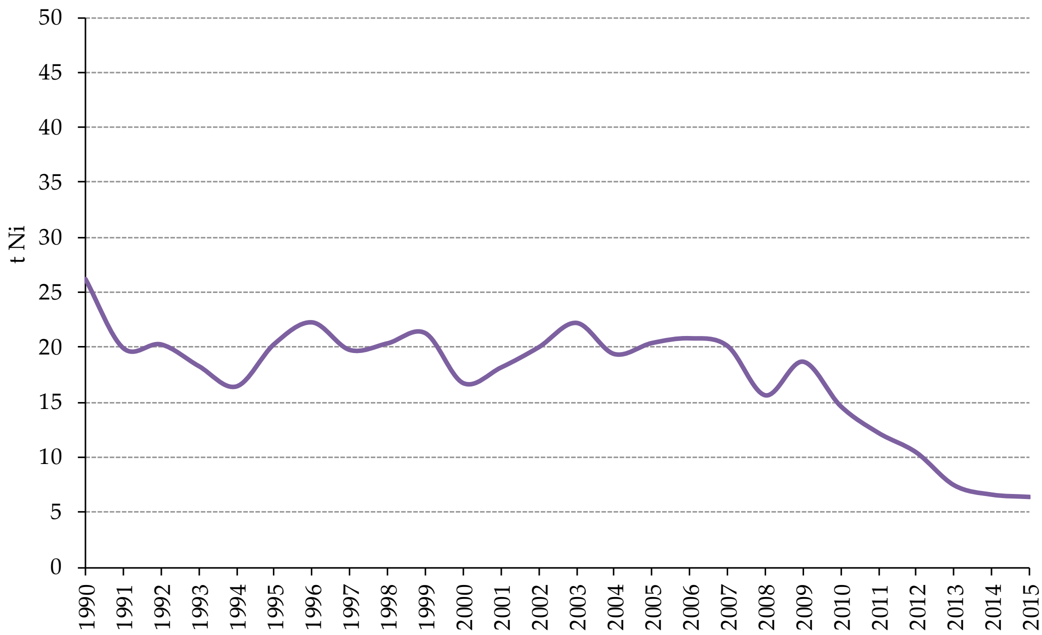
Table 3.9.3-1 The Cu emissions by SNAP nomenclature in the period 1990-2015

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	0.95	0.38	0.38	0.29	NA	0.07	5.88	0.70	1.8E-02	NA	8.7
1991	0.70	0.37	0.25	0.18	NA	0.06	3.01	0.53	1.7E-02	NA	5.1
1992	0.86	0.28	0.20	0.12	NA	0.07	2.95	0.30	1.7E-02	NA	4.8
1993	0.80	0.30	0.17	0.16	NA	0.06	3.21	0.27	1.7E-02	NA	5.0
1994	1.38	0.27	0.18	0.14	NA	0.03	3.43	0.39	1.7E-02	NA	5.8
1995	0.87	0.28	0.16	0.13	NA	0.06	3.55	0.36	1.8E-02	NA	5.4
1996	0.76	0.31	0.16	0.10	NA	0.06	3.83	0.39	1.7E-02	NA	5.6
1997	0.87	0.29	0.17	0.10	NA	0.06	4.30	0.38	1.9E-02	NA	6.2
1998	1.07	0.29	0.19	0.13	NA	0.06	4.55	0.45	2.3E-02	NA	6.8

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**
1999	1.12	0.29	0.21	0.15	NA	0.07	4.90	0.45	2.4E-02	NA	7.2
2000	0.62	0.25	0.25	0.20	NA	0.07	4.92	0.54	2.8E-02	NA	6.9
2001	0.73	0.27	0.27	0.18	NA	0.10	4.29	0.57	3.0E-02	NA	6.4
2002	0.76	0.26	0.26	0.18	NA	0.10	4.71	0.55	2.5E-02	NA	6.8
2003	1.00	0.31	0.25	0.18	NA	0.10	5.14	0.58	2.0E-02	NA	7.6
2004	0.62	0.29	0.28	0.19	NA	0.08	5.30	0.58	2.0E-02	NA	7.4
2005	0.70	0.31	0.29	0.20	NA	0.08	5.43	0.61	2.0E-02	NA	7.6
2006	0.71	0.29	0.34	0.17	NA	0.08	5.89	0.65	2.2E-02	NA	8.1
2007	0.76	0.27	0.26	0.20	NA	0.08	6.33	0.67	2.3E-02	NA	8.6
2008	0.68	0.27	0.24	0.16	NA	0.08	6.35	0.77	1.9E-02	NA	8.6
2009	0.71	0.28	0.21	0.19	NA	0.06	6.22	0.68	2.1E-02	NA	8.4
2010	0.37	0.31	0.22	0.15	NA	0.07	6.00	0.62	6.7E-03	NA	7.7
2011	0.39	0.30	0.18	0.12	NA	0.06	5.87	0.61	7.3E-03	NA	7.5
2012	0.32	0.30	0.18	0.13	NA	0.06	5.80	0.57	1.1E-02	NA	7.4
2013	0.22	0.30	0.19	0.08	NA	0.05	6.16	0.55	6.6E-03	NA	7.6
2014	0.20	0.26	0.19	0.08	NA	0.05	5.92	0.54	7.0E-03	NA	7.2
2015	0.21	0.30	0.18	0.08	NA	0.04	6.24	0.53	7.5E-03	NA	7.6
2015 vs 1990	-78.0%	-22.2%	-52.9%	-72.7%	NA	-32.5%	6.0%	-23.3%	-57.9%	NA	-12.4%
2014 vs 2013	2.7%	14.3%	-6.6%	-4.9%	NA	-2.6%	5.4%	-1.4%	7.1%	NA	4.7%

3.9.4 Nickel (Ni)

Emission of nickel totalled about to 10.4 t in 2015 (Figure and Table 3.9.4-1). Emission of Ni has declined by 60.2 %, since 1990. Majority of Ni emissions in historical trend originate from the public electricity and heat production sector (83.4 % in 1990 and 88.4 % in 2015). The historical trend of Ni emission from this source category shows long-term fluctuations between which mostly depend on the type of fuel. 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 war for the 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 (Siemens Martin' furnaces) in Sisak, 1992. In recent years (since 2010) the trend recorded continuous reduction of Ni emission, as a result of the decreasing use of coal as a fuel in general consumption sector (mainly residential).



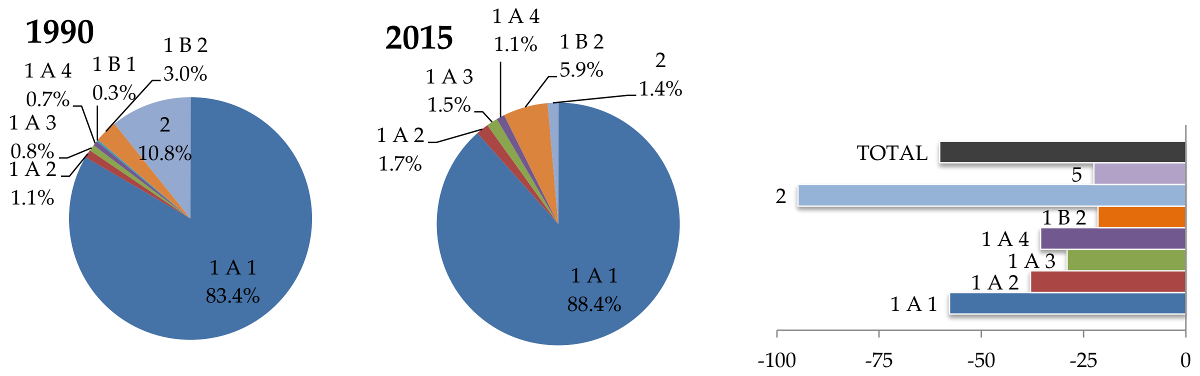


Figure 3.9.4-1The Ni emissions (t/yr) and percentage share by sector and variation in Ni emissions

Table 3.9.4-1 The Ni emissions by SNAP nomenclature in the period 1990-2015

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	21.9	0.16	0.27	3.63	NA	0.03	0.11	0.13	7.5E-03	NA	26.2
1991	17.7	0.14	0.17	1.75	NA	0.03	0.03	0.13	5.5E-03	NA	19.9
1992	19.0	0.10	0.14	0.62	NA	0.03	0.03	0.33	5.0E-03	NA	20.3
1993	16.9	0.11	0.12	0.75	NA	0.03	0.03	0.38	5.7E-03	NA	18.3
1994	15.3	0.09	0.13	0.76	NA	0.01	0.03	0.06	5.6E-03	NA	16.4
1995	19.0	0.10	0.11	0.74	NA	0.03	0.04	0.23	6.7E-03	NA	20.3
1996	20.8	0.11	0.11	0.61	NA	0.03	0.04	0.55	6.0E-03	NA	22.3
1997	18.4	0.10	0.12	0.62	NA	0.03	0.04	0.40	6.1E-03	NA	19.8
1998	19.1	0.10	0.76	0.78	NA	0.03	0.05	0.15	6.4E-03	NA	21.0

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**
1999	20.0	0.10	0.74	0.86	NA	0.04	0.05	0.11	6.9E-03	NA	21.9
2000	15.3	0.09	1.87	1.07	NA	0.04	0.05	0.09	7.1E-03	NA	18.5
2001	15.1	0.09	1.74	0.96	NA	0.05	0.05	0.16	6.7E-03	NA	18.2
2002	17.1	0.09	1.44	0.98	NA	0.05	0.05	0.28	6.1E-03	NA	20.0
2003	19.0	0.11	1.74	0.99	NA	0.05	0.05	0.26	6.1E-03	NA	22.2
2004	16.0	0.10	2.02	1.09	NA	0.04	0.05	0.05	5.8E-03	NA	19.4
2005	16.5	0.11	2.52	1.10	NA	0.04	0.06	0.05	5.8E-03	NA	20.4
2006	16.2	0.10	3.40	0.97	NA	0.04	0.06	0.06	5.8E-03	NA	20.8
2007	18.2	0.09	0.54	1.11	NA	0.04	0.07	0.06	6.4E-03	NA	20.1
2008	13.7	0.09	0.65	0.93	NA	0.04	0.06	0.12	5.8E-03	NA	15.6
2009	16.7	0.10	0.68	1.03	NA	0.03	0.06	0.08	6.3E-03	NA	18.7
2010	13.1	0.10	0.25	0.92	NA	0.04	0.06	0.12	3.1E-03	NA	14.6
2011	11.0	0.10	0.14	0.75	NA	0.03	0.06	0.11	3.9E-03	NA	12.2
2012	9.2	0.10	0.17	0.73	NA	0.03	0.06	0.11	4.3E-03	NA	10.4
2013	6.4	0.10	0.20	0.56	NA	0.03	0.06	0.06	4.0E-03	NA	7.5
2014	5.5	0.09	0.25	0.62	NA	0.02	0.06	0.06	4.4E-03	NA	6.6
2015	5.3	0.10	0.24	0.59	NA	0.02	0.06	0.06	5.2E-03	NA	6.4
2015 vs 1990	-75.7%	-38.3%	-11.4%	-83.7%	NA	-32.5%	-41.2%	-55.6%	-30.6%	NA	-75.6%
2015 vs 2014	-3.5%	14.0%	-3.4%	-4.1%	NA	-2.6%	5.3%	-1.7%	17.7%	NA	-3.2%

3.9.5 Selenium (Se)

Emission of selenium was amounted to 0.33 t in 2015 (Figure and Table 3.9.5-1) and was reduced by 29.2 % since 1990. Dominant sector in the selenium emission during whole observe period has industrial processes and product use sector. It has contributed with 55.8 % in 2015, and in 1990 with 47.8 % in total Se emission. Domination within that sector has glass production activity, due to the metal content in the raw material. That activity has recorded a decreasing trend in recent years, as a result of economic crisis since 2007. About 17.5 % of Se emissions in 2015 originated from fuel combustion in manufacturing industry and construction, and 10.4 % from the public electricity and heat production.

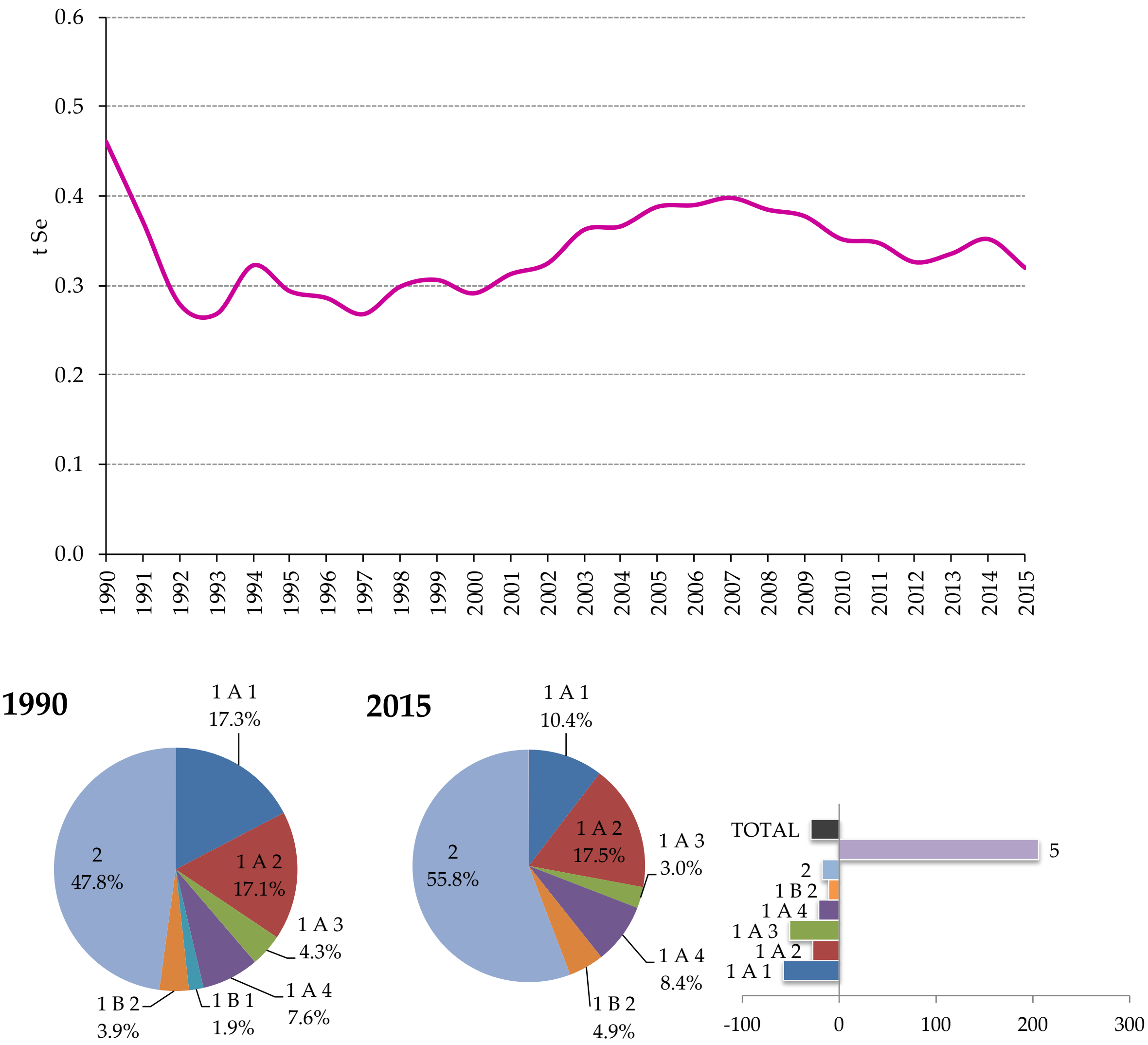


Figure 3.9.5-1 The Se emissions (t/yr) and percentage share by sector and variation in Se emissions

Table 3.9.5-1 The Se emissions by SNAP nomenclature in the period 1990-2015

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	0.08	0.033	0.08	0.25	NA	NA	1.5E-02	8.5E-03	3.6E-05	NA	0.46
1991	0.06	0.032	0.05	0.22	NA	NA	2.9E-03	6.4E-03	4.2E-05	NA	0.37
1992	0.07	0.025	0.05	0.13	NA	NA	2.8E-03	6.8E-03	5.0E-05	NA	0.28
1993	0.06	0.027	0.04	0.13	NA	NA	3.0E-03	6.3E-03	6.0E-05	NA	0.27
1994	0.09	0.023	0.05	0.15	NA	NA	3.2E-03	4.2E-03	6.5E-05	NA	0.32
1995	0.07	0.024	0.04	0.15	NA	NA	3.3E-03	5.5E-03	6.5E-05	NA	0.29
1996	0.07	0.027	0.04	0.14	NA	NA	3.6E-03	8.3E-03	7.1E-05	NA	0.29
1997	0.07	0.025	0.05	0.12	NA	NA	4.0E-03	6.8E-03	7.3E-05	NA	0.27
1998	0.08	0.025	0.05	0.14	NA	NA	4.3E-03	5.6E-03	6.9E-05	NA	0.30

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**
1999	0.08	0.025	0.06	0.13	NA	NA	4.6E-03	5.5E-03	6.8E-05	NA	0.31
2000	0.06	0.022	0.07	0.14	NA	NA	4.7E-03	5.8E-03	6.5E-05	NA	0.29
2001	0.06	0.024	0.08	0.14	NA	NA	4.3E-03	6.4E-03	6.4E-05	NA	0.31
2002	0.06	0.023	0.08	0.15	NA	NA	4.6E-03	7.2E-03	7.0E-05	NA	0.32
2003	0.07	0.027	0.08	0.17	NA	NA	5.0E-03	7.4E-03	7.3E-05	NA	0.36
2004	0.06	0.026	0.08	0.19	NA	NA	5.2E-03	6.0E-03	7.3E-05	NA	0.37
2005	0.06	0.027	0.08	0.21	NA	NA	5.4E-03	6.5E-03	7.8E-05	NA	0.39
2006	0.06	0.025	0.09	0.20	NA	NA	5.8E-03	6.8E-03	7.8E-05	NA	0.39
2007	0.06	0.024	0.09	0.21	NA	NA	6.3E-03	7.1E-03	8.6E-05	NA	0.40
2008	0.05	0.024	0.08	0.21	NA	NA	6.2E-03	8.5E-03	8.4E-05	NA	0.38
2009	0.06	0.025	0.07	0.21	NA	NA	6.1E-03	8.2E-03	8.6E-05	NA	0.38
2010	0.04	0.027	0.07	0.21	NA	NA	5.9E-03	7.3E-03	8.9E-05	NA	0.35
2011	0.04	0.026	0.06	0.21	NA	NA	5.8E-03	7.2E-03	9.1E-05	NA	0.35
2012	0.03	0.026	0.06	0.20	NA	NA	5.7E-03	6.8E-03	9.2E-05	NA	0.33
2013	0.02	0.025	0.06	0.21	NA	NA	5.9E-03	6.8E-03	9.4E-05	NA	0.34
2014	0.02	0.022	0.06	0.23	NA	NA	5.7E-03	7.0E-03	1.0E-04	NA	0.35
2015	0.02	0.026	0.06	0.20	NA	NA	6.1E-03	6.9E-03	1.1E-04	NA	0.32
2015 vs 1990	-72.6%	-22.4%	-23.6%	-19.0%	NA	NA	-59.2%	-18.3%	206.2%	NA	-30.6%
2015 vs 2014	-5.2%	13.8%	-6.7%	-13.0%	NA	NA	5.7%	-1.6%	10.4%	NA	-9.1%

3.9.6 Zinc (Zn)

In IIR 2017, the new data for consumed biomass for the period from 1990 to 2013 were included in inventory (source: revised national energy balances from 1990 to 2013) and has increasing trend by approximately 30 PJ. As an outcome of this revision, Zn emission trend is different from that submitted one in IIR 2016.

The zinc emission in 2015 has amounted to 34.8 t (Figure and Table 3.9.6-1) and has decreased by 9.9 % since 1990. The major sources of Zn emission in Croatia is fuel combustion in energy sector which has contributed with 99.2 % to national total in 2015. Key sources in 2015 were: small combustion sector (72.4 %), transport (16 %) and manufacturing industry and construction (7.7 %). Zinc is mostly emitted as a result of biomass combustion in residential sector, due to its content in wood.

The Zn emission trend 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 thet process in Sisak in 1992, was a result of the war for Croatian independence (1991-1995).

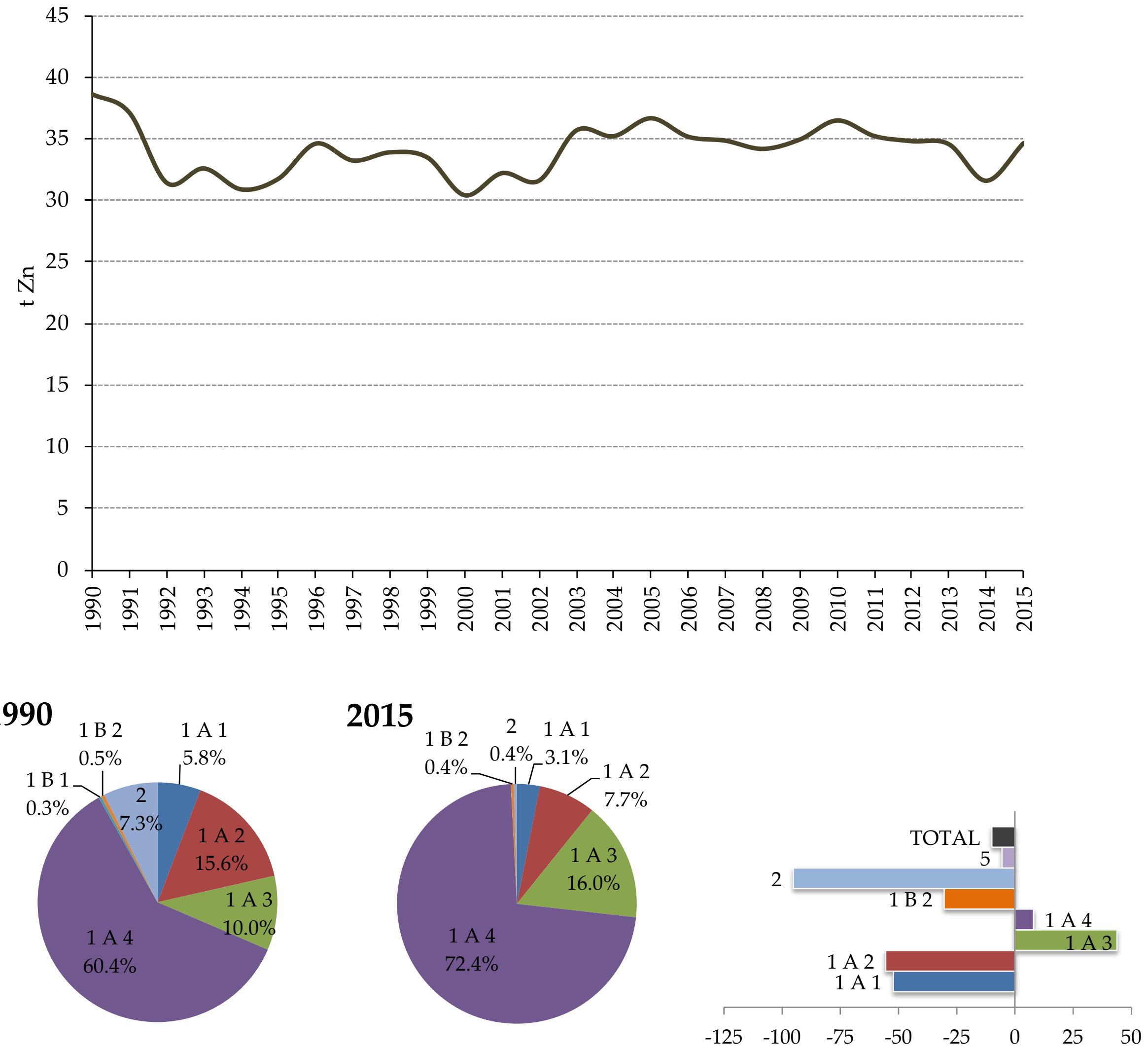


Figure 3.9.6-1 The Zn emissions (t/yr) and percentage share by sector and variation in Zn emissions

Table 3.9.6-1 The Zn emissions by SNAP nomenclature in the period 1990-2015

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	2.3	23.1	5.9	3.1	NA	0.03	3.7	0.5	5.1E-02	NA	38.6
1991	1.7	26.4	4.3	1.5	NA	0.03	2.8	0.4	3.8E-02	NA	37.1
1992	1.7	22.8	3.4	0.6	NA	0.03	2.7	0.2	3.4E-02	NA	31.4

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**
1993	1.7	24.1	3.1	0.5	NA	0.03	2.8	0.2	4.0E-02	NA	32.6
1994	2.4	21.7	2.9	0.5	NA	0.01	3.0	0.3	3.8E-02	NA	30.9
1995	2.1	22.9	2.9	0.3	NA	0.03	3.2	0.3	4.5E-02	NA	31.8
1996	2.0	25.7	2.8	0.3	NA	0.03	3.5	0.3	4.0E-02	NA	34.6
1997	1.9	23.6	3.2	0.4	NA	0.03	3.9	0.3	4.2E-02	NA	33.2
1998	2.1	23.7	3.1	0.5	NA	0.03	4.1	0.3	4.5E-02	NA	33.9
1999	2.2	23.3	2.8	0.5	NA	0.04	4.4	0.3	4.9E-02	NA	33.5
2000	1.6	20.7	2.8	0.5	NA	0.04	4.4	0.3	5.1E-02	NA	30.5
2001	1.5	22.7	2.8	0.4	NA	0.05	4.3	0.4	5.0E-02	NA	32.2
2002	1.7	21.8	2.8	0.3	NA	0.05	4.6	0.4	4.4E-02	NA	31.6
2003	2.0	25.1	2.9	0.4	NA	0.05	5.0	0.4	4.2E-02	NA	35.7
2004	1.6	24.4	3.1	0.6	NA	0.04	5.1	0.4	3.9E-02	NA	35.2
2005	1.6	25.8	3.0	0.5	NA	0.04	5.3	0.4	3.9E-02	NA	36.7
2006	1.6	23.7	3.3	0.5	NA	0.04	5.6	0.4	4.0E-02	NA	35.2
2007	1.7	22.8	3.2	0.5	NA	0.04	6.0	0.4	4.4E-02	NA	34.8
2008	1.4	22.9	2.7	0.7	NA	0.04	5.9	0.5	4.0E-02	NA	34.2
2009	1.5	23.9	2.6	0.4	NA	0.03	5.9	0.5	4.3E-02	NA	34.9
2010	1.2	25.7	2.9	0.6	NA	0.04	5.7	0.4	2.2E-02	NA	36.5
2011	1.2	25.1	2.4	0.5	NA	0.03	5.5	0.4	2.8E-02	NA	35.2
2012	1.1	25.0	2.6	0.2	NA	0.03	5.5	0.4	2.9E-02	NA	34.8
2013	0.8	24.8	2.5	0.4	NA	0.03	5.6	0.4	2.8E-02	NA	34.6
2014	0.8	21.9	2.2	0.8	NA	0.02	5.5	0.4	3.1E-02	NA	31.6
2015	0.7	25.1	2.0	0.7	NA	0.02	5.8	0.4	3.6E-02	NA	34.6
2015 vs 1990	-68.0%	8.5%	-66.7%	-77.5%	NA	-32.5%	55.2%	-27.6%	-30.7%	NA	-10.3%
2015 vs 2014	-10.2%	14.6%	-11.2%	-13.7%	NA	-2.6%	5.4%	-1.3%	14.5%	NA	9.6%

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.

The Republic of Croatia has ratified Protocol on POPs by Low on ratification of the Protocol to the 1979 Convention on long-range transboundary air pollution on Persistent Organic Pollutants (OG-IT 05/07) in 2007.

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 IIR 2017, the new data for consumed biomass for the period from 1990 to 2013 were included in inventory (source: revised national energy balances from 1990 to 2013) and has increasing trend by approximately 30 PJ. As an outcome of this revision, PCDD/F emission trend is different from that submitted one in IIR 2016.

In 2015, PCDD/F emission has amounted to 21.5 g I- TEQ (Figure and Table 3.10.1-1). Emission has decreased by 53 % since 1990. The main contributor in PCDD/F emission during whole observing period is fuel combustion in energy sector. A key sources in 2015 were small combustion sector with domination of combustion in residential. Fluctuations in the trend are directly dependent on the amount of biomass use in small 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 significant reduction since 2005 is a result of gradual replacement of certain percentage of traditional domestic stoves and manual single hous boilers with advanced/ecolabelled stoves and boilers and pellete stoves and boilers (see Table 4.5-1 and Figure 4.5-2).

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

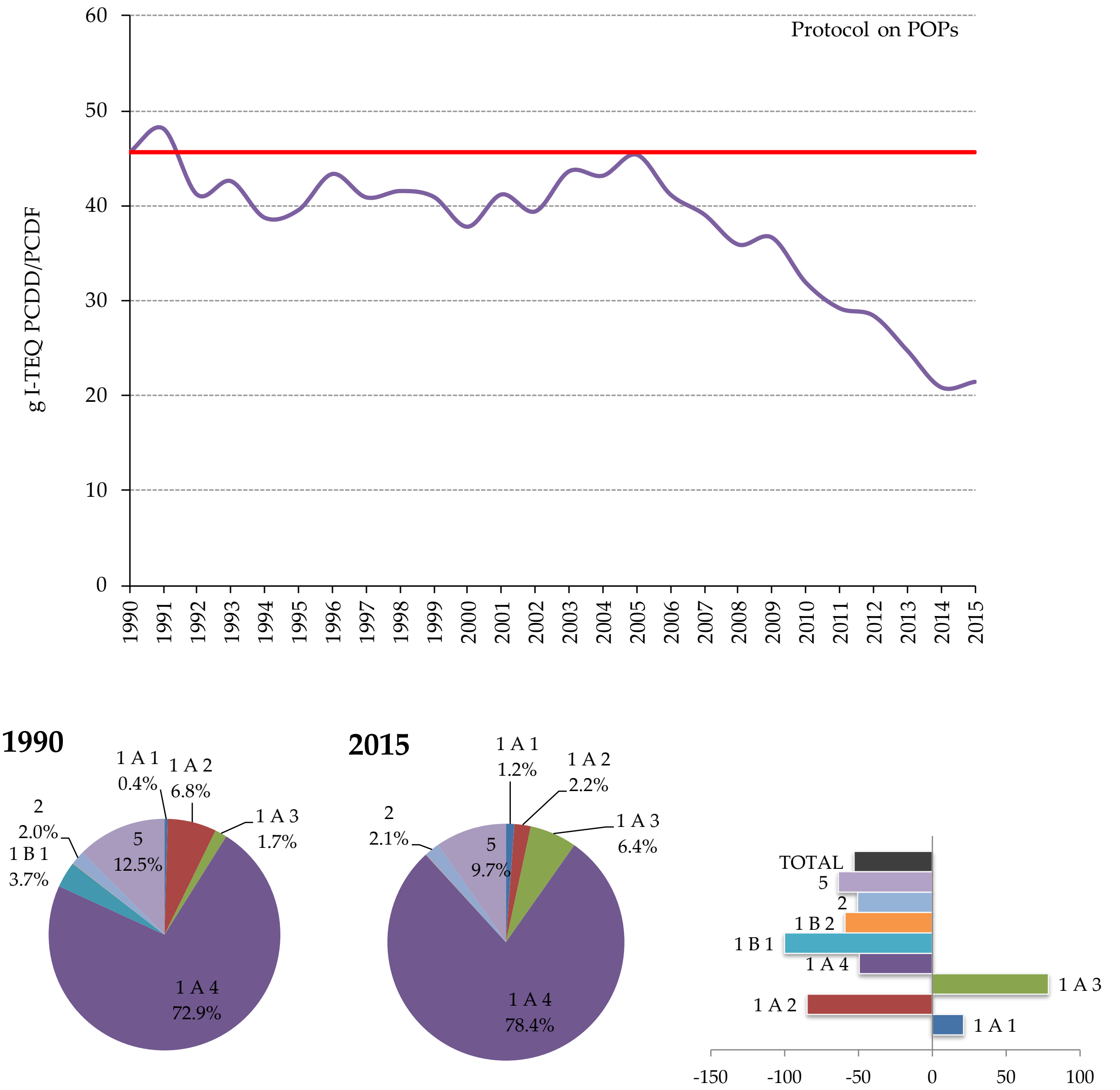


Figure 3.10.1-1 The PCDD/PCDF emissions (g I-TEQ/yr) and percentage share by sector and variation in PCDD/PCDF emissions

Table 3.10.1-1 The PCDD/PCDF emissions by SNAP nomenclature in the period 1990-2015

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	0.2	33.3	3.1	2.59	NA	NA	0.4	0.36	5.7	NA	45.6
1991	0.2	37.6	2.1	2.01	NA	NA	0.3	0.26	5.7	NA	48.1
1992	0.2	31.9	1.3	1.54	NA	NA	0.3	0.30	5.7	NA	41.2
1993	0.2	33.6	1.1	1.51	NA	NA	0.3	0.23	5.7	NA	42.6

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**
1994	0.2	30.3	1.1	1.04	NA	NA	0.3	0.15	5.7	NA	38.7
1995	0.2	32.0	1.1	0.15	NA	NA	0.3	0.19	5.7	NA	39.5
1996	0.1	35.8	1.0	0.15	NA	NA	0.3	0.25	5.7	NA	43.3
1997	0.2	32.9	1.0	0.22	NA	NA	0.4	0.21	6.0	NA	40.9
1998	0.2	33.2	0.8	0.33	NA	NA	0.4	0.21	6.4	NA	41.5
1999	0.2	32.7	0.7	0.25	NA	NA	0.4	0.21	6.5	NA	40.9
2000	0.2	29.1	0.7	0.24	NA	NA	0.4	0.21	6.9	NA	37.8
2001	0.3	31.9	0.6	0.19	NA	NA	0.4	0.21	7.6	NA	41.2
2002	0.3	30.6	0.6	0.12	NA	NA	0.4	0.23	7.1	NA	39.4
2003	0.3	35.4	0.5	0.15	NA	NA	0.4	0.24	6.6	NA	43.6
2004	0.3	34.4	0.6	0.28	NA	NA	0.4	0.24	7.0	NA	43.2
2005	0.3	36.6	0.5	0.25	NA	NA	0.4	0.26	7.0	NA	45.4
2006	0.3	31.8	0.6	0.26	NA	NA	0.4	0.27	7.5	NA	41.2
2007	0.3	28.9	0.7	0.25	NA	NA	0.4	0.28	8.2	NA	39.1
2008	0.3	27.4	0.5	0.44	NA	NA	0.4	0.33	6.6	NA	35.9
2009	0.3	26.8	0.5	0.16	NA	NA	1.2	0.37	7.4	NA	36.6
2010	0.3	26.9	0.8	0.33	NA	NA	1.1	0.28	2.2	NA	31.9
2011	0.3	24.4	0.6	0.30	NA	NA	1.1	0.29	2.3	NA	29.2
2012	0.3	22.4	0.6	0.03	NA	NA	1.1	0.27	3.7	NA	28.4
2013	0.3	20.4	0.6	0.21	NA	NA	1.0	0.31	1.9	NA	24.8
2014	0.3	16.2	0.5	0.53	NA	NA	1.0	0.34	2.0	NA	20.9
2015	0.2	16.8	0.5	0.46	NA	NA	1.0	0.33	2.1	NA	21.5
2015 vs 1990	21.1%	-49.4%	-84.7%	-82.4%	NA	NA	153.6%	-7.2%	-63.6%	NA	-53.0%
2015 vs 2014	-3.4%	4.0%	-7.8%	-14.7%	NA	NA	3.6%	-2.0%	1.4%	NA	2.7%

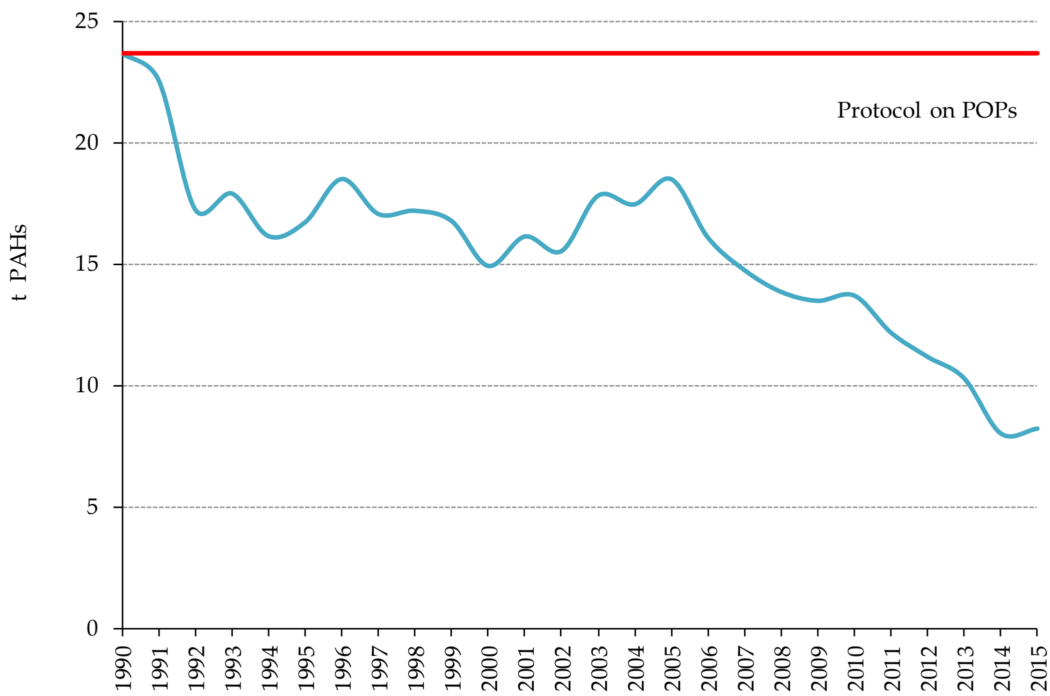
3.10.2 Polycyclic aromatic hydrocarbons (PAHs)

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 in 2015 by sectors is presented in Figure 3.10.2-1 and Table 3.10.2-1.

In IIR 2017, the new data for consumed biomass for the period from 1990 to 2013 were included in inventory (source: revised national energy balances from 1990 to 2013) and has increasing trend by approximately 30 PJ. As an outcome of this revision, PAHs emission trend is different from that submitted one in IIR 2016.

Emissions of PAHs were estimated to about 8.2 t in 2015, and have declined by 65.2 % since 1990. Great reduction in PAHs emission has occurred mostly 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 this happened as a result of the war for Croatian independence (1991 - 1995). A significant reduction since 2005 is a result of gradual replacement of certain percentage of traditional domestic stoves and manual single hous boilers with advanced/ecolabelled stoves and boilers and pellete stoves and boilers (see Table 4.5-1 and Figure 4.5-2).

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



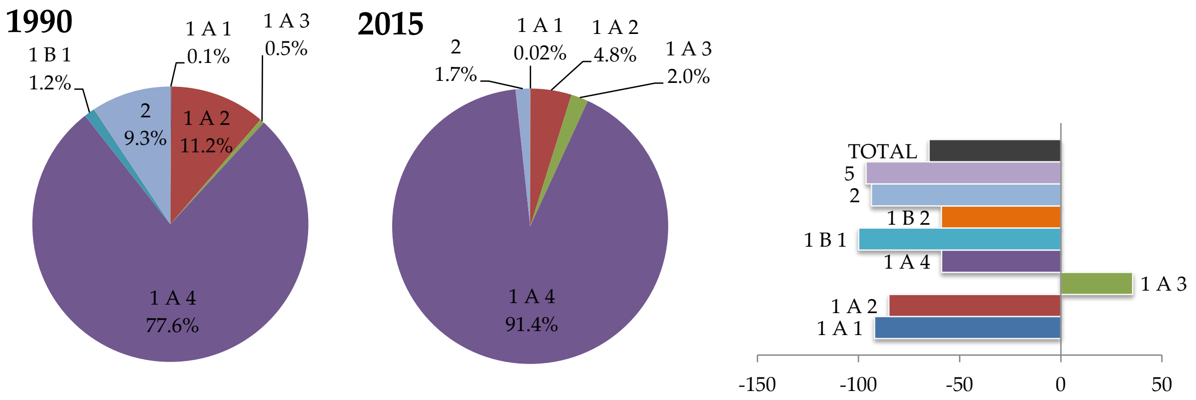


Figure 3.10.2-1 The PAHs emissions (kg/yr), percentage share by sector and variation in PAHs emissions

Table 3.10.2-1 PAHs emissions by SNAP nomenclature in the period 1990-2015

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	0.03	18.36	2.64	2.47	NA	0.04	0.06	0.09	1.0E-05	NA	23.69
1991	0.02	19.25	1.77	1.44	NA	0.02	0.05	0.04	8.6E-06	NA	22.58
1992	0.02	15.71	1.16	0.27	NA	0.03	0.05	0.02	8.3E-06	NA	17.26
1993	0.02	16.51	1.02	0.26	NA	0.03	0.05	0.02	8.8E-06	NA	17.92
1994	0.05	14.78	1.02	0.18	NA	0.06	0.06	0.03	8.8E-06	NA	16.16
1995	0.03	15.54	1.01	NA	NA	0.04	0.06	0.03	9.7E-06	NA	16.73
1996	0.02	17.38	0.94	NA	NA	0.05	0.06	0.03	9.2E-06	NA	18.51
1997	0.03	15.95	0.91	NA	NA	0.05	0.07	0.03	2.5E-05	NA	17.07
1998	0.03	16.14	0.83	NA	NA	0.05	0.08	0.03	4.8E-05	NA	17.21
1999	0.03	15.89	0.66	NA	NA	0.05	0.08	0.03	5.6E-05	NA	16.78
2000	0.01	14.10	0.64	NA	NA	0.03	0.08	0.04	7.8E-05	NA	14.94
2001	0.02	15.34	0.60	NA	NA	0.03	0.08	0.04	8.4E-05	NA	16.15
2002	0.02	14.75	0.60	NA	NA	0.04	0.09	0.04	4.8E-05	NA	15.55
2003	0.03	17.03	0.47	NA	NA	0.13	0.10	0.04	1.2E-05	NA	17.83
2004	0.01	16.52	0.56	NA	NA	0.19	0.11	0.04	6.3E-06	NA	17.47
2005	0.02	17.59	0.55	NA	NA	0.15	0.11	0.04	3.9E-06	NA	18.51
2006	0.02	15.21	0.56	NA	NA	0.11	0.12	0.05	1.1E-05	NA	16.10
2007	0.02	13.72	0.64	NA	NA	0.16	0.14	0.05	9.9E-06	NA	14.76
2008	0.02	12.94	0.52	NA	NA	0.15	0.13	0.05	1.0E-05	NA	13.87
2009	0.02	12.57	0.52	NA	NA	0.19	0.13	0.05	4.3E-06	NA	13.50
2010	0.00	12.62	0.66	NA	NA	0.20	0.13	0.05	2.1E-06	NA	13.71
2011	0.01	11.33	0.49	NA	NA	0.14	0.13	0.05	2.7E-06	NA	12.19
2012	0.004	10.35	0.48	NA	NA	0.19	0.13	0.05	3.0E-06	NA	11.20
2013	0.002	9.35	0.46	NA	NA	0.28	0.13	0.05	2.9E-06	NA	10.31
2014	0.001	7.33	0.41	NA	NA	0.04	0.13	0.05	3.1E-06	NA	8.04
2015	0.002	7.52	0.39	NA	NA	0.07	0.14	0.05	3.7E-06	NA	8.24
2015 vs 1990	-92.1%	-59.0%	-85.3%	NA	NA	75.3%	132.4%	-48.9%	-62.7%	NA	-65.2%

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**
2015 vs 2014	62.1%	2.6%	-4.4%	NA	NA	65.8%	8.1%	-0.7%	21.8%	NA	2.5%

3.10.3 Hexachlorobenzene (HCB)

Hexachlorobenzene (HCB) is an industrial chemical. The HCB emission occurs mainly from biomass and solid fuel combustion and in minor extent from waste incineration if it exists in the county. The dominance in HCB emission in the Republic of Croatia has biomass and coal combustion in residential sector.

In IIR 2017, the new data for consumed biomass for the period from 1990 to 2013 were included in inventory (source: revised national energy balances from 1990 to 2013) and has increasing trend by approximately 30 PJ. As an outcome of this revision, HCB emission trend is different from that submitted one in IIR 2016.

The HCB emission in 2015 has amounted to 0.28 t (Figure and Table 3.10.3-1). In comparison to 1990, HCB emission has increased by 4.7 %, mainly due to increase in biomass combustion in residential heating furnaces. Public electricity and heat production sector (in particularly, thermal power plants on coal) is the sector with increasing influence in HCB emission over time.

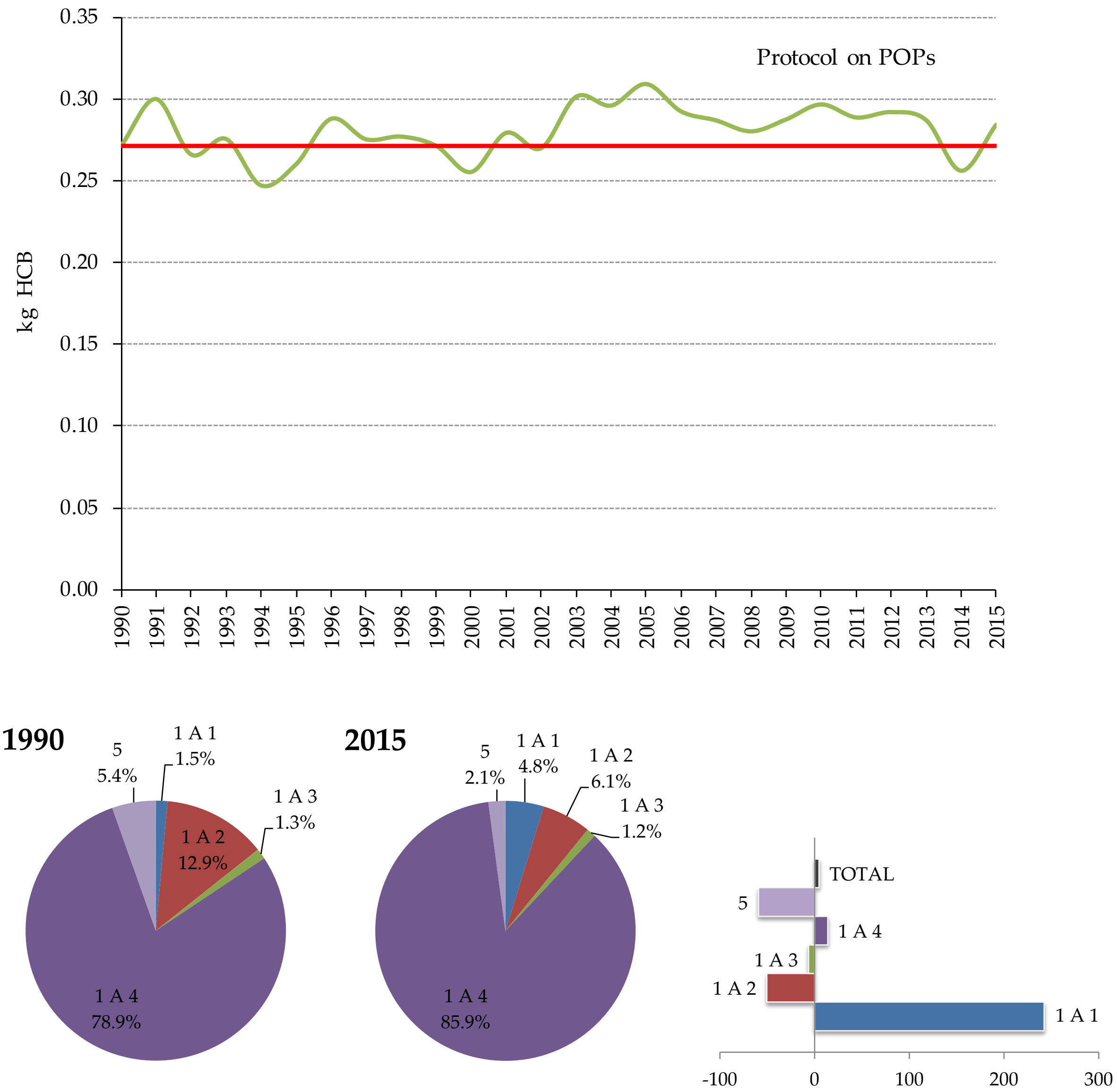


Figure 3.10.3-1 The HCB emission (kg/yr), percentage share by sector and variation in HCB emissions

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 2015, this obligation was not fulfilled.

Table 3.10.3-1 The HCB emission by SNAP nomenclature in the period 1990-2015

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	4.0E-03	0.21	0.03	NA	NA	NA	NA	3.5E-03	1.5E-02	NA	0.27
1991	2.8E-03	0.25	0.03	NA	NA	NA	NA	2.8E-03	1.5E-02	NA	0.30

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**
1992	4.0E-03	0.22	0.02	NA	NA	NA	NA	4.1E-03	1.5E-02	NA	0.27
1993	3.0E-03	0.23	0.02	NA	NA	NA	NA	3.7E-03	1.5E-02	NA	0.28
1994	6.0E-04	0.21	0.02	NA	NA	NA	NA	1.6E-03	1.5E-02	NA	0.25
1995	1.5E-03	0.22	0.02	NA	NA	NA	NA	2.7E-03	1.5E-02	NA	0.26
1996	8.7E-04	0.25	0.02	NA	NA	NA	NA	4.6E-03	1.5E-02	NA	0.29
1997	3.6E-03	0.23	0.02	NA	NA	NA	NA	3.6E-03	1.7E-02	NA	0.28
1998	3.6E-03	0.23	0.02	NA	NA	NA	NA	2.5E-03	1.9E-02	NA	0.28
1999	3.1E-03	0.22	0.02	NA	NA	NA	NA	2.3E-03	2.0E-02	NA	0.27
2000	9.0E-03	0.20	0.02	NA	NA	NA	NA	2.2E-03	2.2E-02	NA	0.26
2001	1.0E-02	0.22	0.02	NA	NA	NA	NA	2.5E-03	2.4E-02	NA	0.28
2002	1.3E-02	0.21	0.02	NA	NA	NA	NA	3.2E-03	2.1E-02	NA	0.27
2003	1.4E-02	0.24	0.03	NA	NA	NA	NA	3.2E-03	1.8E-02	NA	0.30
2004	1.3E-02	0.24	0.03	NA	NA	NA	NA	2.3E-03	1.8E-02	NA	0.30
2005	1.4E-02	0.25	0.03	NA	NA	NA	NA	2.5E-03	1.8E-02	NA	0.31
2006	1.3E-02	0.23	0.03	NA	NA	NA	NA	2.6E-03	1.9E-02	NA	0.29
2007	1.4E-02	0.22	0.03	NA	NA	NA	NA	2.7E-03	2.1E-02	NA	0.29
2008	1.4E-02	0.22	0.02	NA	NA	NA	NA	3.4E-03	1.7E-02	NA	0.28
2009	9.7E-03	0.23	0.02	NA	NA	NA	NA	3.7E-03	1.9E-02	NA	0.29
2010	1.4E-02	0.25	0.02	NA	NA	NA	NA	3.1E-03	6.1E-03	NA	0.30
2011	1.5E-02	0.24	0.02	NA	NA	NA	NA	3.1E-03	6.4E-03	NA	0.29
2012	1.3E-02	0.24	0.02	NA	NA	NA	NA	2.9E-03	1.0E-02	NA	0.29
2013	1.4E-02	0.24	0.02	NA	NA	NA	NA	3.1E-03	5.5E-03	NA	0.29
2014	1.4E-02	0.21	0.02	NA	NA	NA	NA	3.4E-03	5.8E-03	NA	0.26
2015	1.4E-02	0.24	0.02	NA	NA	NA	NA	3.3E-03	6.0E-03	NA	0.28
2015 vs 1990	242.3%	14.0%	-50.5%	NA	NA	NA	NA	-6.5%	-59.3%	NA	4.7%
2015 vs 2014	-4.6%	14.6%	-12.7%	NA	NA	NA	NA	-1.9%	2.7%	NA	11.0%

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.

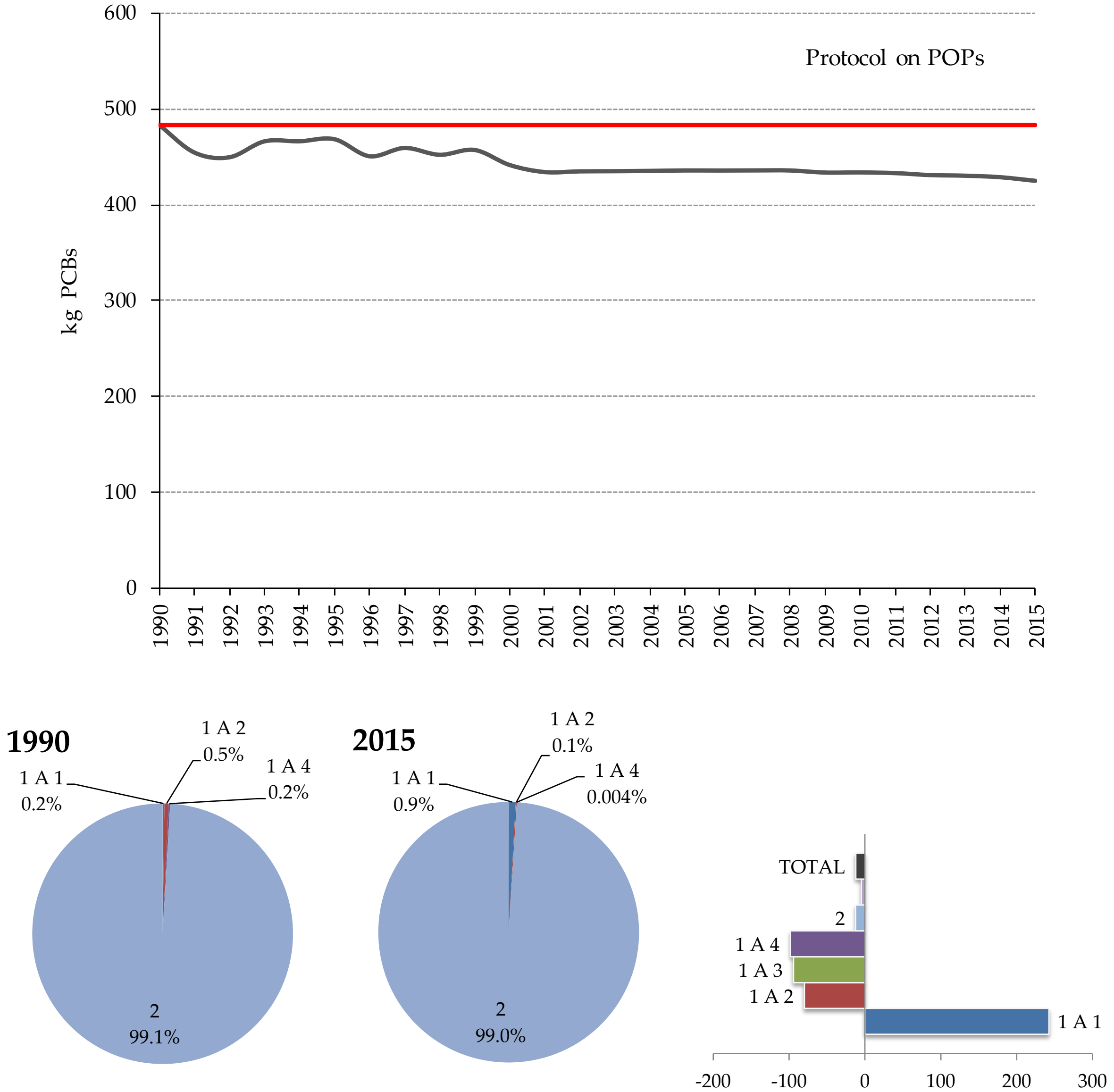


Figure 3.10.4-1 The PCBs emission (kg/yr), percentage share by sector and variation in PCBs emissions

Emission of PCBs in 2015 was estimated to about 425 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 % to national PCBs emission in 2015. Changes in PCBs emission are minimal and are directly depending on the population figure in Croatia, since the emission from a key source is calculating on the basis of population.

Table 3.10.4-1 The PCBs emissions by SNAP nomenclature in the period 1990-2015

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	2.5	0.8	NA	477.8	NA	0.040	0.003	NA	483.1
1991	0.8	0.47	1.5	0.4	NA	451.3	NA	0.017	0.004	NA	454.5
1992	1.1	0.14	1.0	0.3	NA	447.0	NA	0.007	0.004	NA	449.5
1993	0.8	0.20	0.8	0.2	NA	464.1	NA	0.008	0.004	NA	466.1
1994	0.2	0.10	0.8	0.2	NA	464.9	NA	0.001	0.004	NA	466.2
1995	0.4	0.09	0.8	0.1	NA	466.9	NA	0.005	0.004	NA	468.3
1996	0.2	0.10	0.7	0.1	NA	449.4	NA	0.011	0.004	NA	450.6
1997	1.0	0.09	0.7	0.2	NA	457.3	NA	0.008	0.004	NA	459.2
1998	1.0	0.13	0.6	0.3	NA	450.1	NA	0.003	0.004	NA	452.1
1999	0.9	0.11	0.6	0.2	NA	455.4	NA	0.003	0.004	NA	457.1
2000	2.5	0.10	0.6	0.2	NA	438.1	NA	0.002	0.004	NA	441.4
2001	2.8	0.06	0.6	0.1	NA	430.5	NA	0.003	0.004	NA	434.1
2002	3.5	0.08	0.6	0.1	NA	430.5	NA	0.006	0.005	NA	434.8
2003	3.7	0.10	0.4	0.1	NA	430.6	NA	0.006	0.005	NA	435.0
2004	3.4	0.06	0.5	0.2	NA	431.1	NA	0.002	0.005	NA	435.3
2005	3.7	0.07	0.5	0.2	NA	431.2	NA	0.002	0.005	NA	435.7
2006	3.5	0.06	0.6	0.2	NA	431.4	NA	0.002	0.005	NA	435.7
2007	3.7	0.03	0.6	0.2	NA	431.2	NA	0.002	0.006	NA	435.8
2008	3.9	0.04	0.5	0.3	NA	431.0	NA	0.003	0.005	NA	435.7
2009	2.7	0.03	0.5	0.1	NA	430.3	NA	0.003	0.005	NA	433.6
2010	3.7	0.05	0.7	0.3	NA	429.0	NA	0.003	0.003	NA	433.7
2011	4.1	0.04	0.5	0.2	NA	428.1	NA	0.003	0.003	NA	433.0
2012	3.6	0.04	0.5	0.0	NA	426.8	NA	0.003	0.004	NA	430.9
2013	4.0	0.03	0.6	0.2	NA	425.6	NA	0.002	0.003	NA	430.3
2014	3.9	0.02	0.5	0.4	NA	423.8	NA	0.002	0.003	NA	428.7
2015	3.7	0.02	0.5	0.4	NA	420.4	NA	0.002	0.003	NA	425.0
2015 vs 1990	242.3%	-98.1%	-79.7%	-56.1%	NA	-12.0%	NA	-93.9%	-4.7%	NA	-12.0%
2015 vs 2014	-4.6%	-14.6%	-3.7%	-14.9%	NA	-0.8%	NA	-1.9%	8.3%	NA	-0.9%

IV 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.i Residential: Mobile
  - 1.A.4.c.ii Agriculture/Forestry/Fishing: Off-road vehicles and other machinery
- **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 exhausted fuel for national navigation, maritime and river traffic). 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 has source category 1.A.4 Small combustion (Figure 4.1-1), which has recorded the greatest increase of fuel consumption by 22.1 %. On contrary, categories 1.A.1 Energy Industries 1.A.2 Manufacturing Industries and Construction have recorded reduction in fuel consumption by 48.6 % and 60.5 % in the period 1990 – 2015. Regarding 2014, categories 1.A.1 Energy Industries and 1.A.2 Manufacturing Industries and Construction have recorded drop by 4.7 % and 5.1 % in fuel consumption, while categories 1.A.4 Small combustion has recorded an increase by 8.8 %. 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.

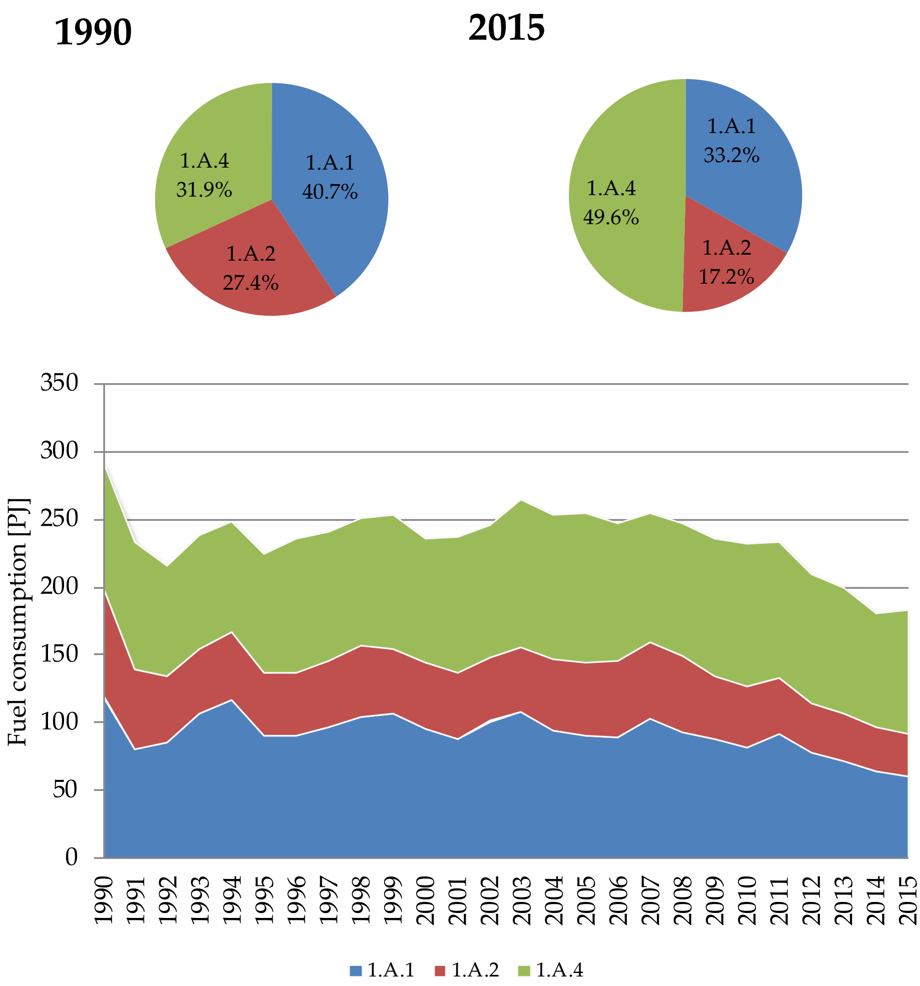


Figure 4.1-1 Activity data on fuel consumption for NFR codes 1.A.1, 1.A.2, 1.A.4

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 - 2015 has decreased by 37.0 %. The consumption of liquid fuel has reduced by 67.3 %, gaseous fuel by 22.4 %, solid fuel by 15.3 %, while the biomass consumption has increased by 9.3 %.

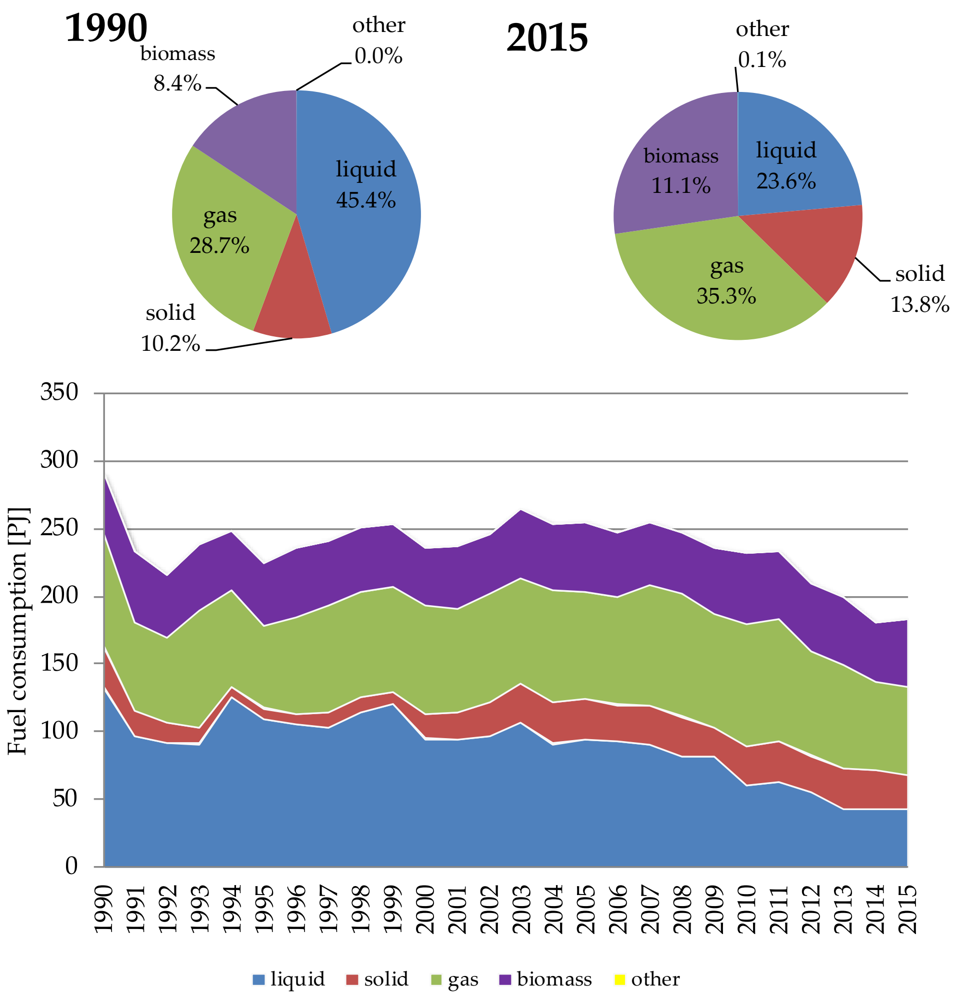


Figure 4.1-2 Activity data on fuel consumption by type for NFR codes 1.A.1, 1.A.2, 1.A.4

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 period 1990-2015 was 1.A.3.b Road transport. Road transport has contributed to overall transport fuel consumption in 2015 with 95.6%, and has recorded an increase in observing period by 61.8%. The 1.A.3.a Aviation (LTO) has contributed with 1.4% to overall fuel consumption in transport sector 2015, and has recorded a decrease by 15.8%. The 1.A.3.c Railways has contributed with 0.9% to overall transport fuel consumption in 2015, and has recorded a decrease by 53.4% in the observing period. The 1.A.3.d Navigation has contributed with 2.1% to overall transport fuel consumption in 2015 and has decreased consumption by 10.0% in comparison to 1990 (Figure 4.1-3).

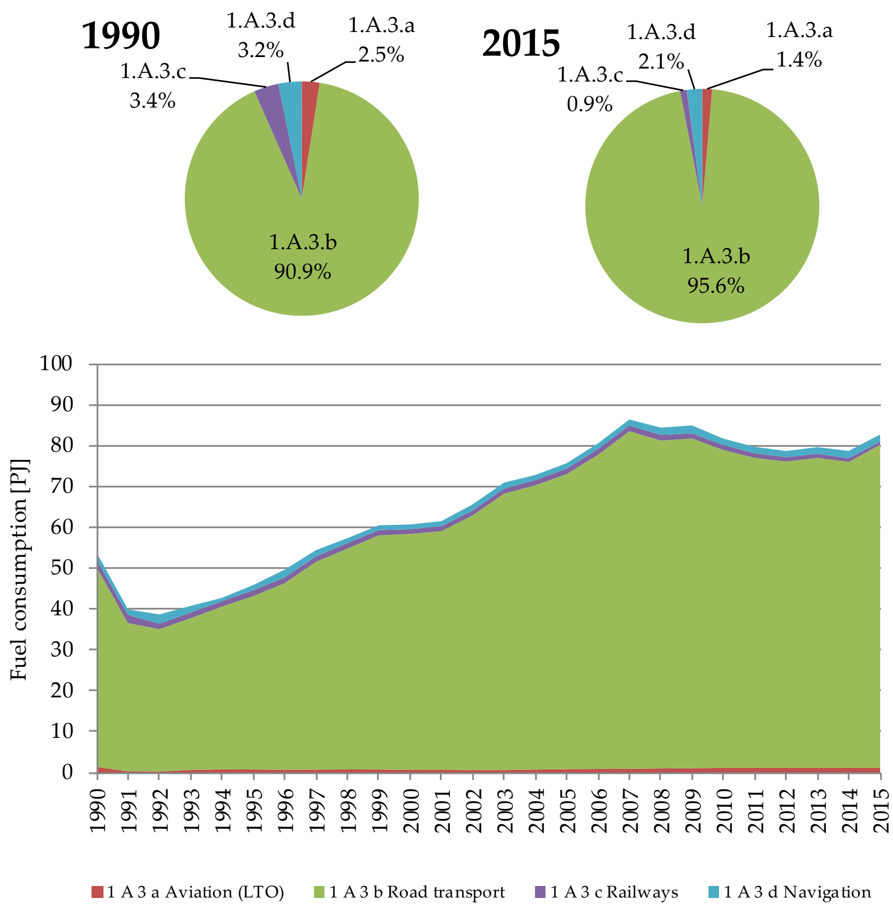


Figure 4.1-3 Consumption and percentage share for fossil fuel by types in 1.A.3 Transport

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. 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).

Source category description

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 in Croatia there are following types of plants:

- 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 one of TPP on coal was started to operate in 2000, and has installation for flue gasses cleaning (SO_2 scrubbing process). Total capacities serving the needs of the Croatian electric power system amount to 4,107.5 MW (including TPP Plomin and excluding NPP Krško). Total capacities serving the needs of the Croatian electric power system amount to 4,455.5 MW (with 50% of Krško capacities). Out of this amount, 1,906 MW is placed in thermal power plant, 2,2201.5 MW in hydro power plant and 348 MW in the nuclear unit Krško (50% of total available capacity). 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. 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	2,201.5	-
NPP Krško*	348.00	uranium oxide (UO_2)
TPP Plomin 1	105.00	coal
TPP Plomin 2**	192.00	coal
TPP Rijeka	303.00	fuel oil
TPP Sisak	631.00	fuel oil / natural gas
CHP Zagreb (east)	422.00	fuel oil / natural gas / extra light oil
CHP Zagreb (west)	89.00	fuel oil / natural gas / extra light oil
CPP Osijek	90.00	fuel oil / natural gas / extra light oil
CCGT Jertovec	74.00	natural gas / extra light oil
Total (HPPs+NPP+TPPs)	**4,455.50**	

* 50% of NPP Krško is owned by HEP, ** TPP Plomin 2 Ltd. (HEP and RWE Power Co-ownership – share 50% : 50%)

Source:MEE

During the observed period since 1990 in Croatia only 14 - 32 % of Croatian electricity demands were covered by thermal power plants. The largest contribution to electricity production in Croatia had hydro power plants 36 - 69 %. Nuclear power plant Krško delivered 50 % of its electricity to Croatian power system until 1998 after which was a four year period of non-delivery. The delivery of electricity from NPP Krško started again in 2003. The past few years the electricity demand was compensated with import.

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 (Source: MEE).

Table 4.2-2 Processing Capacities of Oil and Lube Refineries

PROCESSING CAPACITIES	INSTALLED (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

<u>Manufacturing of Solid Fuels and Other Energy Industries (NFR 1.A.1.c)</u>

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 17 on-shore gas fields and 9 off-shore gas fields, which covers about 67.7 percent of total domestic demand in 2015. The largest share of gas is coming from fields Molve and Kalinovac. They include the units for processing and preparation of gas for transportation – Central Gas Stations (CGS) Molve I, II and III. Their capacities are: 1 mill. m^3/day for Molve I, 3 mill. m^3/day for Molve II and 5 mill. m^3/day for Molve III

Methodology, emission factors and activity data

<u>Public Electricity and Heat Production (NFR 1.A.1.a)</u>

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. For emission calculation for area sources (not LCPs) 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 GB2013. Emission factors together with the direct emissions for 2015 are given in Appendix 4 of this report.

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 base, the default emission factors from GB2013 were used. In the case of heavy metals, for which emission factors are not available in GB2013, 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.

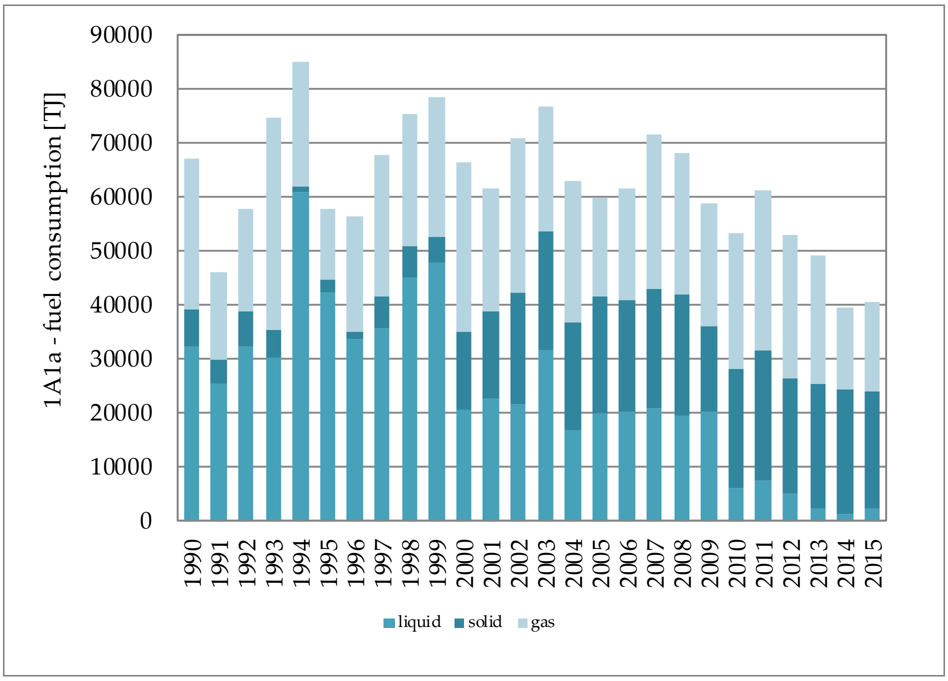


Figure 4.2-1 Activity data on fuel consumption by type for NFR 1.A.1.a

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

Methodology for emission calculation is Tier 3 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 GB2013 are used for emission calculations. Emission factors used for emissions calculation in 2015 are given in Appendix 4 of this report. Activity data on fuel used by type in sector 1.A.1.b are presented in Figure 4.2-2.

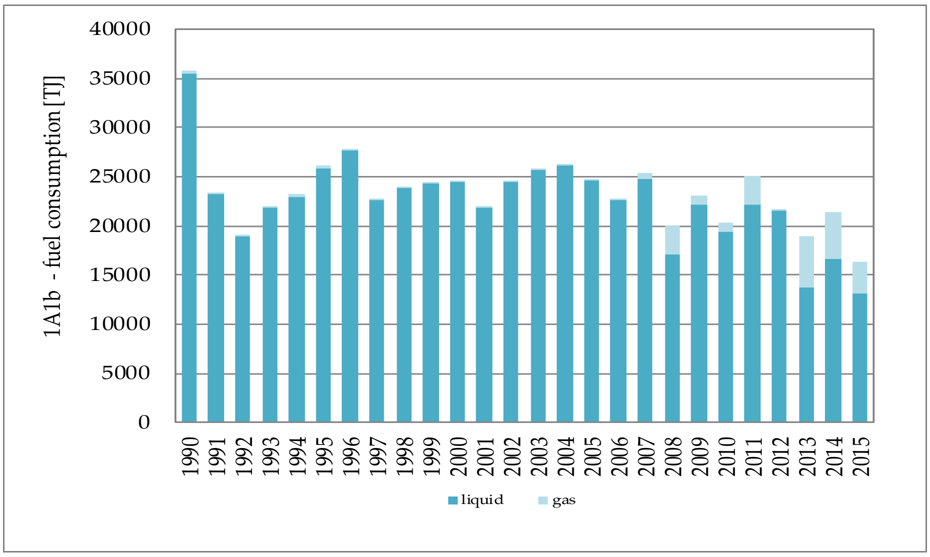


Figure 4.2-2 Activity data on fuel consumption by type for NFR 1.A.1.b

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 GB2013 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 2015 are given in Appendix 4 of this report. Activity data on fuel used by type in sector 1.A.1.c is presented in Figure 4.2-3.

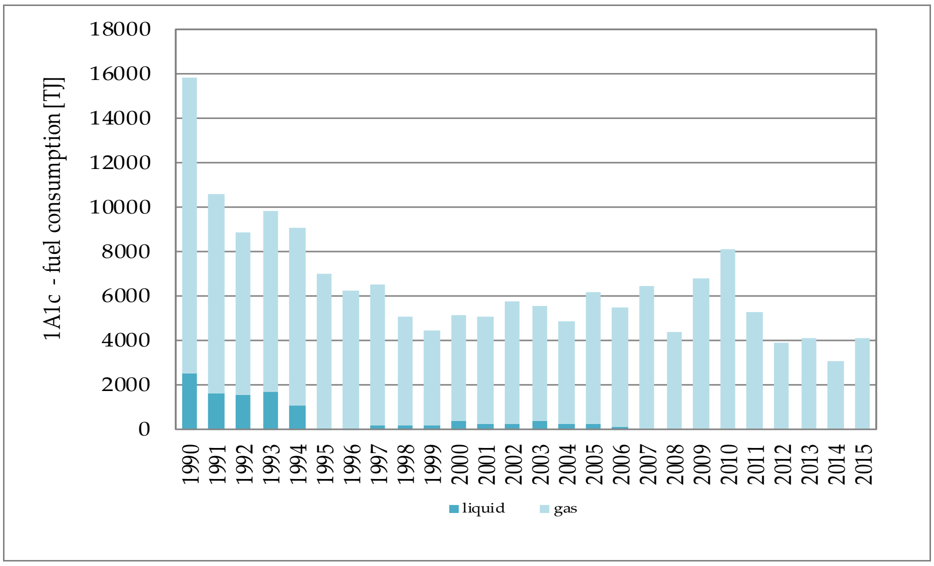


Figure 4.2-3 Activity data on fuel consumption by type for NFR 1.A.1.c

Recalculations and improvements

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

In 2014 wrong emissions were entered in CollectER database for TE Rijeka. This error was corrected.

4.3 MANUFACTURING INDUSTRIES AND CONSTRUCTION (NFR 1.A.2)

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.

Source category description

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 period from 2001 to 2012 and for 2014 and 2015. For 2013 Indusrty analysis balance was estimated using consumption rations from Industry analysis balance for 2012. For the period 2001 to 2015 emissions are reported by specific NFR sector while for period 1990 -2000 all emissions are reported under NFR code 1.A.2.f.

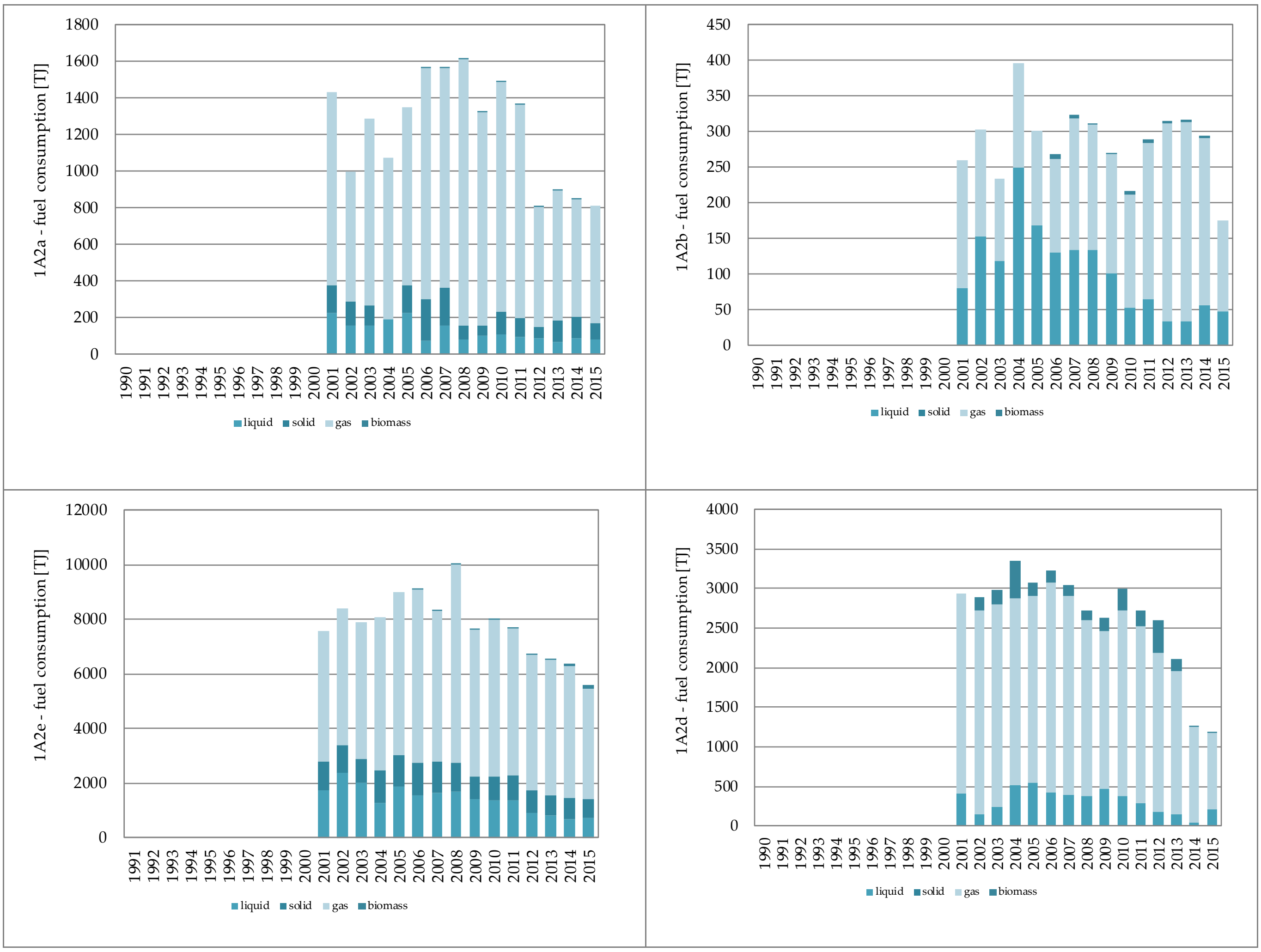
Methodology, emission factors and activity data

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 (GB2013). For NFR code 1.A.2.f Non-metallic minerals for whole observed trend plant specific emission factor are used for emission calculation of SO_2, NOx, CO, and PMs. Non-metallic minerals sector include all facilities for cement production in Croatia which have domination in emissions within the 1.A.2.f Non-metallic minerals sector and within the overall source category 1.A.2.

The amount of fuel consumed and emissions in the sector 1.A.2 Manufacturing Industries and Construction (SNAP 03) is shown as aggregated value (by fuel types) in the scope of sub-sector 1.A.2.f Non-metallic minerals for period 1990 - 2000, while for period 2001 onward are reported on disaggregated value (by fuel types) for each type of industry in the sub-sector where occur.

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.

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.



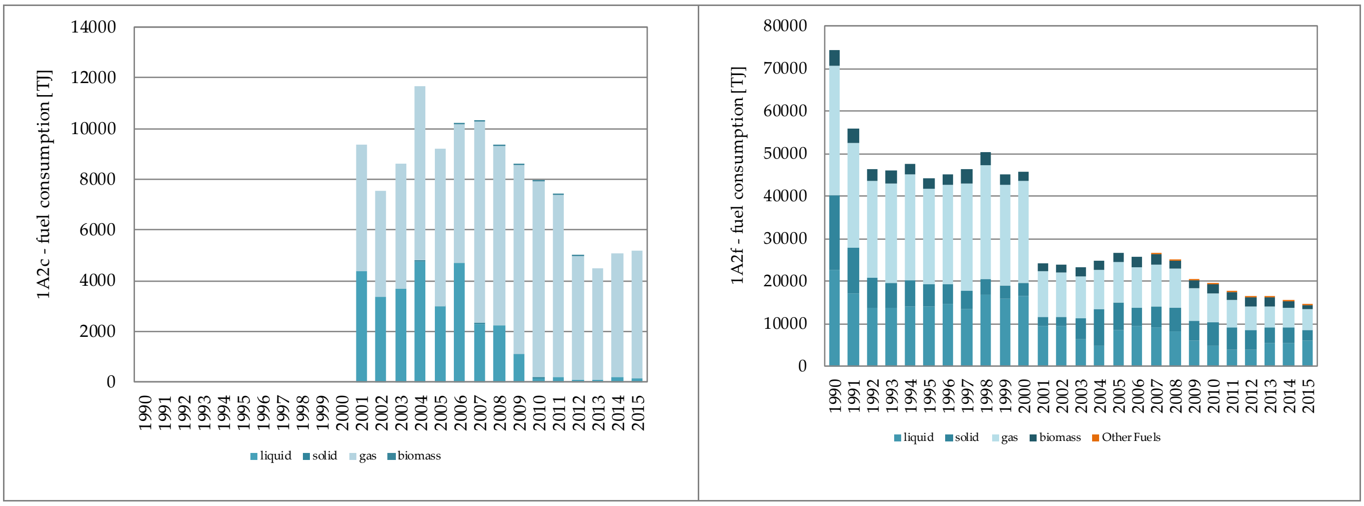


Figure 4.3-1 Activity data on fuel consumption by type for NFR codes 1.A.2.a, 1.A.2.b, 1.A.2.c, 1.A.2.d, 1.A.2.e, 1.A.2.f.

Recalculations and improvements

There was no recalculation, neither improvement in this source category.

4.4 TRANSPORT (NFR 1.A.3)

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. The sub-sector, 1.A.3.d.i (ii) International inland waterways does not take into account.

Source category description

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), 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). The length of railway lines has not changed since 2006 with a total of 2,722 km of which 90 % are single track and the rest are double track railway. The 36% 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.

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

In Croatia all compressor stations are electric, so no emissions occurred from this source for the whole period from 1990 to 2015. 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 2015 for Pipeline transport 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 2015 in NGL plant only natural gas was used in own use purposes (3.3*106 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

<u>Aviation (civil) (NFR 1.A.3.a)</u>

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 - 2013. 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 - 2014 differences vary from 2% - 14% regard to jet fuel) 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 using 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 type of fuel is 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 number of flights on domestic LTO routes is established to be 14%, and the remaining (86%) 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 take into account to get average share of fuel consumed for international LTO long distances flights in total fuel consumed for international LTO flights. 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.

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 4 were used. Regarding combustion of kerosene for stationary combustion, heavy metals, PCDD/PCDF and PAHs emission factors for NFR 1.A.2 were used.

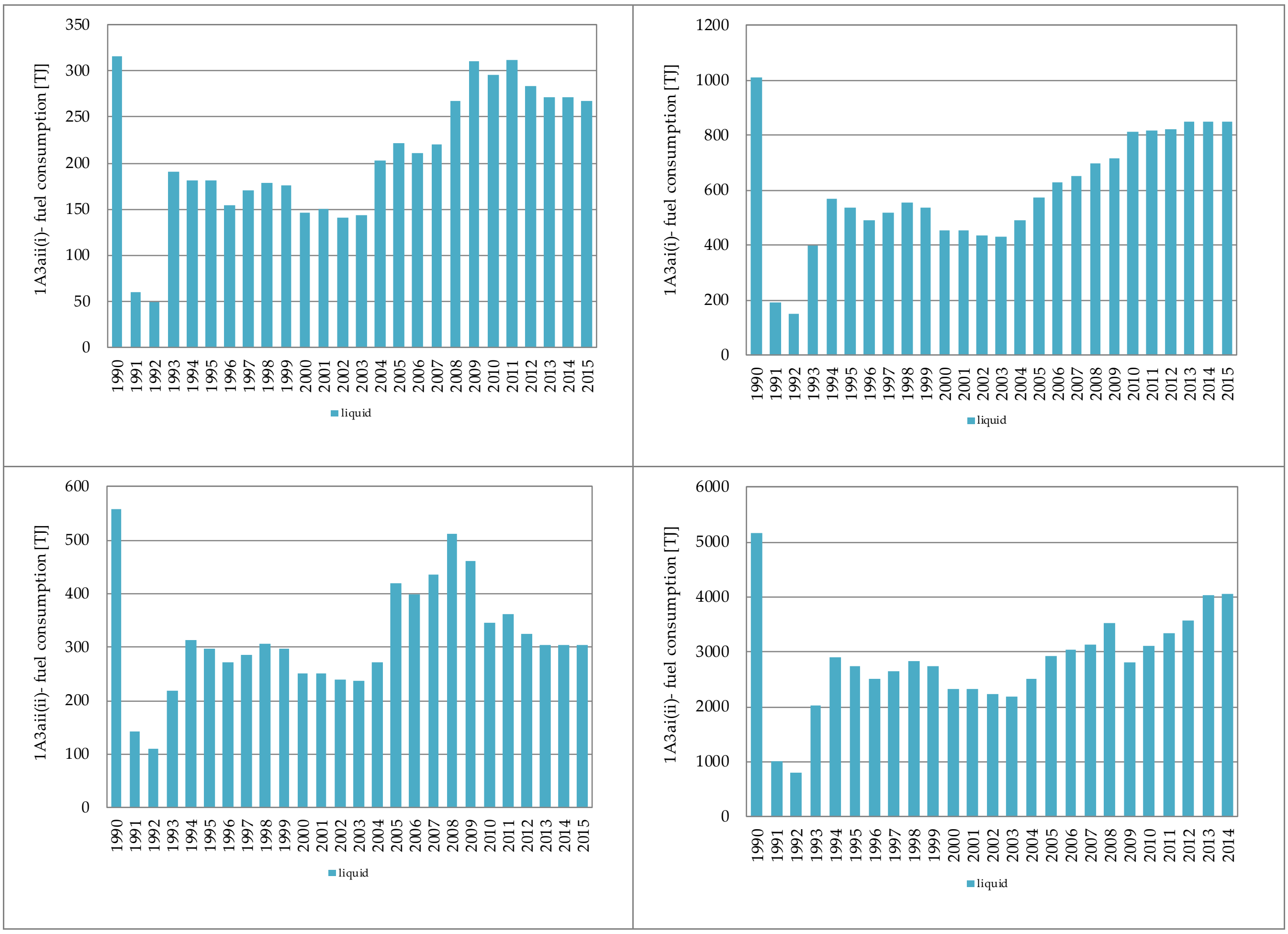


Figure 4.4-1 Activity data on fuel consumption for NFR codes 1.A.3.a.i(i), 1.A.3.a.ii(i), 1.A.3.a.i(ii), 1.A.3.a.ii(ii)

<u>Road transport (NFR 1.A.3.b)</u>

The COPERT 4 ver11.3 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: type of vehicles (passenger cars, light duty vehicles, heavy duty vehicles, buses, mopeds, motorcycles), type of motor (gasoline four-stroke, gasoline two-stroke, diesel, rotation motor and electromotor), cylinder capacity (<1.4 lit, 1.4-2.0 lit, >2.0 lit), weight class (<3.5 t, 3.5-7.5 t, 7.5-16 t, 16-32 t, >32 t) and 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. 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:

1) 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;
2) 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%).

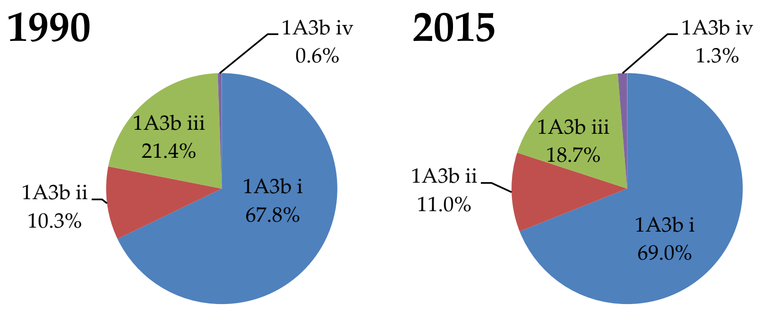
For PMs (TSP, PM_{10} and $PM_{2.5}$) emission calculations from Road surface wear (NFR 1.A.3.b.vii) the Tier 1 EMEP/EEA methodology is used, due to this source category is not a key source. The proposed Tier 1 emission factors have been estimated using the Tier 2 method and assuming some default emission values for vehicle characteristics. Emission factors are given as a function of each vehicle category alone. The relevant activity statistics for Tier 1 are the number of vehicles in each defined category, and the average mileage driven per vehicle in each defined category (or their product, i.e. the total vehicle-km for each defined category) (Table 4.4-1). Defined categories are: (I) Two-wheel vehicles that correspond to mopeds and motorcycles, (II) Passenger cars that are small or larger family cars used mainly for the carriage of people, (III) Light-duty trucks that include vans for the carriage of people or goods and (IV) Heavy-duty vehicles which correspond to trucks, urban buses and coaches.

Table 4.4-1 Activity data for NFR 1.A.3.b.vii

Vehicle category	Two-wheelers	Passenger Cars	Light Duty Vehicles	Heavy Duty Vehicles
Unit	**k(veh*km)**	**k(veh*km)**	**k(veh*km)**	**k(veh*km)**
1990	121924	15680420	1184062	1273526
1991	129040	14689962	1221374	1283593

Vehicle category	Two-wheelers	Passenger Cars	Light Duty Vehicles	Heavy Duty Vehicles
Unit	k(veh*km)	k(veh*km)	k(veh*km)	k(veh*km)
1992	134368	13704348	1245002	1282365
1993	99244	9144898	903254	914294
1994	127028	10506048	1070718	1069551
1995	149352	11440954	1339800	1210891
1996	177040	12265666	1573440	1312718
1997	210660	13518666	1837968	1401264
1998	238520	14336854	1947726	1407495
1999	264208	15206044	2023802	1400757
2000	290256	16029580	2106104	1403346
2001	320932	16945880	2231130	1436720
2002	363048	17589474	2400244	1489777
2003	416360	18289768	2726526	1569713
2004	469732	18958702	2726526	1571000
2005	530852	19524568	2856590	1578570
2006	591444	20204898	2965842	1593991
2007	654660	20647816	3039168	1596261
2008	760508	21455952	3106224	1651410
2009	766600	21230146	2990372	1573003
2010	734780	20891094	2861408	1472130
2011	706756	20721540	2765048	1410692
2012	634180	19675376	2516866	1284313
2013	602780	18778816	2397318	1214087
2014	314056	20952974	2606032	1337042
2015	314700	21294980	2688268	1373448

The dominant fuel consumption activity in the road transport source category in 2015 has 1.A.3.b.i Passenger cars (69.0%) and 1.A.3.b.iv Mopeds and Motorcycles has the smallest contribution (1.3%). The sub-sector 1.A.3.b.ii Light Duty Vehicles has contributed with 11.0% to overall fuel consumption within the road transportation in 2015, and 1.A.3.b.iii Heavy duty vehicles with 18.7%. The trend of fuel consumption in road transportation has growing character (by 61.8%) in period from 1990 to 2015. The increase in the fuel consumption was the largest in sub-sectors 1.A.3.b.iv Mopeds and Motorcycles (by 3.7 times from 1990 to 2015) and 1.A.3.b.ii Light duty vehicles (2.7 times from 1990 to 2015). In sub-sectors 1.A.3.b.iii Heavy duty vehicles and 1.A.3.b.i Passenger cars fuel consumption have increased by 41.6% and 64.5% respectively. The Figure 4.4-2 shows the fuel consumption by type of vehicle in road transport.



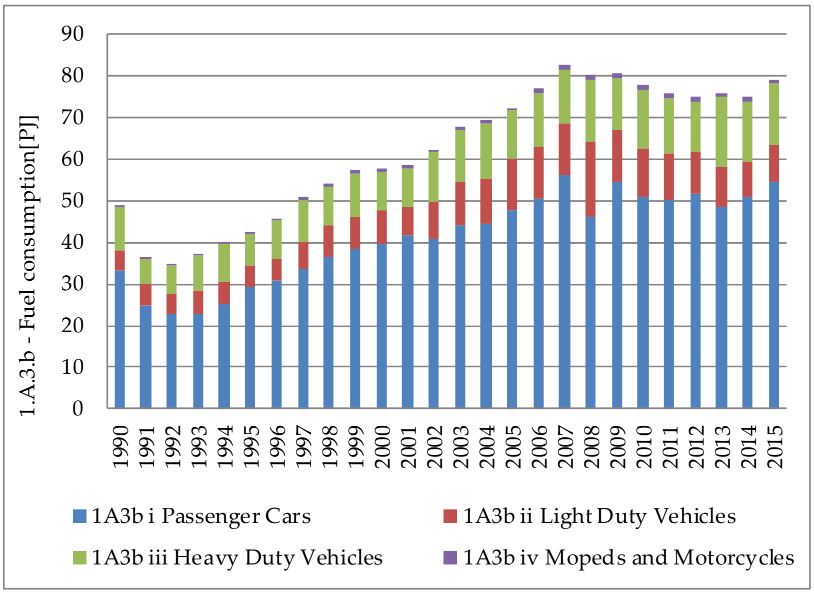


Figure 4.4-2 Fuel consumption by each type of vehicle in the road transportation

The total number of vehicles in the period 1990 - 2015 was increased by 42.1 % (Figure 4.4-3 and Table 4.4-2). The increase was largely a result of increasing number of passenger cars by 35.8 % because they presented 86.6 % of the total number of vehicles in road traffic in 2015. The number of light duty vehicles increase by 2.3 times and mopeds and motorcycles by 2.6 times in the observing period. The type and class of vehicle, their speed and driving share on each type of road are shown in Table 4.4-3.

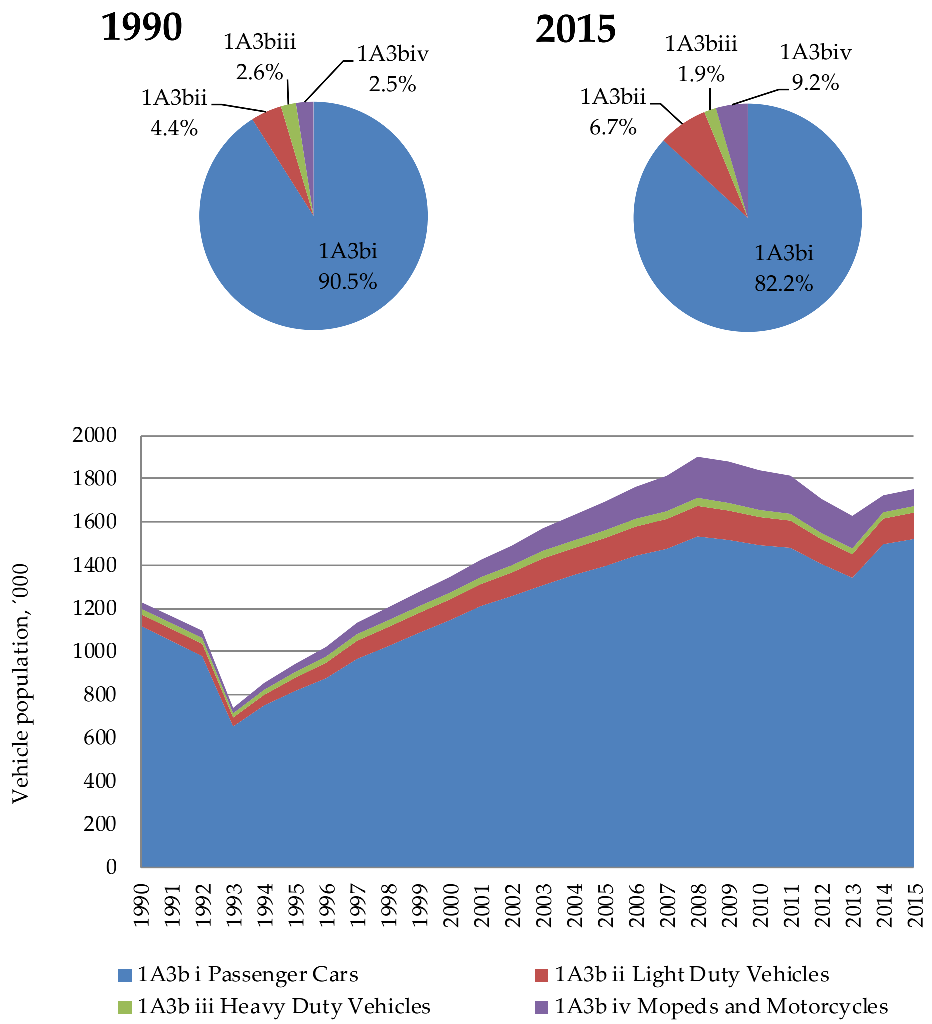


Figure 4.4-3 Number of each type of vehicle in the road transportation

Table 4.4-2 Number of road motor vehicles by type ('000)

Vehicle type	1990	1995	2000	2005	2010	2011	2012	2013	2014	2015
Passenger Cars,´000	1120	817	1145	1395	1492	1480	1405	1341	1497	1521
Light Duty Vehicles, ´000	54	61	96	130	130	126	114	109	118	122
Heavy Duty Vehicles, ´000	26	27	32	36	33	32	29	27	29	30
Mopeds Motorcycles, ´000	30	37	73	133	184	177	159	151	79	79

Source: MIA, Processing: Ekonerg Ltd.

Table 4.4-3 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
	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
Motorcycles	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 isn't a key source. The default Tier 1 emission factors, stratified by fuel types, are from GB2013. 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).

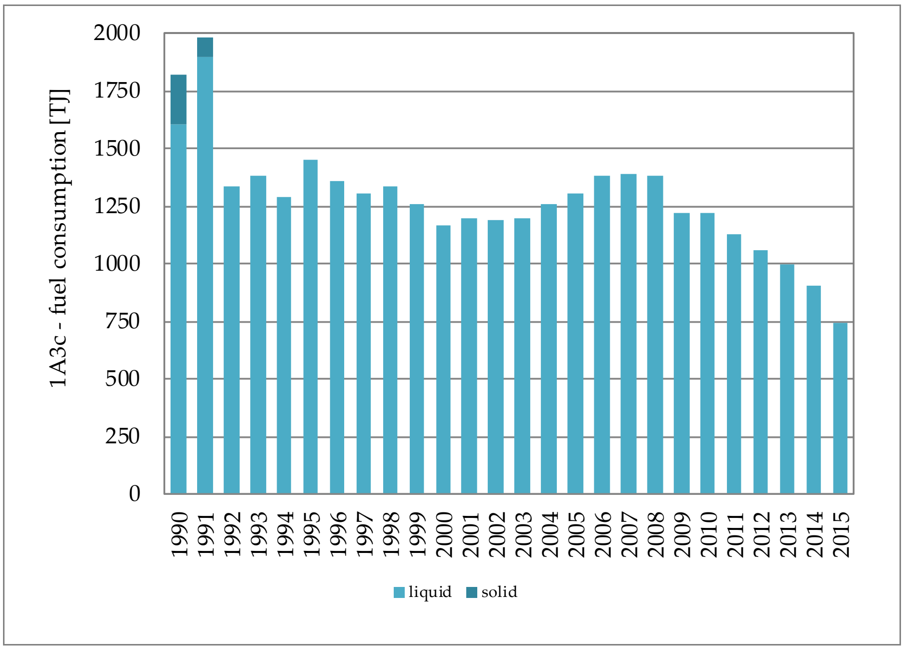


Figure 4.4-4 Activity data on fuel consumption for NFR 1.A.3.c

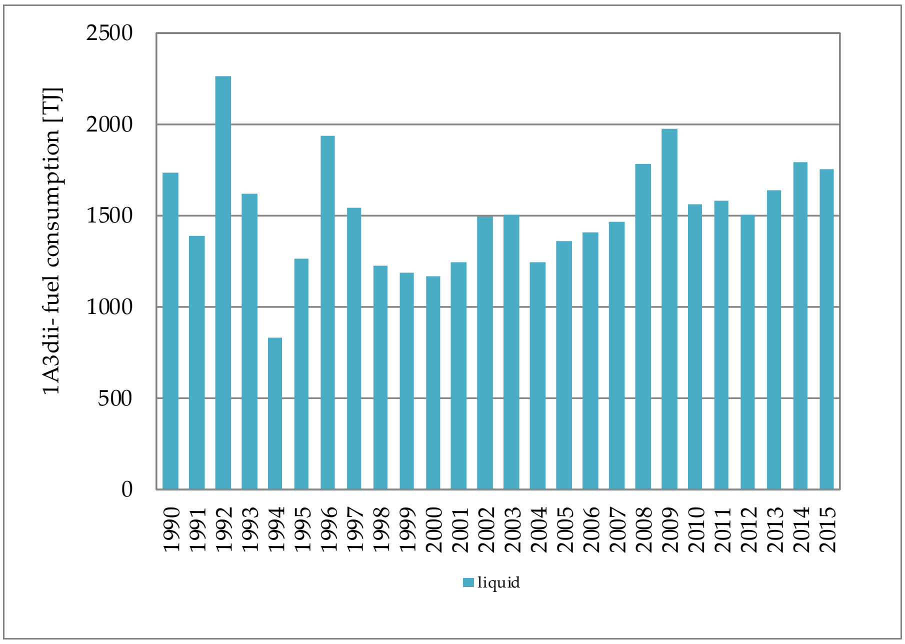
Navigation (shipping) (NFR 1.A.3.d)

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 aren't 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 GB2013 were used for fuel: gasoline and fuel oil and for diesel the Tier 2 FE from GB2013 were used, assuming for small recreational boats that they are conventional type. For pollutants for which EF re not recommended in GB2013, 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)* wer used. The SO_2 emission factors depend on the fuel quality, which is change from year to year and from year to year. 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.



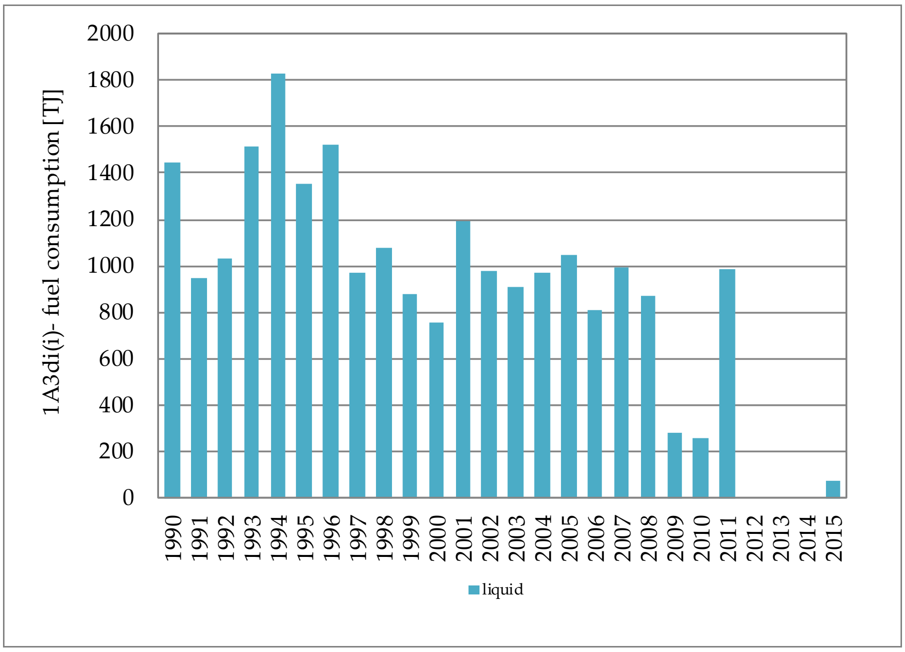


Figure 4.4-5 Activity data on fuel consumption for NFR codes 1.A.3.d.ii, and 1.A.3.d.i(i)

In accordance with the energy balance of the Republic of Croatia in the category 1.A.3.d.i(i) International navigations (bunkers) there was no fuel sold in the period 2012-2015 and notation key "NO" was used.

Recalculations and improvements

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

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), 1.A.3.a.i (ii) International aviation cruise (civil), 1.A.3.a.ii (ii) Domestic aviation cruise (civil): Correction in source due to change of activity data from EUROSTAT to national energy balance 2014.

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

In road transport sector three recalculations were preformed:

- For the period from 2011 to 2014 wrong density for compresed natural gas was used

- In 2014 during the vehicle database sorting double counting of small parts of vehicles database occurred which ledad to small differences in emissions
- Correction in source due to change of activity data from EUROSTAT to national energy balance 2014

Number of vehicles by each category as well as fuel consumption data were corrected and emissions recalculated.

Railways (NFR 1.A.3.c)

Recalculation for the year 2014 was made due to the changes from the EUROSTAT to the 2014 national energy balance, which was not available at time of inventory preparation. A revision of the data on the sulfur content in diesel fuel were made, and necessary corrections were included.

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

Recalculation for the year 2014 was made due to the changes from the EUROSTAT to the National energy balance 2014.

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.

Emission factors are expressed as the quantity of emissions of pollutants per GJ fuel consumed. All emission factors are default Tier 1 from GB2013, and are presented by NFR sectors in Appendix 4 of this report.

Structure of fuel combustion in Commercial/Institutional sector for period 1990 – 2015 is presented in Figure 4.5-1.

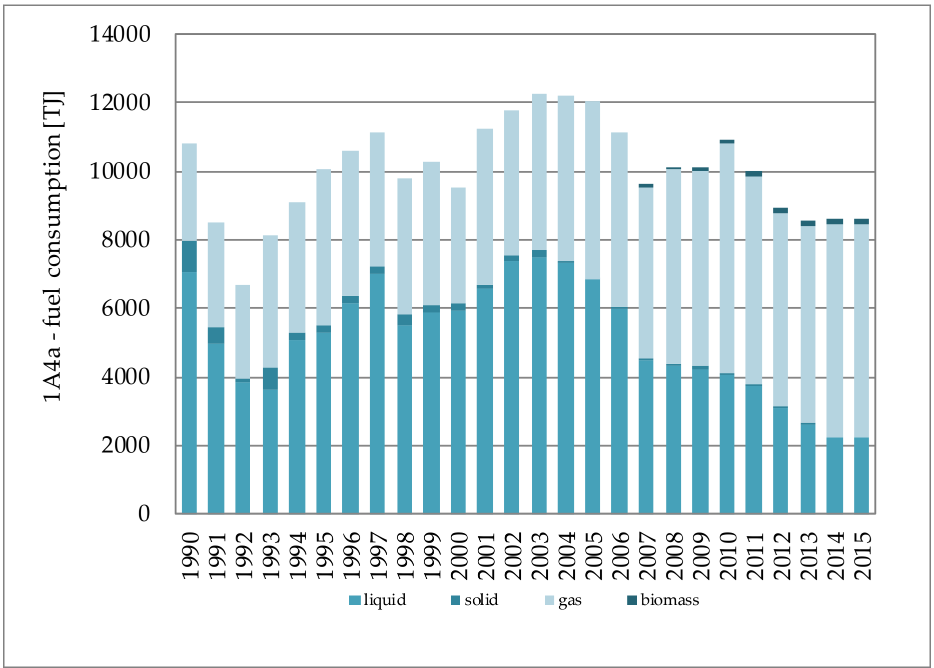


Figure 4.5-1 Activity data on fuel consumption by fuel type for NFR 1.A.4.a

<u>Residential (NFR 1.A.4.b.i)</u>

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. Created model on the technology regard to solid fuels and biomass, data from the GAINS model were used. The GAINS model is using those data for modelling the emission projections for Croatia (Table 4.5-1). For biomass, three basic types of technology were assumed: (I) biomass combustion in heating stoves, (II) biomass combustion in fireplaces and (III) biomass combustion in single house boilers (<50 kW), (IV) biomass combustion in advanced / ecolabelled stoves and boilers and (V) pellet stoves and boilers. For coal, two types of technology were assumed: (I) coal combustion in heating stoves and (II) coal combustion in single house boilers (<50 kW). 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. Results of these calculations in order to obtain images and time representation of a particular type of technology regarding biomass and solid fuels combustion are shown in Figure 4.5-1.

Table 4.5-1 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%
Biomass fuel	fireplaces	5.9%	6.0%	7.7%
	single house boilers (<50 kW)	29.4%	27.4%	15.5%
	heating stoves	64.7%	66.5%	76.8%

Source: the GAINS model

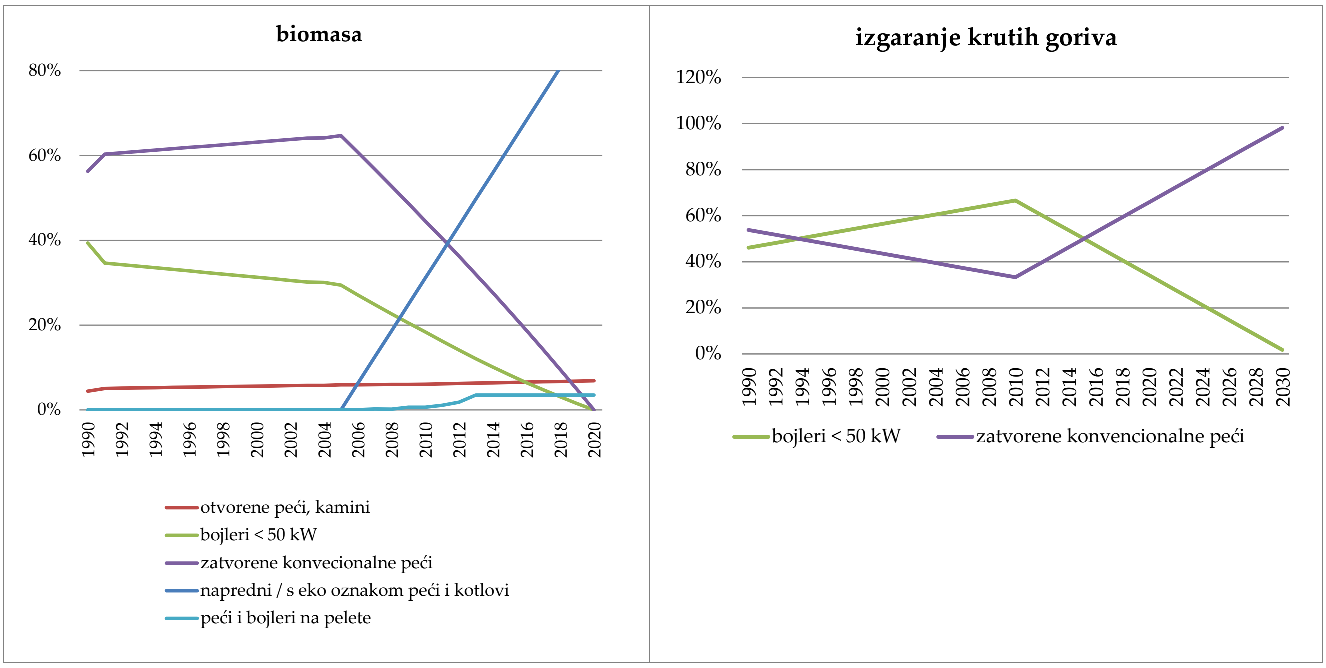


Figure 4.5-2 Model of entering of certain technologies into usage in Residential sector regarding biomass and solid fuels

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 GB2013 are represented in equal proportions for the period since 1990 (Table 4.5-2). For liquid fuels two possible technologies in accordance with GB2013 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 GB2013 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 4.5-2 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 GB2013

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 – 2015 is presented in Figure 4.5-3.

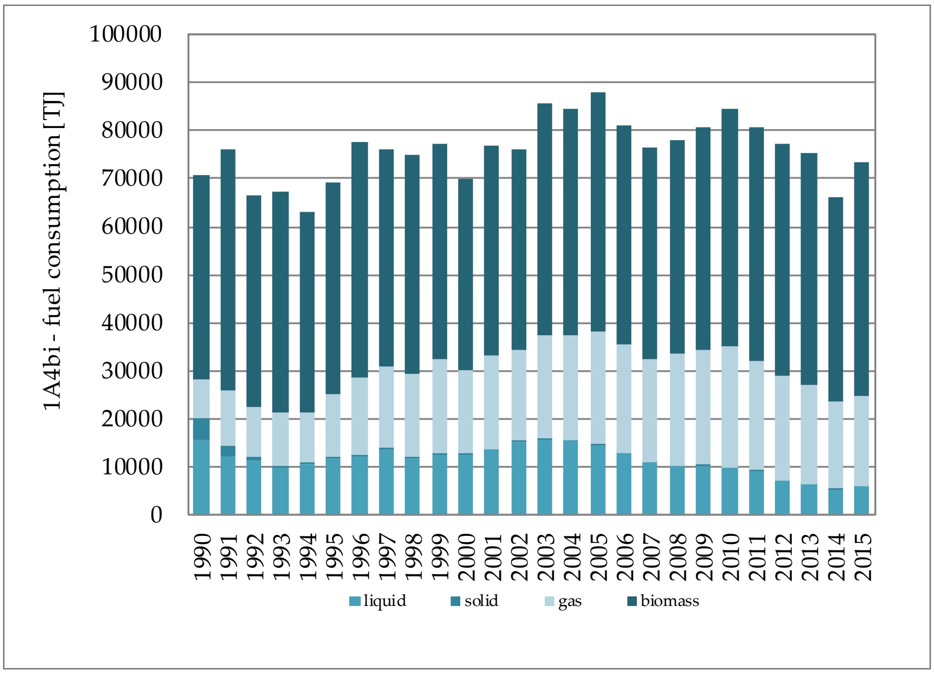


Figure 4.5-3 Activity data on fuel consumption by fuel type for NFR 1.A.4.b.i

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 GB2013 except for SO_2. For SO_2 emission calculation, national emission factor were used. National SO2 emission factor assumed two type of solid fuel use 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. All factors are presented for year 2015 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. All emission factors are default Tier 1 from GB2013, and are presented by NFR sectors in Appendix 4 of this report. Structure of fuel combustion in Agriculture/Forestry sector for period 1990 – 2015 is presented in Figure 4.5-4.

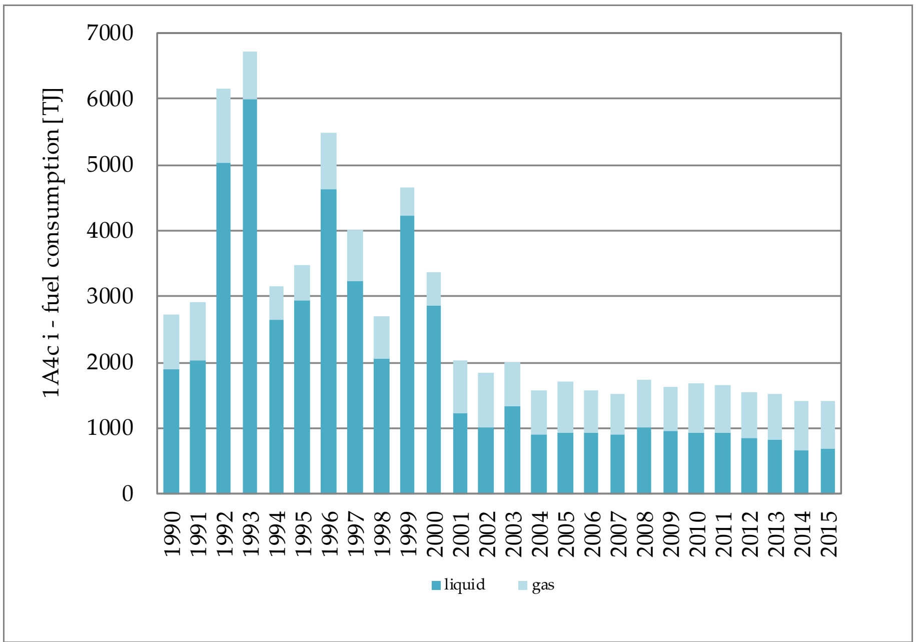


Figure 4.5-4 Activity data on fuel consumption by fuel type for NFR 1.A.4.c.i

Recalculations and improvements

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

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

In IIR 2017, the new data for consumed biomass for the period from 1990 to 2013 were included in inventory (source: revised national energy balances from 1990 to 2013) and has increasing trend by approximately 30 PJ. Data for whole historical trend were included in this submission.

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

There was no recalculation, neither improvement in this source category.

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)

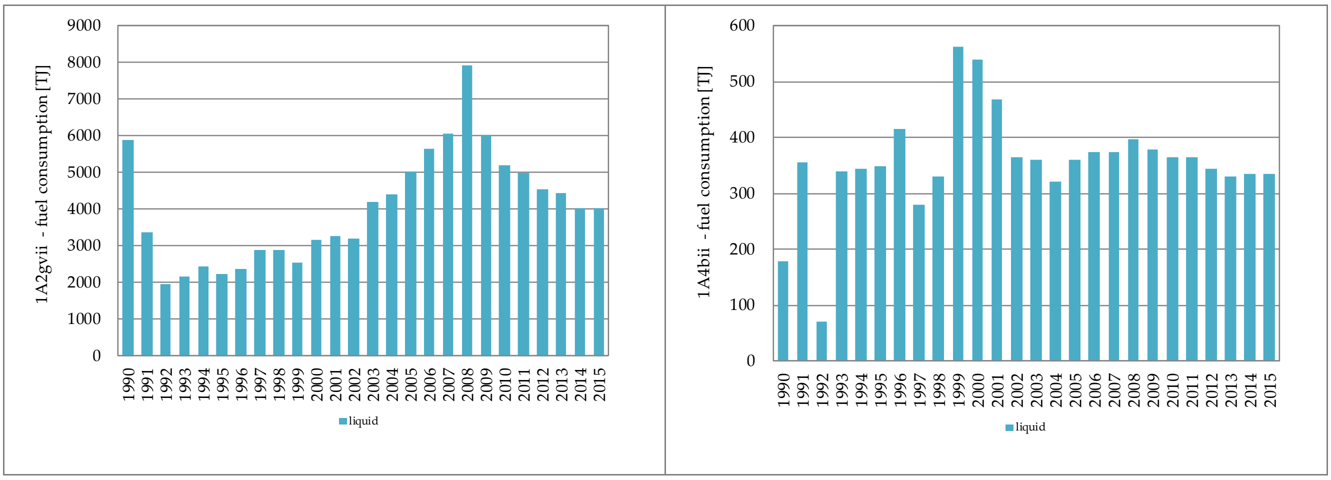
For all types of equipment, the emissions originate from the combustion of fuel to power the equipment.

Methodology, emission factors and activity data

The source category 1.A.4.ii Non-road mobile sources and machinery is a key source in Croatian inventory and Tier 2 technology-dependent advance method proposed in EMEP/EEA GB2013 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 GB2013, 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. For heavy metals and POPs, GB2013 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. For estimation of emissions of SO_2, the country specific factors are used annually stratified by fuel types.

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) 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.



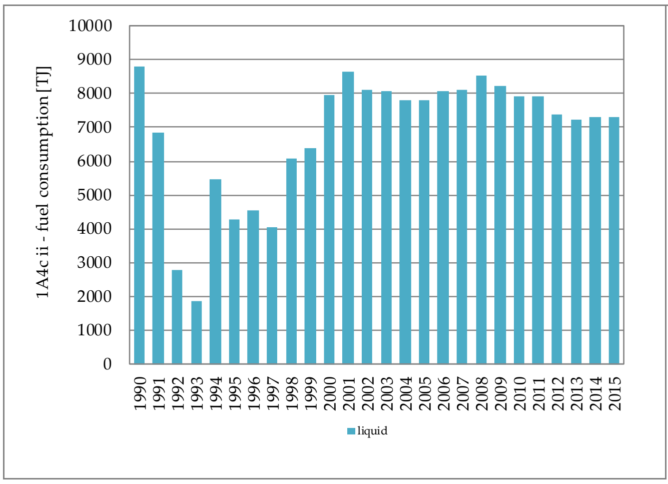


Figure 4.6-1 Activity data on fuel consumption for NFR codes 1.A.2.g.iv, 1.A.4.b.ii and 1.A.4.c.ii

Recalculations and improvements

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

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

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

Recalculation for the year 2014 was made due to the changes from the EUROSTAT to the 2014 national energy balance, which was not available at time of inventory preparation.

4.7 FUGITIVE EMISSIONS FROM FOSSIL FUEL (NFR 1.B)

Sector 1.B Fugitive emissions from fossil fuels are arising from the production, extraction of coal, oil and natural gas; their storage, processing and distribution. This section includes information on methodologies, activity data, emission factors, recalculations and planned improvements for the sector 1.B Fugitive emissions from fossil fuels. Information on this sector are also available in Croatian national inventory report (NIR 2016), under the UNFCCC.

Source category description

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

This chapter provides an overview of the source categories 1.B.1 Fugitive emissions from solid fuels and includes information on methodologies, activity, emission factors and planned improvements. This 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) for which Croatia does not report emissions bur used the notation key "NO".

This category includes emissions from mining and handling with coal, activity that exist in Croatia until 1999, as well as emissions during the coal transformation (fugitive emission from coke production), activity that exist in the Republic of Croatia until 1994. In the period from 1990 to 1999 coal production in Croatia has been on a steady decline. Until 1999 worked only Istrian underground coal (Tupljak, Ripenda and Koromačno) and they produced from 0.015 to 0.174 mill. tons of coal.

All underground and surface treatment of coal result mainly in fugitive emissions of methane, volatile organic compounds and particulate matter (TSP, PM_{10} and $PM_{2.5}$) during mining and post mining activity, handling with coal. Coke Plant is a major source of fugitive emissions into the air such as: sulfur oxides (SOx), nitrogen oxides (NOx), volatile organic compounds (non-methane VOC and methane (CH4), carbon dioxide (CO_2), carbon monoxide (CO) ammonia (NH_3), particulate matter and heavy metals and PAHs (polycyclic aromatic hydrocarbons).

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

This chapter provides an overview of the source categories 1.B.2 Fugitive emissions from oil and natural gas, and includes information on methodologies, activity, emission factors and planned improvements. This category includes emissions from oil - exploration, production and transport (NFR 1.B.2.a.i), Refining / storage (NFR 1B .2.a.iv), distribution of oil products (NFR 1.B.2.a.v), natural gas –production/processing, and transmission (NFR 1.B.2.b), Flares (NFR 1.B.2.c) and 1.B.2.d Other fugitive emissions from energy production for which Croatia do not report emissions but rather used the notation key "NO".

This category includes the fugitive emissions from exploration and production, refining, storage transportation, processing and distribution of crude oil, petroleum products (gasoline) and natural gas. Fugitive emissions also include the emissions from flared gas on oil- and gas-production installations for safety, and emissions due to degassing in the production of oil and gas. Emissions are also occurring during production and processing of natural gas and oil, transportation and use of fossil fuel. During all phases of the extraction of fossil fuel to their final use, the evaporation of highly volatile material occurs and leakage of fossil fuel is also possible.

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

Exploration production and transport of oil in the Republic of Croatia is carried out by company INA - Oil Industry dd in the segment activity SD Exploration & Production of oil and gas (formerly INA NAFTAPLIN). In Croatia, 34 oil fields are active, and the maximum amount of oil came from 8 most important fields, that contain 83% of the total reserves discovered in Croatia. During the war (1991 - 1995) from 34 oil fields, only 22 of them worked. All oil fields in Croatia are "on shore" filds.

Natural gas - production/processing, and transmission (NFR 1.B.2.b)

In Croatia, the production/processing, and transmission of natural gas takes place in private facilities. Extraction and production of natural gas in Croatia carried out by INA - Oil Industry dd in the segment activity SD Exploration & Production (formerly INA NAFTAPLIN). The main gas fields with 70% of total reserves are located in the three largest gas and gas-condensate fields, namely Molve, Kalinovac and Stari Gradac in the western part of the Drava depression, along the border with Hungary. The work site "Molve" provides between 70% and 75% of gas and condensate per year in Croatia, satisfying about 50% of the needs. One of the old gas fields around the Sava Depression, turned into underground gas storage capacity of 500 mil. m^3 (Lit 27).

Transport system, carried out by transport system operator (OTS) company Plinacro Ltd. and by distribution system operators (34 company). Also, in this sector, the Hg emission that originates from process of cleaning natural gas in central gas station (CPS Molve). Natural gas produced on Croatian gas fields (Molve and Kalinovac) contains great content of Hg (516 $\mu g/m^3$), which wasn´t extracted from natural gas until 1992. In 1993 facility for Hg emission reduction started with work and Hg emission was reduced to about 0.12 $\mu g/m^3$ since then.

The transport system managed by the transmission system operator Plinacro doo, consists of international, main, regional and developable pipeline and facilities to the pipeline, measuring reduction stations (MRS) of various capacities and other facilities and systems that enable reliable and secure transport system. Basic data of the Croatian transport system are shown in Table 4.7-1.

Table 4.7-1 Basic data on the natural gas transport system of the Republic of Croatia

Natural gas transport system of the Republic of Croatia	
Number of transmission system operators	1
The total length of pipeline gas transport system	2 693 km
Interconnection / transmission system operator:	Rogatec / Plinovodi d.o.o. (SLO) Drávaszerdahely / FGSZ Ltd. (HU)
Underground gas storage / gas storage system operator:	Okoli / Podzemno skladište plina d.o.o.
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 connection to the transmission system:	34
Number of connections to the distribution systems and the number of distribution system operators:	Number of ports: 153 Number of operators DS: 37
Number of balancing zones:	1

Source: Plinacro d.o.o. (http://www.plinacro.hr)

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

Refining / storage in the Republic of Croatia is carried out in an oil refinery owned by a company INA - Oil Industry dd at two locations in Rijeka (INA - RNR) and Sisak (INA - RNS). Production capacities of the Croatian refineries are shown in Table 4.2-2. The calculation of emissions from these categories for INA - RNS includes emissions from FCC regenerators (without CO boiler) (from 1990), catalytic reforming unit (from 1990), coking plant (from 1994) and Claus installation (from 2007). INA - RNR includes emissions from FCC regenerators (without CO boiler) (from 1990), catalytic reforming unit (two units, from 1990) and Claus installation (from 1997). Diffuse emissions from storage and handling of petroleum products in refinery are calculated from 1990 for all refineries.

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

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

- Shipping and delivery of products in the refinery dispatch stations (SNAP 050501)
- transport and transfer stations oil products (SNAP 050502) and
- reloading and handling of petroleum products at service stations (retail trade) (SNAP 050503).

Distribution in Croatia is handled by company INA - Oil Industry dd segment activity SD Retail trade. The refinery, besides all oil products, NMVOC emissions are significant only for gasoline.

Shipping and delivery of products in the refinery dispatch stations

Shipping and delivery of gasoline is carried out in Croatia in two refinery dispatch stations in Sisak and Rijeka. The following describes their specifics related to the shipping and delivery of gasoline fuel.

Shipping and delivery of gasoline fuel in the Sisak refinery is implemented:

- road transport, which uses the shipping installation: road loading PJ terminal Sisak Shipping derivatives tankers. Charging lines are equipped with a present amount of equipment and catheter to prevent overcharging.
- rail transport which uses manipulative place MM1 - delivery,
- Transportation barges carried out on the Sava River south of Sisak in the port for receiving and unloading of crude oil from the river barges, and for loading products into river barges. Installation for unloading oil, and pumping in the container sector RNS is used, the installation of boarding petroleum products not used for a long time.

Shipping and delivery of gasoline fuel in Rijeka Refinery (import, RNS, MOL) products and MTBE is carried out through the dispatch centre for road, rail, marine and pipeline transport as follows:

- Road Transport Shipping derivatives (gasoline) tank trucks is done on the road loading Šoići. Charging the upper filling open system.
- Rail transport: rail tank loading the wagon-charging also applies outdoor charging system without automatic measurement system. Unloading railway tank is done through flexible pipes, the partially closed system and without the possibility of return

of hydrocarbon vapours. All manipulation with railway tanks takes place motor locomotives. Charging is carried out by charging hands (top loading) open system.

- Marine transport petrol fuel takes place in the Port Bakar and occasionally Luka Urinj.

Transportation and transfer stations gasoline fuel

Emissions from the transport of gas in accordance with GB2013 identified as negligible. This section includes emissions from gas fuel storage at terminals. According to GB2014, the methodology for calculating emissions from the storage of petrol at terminals in refineries is covered under the category 1.B.2.a.iv refinery / storage in refineries. Therefore, it is necessary to take into account to avoid double counting of emissions, as in the case of inventory of the Croatian happened. Due to the use of simple calculation methodology in the sector 1.B.2.a.v distribution of gasoline there was double counting of emissions from the storage of petrol at terminals refineries. The specialized emissions using Tier 2 method are calculated and reported in the sector NFR 1.B.2.a.iv refinery / storage in refineries. This will be corrected for the next check-up when they will collect all the necessary information to move on to higher level budgets.

Gas stations

Handling and manipulation of gas fuel is carried out and at gasoline stations. Most emissions at gasoline stations are emissions from gasoline storage, and GB2013 propose only emission factors for petrol.

Flares (NFR 1.B.2.c)

The inventory included emissions from the two sub-categories: 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)

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

Fugitive emissions from sub-sectors: 1.B.1.a Fugitive emissions from solid fuels: Coal mining and handling (SNAP 050102 Underground mining and SNAP 050103 Storage of solid fuel) and 1.B.1.b

Fugitive emissions from solid fuel: solid fuel transformation (SNAP 040201 Coke oven (door leakage and extinction)), are calculated with Tier 1 EMEP/EEA methodology and with „top-down" approach by multiplying process specific activity data with the corresponding EMEP/EEA Tier 1 emission factors. All emission factors used for the preparation of the IIR are presented by NFR sectors and pollutants in Appendix 4.

Sources to activity data for the total mass of coal produced by underground mining for NFR 1.B.1.a and for the production of coke for the NFR 1.B.1.b are the national energy balance. Annual amount of total mass of coal produced by underground mining and annual amount of coke produced are presented in Table 4.7-2.

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

Fugitive emissions from sub-sector 1.B.2.a.i Extraction, 1st treatment and loading of liquid (SNAP 050200) are calculated with Tier 2 EMEP/EEA methodology by multiplying process specific activity data with the corresponding EMEP/EEA Tier 2 emission factors. 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 extracted in Croatia from the national energy balance and are presented in Table 4.7-2.

Table 4.7-2 Activity data for NFR code 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	Fugitive emissions from solid fuel: coal mining / handling	Fugitive emissions from solid fuel: transfor-mation	Other fugitive emiss. from solid fuel	Fugitive emission from oil: exploration/ production/ transport	Other fugitive emissions not incl. 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

NFR	1 B 1 a	1 B 1 b	1 B 1 c	1 B 2 a i	1 B 3
Name	Fugitive emissions from solid fuel: coal mining / handling	Fugitive emissions from solid fuel: transfor-mation	Other fugitive emiss. from solid fuel	Fugitive emission from oil: exploration/ production/ transport	Other fugitive emissions not incl. in 1 B 2
Unit	kt	kt	-	kt	-
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
2015	NO	NO	NA	670.2	NO

Sources: ME with assistance of EIHP, CBS
Processing: Ekonerg Ltd

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

Fugitive emissions during refining / storage (NFR 1.B.2.a.iv) were calculated using the Tier 2 EMEP/EEA methodology and "bottom-up" approach, multiplying relevant activity data with the recommended EMEP/EEA Tier 2 emission factors for specific process activities. All emission factors used for the calculation are presented by NFR sectors and pollutants in Annex 4.

Scope of process activities within the 1.B.2.a.iv Refining / storage are: 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, and other abatement techniques were not taking into account. Further, the existing facilities for refining haven't got abatement techniques installed within activity catalytic cracking (FCC) units in sub-sector 1.B.2.a.iv. Data on annual throughput of each refinery of fresh feed in FCC, reforming and coking units, and sulphur annual production were obtained from CAEN (survey request). Activity data for calculating emissions from storage and handling of petroleum products in refinery, diffuse emissions is annual total throughput of crude oil in each refinery which are from annual national energy balance. Detail activity data for sub-sector 1.B.2.a.iv by SNAP, are presented in Table 4.7-2.

Table 4.7-2 Activity data for NFR code 1.B.2.a.iv, represented by the relevant SNAP codes

SNAP	040102a	040102b	040105	040103	040104
SNAP, Name	Catalytic Cracking unit regenerator	Catalytic reforming unit	Other (Fluid coking unit)	Sulphur recovery plant	Storage and handling of petroleum products in refinery
Unit	m^3	m^3	m^3	t product	kt product
1990	1281386.9	1604752.5	NO	NO	6860.7
1991	894923.1	1025834.7	NO	NO	4510.9
1992	698051.1	765189.2	NO	NO	3935.0
1993	945750.0	1089993.2	NO	NO	4914.8
1994	842190.2	965896.8	160057.6	NO	4994.3
1995	883426.3	1240143.5	160156.6	NO	5336.1
1996	702792.0	1218952.5	130610.0	NO	5112.7
1997	699881.1	1105752.4	139063.5	2182.0	5112.0
1998	898859.7	1035149.7	154889.9	5328.0	5007.5
1999	1037236.9	1136591.1	194651.3	5898.0	5474.8
2000	1385177.6	1208675.6	190477.4	8344.0	5162.8
2001	1217423.5	1159479.8	190477.4	6742.0	4831.6
2002	1247837.5	1028707.7	214165.0	7069.0	4830.0
2003	1242743.7	1204451.0	189346.3	7471.0	4861.7
2004	1348940.9	1184513.3	176767.0	8463.0	5079.3
2005	1394164.7	1048203.3	149598.6	8134.0	4944.7
2006	1138184.8	1033704.3	191970.8	6694.0	4716.4
2007	1369880.4	1067431.1	181216.5	8910.0	5077.4
2008	1065994.3	925676.0	116827.1	9511.0	4308.7
2009	1330001.8	1048720.6	122365.0	10037.0	4824.4
2010	1027809.8	930965.3	184824.0	6370.0	4256.6
2011	836242.29	743097.3	91182.9	16317.0	3502.7
2012	906166.8	775119.3	109368.5	17534.2	2924.9
2013	562661.8	729726.9	83736.2	15902.3	3062.5
2014	553299.8	661857.0	38501.3	19384.5	2444.4

SNAP	040102a	040102b	040105	040103	040104
SNAP, Name	Catalytic Cracking unit regenerator	Catalytic reforming unit	Other (Fluid coking unit)	Sulphur recovery plant	Storage and handling of petroleum products in refinery
Unit	m^3	m^3	m^3	t product	kt product
2015	524311.0	681111.0	89984.0	17539.6	2998.2

Sources: CAEN (survey request: oil refineries)
Processing: Ekonerg Ltd

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

Fugitive emissions from sub-sectors: 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 with Tier 2 EMEP/EEA methodology and "bottom-up" approach by multiplying relevant activity data with the recommended EMEP / EEA Tier 2 emission factors, both stratified according to the different techniques in the distribution of oil products occurring in the national oil industry. According to the proposed methodology emissions from refinery, storage tanks are reported in 1.B.2.a.iv and emission from loading of mobile container in refinery are reported in 1.B.2.a.v. For source category SNAP 050502 Transport and depots (except 050503) according to GB2016 emissions from transport were identified as negligible, emissions from filling mobile containers at depots are calculated in the scope of refinery dispatch stationsand emissions at depots is gasoline storage which is coverd in 1.B.2.a.iv.

Detail activity country specific data are collected and this includes:

- loading facilities at refinery dispatch stations, terminals and depots — volume of volatile products loaded into different transport modes (road, rail and marine tanker); loading practices for specific modes of transport (top, bottom); type and extent of emission control measures in place (VRU), data source is national oil company;
- service stations — volume of gasoline sold; type and extent of emission control measures in place (Stage IB, Stage II), data source is national oil company, and 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 the true vapour pressure.

Activity data on annual amount of gasoline handled for sub-sector 1.B.2.a.v by SNAP, are presented in Table 4.7-3.

Table 4.7-3 Activity data for NFR code 1.B.2.a.v, represented by the 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 station, Road tanker	Refinery dispatch station, Rail tanker	Refinery dispatch station, Marine tanker
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	764	764	764	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	497	497	497	298.6	280.0	697.1
1994	545.63	545.63	545.63	545.63	321.0	301.1	749.4
1995	575.1	575.1	575.1	575.1	360.7	338.2	842.0
1996	626	626	626	626	319.6	299.7	746.0
1997	678	678	678	678	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	759	759	759	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

Source: MIA with EIHP, CAEN INA d.d.
Processing: Ekonerg d.o.o.

Flares (NFR 1.B.2.c)

Fugitive emissions from sub-sector 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. EMEP/EEA methodology is used with Tier 2 approach. Both the activity data and the emission factors are stratified according to the different techniques that occur in Croatia. In the venting and flaring sector, these are refinery flares, flares in natural gase extraction and well testing. Well testing is not occurring in Croatia. Tier 2 approach for emission calculation is carried out by multiplying process specific activity data for the specific technology with the corresponding EMEP/EEA Tier 2 emission factor for this technology and this pollutant. 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 Flaring in oil refinery is the annual flared amount for each refinery. The data for the flared amount for each refinery were collected for the period 2010 – 2015, and used for methodology improvement, e.g. move to Tier 2. The source of data are the national oil refinery company INA Ltd. For NMVOC and SO_2 emission calculation Tier 1 approach is used, because the data on the gaseous streams composition destructed in flares were not available. Activity data used for Tier 1 approach is the annual total throughput of refineries. Besides, these data, the data on total amount of crude oil at the entrance to the refineries is use, along with amount of fuel used by type in each of refinery. Source for the total amount of crude oil is from from the national energy balance. Source for the annual amount of fuels for the period 2008 – 2015 is the national EPR. Source for the annual amount of fuels for the period 1990-2004 is the basis for the preparation of the Energy Development Strategy of the Republic of Croatia (OG 130/09) collected from oil refinery company INA Ltd. For the period 2005-2007 the amount of fuels by type and refinery were calculated by using of the linear interpolation method. The data on annual fuel amount by refinery is used to determine the annual amount of crude oil at the entrance to each refinery. The data on total crude oil by each of two refineries in Croatia is confidential. Amount of gas flared at the each refinery in the period 1990 - 2009 were calculated by using weighting factors calculated as the average value of the known quantities of gas flared at the refinery for the period 2010-2014 and by multiplying with the estimated amount of crude oil at the entrance to each refinery. It is assumed that the average crude oil density in Croatia is 0.86 kg/dm^3. Table 4.7-4 gives the overview of activity data for NFR 1.B.2.c Venting and Flaring, SNAP 090203 Flaring in oil refinery and SNAP 090206 Flaring in gas and oil extraction.

Table 4.7-4 Activity data for NFR 1.B.2.c Venting and Flaring, SNAP 090203 Flaring in oil refinery and SNAP 090206 Flaring in gas and oil extraction

Activity data	Gas flared in refineries		Crude oil truthput in refineries	Gas flared in gas and oil extraction
Unit	GJ	GJ	t	m³
1990	211,317	727,761	6,860,700	22,313,460
1991	145,779	630,090	4,510,900	19,824,633
1992	64,444	337,790	3,935,000	14,236,376
1993	138,202	558,377	4,914,800	18,026,024
1994	141,458	534,205	4,994,300	14,848,538
1995	117,437	762,467	5,336,100	12,105,367
1996	144,703	705,871	5,112,700	11,294,150
1997	166,576	726,555	5,112,000	13,557,402
1998	162,667	861,277	5,007,500	12,396,234
1999	178,518	889,818	5,474,800	14,990,742
2000	150,652	1,002,606	5,162,800	12,934,101
2001	153,651	929,303	4,831,600	15,866,449
2002	181,054	834,244	4,830,000	16,733,125
2003	166,945	885,158	4,861,700	17,279,182
2004	193,983	713,208	5,079,300	17,345,753
2005	185,887	715,937	4,944,700	18,018,016
2006	179,773	742,919	4,716,400	21,409,983
2007	171,970	801,227	5,077,400	22,818,263
2008	142,593	855,865	4,308,700	21,534,636
2009	140,486	855,909	4,824,400	19,029,619
2010	125,923	512,107	4,256,600	12,015,485
2011	135,550	683,021	3,502,700	14,906,257
2012	208,873	730,163	2,924,900	11,197,569
2013	114,215	774,082	3,062,500	10,813,905
2014	54,193	893,471	2,444,000	15,115,023
2015	44,524	1,114,887	2,998,000	12,300,115

Activity data for SNAP 090206 Flaring in gas and oil extraction is the annual volume of gas flared in hydrocarbons (oil and gas) extraction. The data were collected for the period 2009 – 2015 from national oil refinery company INA Ltd., and used for methodology improvement, e.g. move to Tier 2. Annual volume of gas flared in gas and oil extraction in the period 1990 - 2008 were calculated by using weighting factor calculated as the average value of the known quantities of annual gas flared in gas and oil extraction for the period 2009-2015 and by multiplying with the annual volume of total gas and crude oil extracted in Croatia. It is assumed that the average crude oil density in Croatia is 0.86 kg/dm^3 and average desiti of natural gas 0.73 kg/m^3.

Natural gas - production / processing and transmission (NFR 1.B.2.b)

Emissions from the production / processing and transmission of natural gas are calculated by applying the Tier 2 EMEP / EEA methodology. Company OTS Plinacro Ltd reports CH_4 emissions to the EPR. Data were available from 2011 to 2015. CH_4 emissions from natural gas transmission are estimated on the basis of the registered loss in transmission networks and emissions from natural gas consumption on measuring reduction stations for pressure regulation (MRS) (Oertenblad, 2007). In Croatian natural gas transmission system, the only loss in network is during the maintenance on specific pipeline section. According to OTS Plinacro Ltd, there is a very good maintenance of pipelines in the network, and looses are minimized because they are the expence of the system. Further more, the plan is to include the compressors during the maintance of the pipeline sequence so the losses will be further reduced.

NMVOC emissions from natural gas distribution was calculated on the base of direct CH_4 emissions reported in EPR basis and are directly related on the quality of natural gas that are published by the company Plinacro doo (Equation 1). Standard quality gas in Croatia is regulated by the following legal framework: The Energy Act (OG 120/12 and 14/14), Gas Market Act (OG 28/13 and 14/14) and the General Terms of gas supply - Table 3 in Annex 2 (OG 158/13). Monitoring the quality of natural gas and reporting of the same in the legal competence of the OTS company Plinacro doo and ODS which every 15 days, in accordance with Article 57 of the Grid Code Gas Distribution System (OG 155/14), based on samples of natural gas to take measurement-reduction station (PMRS) by a certified laboratory, delivers suppliers of natural gas report on testing the quality of gas. All values refer to the volume of gas of 1 m^3 in standard condition in which the absolute pressure of the gas 101.325 Pa (1.01325 bar) and temperature of gas 288.15 K (15° C).

$$\boldsymbol{E_{NMHOS} = E_{CH4} \times (W_{NMHOS} / W_{CH4})} \qquad \text{(Equation 1)}$$

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 RPR

For the calculation of emissions from the transmission and distribution of natural gas Tier 2 methodology was used with activity data on the quantities of natural gas transported in period from 2002 to 2015 (Table 4.7-4). For the period from 1990 to 2001, data on the natural gas quantities were estimated on the basis of production data for natural gas (source: National energy balance) and the average share for gas transportation in the total amount of natural gas produced (2002 - 2013). Based on specific data for CH_4 emission available since 2010 and specific data on mass composition of natural gas available since 2010. Specific NMVOC emission factors were calculated on the yearly base and their average value was applied to the historical trend from 1990 – 2009 (Table 4.7-6). For the calculation of NMVOC emission from extracting natural gas, the recommended Tier 2 emission factor is used (Table 4.7-5).

Table 4.7-4 Activity data for NMVOC emission estimation for sector NFR 1.B.2.b.2 Transmission of natural gas

NFR 1.B.2.b.2	Transported amount NG (historical data) (IMRS +PSP)		
Year	**GWh**	**GJ**	**1000 m3***
1990			2507.45
1991			2355.86
1992			2233.00
1993			2537.67
1994			2219.38
1995			2476.37
1996			2336.29
1997			2215.54
1998			2026.42
1999			2017.32
2000			2117.20
2001			2610.62
2002	27900	100440000	2954.12
2003	29500	106200000	3123.53
2004	29100	104760000	3081.18
2005	29900	107640000	3165.88
2006	29700	106920000	3144.71
2007	32300	116280000	3420.00
2008	33100	119160000	3504.71
2009	30147	108529200	3192.04
2010	32425	116730000	3433.24
2011	31679	114044400	3354.25

NFR 1.B.2.b.2	Transported amount NG (historical data) (IMRS +PSP)		
Year	GWh	GJ	1000 m3*
2012	31259	112532400	3309.78
2013	28710	103374000	3038.82
2014	25200	90720000	2668.24
2015	26400	95040000	2795.29

Note:* Grey fields contain estimated values
NG – natural gas

Source: Plinacro d.o.o. and IIR2016

Table 4.7-5 Tier 2 emission factor for NMVOC emission calculation for sector NFR 1.B.2.b

Activity	Category	Pollutant	Tier 2 emission factor	Unit
Natural gas distribution (losses)	1.B.2.b.2	NMVOC	35.85	t/m3
Natural gas production / processing	1.B.2.b.1	NMVOC	0.1	g/m3

Table 4.7-6 Tier 2 emission factor for NMVOC emission calculation for sector NFR 1.B.2.b.2

Activity	Category	Pollutant	Tier 2 emission factor, t/m3						
			*1990–2009	2010	2011	2012	2013	2014	2015
Transmission of natural gas (transport + distribution)	1.B.2.b.2	NMVOC	0.008	0.004	0.005	0.014	0.010	0.019	0.014

* FE NMVOC estimated on average value for period 2010-2015

Table 4.7-9 Activity data for NFR code 1.B.2.b, represented by the relevant SNAP codes

NFR	1 B 2 b 1	1 B 2 b 2
SNAP	050300	050600
Name	Fugitive emission from natural gas (production / processing)	Fugitive emission from natural gas: Transmission
Jed.	1000 m³	1000 m³
1990	1982300	2507.45
1991	1824300	2355.86
1992	1803000	2233.00
1993	2049000	2537.67
1994	1792000	2219.38
1995	1966400	2476.37
1996	1785600	2336.29
1997	1717200	2215.54
1998	1570100	2026.42
1999	1550550	2017.32
2000	1638500	2117.20

NFR	1 B 2 b 1	1 B 2 b 2
SNAP	050300	050600
Name	Fugitive emission from natural gas (production / processing)	Fugitive emission from natural gas: Transmission
Jed.	1000 m³	1000 m³
2001	2010400	2610.62
2002	2120300	2954.12
2003	2189600	3123.53
2004	2198100	3081.18
2005	2283400	3165.88
2006	2713500	3144.71
2007	2892100	3420.00
2008	2729400	3504.71
2009	2704800	3192.04
2010	2727200	3433.24
2011	2471400	3354.25
2012	2013100	3309.78
2013	1856100	3038.82
2014	1747000	2668.24
2015	1780500	2795.29

Source: MIA with EIHP, CAEN and Plinacro d.o.o.
Processing: Ekonerg d.o.o.

Recalculations and improvements

Natural gas - production / processing and transmission (NFR 1.B.2.b)

Recalculation was carried out due to methodology improvement to Tier 2. The improvement was carried out within the project "Improvement of emission inventories of air pollutants in accordance with the requirements of the LRTAP Convention - Tier 2" project assignment "Improvement of air emission calculations for sector 1.B.2 Fugitive emissions from fossil fuels (i. NFR 1.B.2.b Distribution of natural gas), 2016 g.

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

Recalculation was made, due to the update of FE according to EMEP/EEA methodology and using a new set of activity data.

The plan is to recalculate the trend due to methodology improvement to Tier 2. Improvement was conducted within the project "Improvement of emission inventories of air pollutants in accordance with the requirements of the LRTAP Convention" project assignment "Improvement of air emission calculations for the sector 1.B.2 Fugitive emissions from fossil fuels (ii. NFR 1.B.2.b distribution of petroleum products (gasoline)), 2016 g. Due to the short deadline, the improvement could not be included in this year's submission and will be included in the report in the next submission.

Flares (NFR 1.B.2.c)

Recalculation of historical trend was carried out due to the methodology improvements.

V INDUSTRIAL PROCESSES AND PRODUCT USE (NFR 2)

This chapter gives an overview of the sector 2 Industrial processes and product use and contains information on methodologies, activity data, emission factors, recalculations and planned improvements. Information on this sector is also available in the Croatian NIR 2017 under the UNFCCC. Industrial process includes emissions that originate from the process (called process emissions). Emissions from fuel combustion in industry are distributed in NFR sector 1.A.2.f.i fuel combustion in industry and construction (see section 3.1). Product use is concerning solvent and solvent-based products which are the source of NMVOC emission. Solvents are chemical compounds, which are used to dissolve substances as paint, glues, ink, rubber, plastic, pesticides or for cleaning purposes (degreasing). After application of these substances or other procedures of solvent use most of the solvents are released into air. Because solvents consist mainly of NMVOC, solvent use is a major source for anthropogenic NMVOC emissions. Once released into the atmosphere NMVOCs react with reactive molecules (mainly HO-radicals) to finally form CO_2.

This source category includes the following sub-sectors from which certain pollutant emissions in the Republic of Croatia occur:

- **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 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

Generally, method for emission calculation from industrial processes and product use includes product of observed activity data with the appropriate emission factors (Tier 1 and Tier 2). Methodology for specified activity in NFR code 2 is providing in following sub-chapters.

Emission factors are expressed as the quantity of pollutant emission per unit of production or per population. Used emission factors are from *the EMEP / CORINAIR Atmospheric emission inventory Guidebook - Second Edition (1999), EMEP/EEA Guidebook – 2013*. The source of emission factors used for emission calculation is noted in each of sub-sector under NFR code 2. Emission factors used for the preparation of the IIR presented by NFR sectors and pollutants are given in Appendix 4.

Generally three sources of information concerning activity and emission data for the processes and product use have been used:

- Emission data as reported annually by facilities in legally required forms under the Croatian EPR.
- National production statistics at national level from the Croatian CBS (the Annual Statistical Reports, Industrial production, Annual PRODCOM Results).
- Plant specific data collected by direct contacts with facilities mainly for LCPs (e.g. facilities for production of cement, lime, sugar etc.)

5.1 MINERAL PRODUCTS (NFR 2.A)

Source category description

The present source category gives overview of the production of various mineral products in the Republic of Croatia. The following processes are represented under source category 2.A Mineral products (SNAP codes are included) in Croatia: 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" due to PM emissions are included in other NFR 2.A codes.

Cement production (NFR 2.A.1)

Cement production occurs at four facilities in Croatia. In three facilities Portland cement is producing and in one Aluminate cement is producing. Different raw materials are used for Portland cement and Aluminate cement production.

Lime production (NFR 2.A.2)

During the reporting period, in operation were total of four manufacturers (five factories) of lime in Croatia; one of them was producing both quicklime and dolomitic lime and the others were producing only quicklime, which had a varying production and even periods of halted operations over the years. Since March 2011, two of the factories canceled their production and since 2012 yet another. An amount of quicklime produced in sugar factories (in three facilities) during observing period, together with amounts of quicklime produced in the blast furnace processes during 1990 and 1991, have been also included in this source category.

Glass production (NFR 2.A.3)

This source category includes production of flat glass production, container glass production, and mineral wool production. Facility for mineral wool production has started to work 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, chalk and slate, operation of gravel and sand pits; mining of clays and kaolin, mining of chemical and fertiliser minerals, extraction of salt and mining and quarrying of other minerals not elsewhere classified. Information on production statistic by type of minerals is using for emission calculation.

Construction and demolition (NFR 2.A.5.b)

The basis for the calculations is national statistical data on construction and demolition activities, specifically 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 for cement production is based on Tier 2 EMEP/EEA methodology, by multiplying the annual amount of clinker produced with the appropriate emission factor. Emission factors for cement production are from GB2013. In direct contacts with all existing facilities for cement production it was decided to include Tier 2 emission factors for PM for source category 2.A.1 Cement production with inclusion of existing abatement technologies in all of facilities: ESP on main stack and smaller fabric filters for moderate control of fugitive sources for whole observed trend. For each of facilities and emissions of pollutants specific for fuel combustion are allocated in energy sector, source category 1.A.2.f.i for whole trend since 1990.

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 GB2013.

The activity data on clinker and cement production are collected by survey of all cement manufacturers in Croatia and cross-checked with cement and clinker production data from Annual Statistical Reports, Industrial production, Annual PRODCOM Results (CBS) and with data provide in EPR data base. Results of comparison showed that there is no significant difference between these sets of data. The activity data on clinker and cement (Portland and Aluminate) production are presented in Table 5.1-1. Emission factors used for the preparation of the IIR 2017, presented by NFR sectors and pollutants, are given in Appendix 4.

Lime production (NFR 2.A.2)

Methodology for emission calculation for lime production is based on Tier 2 EMEP/EEA methodology, by multiplying the annual amount of quicklime produced with the appropriate emission factor. For lime production Tier 2 controlled emission factors for PM from GB2013 are used.

All facilities for lime production have installed fabric filter on rotary kilns and bag filters for de-dust the emissions during lime hydrating, and also fabric filters for emissions control from conveyor belts of quicklime in all of facilities. Emission of pollutants which are specific for fuel combustion, were allocated in energy sector, source category 1.A.2.f for whole trend since 1990.

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 GB2013.

Data on the amount of lime produced in Croatia includes the amount of lime produced in a lime facilities (1990 - 2015), quicklime produced in blast furnaces in 1990 and 1991 and the quantity produced in sugar production facilities. The activity data for quicklime and dolomitic lime production were collected by survey among all lime manufacturers in Croatia and cross-checked with lime production data from Annual Statistical Reports, Industrial production, Annual PRODCOM Results (CBS) and with data provide in EPR data base. Results of comparison showed that there is no significant difference between these sets of data. The activity data on lime production are presented in Table 5.1-1. Emission factors used for the preparation of the IIR 2017, presented by NFR sectors and pollutants, are given in Appendix 4.

Glass production (NFR 2.A.3)

Methodology for emission calculation for glass production is based on Tier 1 EMEP/EEA methodology, by multiplying the annual amount of glass produced with the appropriate emission factor. Methodology for emission calculation for mineral wool production is based on Tier 3 EMEP/EEA methodology and is based on continuously measured and verified annual emissions from one facility. For the activity glass production, the recommended Tier 1 emission factors from GB2013 were used. Emissions of PMs and HMs were estimated using Tier 1 EMEP/EEA methodology. For activity mineral wool production, facility specific emission factors for NH_3, NMVOC, PMs were calculated from facility direct emissions and annual production capacity. The 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 includes also the data for mineral wool production are presented in Table 5.1-1. Emission factors used for the preparation of the IIR 2017, 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 methodology, by multiplying the annual amount of minerals with the appropriate emission factor. The recommended Tier 1 emission factors from GB2013 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 presented in Table 5.1-1. Emission factors used for the preparation of the IIR 2017, 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 methodology, by multiplying the annual amount of floor area of the building constructed or demolished with the appropriate emission factor. The recommended Tier 1 emission factors from GB2013 were used. The activity data are taken from the Annual Statistical Reports, Industrial production, Annual PRODCOM Results (CBS) and presented in Table 5.1-1. Emission factors used for the preparation of the IIR 2017, presented by NFR sectors and pollutants, are given in Appendix 4.

Table 5.1-1 Activity data for NFR codes 2.A.1, 2.A.2, 2.A.3, 2.A.5.a and 2.A.5.b

NFR	2.A.1			2.A.2	2.A.3	2.A.5.a	2.A.5.b
Name	Clinker	Portland Cement	Aluminate Cement	Lime production	Glass production	Quarrying and mining of minerals other than coal	Construction and demolition
Unit	kt	kt	kt	kt	kt	kt	m^2
1990	1888.11	2598.07	44.70	232.30	275.49	27.02	2826634
1991	1177.59	1702.59	33.18	165.40	252.94	18.86	2119965
1992	1401.77	1810.78	30.53	124.49	143.90	18.51	1411541
1993	1206.36	1596.24	36.90	134.48	134.41	16.77	1345926
1994	1531.48	2049.14	31.50	140.12	162.22	19.84	1499057
1995	1182.29	1571.42	39.73	139.70	166.81	20.43	1918453
1996	1286.50	1643.05	51.65	175.74	153.76	23.25	2359648
1997	1505.72	1906.13	59.37	186.91	127.32	17.60	2216206
1998	1649.11	2161.83	68.50	195.38	148.33	18.83	2206747
1999	2151.01	2549.73	79.74	189.11	136.26	19.39	2012288
2000	2382.15	2909.47	83.39	193.01	139.06	20.76	717801
2001	2739.25	3152.81	84.66	239.36	150.34	23.66	2061231

NFR	2.A.1			2.A.2	2.A.3	2.A.5.a	2.A.5.b
Name	Clinker	Portland Cement	Aluminate Cement	Lime production	Glass production	Quarrying and mining of minerals other than coal	Construction and demolition
Unit	kt	kt	kt	kt	kt	kt	m^2
2002	2698.60	3415.01	76.74	269.27	158.54	26.19	2942136
2003	2692.09	3607.84	81.86	249.34	186.97	31.23	3438150
2004	2852.24	3553.99	89.56	284.01	210.65	33.20	3449089
2005	2926.58	3528.54	100.51	309.59	227.81	30.92	4089576
2006	3104.37	3657.89	98.04	366.24	228.67	35.95	4570084
2007	3160.52	3613.55	111.62	376.59	237.50	37.51	5218050
2008	2995.05	3671.83	108.89	367.38	255.07	43.89	4882190
2009	2439.06	2847.05	80.95	251.00	280.92	35.02	3967687
2010	2320.48	2687.54	93.13	222.47	295.17	24.16	3388897
2011	2071.66	2602.96	104.69	182.14	320.47	25.60	2703950
2012	1979.91	2155.36	100.20	139.61	300.11	24.86	2727335
2013	2198.30	2333.11	103.04	126.99	327.38	23.73	1961243
2014	2278.48	2375.33	112.17	135.62	364.92	23.48	1695871
2015	2158.66	2355.90	118.36	134.24	334.80	24.29	1924884

Source: CBS,
Processing: Ekonerg Ltd

Recalculations and improvements

Cement production (NFR 2.A.1)

The activity data on clinker and cement (Portland and Aluminate) production for the period 2010 – 2014 are aligned with the data presented in the Croatian NIR 2017.

Lime production (NFR 2.A.2)

The activity data on quicklime and dolomitic lime production for the periods 1990 - 1992, 1994 - 1998 and 2000 - 2014 are aligned with the data presented in the Croatian NIR 2017.

Glass production (NFR 2.A.3)

Recalculation was performed for 2014 due to alignment with the data presented in the Croatian NIR 2017.

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

Construction and demolition (NFR 2.A.5.b)

There was no recalculation and other improvement in this report.

5.2 CHEMICAL INDUSTRY (NFR 2.B)

Source category description

The present sub-chapter gives overview of the production of various inorganic and organic chemicals in the Republic of Croatia. The following processes are represented under sub-sector 2.B Chemical industry (SNAP codes are included) in Croatia: 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).

Neither Adipic acid production (2.B.3) nor Carbide production (2.B.5) occurs in Croatia.

For source category 2.A.10.b Croatia is using notation key "IE" due to PM emissions are included in other NFR 2.B codes.

Ammonia production (NFR 2.B.1, SNAP 040403)

There is only one facility of ammonia in Croatia. The same manufacturer also has facilities for nitric acid production, sulphuric acid production and mineral fertilizers production. Also the same manufacturer had facility for black carbon production which was shut down during 2009. Data on emissions have been obtained directly from the facilities and from official statistics.

Nitric acid production (NFR 2.B.2, SNAP 040402)

There is one manufacturer of nitric acid in Croatia. Nitric acid is used in the manufacture of fertilizers by same facility. Data on emissions have been obtained directly from the facilities and from official statistics.

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. Production of following chemical products was shut down as follow: ammonium phosphate and carbon black during 2009, ethylene, propylene, polyethylene LD and polystyrene during 2011, 1,2 dichloroethane during 2001, vinyl chloride during 2002, polyvinylchloride during 2000, styrene during 1992, ethyl benzene during 1991. Production of sulphuric acid has been stopped for two years in 2010 and 2011. Data on emissions have been obtained directly from the facilities for sulphuric acid, NPK fertilizers, urea, and carbon black and from official statistics for all other activities. In 2015 there was no production of following inorganic chemicals: ethylene, propylene, polyethylene LD, polystyrene.

Methodology, emission factors and activity data

Ammonia production (NFR 2.B.1, SNAP 040403)

The methodology of the emission calculation is based on the Tier 2 EMEP/EEA methodology by means of multiplying annual amount of ammonia produced with the appropriate emission factor. For ammonia production Tier 2 EF from GB2013 were used for CO and NH_3 emissions while for NOx, the facility specific annual emission factors were used since 1998. For years in period 1990 to 1997 an average NOx emission factor was calculated and used, based on available direct NOx emissions. Data on the ammonia production were collected from the survey of one manufacturer in Croatia and verified by comparison with Annual Statistical Reports, Industrial production, Annual PRODCOM Results (CBS). Data are presented in Table 5.2-1.

Nitric acid production (NFR 2.B.2, SNAP 040402)

For nitric acid production the NOx emission is estimated. The methodology of the emission calculation for nitric acid production is Tier 2 EMEP/EEA methodology. Since 1998, facility specific emission factors were calculated from direct measured NOx emissions and annual production capacity. For years in period 1990 to 1997 an average NOx emission factor was calculated and used, based on available direct NOx emissions. Data on the production of nitric acid were collected from the survey of the one existing manufacturer in Croatia and verified by comparison with Annual Statistical Reports, Industrial production, Annual PRODCOM Results (CBS). Data are presented in Table 5.2-1.

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 GB2013 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 measured emissions and annual production capacity. For years in period 1990 to 1997 (for TSP period 1990 - 2006) an average NOx, NH_3 and TSP emission factors were calculated and used, based on available direct emissions.

For Sulphuric acid production SO_2 emissions were reported. Those direct SO_2 emissions are facility specific emission since 1998. For years in period 1990 to 1997 an average SO_2 emission factor was calculated and used, based on available direct SO_2 emissions 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 GB2013 were used. Regarding NH_3, direct facility specific emissions since 1998 were used. For years in period 1990 to 1997 an average

NH_3 emission factor was calculated and used, based on available direct NH_3 emissions and annual production capacity.

For Carbon black production Tier 2 EMEP/EEA 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. In the period 2000 - 2009 a facility specific direct CO emissions were reported.

For Ammonium phosphate production Tier 2 emission factors form GB2013 were used for TSP, PMs and BC emission estimation.

Data on the production of ammonia, nitric acid, sulfuric acid, NPK fertilizer and urea were collected from the survey of the main 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 from national statistic (Annual Statistical Reports, Industrial production, Annual PRODCOM Results (CBS)). All activity data regarding source category other chemical industry (NFR 2.B.10.a) are presented in Tables 5.2-1 and 5.2-2. Emission factors used for the preparation of the IIR 2017, presented by NFR sectors and pollutants, are given in Appendix 4.

Table 5.2-1 Activity data for NFR codes 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

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
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

Source: CBS (survey request: fertilizers producers), Processing: Ekonerg Ltd

Table 5.2-2 Activity data for NFR code 2.B.10.a, represented by the relevant SNAP codes

NFR	2.B.10.a									
Name	Styrene	Ethyl-ene	Propyl-ene	1,2 dichloro-ethane	Vinyl-chloride	Poly-ethylene LD	Poly-vinyl-chloride	Poly-styrene	Ethyl-benzene	Form-aldehyde
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	NO
1991	NO	66871	15272	68325	88135	136039	67934	33719	288	NO
1992	NO	68318	13349	92089	118570	141614	70969	44389	NO	NO
1993	NO	68634	9026	79608	103851	144415	44259	64269	NO	NO
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
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

NFR	2.B.10.a									
Name	**Styrene**	**Ethyl-ene**	**Propyl-ene**	**1,2 dichloro-ethane**	**Vinyl-chloride**	**Poly-ethylene LD**	**Poly-vinyl-chloride**	**Poly-styrene**	**Ethyl-benzene**	**Form-aldehyde**
SNAP	**040510**	**040501**	**040502**	**040503**	**040504**	**040506**	**040508**	**040511**	**040518**	**040517**
Unit	**t**	**t**	**t**	**t**	**t**	**t**	**t**	**t**	**t**	**t**
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

Source: CBS, Processing: Ekonerg Ltd

Recalculations and improvements

Ammonia (NFR 2.B.1, SNAP 040403)

Nitric acid (NFR 2.B.2, SNAP 040402)

Other chemical industry (NFR 2.B.10.a, SNAP 040400 and 040500)

There was no recalculation and other improvement in this report.

5.3 METAL PRODUCTION (NFR 2.C)

Source category description

The present sub-chapter gives overview of the production of various metals in the Republic of Croatia. The following primary metal production processes are represented under sub-sector 2.C Metal production (SNAP codes are included) 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 non-ferrous metals such as magnesium, lead, zinc, copper, nickel etc. in Croatia.

Iron and steel production (NFR 2.C.1, SNAP 0402)

In the scope of primary Iron and steel production there are: 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). The primary production of Pig iron produced in blast furnaces was existed up to 1992 when it is stopped. It should be noted that in 1990 and 1991 the required amount of sinter and pellets needed for the production of pig iron were imported from abroad, so these activities were not present in Croatia at that time. The steel was produced in the open hearth furnaces with Siemens Marten (SM) process up to 1991 when it was stopped and in the electric-arc steel furnaces (EAF) which is still present in Croatia. There are five steel manufacturers in Croatia. Steel production by one manufacturer was stopped in 2009. In 2012, steel production was considerably reduced, while in 2013 it was increased. Since 1990 in Croatia there were two rolling manufacturing processes, hot and cold. In 2009 the cold rolling mill process was stopped. Data on production have been obtained from official statistics and from existing facilities.

Ferroalloys production (NFR 2.C.2, SNAP 0403)

Ferroalloys are alloys of iron and metals such as silicon, manganese and chromium. Primary ferroalloys production was stopped in 2003. Ferroalloys production fluctuated over the period. It is mainly a result of discontinuous operation, caused by the war of independence in Croatia. Data on production have been obtained from official statistics.

Aluminium production (NFR 2.C.3, SNAP 0401)

There was only one facility for primary aluminium production in Croatia and it was shut down during 1991 mainly as a result of war activities near the location of aluminium plant. Production was carried out in two steps: 1) Preparation of bauxite ore; grind, purification and calcinations as a result of which is aluminium oxide (Al_2O_3) and 2) Electrical reduction of Al_2O_3 to aluminium by smelting.

Two types of furnace were used - indoor and outdoor types. Data on primary aluminium production were collected by survey of aluminium manufacturer. Data on production have been obtained from official statistics.

Methodology, emission factors and activity data

The methodology for emission calculation for the sector 2.C Metal production is based on the Tier 2 of the CORINAIR methodology and implies multiplication of annual amount of products with 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.

All emission factors are recommended ones for activities in the sub-sector 2.C Metal production and are in accordance with the GB2013. Emission factors used for the preparation of the IIR 2017, presented by NFR sectors and pollutants, are given in Appendix 4.

Information on the annual amounts of pig iron produced, are taken from the Croatian NIR 2017. Activity data for the quantities of steel produced (with both methods) and for rolling mills for period 1990 – 2008 that are presented in the published scientific article *Sofilić et all., Archives of Metallurgy and Materials, Vol. 53, 2008 Issue 2* are verified with data from the Annual Statistical Reports, Industrial production, Annual PRODCOM Results (CBS) as well with the data for steel production presented in the NIR 2017. Data for the quantities of steel produced in electric furnace steel plant were taken from NIR 2017 for entire reporting period (1990 – 2015). Activity data for rolling mills for the period 1990 – 2008 were taken from abovementioned scientific article, and since 2008 data were taken from the Annual Statistical Reports, Industrial production, Annual PRODCOM Results (CBS). Activity data for ferroalloys production were taken from the Annual Statistical Reports, Industrial production, Annual PRODCOM Results (CBS). Activity data for aluminium production were collected by direct survey of manufacturer. Production of iron and steel, ferroalloys and aluminium are shown in Table 5.3-1.

Table 5.3-1 Activity data for NFR codes 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	5896	NO	NO	28060	NO	NO
2013	65258	NO	NO	42248	NO	NO
2014	174620	NO	NO	35851	NO	NO
2015	148583	NO	NO	24886	NO	NO

Source: CBS (survey request: steel producers), Processing: Ekonerg Ltd

Recalculations and improvements

Iron and steel production (NFR 2.C.1, SNAP 040202, 400205, 040207 and 040208)

Electric furnace steel plant (NFR 2.C.1.1, SNAP 040207)

Recalculation was performed for the years 1992, 1994, 1995, 1997 – 2009, 2011 – 2014 due to alignment with the data presented in the Croatian NIR 2017.

Ferroalloys production (NFR 2.C.2, SNAP 040300)

Aluminium production (NFR 2.C.3, SNAP 040100)

There was no recalculation and other improvement in this report.

5.4 OTHER SOLVENT AND PRODUCT USE (NFR 2.D – 2.L)

Source category description

This chapter gives an overview of source categories NFR 2.D - 2L Other solvent and product use in the framework of which will address the sub-sectors: 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 2D-2K.

Domestic solvent use including fungicides (NFR 2.D.3.a)

Domestic solvent use including fungicides includes emissions of NMVOCs and other pollutants (e.g. Hg) arising from the domestic use of solvent-containing products. Many of these products are also used in industry and commerce. The Croatian inventory stratified following solvent-containing products use by the public: Cosmetics and toiletries products, Car care products, DIY/buildings, Paint/varnish removers and solvents, DIY/buildings, Sealants, filling agents, Hg (fluorescent tubes), Pesticides, and Domestic use of pharmaceutical products. A further distinction between aerosol and non-aerosol products is not available in national statistics.

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.

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. The national production of shingles is used as activity data.

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.d. The Croatian inventory stratified decorative, industrial and other coating application. The sub-category other coating application is excluded amount of coatings for decorative and industrial application. Available activity data in national statistic is annual amount of paint produced as aggregated value which is used in conjunction with data from EVOC database to stratify it to different techniques of application. This improvement was done in 2013 reporting round. The EVOC database at CAEN covers following activities: adhesive coating; coating activity; coil coating; dry cleaning; footwear manufacture; manufacture of coating preparations, varnishes, inks and adhesives; manufacturing of pharmaceutical products; printing; rubber conversion; surface cleaning; vegetable oil and animal fat extraction and vegetable oil refining activities; vehicle refinishing; winding wire coating; wood impregnation; wood and plastic lamination. The EVOC database had available data on the coating application in industry for the years from 2007 onward. Due to relative new database it was decided to get the representative sample of the total amount of coatings applied for each of year in period from 2008 to 2011. The average amount of coatings applied (paint) in the industrial sector in Croatia is 23% of the total amount of paint annually produced in Croatia. Few assumptions needed to be introduced to improve methodology. First it was assumed that about 10% of the total amount of coatings which is annually used in the industry is actually used by small users who do not have a legal obligation to report data in the EVOC database. The second assumption was that the amount of paint produced for industry is equal to amount of paint applied in the industry. The third assumption was that other two sub-categories, decorative and other coating application contribute with equal weighting in paints consumption as industrial coating application. Taking into account all previously mentioned, the application of paint in the industry present about 33% of the paint produced in Croatia, and the same proportion was allocated to paint consumption in industrial and other coating application. As a result, each of technique contributes with 33.3% to the total application of paint. At the end, the total amount of the paint produced in Croatia was distributed by the present methodology and resulting amounts of paint in each sub-sector were multiplied by the recommended FE (NMVOC) from the EMEP/EEA GB2013.

Degreasing (NFR 2.D.3.e)

Degreasing is a process for cleaning products from water-insoluble substances 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.

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 fibers, using organic solvents. There is no available data on quantity of solvent sold to the laundry and dry cleaning industry so for emission calculation the national population statistics is using. Activity data is from official statistical reports prepared by CBS. It need to be noted that the CBS has no intention to collect this data in the future because it is not in the scope of CBS data collection.

Chemical products (NFR 2.D.3.g)

Source category Chemical products cover 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 include 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) and Glues manufacturing (SNAP 060309). Almost all activities still exist in Croatia with the exception of the rubber production which was stopped during 2006, and polystyrene foam processing which was stopped during 2011.

Printing (NFR 2.D.3.h)

Printing includes emissions of NMVOCs arising from solvent used in printing industry. 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. In Croatian inventory the following printing categories are identified: heat set offset printing (lithography), flexography and other printing processes.

Other solvent and product use (NFR 2.D.3.i, 2.G)

Other solvent and product use includes emissions of NMVOCs arising from following activities that are present in Croatia with corresponding SNAP code: 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 060412-1), Concrete additive (SNAP 060412-2), Cooling lubricant (SNAP 060412-3), Lubricant (SNAP 060412-4) and Tobacco combustion (SNAP 060413).

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.

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.

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 emissions. The relevant activity statistic is the mass of wood products processed in Croatia.

Production of POPs (NFR 2.J)

According to GB2013 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 e.g. 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, measurement and control instruments (including laboratory and hospital instruments), electrical equipment and light bodies (light bulbs). Other products (e.g. paints, pharmaceuticals, other medical/health problems and dental amalgams) may also be a source of Hg emissions but are unlikely to be very significant on a national level. The majority of emissions of PCBs arise from leaks from electrical transformers and capacitors which contain PCBs and which are in a poor condition and/or are poorly maintained.

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 2 of EMEP/EEA 2013 methodology; multiplication of annual products amount with the appropriate emission factor. Emission factor is expressed as the amount of NMVOC emissions per annual production unit or per number of inhabitants and are shown in Appendix 4. Activity data for NFR code 2.D.3.a, represented by the relevant SNAP code are presented in Table 5.4-1.

Table 5.4-1 Activity data for NFR code 2.D.3.a, represented by the relevant SNAP code

NFR 2.D.3.a	Cosmetics and toiletries	House-hold products	Car care products	DIY/ build-ings, Paint/ varnish removers & solvents	DIY/ buildings, Sealants, filling agents	Pharma-ceutical products	Various products: Hg (fluorescent tubes)	Various products: pesticides
SNAP	060408-1	060408-2	060408-3	060408-4	060408-5	060411	060408-6	060408-7
Unit	kg products	kg products	kg products	kg solvent	kg products	population		kg 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

NFR 2.D.3.a	Cosmetics and toiletries	House-hold products	Car care products	DIY/ build-ings, Paint/ varnish removers & solvents	DIY/ buildings , Sealants, filling agents	Pharma-ceutical products	Various products: Hg (fluoresce nt tubes)	Various products: pesticide s
SNAP	**060408-1**	**060408-2**	**060408-3**	**060408-4**	**060408-5**	**060411**	**060408-6**	**060408-7**
Unit	**kg products**	**kg products**	**kg products**	**kg solvent**	**kg products**	**population**		**kg products**
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

Source: CBS, Processing: Ekonerg Ltd

Road paving with asphalt (NFR 2.D.3.b)

The methodology for emission estimation is based on the Tier 1 of EMEP/EEA 2013 methodology; multiplication of annual products amount with the appropriate emission factor. The recommended Tier 1 emission factors from the GB2013 are used. Emission factor is expressed as the amount of NMVOC emissions per annual production unit and are shown in Appendix 4. Activity data for NFR code 2.D.3.b is represented in Table 5.4-2.

Asphalt roofing (NFR 2.D.3.c)

The methodology for emission estimation is based on the Tier 1 of EMEP/EEA 2013 methodology; multiplication of annual products amount with the appropriate emission factor. The recommended Tier 1 emission factors from the GB2013 are used. Emission factor is expressed as the amount of NMVOC emissions per annual production unit and are shown in Appendix 4. Activity data for NFR code 2.D.3.c is represented in Table 5.4-2.

Coating applications (NFR 2.D.3.d)

In Croatia a data on the total amount of paint produced is available from national statistic. This data does not take into account import and export products. So, the NMVOC emission calculation includes the assumption that the quantity of imported paint is equal to quantity of paint exported. The emission calculation is performed with Tier 1 EMEP/EEA 2013 methodology; multiplication of annual paint production statistics with the appropriate emission factor. Emission factor is expressed as the amount of NMVOC emissions per annual production unit and are shown in Appendix 4. Information on activities is collected from Annual Statistical Yearbooks of the Republic of Croatia and the Annual Statistical Reports, Industrial production, Annual PRODCOM Results from the Central Bureau of Statistics and the EVOC database at CAEN. Activity data for NFR code 2.D.3.d is represented in Table 5.4-2.

Degreasing (NFR 2.D.3.e)

Emission calculation is performed with Tier 1 CORINAIR methodology; multiplication of annual population statistics with the appropriate emission factor. Tier 1 emission factor from the *EMEP / CORINAIR Atmospheric emission inventory Guidebook - Second Edition (1999)* is used for emission calculation. Emission factor is expressed as the amount of NMVOC emissions per number of inhabitants and are shown in Appendix 4. Activity data for NFR code 2.D.3.e is represented in Table 5.4-2.

Dry cleaning (NFR 2.D.3.f)

Emission calculation is performed with Tier 1 methodology, with Tier 1 emission factor proposed in EMEP/EEA 2013 methodology; multiplication of annual population statistics with the appropriate emission factor. Emission factor is expressed as the amount of NMVOC emissions per number of inhabitants and are shown in Appendix 4. Activity data for NFR code 2.D.3.f is represented 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	tone	tone	tone	population	
1990	200.42	24.52	7318	7318	7318	4778000	
1991	143.65	14.45	4624	4624	4624	4513000	

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	tone	tone	tone	population	
1992	35.60	14.34	3048	3048	3048	4470000	
1993	28.01	13.02	3022	3022	3022	4641000	
1994	254.33	13.62	3599	3599	3599	4649000	
1995	270.20	14.83	3694	3694	3694	4669000	
1996	338.82	19.65	4645	4645	4645	4494000	
1997	511.19	6.03	5001	5001	5001	4572500	
1998	500.75	9.87	5157	5157	5157	4501000	
1999	547.49	13.57	5064	5064	5064	4554000	
2000	491.33	23.41	5036	5036	5036	4381000	
2001	385.04	11.63	5598	5598	5598	4305494	
2002	741.29	9.50	5057	5057	5057	4305384	
2003	1139.45	24.74	5110	5110	5110	4305725	
2004	1350.26	24.87	5286	5286	5286	4310861	
2005	1212.13	43.79	5464	5464	5464	4312487	
2006	1118.12	72.73	5773	5773	5773	4313530	
2007	1108.25	46.82	6699	6699	6699	4311967	
2008	1338.68	25.28	6572	6572	6572	4309796	
2009	1107.73	23.49	5062	5062	5062	4302847	
2010	915.53	17.96	5465	5465	5465	4289857	
2011	973.45	16.60	5539	5539	5539	4280622	
2012	863.56	9.96	4754	4754	4754	4267558	
2013	669.99	8,22	4206	4206	4206	4255689	
2014	780.64	13.08	4727	4727	4727	4238389	
2015	763.90	38.49	4852	4852	4852	4203604	

Source: CBS, Processing: Ekonerg Ltd

<u>Chemical products (NFR 2.D.3.g)</u>

Emission calculation from the source category Chemical products is performed with Tier 2 of EMEP/EEA methodology. For the Tier 2 approach, both the activity data and the emission factors need to be stratified according to the different products that are used in Croatia, represented by the relevant SNAP codes. For chemical products with SNAP code as following: Polyvinyl-chloride processing (SNAP 060302), Polyurethane solid and soft foam processing (SNAP 060303), Rubber processing (SNAP 060305), Pharmaceutical products manufacturing (SNAP 060306), Paints manufacturing (SNAP 060307), Inks manufacturing (SNAP 060308), Glues manufacturing (SNAP

060309), recommended emission factors from *CORINAIR Technical Annexes. Vol. 2 Default emission factors handbook (1994)* were used. Emission factor is expressed as the amount of NMVOC emissions per unit of annual manufactured organic chemicals (polyester, polyvinylchloride, polyurethane soft and solid foam, polystyrene foam, rubber, paints, inks and glues), or per population (for pharmaceutical products manufacturing), and are presented in Appendix 4. For activities following activities Tier 2 default emission factors from EMEP/EEA 2013 are used: Polyester processing and Polystyrene foam processing. Activity data for various activities in the scope of NFR code 2.D.3.g are represented 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	Polyvinyl-chloride processing	Polyurethane processing	Polystyrene foam processing	Rubber process.	Paints manufac.	Inks manufac.	Glues manufac.
SNAP	**060301**	**060302**	**060303**	**060304**	**060305**	**060307**	**060308**	**060309**
Unit	**tone**	**tone**	**tone**	**tone**	**tone**	**tone**	**tone**	**tone**
1990	6.05	30.72	3.76	7.84	5.74	21.96	4.71	5.14
1991	4.16	20.34	2.80	7.34	5.44	13.83	3.65	13.45
1992	3.52	19.98	1.68	6.74	2.44	9.49	1.37	7.15
1993	2.57	15.15	2.05	6.60	2.48	9.06	1.05	10.91
1994	2.55	5.51	2.46	9.28	2.34	10.80	1.48	11.17
1995	2.23	5.35	2.91	6.45	2.29	10.77	1.42	10.08
1996	3.37	5.34	1.82	7.61	1.28	13.93	1.47	17.20
1997	7.02	5.21	1.75	10.41	0.03	15.00	1.45	10.87
1998	8.26	4.16	1.83	9.95	0.02	15.47	1.09	10.38
1999	5.61	2.90	1.83	5.35	0.02	15.19	0.81	8.21
2000	12.85	1.46	1.86	3.65	0.02	15.11	0.92	10.36
2001	9.66	1.04	2.75	1.42	0.02	16.79	0.83	12.39
2002	14.69	8.39	5.61	NO	0.02	15.17	0.87	25.85
2003	9.70	8.39	2.93	NO	0.01	15.33	0.79	30.87
2004	10.95	10.06	2.48	1.02	0.01	14.98	0.88	46.12
2005	10.89	9.40	2.92	1.68	4.0E-03	16.39	0.67	56.57
2006	14.11	8.05	2.36	10.97	4.0E-03	17.32	0.69	71.33
2007	16.55	8.61	1.87	15.77	NO	20.10	0.92	81.77
2008	16.55	9.34	1.87	16.23	NO	19.72	0.94	77.70
2009	13.99	6.82	1.03	11.05	NO	15.19	0.62	33.82
2010	7.27	4.67	0.78	10.13	NO	16.39	0.34	35.51
2011	7.07	3.83	0.62	0.58	NO	16.62	0.42	28.72
2012	7.66	3.77	0.56	NO	NO	14.26	0.26	28.80

NFR 2.D.3.g	Polyester processing	Polyvinyl-chloride processing	Polyurethane processing	Polystyrene foam processing	Rubber process.	Paints manufac.	Inks manufac.	Glues manufac.
SNAP	**060301**	**060302**	**060303**	**060304**	**060305**	**060307**	**060308**	**060309**
Unit	**tone**	**tone**	**tone**	**tone**	**tone**	**tone**	**tone**	**tone**
2013	7.87	3.16	0.55	NO	NO	12.62	0.28	31.62
2014	7.28	0.70	0.56	NO	NO	14.18	0.30	21.62
2015	8.51	0.90	0.40	NO	NO	14.56	0.35	18.81

Source: CBS, Processing: Ekonerg Ltd

Printing (NFR 2.D.3.h)

Emission calculation for source category Printing is performed with Tier 2 of CORINAIR methodology. Emission factor is expressed as the amount of NMVOC emissions per annual production unit and are shown in Appendix 4. Tier 2 default emission factors from *EMEP / CORINAIR Atmospheric emission inventory Guidebook - Second Edition (1999)* are used for NMVOC emission calculation from printing activities. For this source category emission factors are specific to the various printing process and are presented in Appendix 4. Relevant activity data for the NFR 3.D.1 is annual quantity of printing inks produced. Printing process stratification on heat set offset printing (lithography), flexography and other printing processes is available from national statistics for period from 1994 to 2006. Average quantity of graphic paint, used by identified categories are used to calculated average fraction for each of category. For all other years in trend 1990 -2015 the total quantity of graphic paint are multiply with average fraction to get quantity of graphic paint used for identified categories. The average fraction is following: 0.125 for flexography, 0.309 for offset and 0.566 for other printing processes. Activity data for NFR code 2.D.3.h are represented in Table 5.4-3.

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 2013 methodology; multiplication of annual products amount with the appropriate emission factor. Used Tier 2 emission factors are expressed as the amount of NMVOC emissions per annual production unit or per number of inhabitants and are shown in Appendix 4.

For source category 2.D.3.i, 2.G basic activity statistics are stratified by the activities involved. For activity under SNAP code 060404 Oil extractions the 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 the 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) combined with proposed assumptions in EMEP/EEA 2013.

For activity under SNAP 060413 Tobacco combustion the 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 Car dewaxing (SNAP 060409) relevant activity data annual number of motor vehicles (passenger and light cargo) imported by sea on Croatian territory. Data are available for the period 2000 - 2015, and for the years in the period 1990-1999 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 Use of shoes (SNAP 060412-1) the relevant activity statistics is annual number of sold pairs of shoes.

For Concrete additive (SNAP 060412-2) the relevant activity statistics is annual quantity of sold additives for construction activities.

For Cooling lubricant (SNAP 060412-3) and Lubricant (SNAP 060412-4) national energy balance was used as source of activity data. 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 060412-3) are assumed to be oils and fats and all other types of lubricant are assumed to be Lubricant (SNAP 060412-4).

Basic activity statistics are taken from Annual Statistical Reports, Industrial production, Annual PRODCOM Results (CBS). Activity data for SNAP 060406 and 060413 in the scope of NFR code

2.D.3.i, 2G are represented in Table 5.4-3. Activity data for SNAP codes 060406 and 060413 in the scope of NFR code 2.D.3.i, 2G are represented in Table 5.4-3. Activity data for SNAP codes: 060404, 060405, 060409, 060412-1, 060412-2, 060412-3, 060412-4 also in the scope of NFR code 2.D.3.i, 2G are represented in Table 5.4-4.

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, 2G		
Name	Printing	Wood preservation with solvent borne preservative	Wood preservation with creosote	Tobacco combustion
SNAP	060403	060406b	060406a	060413
Unit	kt	tone	tone	tone
1990	4.67	31.69	334.83	12091
1991	3.63	11.77	124.32	11232
1992	1.34	25.50	269.43	12428
1993	0.98	21.40	226.08	11271
1994	1.42	51.41	508.73	4856
1995	1.37	50.68	362.50	11845
1996	1.42	50.05	473.00	11327
1997	1.43	43.21	409.63	11185
1998	1.07	47.91	402.58	11965
1999	0.80	33.54	434.43	13839
2000	0.92	34.33	243.73	13531
2001	0.82	37.54	234.65	17674
2002	0.86	53.54	334.65	18350
2003	0.79	60.63	1145.83	19070
2004	0.87	53.11	1761.98	14256
2005	0.66	32.86	1361.48	14634
2006	0.68	18.54	971.35	14422
2007	0.91	96.01	1451.90	14595
2008	0.93	422.14	1337.15	15405
2009	0.61	2058.15	1750.10	11335
2010	0.34	401.83	1819.20	13279
2011	0.42	448.51	1319.18	11665
2012	0.26	421.02	1712.98	11144
2013	0.28	572.80	2600.20	9598
2014	0.30	518.98	364.18	8377
2015	0.34	675.70	617.23	8157

Source: CBS, 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	Fat, edible and nonedible 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	tone	tone of glue	number of vehicle	pair of shoes	tone	tone	tone
1990	121158	21591	751	26384000	3109	130496	63304
1991	28401	13209	704	11977000	1152	111631	54153
1992	72700	7079	657	8751000	757	79388	38512
1993	42622	7479	438	13865000	778	97300	47200
1994	72922	6280	503	8407000	1081	108198	52487
1995	73551	7180	548	9408000	934	105380	51120
1996	69991	8972	588	5766000	964	113931	55269
1997	132847	10874	648	6715000	1124	124705	60495
1998	157060	10379	687	5191800	1102	93394	45306
1999	100509	8206	729	5159000	1123	33500	15500
2000	25260	10355	768	2381000	603	30000	14600
2001	24256	12385	673	2279000	539	31100	20600
2002	155631	25851	58	3891000	912	33600	24200
2003	151524	30873	7	4935000	1583	29000	25100
2004	95505	46119	36	7130000	1983	39400	19400
2005	123783	56573	152	5477000	4724	35400	21700
2006	129269	71330	45	5776000	6319	38100	19400
2007	98045	81768	70	5803000	3872	45100	16400
2008	96740	77701	48	5443000	2023	38900	17200
2009	76898	33849	25	5069000	1722	37300	14800
2010	83669	35507	26	5276000	2449	33200	11200
2011	86646	28722	10	4966000	1668	33400	10300
2012	26214	28801	16	4486000	1989	29700	10200
2013	34087	31622	5	4533000	1394	28700	9700
2014	44358	21616	5	5148000	522	29800	12200
2015	51005	18810	5	5010000	500	32200	10900

Source: CBS, Processing: Ekonerg Ltd

<u>Pulp and paper industry (NFR 2.H.1)</u>

The methodology for emission estimation is based on the Tier 2 of EMEP/EEA 2013 methodology; multiplication of annual products amount with the appropriate emission factor. For all activities in the source category 2.H.1 Pulp and paper recommended Tier 2 emission factors are used according to the EMEP/EEA 2013. Emission factor is expressed as the amount of NMVOC 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.

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	tone	tone	tone	tone	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

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 2013 methodology; multiplication of annual products amount with the appropriate emission factor. For all activities in the source category Food and beverages recommended emission factors are used according to the EMEP/EEA 2013. 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 represented 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	Margarine 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	1299550	2800220	1222918	40848	24507	970853	200645	135315	12905
1991	205425	1114993	2247510	1125981	32337	21000	755750	100162	104501	12591
1992	202327	1099244	2720037	611939	23525	17723	653431	94666	90577	8248
1993	185419	851302	2481344	551763	21307	14687	650745	78847	86103	7296
1994	201668	858680	3156610	323896	22371	13094	530053	115440	86112	8420
1995	172510	829480	3170134	310632	23505	24507	519900	175340	86795	8003
1996	154330	793676	3291972	418724	24146	16637	477753	195316	89773	8144
1997	154443	548426	3662853	358295	26151	16170	476549	141380	84603	8643
1998	139070	626098	3759435	315762	26507	15755	537653	139207	82321	8429
1999	124364	483515	3606546	326754	25666	16124	496339	113966	79562	7639
2000	122585	612812	3993439	320831	26320	20261	694835	56729	134297	7768
2001	123620	548667	3779271	253721	26943	16414	530348	130693	84992	7955
2002	138063	600463	3638502	265219	29454	22232	559542	173896	101742	11056
2003	136241	638412	3701131	247523	36822	27378	583495	146561	101212	11181
2004	140597	631784	3606304	218749	34988	30635	758976	214934	101972	10545
2005	136930	504248	3495910	281664	36322	25427	534785	245387	106546	9697
2006	144683	534735	3688972	203974	36313	31814	590284	320345	116218	13040
2007	202890	652852	3810230	49582	39349	29600	643886	328322	115739	13549
2008	194473	508689	3879887	52652	46395	4688	637284	315764	223998	12832
2009	191204	556945	3674323	48824	47396	17284	602422	255956	133945	13934
2010	193074	463463	3438947	55617	49494	16136	599633	261568	131874	13010
2011	192282	488750	3738332	51300	49221	17542	654202	329322	141720	14203
2012	193307	441905	3625144	41924	47762	16200	656880	296728	137243	12129
2013	157647	487803	3443429	53504	47365	15010	654983	273843	130385	11667
2014	194812	452727	3416678	49926	50662	13574	736066	335388	130027	11620
2015	190523	472699	3396272	44607	49691	12839	517659	248827	125013	11927

Source: CBS; Processing: Ekonerg Ltd

Wood processing (NFR 2.I)

The methodology for emission estimation is based on the Tier 1 of EMEP/EEA 2013 methodology; multiplication of annual products amount with the appropriate emission factor. Proposed Tier 1 emission factors are used according to the EMEP/EEA GB2013 and are presented in Appendix 4. Activity data is from the Annual Statistical Reports, Industrial production, Annual PRODCOM Results (CBS). Activity data for NFR code 2.I is represented 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, a Tier 1 default emission factors were used which is according to GB2013 only available Tier 1 method. 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 is using as activity data for pollutants emission calculation (Table 5.4-6).

Recalculations and improvements

Domestic solvent use including fungicides (NFR 2.D.3.a)

Road paving with asphalt (NFR 2.D.3.b)

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)

Pulp and paper production (NFR 2.H.1)

Food and beverages (NFR 2.H.2)

Wood processing (NFR 2.I)

Consumption of POPs and heavy metals (NFR 2.K)

There was no recalculation and other improvement in this report.

Asphalt roofing (NFR 2.D.3.c)

Recalculation of emissions in 2012 were made, due to the correction of activity data.

Other solvent and product use (NFR 2.D.3.i, 2g)

Recalculation was performed for 2013 and 2014 due to the correction of activity data for Cooling lubricant (SNAP 060412-3) and Lubricant (SNAP 060412-4).

VI 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}) and NOx are reported. This sector includes the following sub-sectors from which certain pollutant emissions in the Republic of Croatia occur:

- **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.a.4 Crop residues applied to soils
    - 3.D.b Indirect emissions from managed soils

- 3.D.c Farm-level agricultural operations including storage, handling and transport of agricultural products
- 3.D.d Off-farm storage, handling and transport of bulk agricultural products
- 3.D.e Cultivated crops
- 3.D.f Use of pesticides

Emission calculations within the source category 3.B and 3.D were performed with Tier 2 methodology.

Default emission factors used in emission calculation are default factors attained from GB2009 and GB2013 and presented in Appendix 4.

There are five main sources of activity data for emission calculation: the Central Bureau of Statistics (CBS), Croatian Agricultural Agency (CAA), FAOSTAT and fertilizer companies.

For source category NFR 3.F Field burning of agricultural residues the notation key "NO" is used due to that activity is prohibited by law in Croatia.

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.

Key source in 2014 of ammonia emissions are following source category: 3.B.3 Swine, 3.B.1.a Dairy cattle, 3.B.1.b Non-dairy cattle and 3.B.4.g.i Poultry. 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 m^2 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

The methodology used is in accordance with the GB2013. For the calculation of NO, NH_3 and PM emissions from the NFR sector 3.B Animal husbandry and manure management, Tier 2 methodology was used. Emission factors used for NO, NH_3 and PM emission calculation are a combination of default factors attained from GB2013 which 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.

The NMVOC emissions were also calculated for this report and NFR 3.B became the key source category. Methodology andf EF used for emissions calculation with Tier 2 methodology are the same for the whole period of time and are presented in Table 6.1-1.

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, goats, horses) and for some categories (primarily mules/asses) the FAOSTAT database. Data sources for each year and livestock category are presented in Table 6.1-2. Trend of animal number for each livestock category is presented in Tables 6.1-3 and 6.1-4.

Table 6.1-2 Sources for activity data for NFR code 4.B Animal husbandry and manure management

Livestock	CBS	FAO	CAA	Extrapolation
Dairy cattle			2008-2015	1990-2007
Other cattle	1990-2015			
Swine	1990-2015			
Sheep	1990-1991; 1999-2015	1992-1998		
Goats	1990-1995		1995-2015	
Horses	1990-1991	1992-1994	1995-2015	
Mules/assess	1990-2015			
Poultry	1990-2015			

Table 6.1-3 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	Cattle Dairy	Cattle Non-Dairy	Cattle Non-Dairy (Calves)	Sheep	Goats	Horses	Mules and asses	Sows	Fattening pigs
Unit	animal	animal	animal	animal	animal	animal	animal	animal	animal
1990	487511	47405	315804	751000	172000	39000	17000	232000	562639
1991	467535	65873	268586	753000	133000	36000	13000	234000	579724
1992	448378	29830	195326	539000	113809	26000	13440	180000	419986
1993	430006	47269	209368	525000	105000	22000	12430	193000	444452
1994	412386	28338	162736	444000	107685	21000	6640	198000	471450
1995	395489	35873	149209	453000	107292	4685	1549	182000	401243
1996	379283	36373	141822	427000	105271	5274	1750	181000	403469
1997	363742	33965	137815	453000	99544	5886	1902	185000	382996
1998	348838	38451	134112	427000	84403	6540	2077	186000	379055
1999	334544	29339	140920	488000	78000	7309	2255	205000	450043
2000	320836	26933	137428	528675	79393	9611	2518	185249	401317
2001	307690	28104	156223	539498	92943	10871	2780	187102	392893
2002	295082	32285	137802	580016	96534	13570	3097	190189	414880
2003	282991	29424	162685	586641	86087	15217	3033	200907	436675
2004	271396	48078	191568	721578	126060	17057	3195	229446	471336
2005	260275	38787	197272	796480	134483	17883	3146	199351	358553
2006	249610	37300	212682	679839	102877	18885	3299	198668	549522
2007	239382	21928	209618	645992	91902	18075	3415	182635	461636
2008	226000	30526	203131	643384	83877	19687	3591	162063	379825
2009	224719	28102	206647	619044	76119	19958	3617	167649	434071
2010	209336	47626	214243	629437	75215	20537	3722	163956	424797
2011	206291	26742	236127	638608	70030	21836	3365	129375	433062
2012	191354	29175	244547	679313	71978	22426	3363	125966	418437
2013	180946	39447	236940	620000	69000	21256	3273	127643	404852
2014	178827	45282	218954	604866	60697	21144	2159	119277	431363
2015	174805	66613	236157	607711	62057	21868	2468	150377	469034

Source: CBS, FAO, CAA
Processing: Ekonerg Ltd, 2016

Table 6.1-4 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	786574	632369	170412	55798	3615510
1991	7671000	747755	601508	164533	53873	3308206
1992	6648000	585843	471545	130952	42878	2090416
1993	6321000	557022	448622	126518	41426	2121525

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
1994	6253000	539664	434919	124585	40793	2060530
1995	6503000	510481	411670	119812	39231	1492032
1996	6260000	462821	375618	109539	35867	1049497
1997	6089000	456927	373229	109061	35710	1188581
1998	5853000	412241	338924	99236	32493	768967
1999	5851000	424751	370301	108323	35469	1510422
2000	5988000	509623	349890	112160	36725	1215096
2001	5709000	523463	336326	117052	38327	1873926
2002	5775000	570573	356581	116235	38059	1363126
2003	5610000	603879	321485	117361	38428	1439095
2004	6447000	400512	402889	111452	36493	1205000
2005	6056000	379726	289301	86301	33534	1390000
2006	5758000	308217	383047	108000	37479	1394000
2007	5529907	309234	451031	94192	34521	1487000
2008	5486401	332592	382881	90740	28110	1429000
2009	5673000	448325	385600	92207	30675	1170187
2010	4357905	481193	477568	99017	22671	760873
2011	4078789	624995	400219	85013	19320	203421
2012	3696170	698586	309502	103601	22682	757258
2013	3979081	629730	292021	59284	12927	212428
2014	3722447	767319	242923	47354	24170	523209
2015	3017389	818451	325502	36728	10689	606517

Source: CBS
Processing: Ekonerg Ltd, 2016

Recalculations and improvements

Manure Management (NFR 3.B)

Information regarding new activity data by NFR category:

- Cattle dairy (NFR 3.B.1.a): Updated number of animals produced annually on dairy cattle category for the years 2013-2014.

In addition, emissions were recalculated for the entire 1990-2014 period due to implementation of rounding of activity data following NAPA to AAP animal number conversion and extrapolation procedures. This resulted in a insignificant change of emission for NFR 3.B.1.a Cattle dairy and 3.B.3 Fattening pigs.

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. This includes emissions both from land to which nitrogen (N)-containing fertilisers are applied and soils cultivated for crop production and grasslands, where N-fertiliser was not applied.

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 3.D.a.1 Mineral N fertilizers.

For NOx and NH_3 emissions from the source categories 3.D.a.2.a Animal manure applied to soil the notation key IE is used, and those emissions are included within the source category 3.B. For NH_3 emissions from the source categories 3.D.a.2.b Sewage sludge applied to soil the notation key IE is used, and that emissions are included within the source category 3.B. For NH_3 emissions from the source categories 3.D.a.3 Urine and dung deposited by grazing animals the notation key IE is used, and that emissions are included within the source category 3.B. For NOx, NMVOC, NH_3 and PM emissions from the source categories 3.D.a.4 Crop residues applied to soils the notation key IE is used, and that emissions are included within the source category 3.B. For the PMs ($PM_{2.5}$, PM_{10} and TSP) emissions from source categories: 3.D.b Indirect emissions from managed soils, 3.D.c Farm-level agricultural operations including storage, handling and transport of agricultural products, and 3.D.d Off-farm storage, handling and transport of bulk agricultural products the notation key IE is used, and that emissions are included within the source category 3.D.a.1. For NOx, NMVOC, NH_3 and PM emissions from the source category 3.D.e Cultivated crops the notation key IE is used, and that emissions are included within the source category 3.D.a.1.

Emissions of NMVOC regarding source category 3.D.f Use of pesticides are presented in the scope of source category NFR 2.D.3.a Domestic solvent use including fungicides.

Methodology, emission factors and activity data

The methodology used is in accordance with GB2013. For NH_3 emission calculation from the source category 3.D.1.a Mineral N fertilizers, Tier 2 methodology was used, and for NOx, NMVOC and PM emission calculations Tier 1 methodology was used. An assumption that all mineral fertilizers sold and imported in Croatia are actually applied to soil is used for emissions calculation. Methodology also includes preparation of activity data that includes calculation the amount of nitrogen (N) in each of mineral fertilizers produced minus mineral fertilizers exported plus 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.

Emission factors used for NH3 emission calculation from source category 3.D.1.a Mineral N fertilizers are default Tier 2 factors attained from GB2013 with exception for urea for which the Tier 2 factor attained from GB2009 was used. Factors are presented in Appendix 4.

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. The activity data on import before the year 2000 were negligible due to tariffs which were eliminated in 2000; thus, the activity data regarding imported amounts is available from 2000 onwards. Regarding activity data received from fertilizer company that started with production in 2006, for period 2007 – 2010, due to lack of formulation data, interpolation was conducted to obtain N in mineral fertilizer (NIR 2012). Activity data for nitrogen (N) applied for each type of mineral fertilizer is shown in Table 6.2-3.

Relevant activity data for NOx, NMVOC and PM emission calculations is the area covered by crop (ha). There are two type of crops in Croatia N-fixing crops (Soyabeans, Beans - dry, Cow peas – dry, Lentils, Peas – dry, Vetches, Clover, and Alfaalfa) and non N-fixing crops (wheat, maize, potatoes, Sugar beets, Tobacco, Sunflowers, Rape seed, Tomatoes, Barley, Oats, Cabbages and other brassicas, Garlic, Onions, Rye, Sorghum and Watermelons). The activity data on the area under crops were obtained from the Central Bureau of Statistics, FAO database and for certain years by extrapolation. National data (provided by Croatian CBS) are considered to be the most accurate source and was always used when available. For crops where national data was not available, FAO data was considered an adequate replacement source. Where only a part of the national dataset was missing for a specific crop, trend of FAO data was found to be in line with the national data trends and was used for the missing years rather than interpolation. Extrapolation was used only where no national or FAO data was available. Data sources used regarding crop production (t) and total area covered by crop (ha) for the period 1990 – 2015 is presented in Table 6.2-1.

Table 6.2-1 Data sources regarding N-fixing crop production

Crop	Crop yield			Crop area		
	CBS	FAO	Extrapolation*	CBS	FAO	Extrapolation*
Soyabeans	1990-2015			1990-2015		
Beans, dry	1990-2015			1990-2015		
Cow peas, dry	2008-2015	1992-2007	1990-1991	1998-1999	1992-1997	1990-1991
Lentils	1990-1991	1992-2015		1990-1998	1999-2015	
Peas, dry	1990-2015			1990-2015		
Vetches	1990-1997	1998-2015		1990-1997	1998-2015	
Clover	1990-2015			1990-2015		
Alfaalfa	1990-2015			1990-2015		
Wheat	1990-2015			1990-2015		
Maize	1990-2015			1990-2015		
Potatoes	1990-2015			1990-2015		
Sugar beets	1990-2015			1990-2015		
Tobacco	1990-2015			1990-2015		
Sunflowers	1990-2015			1990-2015		
Rape seed	1990-2015			1990-2015		
Tomatoes	1990-2015			1990-2015		
Barley	1990-2015			1990-2015		

Crop	Crop yield			Crop area		
	CBS	FAO	Extrapolation*	CBS	FAO	Extrapolation*
Oats	1990-2015			1990-2015		
Cabbages and	1990-2015			1990-2015		
Garlic**	1990-2015			1990-2015		
Onions**	1990-2015			1990-2015		
Rye	2014-2015	1992-2013	1990-1991	2014-2015	1992-2013	1990-1991
Sorghum***	1990-1997	1998-2015		1990-1997	1998-2015	
Watermelons	1990-2015			1990-2015		

**Extrapolation was based on data for the period of 5 consecutive years.*

***CBS provides aggregated data for garlic & onions.*

FAO data was used to calculate yearly ratios of garlic and onions in the total, aggregated number.

****CBS did not obtain sorghum production data from 1997 to 2012*

Table 6.2-2 Activity data for NFR code 3.D.1.a

NFR 3.D.1a		N (nitrogen) applied					
Name	Area covered by crops	Urea	Calcium ammonium nitrate	NPK	Ammonium nitrate	Urea ammonium nitrate	TOTAL
Unit	ha	kg N	kg N	kg N	kg N	kg N	kg N
1990	1,233,513	31,376,02	39,030,12	36,285,99	721,27	0	107,413,40
1991	1,210,370	31,957,26	38,643,46	37,441,72	672,22	0	108,714,66
1992	835,996	41,093,64	43,521,03	39,921,42	282,41	0	124,818,50
1993	886,083	32,705,54	27,743,58	29,856,30	1,053,58	0	91,358,99
1994	876,272	29,839,28	36,707,85	29,814,55	549,07	0	96,910,74
1995	875,068	29,038,88	35,701,02	28,395,91	279,73	0	93,415,53
1996	859,808	32,894,14	34,644,78	30,768,66	81,74	0	98,389,32
1997	876,071	42,897,76	43,609,05	35,924,21	920,92	0	123,351,94
1998	971,787	27,755,94	38,790,63	28,358,87	341,03	0	95,246,47
1999	946,098	31,669,16	34,221,42	39,495,69	235,17	0	105,621,44
2000	740,424	38,179,54	39,921,66	39,861,79	41,88	0	118,004,86
2001	756,112	57,768,64	37,933,11	32,340,63	300,50	0	128,342,88
2002	761,276	50,655,66	38,065,68	31,650,89	96,82	0	120,469,05
2003	749,144	42,176,48	31,017,33	33,360,69	5,203,22	1,863,30	113,621,02
2004	738,479	45,109,44	32,069,52	33,626,10	5,126,17	1,647,30	117,578,53
2005	767,863	41,939,58	36,264,78	36,438,61	4,983,13	1,682,70	121,308,80
2006	775,406	37,505,18	36,121,41	34,055,42	2,729,58	1,390,20	111,801,79
2007	746,278	44,424,04	37,700,91	38,342,62	3,415,66	777,30	124,660,53
2008	757,417	46,659,18	39,456,18	34,110,03	332,99	589,50	121,147,88
2009	762,733	39,667,18	36,485,91	31,102,13	18,76	737,40	108,011,38
2010	730,839	40,999,13	34,811,64	23,196,56	21,11	498,00	99,526,43
2011	728,375	51,674,69	35,651,19	26,631,44	17,76	603,53	114,578,60

NFR 3.D.1a		**N (nitrogen) applied**					
Name	**Area covered by crops**	**Urea**	**Calcium ammonium nitrate**	**NPK**	**Ammonium nitrate**	**Urea ammonium nitrate**	**TOTAL**
Unit	**ha**	**kg N**	**kg N**	**kg N**	**kg N**	**kg N**	**kg N**
2012	760,610	53,465,65	31,327,41	22,413,62	0	661,99	107,868,67
2013	760,948	37,397,93	32,440,15	18,356,24	0	314,58	88,508,90
2014	658,852	30,539,66	31,633,10	18,212,75	0	321,60	80,707,11
2015	682,053	35,377,73	32,176,82	19,825,93	8,38	347,04	87,735,90

Source: CBS, FAO, producers of mineral fertilizers
Processing: Ekonerg Ltd, 2016

Recalculations and improvements

Inorganic N-fertilizers (includes also urea application) (NFR 3.D.1.a)

Recalculation of emissions for 2014 were made, due to new information on the activity data for total amounts of mineral N-fertilizer, which was not available at the time of writing IIR 2016.

Due to replacement of FAO activity data on harvested area of crops with national sources (CBS) and updating the AD on crop yield with new CBS values, emissions were recalculated as follows.

Crop area: Sorghum (1999-2001, 2004, 2014), cow peas, dry (1996, 1997, 2000, 2005), lentils (1999-2005, 2007), vetches (1998, 2002-2006, 2008-2009, 2012).

Crop yield: Sorghum (1998-2004), cow peas, dry (1996-1998, 2000, 2005), lentils (1998-2000, 2002-2005), vetches (2002-2005, 2008, 2010).

VII 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.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 Industrial waste water
  - 5.D.1 Domestic and commercial waste water
  - 5.D.2 Latrines

- **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

From the above sources mainly come from the emission of ammonia and partly to a NMVOC, and PM emissions. Emission from fires includes emissions of particulates, possibly heavy metals, dioxins/furans, HCB, PAHs and main pollutants like NO_x, SO_2, CO.

In Croatia the integral waste management system is established 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 [19] and Waste Management Plan[20]. 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[21] 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) 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 CORINAIR simple methodology, multiplying activity data for each sub category with an emission factor, is applied.

Emission factors are expressed as the quantity of pollutant emission per unit of waste treated. Used emission factors are from GB2013 and GB2009. 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 2017, presented by NFR sectors and pollutants, are given in Appendix 4.

[19] Sustainable Waste Management Act (OG 94/2013)
[20] Waste Management Plan of the Republic of Croatia for the period 2017 - 2022 (OG 5/2017)
[21] Waste Framework Directive 2008/98/EC

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 EPR under CAEN;
- National statistical reports at national level from the Croatian CBS (the Annual Statistical Reports, and 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 the 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 also relevant for IIR, are taken from NIR 2017.

Data source for disposed waste amounts is Croatian Agency for Environment and Nature/CAEN. 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 2017 under IPCC. The CAEN 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 87/15), adopted according to Environment Protection Act, the CAEN 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 for 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 CAEN. The CAEN is cooperating with competent offices in counties and with companies collecting municipal solid waste (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 CAEN from 2005 onwards. Total annual MSW disposed to SWDSs 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. 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 Report of Environment Condition, Ministry of Environmental and Nature Protection. Data for the quantity of disposed MSW in 2005 were obtained from Waste Management Plan in the Republic of Croatia (OG 130/05). 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 for the quantity of disposed MSW for the period 2006-2009 was obtained from the Environmental Pollution Register. Due to low quality of data provided by operators of landfills, the data was taken from the reports of companies collecting the MSW (reporting destination of MSW). Data on the quantity of generated and disposed municipal and industrial solid waste for the period 2010 - 2015 was obtained from the Environmental Pollution Register - reports delivered by the operators of active landfills. Data on the quantity of disposed biodegradable municipal and inustrial solid waste as well sludge from wastewater treatment for the period 2010 - 2015 was obtained from the Waste Management Information System- reports on landfills and waste disposal.

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 CEAN 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 CAEN or the update is done upon receiving the information on individual landfill from other sources. Data on remediation status is requested by CAEN 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

The Tier 1 of EMEP/EEA methodology for process emissions is applied. Tier 2 is not available for this source.

Emission factors are Tier 1 from GB2013 expressed as the amount of pollutant per amount of landfilled waste (Appendix 4).

Relevant activity data is an annual amount of landfilled waste Table 7.1-1.

Table 7.1-1 Activity data for NFR codes 5.A, 5.B.1, 5.B.2, 5.C.a, 5.B.b and 5.C.d, represented by the relevant SNAP codes

NFR	5.A	5.C.1.b.i	5.C.1.b.iii	5.C.1.b.v	5.D.1	5.D.1	5.D.2
SNAP	090401	090202	090207	090901	091001	091002	091007
Name	Solid waste disposal on land	Industrial waste incineration	Clinical waste incineration	Cremation	Industrial wastewater	Domestic and commercial wastewater	Latrines
Unit	t	t	t	corps	1000 m^3	1000 m^3	inhabitant
1990	590000	250	NO	1464	104000	NO	433305
1991	598780	250	NO	1786	94488	NO	431084
1992	613040	250	NO	2287	46785	NO	428862
1993	643205	250	NO	2760	87343	NO	428862
1994	677370	250	NO	3037	34419	NO	426640
1995	736700	250	NO	3109	33758	54353	422196

NFR	5.A	5.C.1.b.i	5.C.1.b.iii	5.C.1.b.v	5.D.1	5.D.1	5.D.2
SNAP	090401	090202	090207	090901	091001	091002	091007
Name	Solid waste disposal on land	Industrial waste incineration	Clinical waste incineration	Cremation	Industrial wastewater	Domestic and commercial wastewater	Latrines
Unit	t	t	t	corps	1000 m³	1000 m³	inhabitant
1996	787600	250	NO	3385	93836	58009	419974
1997	847550	1031	NO	3476	41857	61661	417752
1998	913390	2168	NO	3312	30985	87796	415531
1999	976087	2580	NO	3201	28924	88785	413309
2000	938400	3652	1.50	3080	22208	86579	411087
2001	1007000	3967	15.58	2972	21337	83533	408865
2002	1077000	2206	18.45	3254	21883	81196	406643
2003	1147000	400	22.64	3392	28408	84283	404421
2004	1216000	120	33.20	3404	22468	160277	402199
2005	1286078	5	35.70	3633	15984	132280	399978
2006	1447984	350	47.56	3593	19758	140906	397756
2007	1609890	285	64.89	3962	14118	140228	395534
2008	1730671	316	165.00	3911	16507	192033	393312
2009	1778143	IE	185.17	4060	17445	206042	391090
2010	1599358	IE	54.40	4314	26679	205709	388868
2011	1583406	IE	57.45	4344	7205	209150	386646
2012	1400176	IE	93.10	4478	11536	259135	384425
2013	1453326	IE	48.00	4601	12574	295264	382203
2014	1348581	IE	51.08	4803	13301	268002	379981
2015	1360908	IE	51.79	5373	12943	256690	377759

Source: 5.A and 5.C CAEN, 5.B CBS, Processing: Ekonerg Ltd

Recalculation and improvements

<u>Biological treatment of waste - solid waste disposal on land (5.A)</u>

The activity data on disposed municipal and industrial waste for the period 2010 – 2014 are aligned with the data presented in the Croatian NIR 2016.

7.2 WASTE INCINERATION (NFR 5.C)

Source category description

This sector considers the emission of pollutants from activities in the industrial waste incineration, clinical waste incineration and cremation without energy recovery. Emissions that occur as a result of waste incineration with energy recovery are presented in the Energy Sector 1.A.

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 now, and for the source category NFR 5.C.1.b.ii Hazardous waste incineration the notation key "IE" is using. There is no incineration of municipal waste (NFR 5.C.1.a), neither incineration of sludge from waste water treatment (NFR 5.C.1.b.iv) in Croatia, and notation key "NO" for that source activities are reported. Also, there is no incineration of carcasses in Croatia.

Croatia uses EWC codes for waste classification it is part of the Regulation on categories, types and classification of waste with a Waste Catalogue and List of hazardous waste (OG 50/05 and 39/09) and Ordinance on Waste Catalogue (OG 90/15).

The official source of activity data for waste incineration is CAEN 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 87/15), 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 CAEN coordinates activities relating to data quality assurance and control.

Methodology, emission factors and activity data

<u>Industrial waste incineration (NFR 5.C.1.b.i)</u>

The Tier 1 EMEP/EEA methodology is used, along with Tier 1 emission factors from GB2016. Relevant activity data is the annual quantity of industrial waste incinerated.

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 2008 - 2015 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) has 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. The activity data is presented in Table 7.1-1.

Clinical waste incineration (NFR 5.C.1.b.iii)

Relevant activity data for clinical waste incineration is the annual amount of clinical waste incinerated. The activity data is presented in Table 7.1-1. The recommended Tier 1 emission factors from GB2013 were used for emission calculation.

Cremation (NFR 5.C.1.b.v)

Relevant activity data for cremation is the number of corps incinerated. The activity data is presented in Table 7.1-1. The recommended Tier 1 emission factors from GB2013 were used for emission calculation.

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 in this report.

7.3 WASTEWATER HANDLING (NFR 5.D)

This section covers emissions from Waste water handling (NFR 5.D). Activities considered within this sector in Croatia are biological treatment plants for Domestic wastewater handling (NFR 5.D.1), Industrial wastewater handling (NFR 5.D.2) and Other wastewater handling – latrines (NFR 5.D.3).

Source category description

Domestic wastewater handling (NFR 5.D.1) and Industrial wastewater handling (NFR 5.D.2)

Processing wastewater is most commonly used aerobic biological treatment. Only, disposal of domestic and commercial wastewater, particularly in rural areas, where systems such as septic tanks, are used partly anaerobic treatment. Biological treatment plants have minor influence on the emissions of pollutants. Only NMVOC emissions are reporting in this two source categories.

Other wastewater handling (NFR 5.D.3)

In the scope of source category other wastewater handling 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 ammonia emissions in Croatia.

Methodology, emission factors and activity data

Domestic wastewater handling (NFR 5.D.1)

For emission calculation from domestic wastewater handling Tier 2 EMEP/EEA methodology was used along with Tier 2 emission factor for NMVOC emission calculation (EMEP/EEA GB2016). The NMVOC emission factor is presented in Appendix 4. The annual amount of total waste water treated in residential / commercial sectors is the relevant activity data. Source of data is the Statistical Yearbook of Statistical Bureau of Statistics. Data for the 1997 wasn't available and it was estimated with interpolation method. The activity data is presented in Table 7.1-1.

Industrial wastewater handling (NFR 5.D.2)

For emission calculation from industrial wastewater handling Tier 2 EMEP/EEA methodology was used along with Tier 2 emission factor for NMVOC emission calculation(EMEP/EEA GB2016). The NMVOC emission factor is presented in Appendix 4. Information on amount of waste water treated in industry sectors are taken from the Statistical Yearbook of Statistical Bureau of Statistics. Unavailable data for the 1997 was estimated with interpolation method. Data for total amount of waste water handled in industries in Croatia are included in the emission calculation. The activity data is presented in Table 7.1-1.

Other wastewater handling (NFR 5.D.3)

The recommended emission factors specific to technology for NH_3 emission calculation in the case of latrines, and NMVOC emission in the case of wastewater handled were used (EMEP/EEA GB2013). Default emission factor for NH_3 emissions calculation from latrines is expressed as the amount of NH_3 per the number of residents who use septic tanks. The source of activity data used are Census 2011, Census 2001, Census 1991 and Census 1981 from CBS. Activity data is the number of population in the housing units without toilets was collected for years: 1981, 1991, 2001 and 2011. The activity data is presented in Table 7.1-1.

Recalculation and improvements

Domestic wastewater handling (NFR 5.D.1)

Industrial wastewater handling (NFR 5.D.2)

Other wastewater handling (NFR 5.D.3)

There was no recalculation and other improvement in this report.

7.4 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 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 approach is used for pollutant emission estimation. 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 collect from MIA per year (Table 7.4-1). Emission factors are Tier 2 technology-specific emission factors for car fires and various types of house fires recommended by GB2009 and presented in Appendix 4.

Table 7.4-1 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

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
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

Source: MIA, Processing: Ekonerg Ltd

Recalculation and improvements

Recalculation of categories included into NFR code 5.E for 2014 were made, due to correction of activity data for these categories.

The plan is to harmonize emission factor for PMs with GB2013 due to pretty big differences between those ones in GB2009.

The plan is to collect required activity data for emission calculation from activities: sludge spreading compost and production from waste. The data will be aligned with the data presented in the Croatian NIR. In order to realize the plan Croatia will make efforts to collect data on amounts of organic domestic waste produced for compost production, and sludge production and the fraction that is dried by spreading for sludge spreading if possible for one of the next inventories.

VIII 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 EMEP/EEA GB2016 were applied.

The activity data is the area of land burned (source: annual Statistical Yearbook, CBS).

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 EMEP/EEA GB2016 will be available.

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

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	191

Data source: CBS, St.Y.

Recalculation and improvements

No recalculations, neither improvement was made for reporting round 2016.

IX 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)

In 2014 wrong emissions were entered in database for TE Rijeka. This error was corrected.

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

In 2014 Recalculation was performed due to harmonisation of data with NIR and Industry analysis balance for 2014

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

In road transport sector three recalculations were preformed:

- For the period from 2011 to 2014 wrong density for compresed natural gas was used
- In 2014 during the vehicle database sorting double counting of small parts of vehicles database occurred which ledad to small differences in emissions
- Correction in source due to change of activity data from EUROSTAT to national energy balance 2014

Number of vehicles by each category as well as fuel consumption data were corrected and emissions recalculated.

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

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

In IIR 2017, the new data for consumed biomass for the period from 1990 to 2013 were included in inventory (source: revised national energy balances from 1990 to 2013) and has increasing trend by approximately 30 PJ. Data for whole historical trend were included in this submission.

Railways (NFR 1.A.3.c)

Correction in data source due to change of activity data from EUROSTAT to national energy balance 2014. A revision of the data on the sulfur content in diesel fuel were made, and necessary corrections were included.

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

Correction in source due to change of activity data from EUROSTAT to national energy balance 2014 and due to changes in sulphur content in fuel oil in navigation.

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

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

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

Recalculation for the year 2014 was made due to the changes from the EUROSTAT to the 2014 national energy balance, which was not available at time of inventory preparation.

Natural gas - production / processing and transmission (NFR 1.B.2.b)

Recalculation was carried out due to methodology improvement to Tier 2. The improvement was carried out within the project "Improvement of emission inventories of air pollutants in accordance with the requirements of the LRTAP Convention - Tier 2" project assignment "Improvement of air emission calculations for sector 1.B.2 Fugitive emissions from fossil fuels (i. NFR 1.B.2.b Distribution of natural gas), 2016 g.

Flares (NFR 1.B.2.c)

Improvements were made due to the changes in methodology.

INDUSTRIAL PROCESSES AND PRODUCT USE SECTOR

Cement production (NFR 2.A.1)

The activity data on clinker and cement (Portland and Aluminate) production for the period 2010 – 2014 are aligned with the data presented in the Croatian NIR 2017.

Lime production (NFR 2.A.2)

The activity data on quicklime and dolomitic lime production for the periods 1990 - 1992, 1994 - 1998 and 2000 - 2014 are aligned with the data presented in the Croatian NIR 2017.

Glass production (NFR 2.A.3)

Recalculation was performed for 2014 due to alignment with the data presented in the Croatian NIR 2017.

Electric furnace steel plant (NFR 2.C.1.1)

Recalculation was performed for the years 1992, 1994, 1995, 1997 – 2009, 2011 – 2014 due to alignment with the data presented in the Croatian NIR 2017.

Asphalt roofing (NFR 2.D.3.c)

Recalculation of emissions in 2012 were made, due to the correction of activity data.

Other solvent and product use (NFR 2.D.3.i, 2.G)

Recalculation was performed for 2013 and 2014 due to the correction of activity data for Cooling lubricant (SNAP 060412-3) and Lubricant (SNAP 060412-4).

AGRICULTURE SECTOR

Manure Management (NFR 3.B)

The recalculations was implemented for the years 2013 and 2014 due to updated number of dairy cattle activity data 3.D.1.a Inorganic N-fertilizers (includes application of urea): updated value for mineral N-fertilizers for year 2014

Inorganic N-fertilizers (includes also urea application) (NFR 3.D.1.a)

Recalculation of emissions for 2014 were performed, due to updated value for mineral N-fertilizers activity data, which was not available at the time of writing IIR 2016.

WASTE SECTOR

Biological treatment of waste - solid waste disposal on land (5.A)

The activity data on disposed municipal and industrial waste for the period 2010 – 2014 are aligned with the data presented in the Croatian NIR 2017.

Other waste (5.E)

Recalculation of categories included into NFR code 5.E for 2014 were made, due to correction of activity data for these categories.

9.2 PLANNED IMPROVEMENTS

ENERGY SECTOR

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.

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

The application of COPERT 5 software programme is planned for next submission.

Also, during the processing of "raw" data (Ministry of interior vehicle data base in text form), it was noted that some vehicles are missing, so clarification of data was requested from the Ministry of Interior. Interior Ministry drew attention to the different categorization of vehicles in 2014. Consequently the model for the processing of "raw" vehicle data was amended and it was found that the model should be applied to the whole historical trend, because some vehicles due to insufficiently described categorization were not counting. The above improvement will be carried out in one of the following submissions.

In 2014 Croatia reported annual mileage of each vehicle type to Odyssee database. It is planned to incorporate those data in COPERT 5 model

INDUSTRIAL PROCESSES AND PRODUCT USE SECTOR

Other solvent and product use (NFR 2.D.3.i, 2.G)

The plan is to recalculate the trend (entire reporting period) for categories Cooling lubricant (SNAP 060412-3) and Lubricant (SNAP 060412-4) to align with the data presented in the Croatian NIR. In the NIR 2017, separation of aggregated data have been performed for the period 1990 – 1998 according to estimation on share in total quantity that should be further investigated. Trend analysis should be carried out so the recalculations will be included in the next the next submission.

AGRICULTURE SECTOR

Field burning of agricultural residues (NFR 3.F)

Although the activity of burning of agricultural residues in the open field is forbidden according to Croatian low, according to IIASA statement such activities are carried out on Croatia territory (in possession of satellite images that confirmed the statement). A plan is to calculate relevant emissions from this source category, when the activity data will be available.

WASTE SECTOR

Other waste (NFR 5.E)

The plan is to harmonize emission factor for PMs with GB2016 due to pretty big differences between those ones in GB2009.

Also, the plan is to collect required activity data for emission calculation from activities: sludge spreading compost and production from waste. The data will be aligned with the data presented in the Croatian NIR. In order to realize the plan, Croatia will make efforts to collect data on amounts of organic domestic waste produced for compost production, and sludge production and the fraction that is dried by spreading for sludge spreading if possible for one of the next inventories.

X PROJECTIONS

10.1 METHODOLOGY

Methodology for estimating projections is prescribed in chapter 8 Projections, Part A: general guidance chapters EMEP / EEA air pollutant emission inventory guidebook - 2013 (hereinafter: GB2013). The Program consider two groups of scenarios: scenario with existing measures (WEM) and scenario with additional measures (WAM), taking into account the definition of scenario without measures (WOM).

Historic year due to the used starting assumptions and parameters for the projections was 2012 years ago and emissions of pollutants reported pursuant to the LRTAP Convention in 2015.

Pollutants emission projections were for the first time coordinated with greenhouse gas emission projections in the Republic of Croatia. The Republic of Croatia reported greenhouse gas emission projections in accordance to obligation at EU and international level related to UNFCCC and pollutants emission projections in accordance to obligation at EU and international level related to CLRTAP and new NEC Directive. Stakeholders for greenhouse gas emission projections and pollutants emission projections recognized the importance and the need for mutual understanding. Consequently, all of the activities necessary for pollutants emission projections are based on identical initial asumptions and parameters as well as for greenhouse gas emission projections.

Scenario without measures (WOM): projection excludes all policies and measures implemented, adopted or planned after the year chosen as the starting point for this projection

Scenario with existing measures (WEM): 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.

Scenario with existing measures (WEM) is considered as the reference scenario (NUR) in accordance with standard nomenclature CLRTAP and the UNFCCC and the scenario with additional measures (WAM) is considered as a scenario of moderate transition (LC1) and scenario of strong transition (LC2) according to standard nomenclature CLRTAP and the UNFCCC.

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 should reflect technological advances, environmental regulations, deterioration in operating conditions and any expected changes in fuel formulations. Rates of penetration of new technologies and/or controls are important in developing the right sectoral emission factors for any particular projection year.

For estimating projection the Tier 2 model from GB2013 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 includes measures intended only for that particular activity in an appropriate volume (capacity controlled) for each year of the projection.

Sources for activity data that have been used as a starting point for the projection estimation are:

- Technical basis for the preparation of the low-carbon development strategy of the Republic of Croatia for the period until 2030, The Green Paper and
- The Republic of Croatia 2015 Informative Inventory Report (1990-2013) - IIR Croatia 2015

Activity levels in 2012 result from official national data set for all sectors: the Republic of Croatia 2015 Informative Inventory Report (1990-2013) (IIR 2015). Also, all data used for the pollutants emissions calculation in 2013 and further for developing emission reduction scenario for 2020, 2025 and 2030, and activity levels and emission factors are published and referenced in the GAINS model. All underlying assumptions are listed in the tables in the prescribed form for reporting "Annex IV: Projections reporting template - Projected national emissions and activity parameters of main pollutants and PM"

(http://www.ceip.at/ms/ceip_home1/ceip_home/status_reporting/2016_submissions/).

Sources of current and new technologies and their impact on the emissions involved in the emission factors are: GB2013 and GAINS model. Information on the rate of penetration of diferent technologies have been taken from: (1) Technical basis for the preparation of the low-carbon development strategy of the Republic of Croatia for the period until 2030, The Green Paper and (2) GAINS model.

The model used for the projections is the LEAP (The Long-range Energy Alternatives Planning System).

Making projections included three basic steps:

- The first step: determining the key sources of pollutants and of their share in the total emissions of substances observed in 2012 in Croatia,
- The second step: the inclusion of data on activity from available development plans,
- Third step: where development plans were not available, future activity data were assumed (expert judgement). The above is worked out by relevant pollutants and key sectors.

10.2 SCENARIOS

Reference scenario (WEM): The referent scenario includes current legislations of the Republic of Croatia and the EU's adopted legislations for the period until 2030. Strategies, plans and programmes that have been adopted, but are not supported by implementing regulations are not included in the referent scenario.

In the power system the Reference scenario presumes technology penetration depending on their price which is reduced over time. Technology price reduction curves for the production of renewable energy sources are taken from the JRC-EU-TIMES model, also used for fossil fuel technologies. The referent scenario is not a 'frozen state' scenario. It presumes the development of technologies and their use.

The gradual transition scenario (LC1) (WAM1) is scenario reduces emissions appropriately to Croatia's economic possibilities. The transition is accomplished in a way that does not jeopardize economic growth, with a change which is realistically achievable, in the technical, economic and sociological sense. This scenario is pursuant with the 2030 Framework and other strategic planning documents of the EU. It is the scenario of minimum obligations according to the internal allocation of EU's efforts.

10.3 RESULTS

Results of emission projections for NOx, SO_2, NMVOCs, NH_3, $PM_{2.5}$ and PM_{10} are presented in Figures 11.4-1 to 11.4-6. Each of the graphic figures gives an overview by individual pollutant of the historical emission trend (1990 - 2015) according to submission in 2017, applied scenarios, and compliance with emission reduction commitment prescribed in the Gothenburg Protocol - original and revised one.

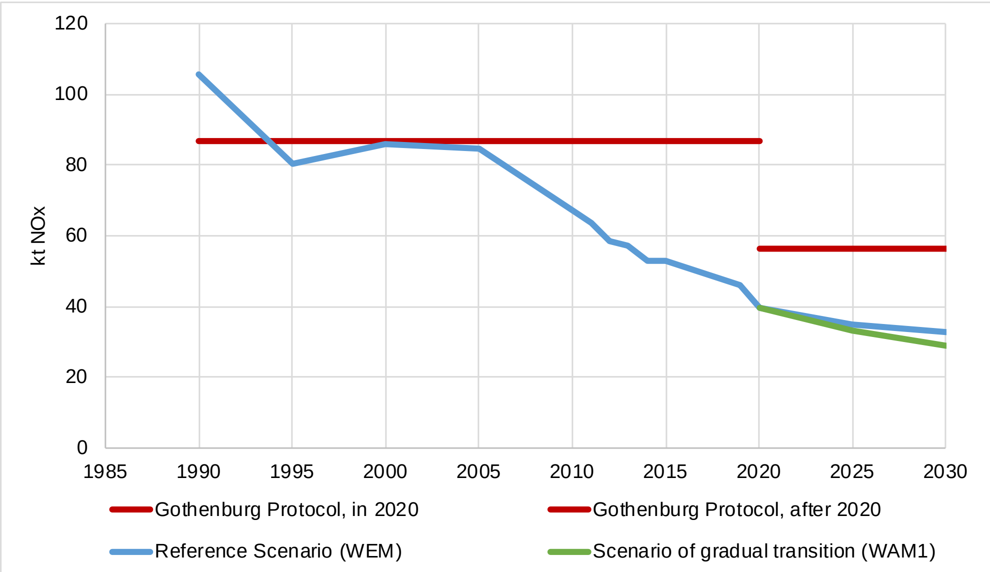


Figure 11.4-1 Trend and projections of NOx emissions

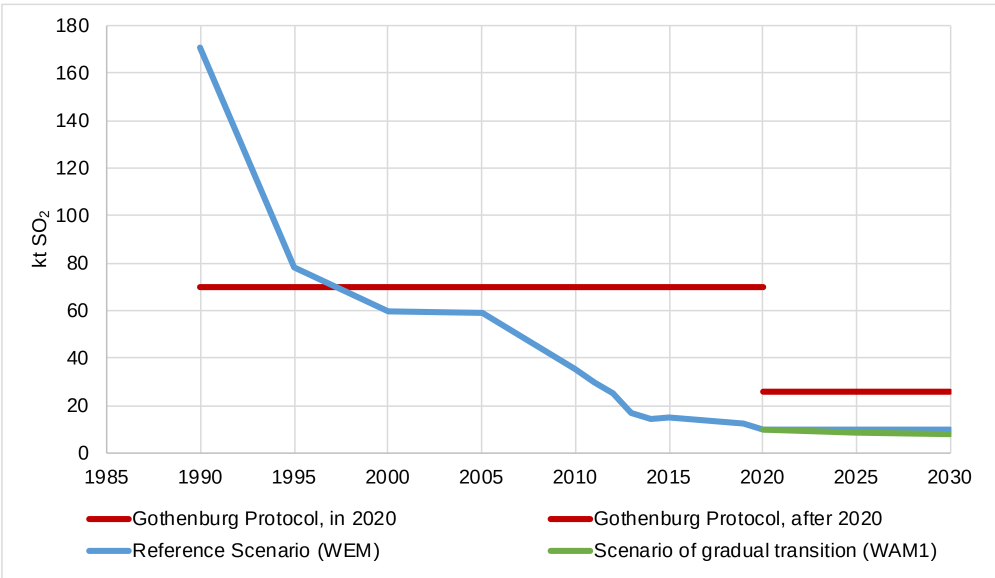


Figure 11.4-2 Trend and projections of SO_2 emissions

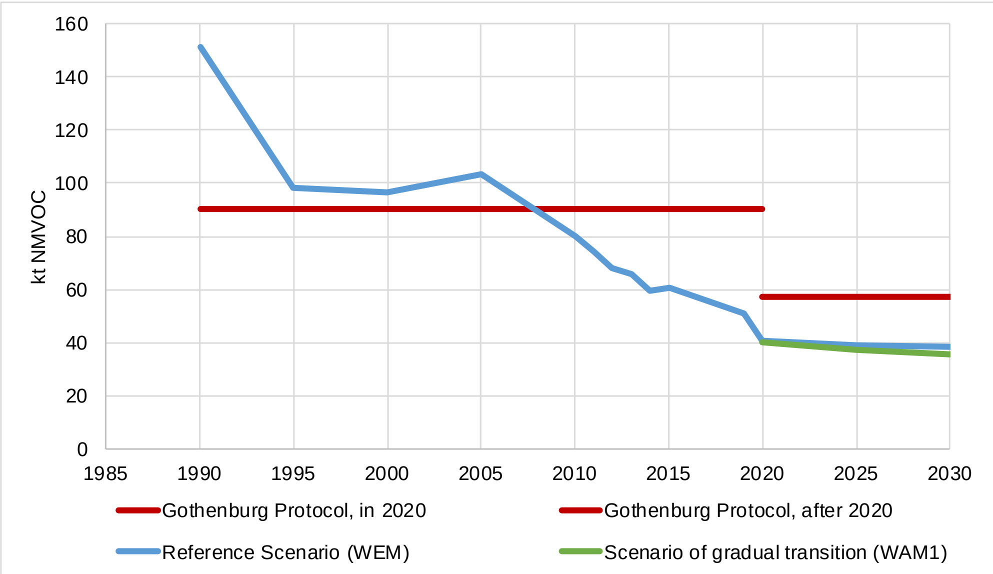


Figure 11.4-3 Trend and projections of NMVOC emissions

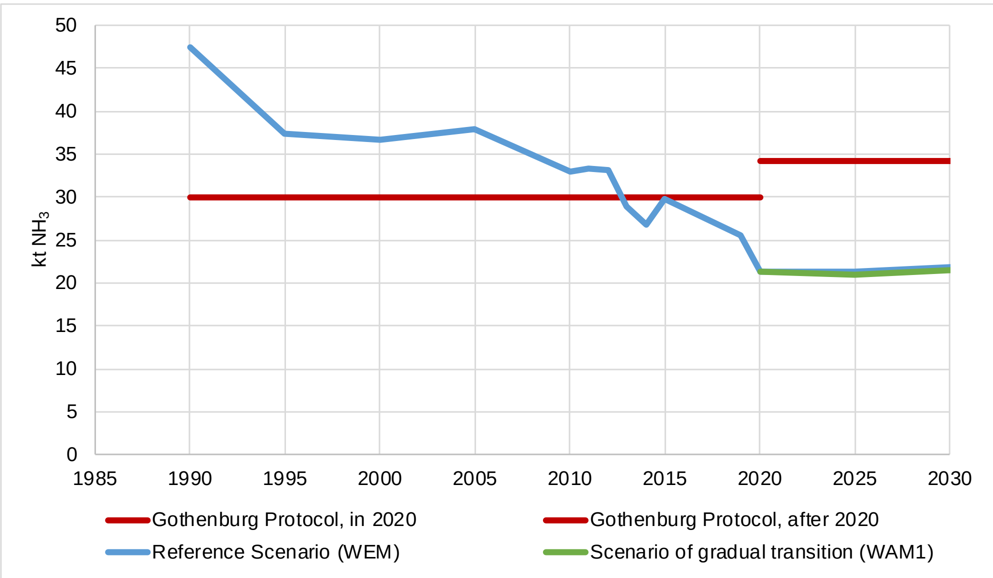


Figure 11.4-4 Trend and projections of NH_3 emissions

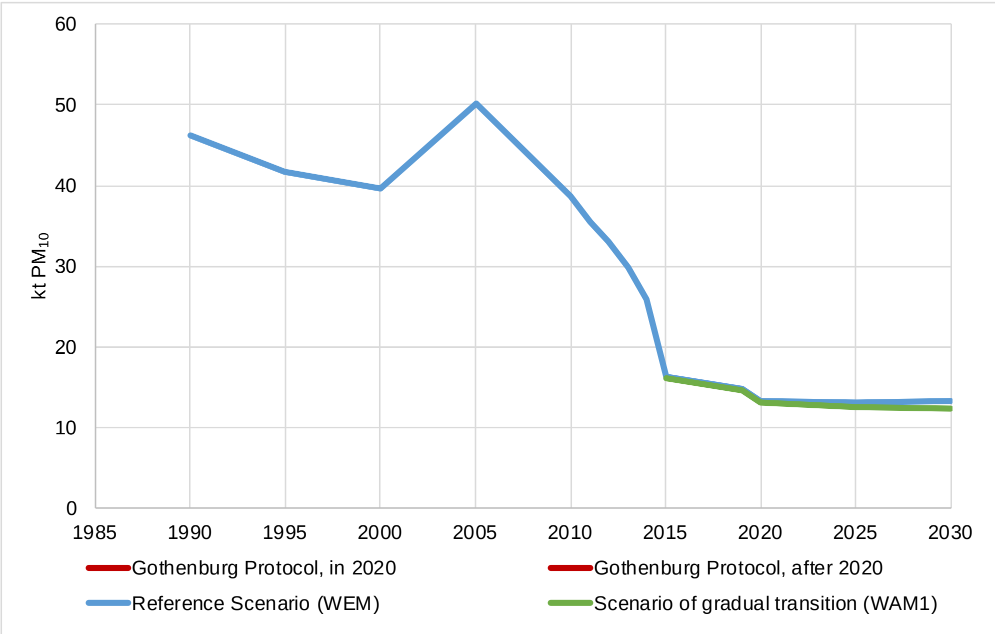


Figure 11.4-5 Trend and projections of $PM_{2.5}$ emissions

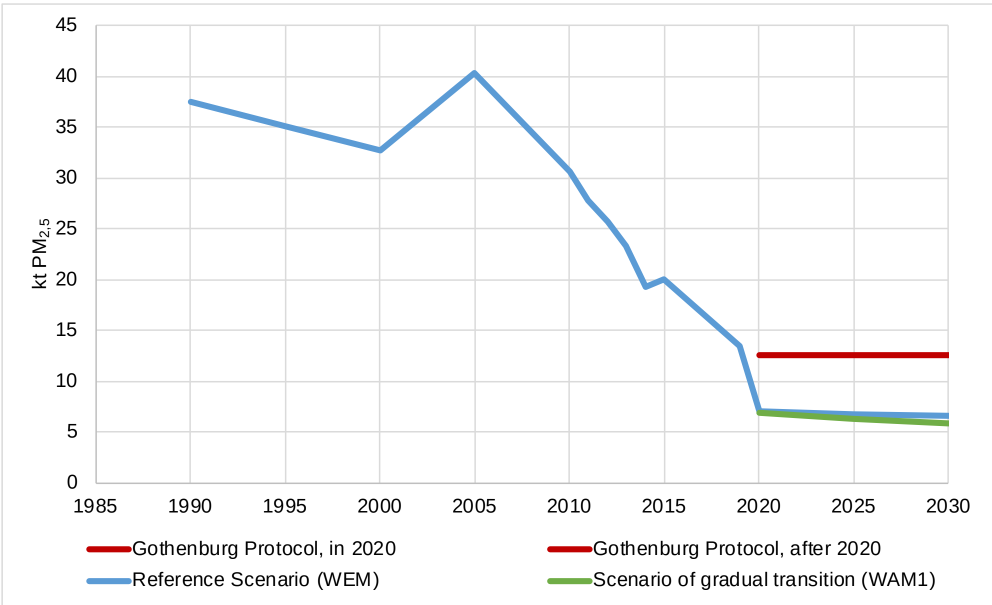


Figure 11.4-6 Trend and projections of PM_{10} emissions

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IIR APPENDICES

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APPENDIX 2: Description of SNAP97 sectors

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APPENDIX 1. QA/QC activities

Table Appendix 1 QA/QC activities

Activity	QC checks / reviews		QC others (Correction)		Comment
	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, ie 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	

Activity	QC checks / reviews		QC others (Correction)		Comment
	Expert name	Period / deadline	QA / QC manager / other person	Deadline	
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	
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 -…	-	-	

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.

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.

APPENDIX 3. 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	-

NFR Code	Long name	SNAP code
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
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

NFR Code	*Long name*	*SNAP code*
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**
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**

APPENDIX 4. EMISSION FACTORS – 2015

Tech. ID	Technology Name	Category	Pollutant	Emission Factor	Unit
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
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
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
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
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
4647	Decorative coating application	3.A.1	NMVOC	150	kg/t
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
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

Tech. ID	Technology Name	Category	Pollutant	Emission Factor	Unit
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	39.3	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
4507	Petroleum refining	1.A.1.b	BC	0.1638	g/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
4490	Margarine and solid cooking fats	2.D.2	NMVOC	10	kg/t
4494	Cakes, biscuits and breakfast cereals	2.D.2	NMVOC	1	kg/t
98	Bread (white bread)	2.D.2	NMVOC	2	kg/t
4500	040620_wood processing	2.D.3	TSP	1	kg/t
4504	Sulphur recovery plants	1.B.2.a.4	SO2	140	kg/t
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
4505	Fluid coking units	1.B.2.a.4	TSP	1.5	kg/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
4506	Diffuse NMVOC emissions	1.B.2.a.4	NMVOC	0.2	kg/t
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
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
104	Mineral Production, Road Paving with Asphalt	2.A.6	BC [Gg]	22.8	g/t
4430	Mineral Industry, Quaring and mining	2.A.7.a	TSP	102	g/t

Tech. ID	Technology Name	Category	Pollutant	Emission Factor	Unit
	of minerals other than coal				
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
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
108	2.A.7.d_glass production	2.A.7.1	BC	0.1488	g/t
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
4436	Ammonium phosphate production	2.B.5.a	BC	9	g/t
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

Tech. ID	Technology Name	Category	Pollutant	Emission Factor	Unit
3701	1.A.2.a_301A	1.A.2.c	NMVOC	7	g/GJ
120	Polyester processing	3.C	NMVOC	50	kg/t
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
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	mg/fire
4841	Car fire	6.D	DIOX	0.047	µg/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
4837	Detached house fire	6.D	As	1.4	mg/fire
4837	Detached house fire	6.D	Cd	0.85	mg/fire
4837	Detached house fire	6.D	Cr	1.3	mg/fire
4837	Detached house fire	6.D	Cu	1.4	mg/fire
4837	Detached house fire	6.D	Hg	0.85	mg/fire
4837	Detached house fire	6.D	Pb	0.42	mg/fire
4837	Detached house fire	6.D	DIOX	1.4	µg/fire
4837	Detached house fire	6.D	TSP	0.14	kg/fire

Tech. ID	Technology Name	Category	Pollutant	Emission Factor	Unit
4837	Detached house fire	6.D	PM25	0.14	kg/fire
4837	Detached house fire	6.D	PM10	0.14	kg/fire
4838	Undetached house fire	6.D	As	0.58	mg/fire
4838	Undetached house fire	6.D	Cd	0.36	mg/fire
4838	Undetached house fire	6.D	Cr	0.55	mg/fire
4838	Undetached house fire	6.D	Cu	1.3	mg/fire
4838	Undetached house fire	6.D	Hg	0.36	mg/fire
4838	Undetached house fire	6.D	Pb	0.18	mg/fire
4838	Undetached house fire	6.D	DIOX	0.62	µg/fire
4838	Undetached house fire	6.D	TSP	0.06	kg/fire
4838	Undetached house fire	6.D	PM25	0.06	kg/fire
4838	Undetached house fire	6.D	PM10	0.06	kg/fire
4839	Apartment building fire	6.D	As	0.41	mg/fire
4839	Apartment building fire	6.D	Cd	0.26	mg/fire
4839	Apartment building fire	6.D	Cr	0.39	mg/fire
4839	Apartment building fire	6.D	Cu	0.91	mg/fire
4839	Apartment building fire	6.D	Hg	0.26	mg/fire
4839	Apartment building fire	6.D	Pb	0.13	mg/fire
4839	Apartment building fire	6.D	DIOX	0.44	µg/fire
4839	Apartment building fire	6.D	TSP	0.04	kg/fire
4839	Apartment building fire	6.D	PM25	0.04	kg/fire
4839	Apartment building fire	6.D	PM10	0.04	kg/fire
4840	Industrial building fire	6.D	As	0.25	mg/fire
4840	Industrial building fire	6.D	Cd	0.16	mg/fire
4840	Industrial building fire	6.D	Cr	0.24	mg/fire
4840	Industrial building fire	6.D	Cu	0.57	mg/fire
4840	Industrial building fire	6.D	Hg	0.16	mg/fire
4840	Industrial building fire	6.D	Pb	0.08	mg/fire
4840	Industrial building fire	6.D	DIOX	0.27	µg/fire
4840	Industrial building fire	6.D	TSP	0.03	kg/fire
4840	Industrial building fire	6.D	PM25	0.03	kg/fire
4840	Industrial building fire	6.D	PM10	0.03	kg/fire
4846	2.D.3.i, 2G Tabacco combustion	3.D.3	Ni	2.7	g/t tobaccoa
4846	2.D.3.i, 2G Tabacco combustion	3.D.3	Cd	5.4	g/t tobaccoa
4846	2.D.3.i, 2G Tabacco combustion	3.D.3	Zn	2.7	g/t tobaccoa
4846	2.D.3.i, 2G Tabacco combustion	3.D.3	Benzo(b)	0.045	g/t tobaccoa
4846	2.D.3.i, 2G Tabacco combustion	3.D.3	NMVOC	4.8	kg/t tobaccoa
4846	2.D.3.i, 2G Tabacco combustion	3.D.3	TSP	27	kg/t tobaccoa
4846	2.D.3.i, 2G Tabacco combustion	3.D.3	PM25	27	kg/t tobaccoa
4846	2.D.3.i, 2G Tabacco combustion	3.D.3	PM10	27	kg/t tobaccoa
4846	2.D.3.i, 2G Tabacco combustion	3.D.3	NOX	1.8	kg/t tobaccoa
4846	2.D.3.i, 2G Tabacco combustion	3.D.3	CO	55.1	kg/t tobaccoa
4846	2.D.3.i, 2G Tabacco combustion	3.D.3	Cu	5.4	g/t tobaccoa
4846	2.D.3.i, 2G Tabacco combustion	3.D.3	DIOX	0.1	µg/t tobaccoa
4846	2.D.3.i, 2G Tabacco combustion	3.D.3	Benzo(k)	0.045	g/t tobaccoa

Tech. ID	Technology Name	Category	Pollutant	Emission Factor	Unit
4846	2.D.3.i, 2G Tabacco combustion	3.D.3	Benzo(a)	0.111	g/t tobaccoa
4846	2.D.3.i, 2G Tabacco combustion	3.D.3	BC	12.15	kg/t tobaccoa
4846	2.D.3.i, 2G Tabacco combustion	3.D.3	NH3	4.15	kg/t tobaccoa
4846	2.D.3.i, 2G Tabacco combustion	3.D.3	Indeno	0.045	g/t tobaccoa
4842	2.D.3.i, 2G Fat, edible and non-edible oil extraction	3.D.3	NMVOC	1.57	kg/t seed
4842	2.D.3.i, 2G Fat, edible and non-edible oil extraction	3.D.3	TSP	1.1	kg/t seed
4842	2.D.3.i, 2G Fat, edible and non-edible oil extraction	3.D.3	PM25	0.6	kg/t seed
4842	2.D.3.i, 2G Fat, edible and non-edible oil extraction	3.D.3	PM10	0.9	kg/t seed
4844	2.D.3.i, 2G Organic solventborne preservative	3.D.3	NMVOC	945	kg/t seed
4843	Creosote preservative type	3.D.3	NMVOC	105	kg/t creosote
4843	Creosote preservative type	3.D.3	Benzo(a)	105	g/t creosote
4843	Creosote preservative type	3.D.3	Benzo(b)	0.53	g/t creosote
4843	Creosote preservative type	3.D.3	Benzo(k)	0.53	g/t creosote
4843	Creosote preservative type	3.D.3	Indeno	0.53	g/t creosote
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
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
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

Tech. ID	Technology Name	Category	Pollutant	Emission Factor	Unit
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
4948	derived gas - gas oil (ELLU)	1.A.2.f.1	Indeno	0.8	µg/GJ
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
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
5410	N from fertilizers use	4.D.1.a	NOX	0.026	kg/kg
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	7.6E-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
5452	Natural gas	1.A.1.b	SO2	0.281	g/GJ
5452	Natural gas	1.A.1.b	NOX	63	g/GJ
5452	Natural gas	1.A.1.b	NMVOC	2.58	g/GJ
5452	Natural gas	1.A.1.b	CO	39.3	g/GJ

Tech. ID	Technology Name	Category	Pollutant	Emission Factor	Unit
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
5413	Urea	4.D.1.a	NH3	0.1522	kg/t
5411	KAN	4.D.1.a	NH3	0.022	kg/t
5294	gaseous fuel	1.A.1.c	Pb	0.011	mg/GJ
5294	gaseous fuel	1.A.1.c	Se	0.058	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.1.c	Benzo(b)	2.9	μg/GJ
5294	gaseous fuel	1.A.1.c	Benzo(k)	1.1	μg/GJ
5294	gaseous fuel	1.A.1.c	Benzo(a)	0.72	μg/GJ
5294	gaseous fuel	1.A.1.c	Indeno	1.08	μg/GJ
5294	gaseous fuel	1.A.1.c	SO2	0.67	g/GJ
5294	gaseous fuel	1.A.1.c	NOX	74	g/GJ
5294	gaseous fuel	1.A.1.c	NMVOC	23	g/GJ
5294	gaseous fuel	1.A.1.c	CO	29	g/GJ
5294	gaseous fuel	1.A.1.c	TSP	0.78	g/GJ
5294	gaseous fuel	1.A.1.c	PM25	0.78	g/GJ
5294	gaseous fuel	1.A.1.c	PM10	0.78	g/GJ
5294	gaseous fuel	1.A.1.c	BC	0.0312	g/GJ
5294	gaseous fuel	1.A.1.c	As	0.1	mg/GJ
5294	gaseous fuel	1.A.1.c	Cd	1.8	mg/GJ
5294	gaseous fuel	1.A.1.c	Cr	0.013	mg/GJ
5294	gaseous fuel	1.A.1.c	Cu	0.0026	mg/GJ
5294	gaseous fuel	1.A.1.c	Hg	0.54	mg/GJ
5294	gaseous fuel	1.A.1.c	Ni	0.013	mg/GJ
5294	gaseous fuel	1.A.1.c	NH3	0.15	g/GJ
5294	gaseous fuel - natural gas, gas work gas, LPG	1.A.4.a.1	Pb	0.011	mg/GJ
5294	gaseous fuel - natural gas, gas work gas, LPG	1.A.4.a.1	Se	0.058	mg/GJ
5294	gaseous fuel - natural gas, gas work gas, LPG	1.A.4.a.1	Zn	0.73	mg/GJ
5294	gaseous fuel - natural gas, gas work gas, LPG	1.A.4.a.1	DIOX	0.52	ng/GJ
5294	gaseous fuel - natural gas, gas work gas, LPG	1.A.4.a.1	Benzo(b)	2.9	μg/GJ
5294	gaseous fuel - natural gas, gas work gas, LPG	1.A.4.a.1	Benzo(k)	1.1	μg/GJ
5294	gaseous fuel - natural gas, gas work	1.A.4.a.1	Benzo(a)	0.72	μg/GJ

Tech. ID	Technology Name	Category	Pollutant	Emission Factor	Unit
	gas, LPG				
5294	gaseous fuel - natural gas, gas work gas, LPG	1.A.4.a.1	Indeno	1.08	µg/GJ
5294	gaseous fuel - natural gas, gas work gas, LPG	1.A.4.a.1	SO2	0.67	g/GJ
5294	gaseous fuel - natural gas, gas work gas, LPG	1.A.4.a.1	NOX	74	g/GJ
5294	gaseous fuel - natural gas, gas work gas, LPG	1.A.4.a.1	NMVOC	23	g/GJ
5294	gaseous fuel - natural gas, gas work gas, LPG	1.A.4.a.1	CO	29	g/GJ
5294	gaseous fuel - natural gas, gas work gas, LPG	1.A.4.a.1	TSP	0.78	g/GJ
5294	gaseous fuel - natural gas, gas work gas, LPG	1.A.4.a.1	PM25	0.78	g/GJ
5294	gaseous fuel - natural gas, gas work gas, LPG	1.A.4.a.1	PM10	0.78	g/GJ
5294	gaseous fuel - natural gas, gas work gas, LPG	1.A.4.a.1	BC	0.0312	g/GJ
5294	gaseous fuel - natural gas, gas work gas, LPG	1.A.4.a.1	As	0.1	mg/GJ
5294	gaseous fuel - natural gas, gas work gas, LPG	1.A.4.a.1	Cd	1.8	mg/GJ
5294	gaseous fuel - natural gas, gas work gas, LPG	1.A.4.a.1	Cr	0.013	mg/GJ
5294	gaseous fuel - natural gas, gas work gas, LPG	1.A.4.a.1	Cu	0.0026	mg/GJ
5294	gaseous fuel - natural gas, gas work gas, LPG	1.A.4.a.1	Hg	0.54	mg/GJ
5294	gaseous fuel - natural gas, gas work gas, LPG	1.A.4.a.1	Ni	0.013	mg/GJ
5294	gaseous fuel - natural gas, gas work gas, LPG	1.A.4.a.1	NH3	0.15	g/GJ
5415	NPK	4.D.1.a	NH3	0.037	kg/kg
5414	Amonij nitrat	4.D.1.a	NH3	0.037	kg/kg
5412	Urea Amonij nitrat	4.D.1.a	NH3	0.125	kg/kg
5155	Single house boilers <50kWth, biomass	1.A.4.b.1	Pb	27	mg/GJ
5155	Single house boilers <50kWth, biomass	1.A.4.b.1	Se	0.5	mg/GJ
5155	Single house boilers <50kWth, biomass	1.A.4.b.1	Zn	512	mg/GJ
5155	Single house boilers <50kWth, biomass	1.A.4.b.1	DIOX	550	ng/GJ
5155	Single house boilers <50kWth, biomass	1.A.4.b.1	Benzo(b)	111	mg/GJ
5155	Single house boilers <50kWth, biomass	1.A.4.b.1	Benzo(k)	42	mg/GJ
5155	Single house boilers <50kWth, biomass	1.A.4.b.1	Benzo(a)	121	mg/GJ
5155	Single house boilers <50kWth, biomass	1.A.4.b.1	Indeno	71	mg/GJ
5155	Single house boilers <50kWth, biomass	1.A.4.b.1	SO2	11	g/GJ

Tech. ID	Technology Name	Category	Pollutant	Emission Factor	Unit
5155	Single house boilers <50kWth, biomass	1.A.4.b.1	NOX	80	g/GJ
5155	Single house boilers <50kWth, biomass	1.A.4.b.1	NH3	74	g/GJ
5155	Single house boilers <50kWth, biomass	1.A.4.b.1	NMVOC	350	g/GJ
5155	Single house boilers <50kWth, biomass	1.A.4.b.1	CO	4000	g/GJ
5155	Single house boilers <50kWth, biomass	1.A.4.b.1	TSP	500	g/GJ
5155	Single house boilers <50kWth, biomass	1.A.4.b.1	PM25	470	g/GJ
5155	Single house boilers <50kWth, biomass	1.A.4.b.1	PM10	480	g/GJ
5155	Single house boilers <50kWth, biomass	1.A.4.b.1	BC	75.2	g/GJ
5155	Single house boilers <50kWth, biomass	1.A.4.b.1	PCBs	0.06	µg/GJ
5155	Single house boilers <50kWth, biomass	1.A.4.b.1	HCB	5	µg/GJ
5155	Single house boilers <50kWth, biomass	1.A.4.b.1	As	0.19	mg/GJ
5155	Single house boilers <50kWth, biomass	1.A.4.b.1	Cd	13	mg/GJ
5155	Single house boilers <50kWth, biomass	1.A.4.b.1	Cr	23	mg/GJ
5155	Single house boilers <50kWth, biomass	1.A.4.b.1	Cu	6	mg/GJ
5155	Single house boilers <50kWth, biomass	1.A.4.b.1	Hg	0.56	mg/GJ
5155	Single house boilers <50kWth, biomass	1.A.4.b.1	Ni	2	mg/GJ
5294	gaseous fuel - natural gas, gas work gas, LPG	1.A.4.c.1	Pb	0.011	mg/GJ
5294	gaseous fuel - natural gas, gas work gas, LPG	1.A.4.c.1	Se	0.058	mg/GJ
5294	gaseous fuel - natural gas, gas work gas, LPG	1.A.4.c.1	Zn	0.73	mg/GJ
5294	gaseous fuel - natural gas, gas work gas, LPG	1.A.4.c.1	DIOX	0.52	ng/GJ
5294	gaseous fuel - natural gas, gas work gas, LPG	1.A.4.c.1	Benzo(b)	2.9	µg/GJ
5294	gaseous fuel - natural gas, gas work gas, LPG	1.A.4.c.1	Benzo(k)	1.1	µg/GJ
5294	gaseous fuel - natural gas, gas work gas, LPG	1.A.4.c.1	Benzo(a)	0.72	µg/GJ
5294	gaseous fuel - natural gas, gas work gas, LPG	1.A.4.c.1	Indeno	1.08	µg/GJ
5294	gaseous fuel - natural gas, gas work gas, LPG	1.A.4.c.1	SO2	0.67	g/GJ
5294	gaseous fuel - natural gas, gas work gas, LPG	1.A.4.c.1	NOX	74	g/GJ
5294	gaseous fuel - natural gas, gas work gas, LPG	1.A.4.c.1	NMVOC	23	g/GJ
5294	gaseous fuel - natural gas, gas work gas, LPG	1.A.4.c.1	CO	29	g/GJ
5294	gaseous fuel - natural gas, gas work gas, LPG	1.A.4.c.1	TSP	0.78	g/GJ
5294	gaseous fuel - natural gas, gas work gas, LPG	1.A.4.c.1	PM25	0.78	g/GJ
5294	gaseous fuel - natural gas, gas work	1.A.4.c.1	PM10	0.78	g/GJ

Tech. ID	Technology Name	Category	Pollutant	Emission Factor	Unit
	gas, LPG				
5294	gaseous fuel - natural gas, gas work gas, LPG	1.A.4.c.1	BC	0.0312	g/GJ
5294	gaseous fuel - natural gas, gas work gas, LPG	1.A.4.c.1	As	0.1	mg/GJ
5294	gaseous fuel - natural gas, gas work gas, LPG	1.A.4.c.1	Cd	1.8	mg/GJ
5294	gaseous fuel - natural gas, gas work gas, LPG	1.A.4.c.1	Cr	0.013	mg/GJ
5294	gaseous fuel - natural gas, gas work gas, LPG	1.A.4.c.1	Cu	0.0026	mg/GJ
5294	gaseous fuel - natural gas, gas work gas, LPG	1.A.4.c.1	Hg	0.54	mg/GJ
5294	gaseous fuel - natural gas, gas work gas, LPG	1.A.4.c.1	Ni	0.013	mg/GJ
5294	gaseous fuel - natural gas, gas work gas, LPG	1.A.4.c.1	NH3	0.15	g/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	mg/GJ
5290	sub-bituminous coal	1.A.4.a.1	Benzo(k)	23.7	mg/GJ
5290	sub-bituminous coal	1.A.4.a.1	Benzo(a)	45.5	mg/GJ
5290	sub-bituminous coal	1.A.4.a.1	Indeno	18.5	mg/GJ
5290	sub-bituminous coal	1.A.4.a.1	SO2	2469.14	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
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

Tech. ID	Technology Name	Category	Pollutant	Emission Factor	Unit
5291	lignit	1.A.4.a.1	DIOX	203	ng/GJ
5291	lignit	1.A.4.a.1	Benzo(b)	58.9	mg/GJ
5291	lignit	1.A.4.a.1	Benzo(k)	23.7	mg/GJ
5291	lignit	1.A.4.a.1	Benzo(a)	45.5	mg/GJ
5291	lignit	1.A.4.a.1	Indeno	18.5	mg/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
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	mg/GJ
5295	biomass	1.A.4.a.1	Benzo(k)	5	mg/GJ
5295	biomass	1.A.4.a.1	Benzo(a)	10	mg/GJ
5295	biomass	1.A.4.a.1	Indeno	4	mg/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

Tech. ID	Technology Name	Category	Pollutant	Emission Factor	Unit
5295	biomass	1.A.4.a.1	Hg	0.56	mg/GJ
5295	biomass	1.A.4.a.1	Ni	2	mg/GJ
5361	5.C.1.b.v Cremation	6.C.d	Hg	1.49	g/body
5361	5.C.1.b.v Cremation	6.C.d	SO2	0.113	kg/body
5361	5.C.1.b.v Cremation	6.C.d	NOX	0.825	kg/body
5361	5.C.1.b.v Cremation	6.C.d	CO	0.14	kg/body
5361	5.C.1.b.v Cremation	6.C.d	TSP	38.56	g/body
5361	5.C.1.b.v Cremation	6.C.d	PM25	34.7	g/body
5361	5.C.1.b.v Cremation	6.C.d	PM10	34.7	g/body
5361	5.C.1.b.v Cremation	6.C.d	NMVOC	0.013	kg/body
5361	5.C.1.b.v Cremation	6.C.d	Pb	30.03	mg/body
5361	5.C.1.b.v Cremation	6.C.d	Cd	5.03	mg/body
5361	5.C.1.b.v Cremation	6.C.d	As	13.61	mg/body
5361	5.C.1.b.v Cremation	6.C.d	Cr	13.56	mg/body
5361	5.C.1.b.v Cremation	6.C.d	Cu	12.43	mg/body
5361	5.C.1.b.v Cremation	6.C.d	Ni	17.33	mg/body
5361	5.C.1.b.v Cremation	6.C.d	Se	19.78	mg/body
5361	5.C.1.b.v Cremation	6.C.d	Zn	160.12	mg/body
5361	5.C.1.b.v Cremation	6.C.d	PCBs	0.41	mg/body
5361	5.C.1.b.v Cremation	6.C.d	DIOX	0.027	µg/body
5361	5.C.1.b.v Cremation	6.C.d	HCB	0.15	mg/body
5361	5.C.1.b.v Cremation	6.C.d	Benzo(a)	13.2	µg/body
5361	5.C.1.b.v Cremation	6.C.d	Benzo(b)	7.21	µg/body
5361	5.C.1.b.v Cremation	6.C.d	Benzo(k)	6.44	µg/body
5361	5.C.1.b.v Cremation	6.C.d	Indeno	6.99	µg/body
5240	Gaseous fuels	1.A.2.f.1	Pb	0.011	mg/GJ
5240	Gaseous fuels	1.A.2.f.1	Se	0.058	mg/GJ
5240	Gaseous fuels	1.A.2.f.1	Zn	0.73	mg/GJ
5240	Gaseous fuels	1.A.2.f.1	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.f.1	Benzo(k)	1.1	µg/GJ
5240	Gaseous fuels	1.A.2.f.1	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.f.1	SO2	0.67	g/GJ
5240	Gaseous fuels	1.A.2.f.1	NOX	74	g/GJ
5240	Gaseous fuels	1.A.2.f.1	NMVOC	23	g/GJ
5240	Gaseous fuels	1.A.2.f.1	CO	29	g/GJ
5240	Gaseous fuels	1.A.2.f.1	TSP	0.78	g/GJ
5240	Gaseous fuels	1.A.2.f.1	PM25	0.78	g/GJ
5240	Gaseous fuels	1.A.2.f.1	PM10	0.78	g/GJ
5240	Gaseous fuels	1.A.2.f.1	BC	0.0312	g/GJ
5240	Gaseous fuels	1.A.2.f.1	As	0.1	mg/GJ
5240	Gaseous fuels	1.A.2.f.1	Cd	0.0009	mg/GJ
5240	Gaseous fuels	1.A.2.f.1	Cr	0.013	mg/GJ
5240	Gaseous fuels	1.A.2.f.1	Cu	0.0026	mg/GJ

Tech. ID	Technology Name	Category	Pollutant	Emission Factor	Unit
5240	Gaseous fuels	1.A.2.f.1	Hg	0.54	mg/GJ
5240	Gaseous fuels	1.A.2.f.1	Ni	0.013	mg/GJ
3813	2.D.1_Paper pulp (Neutral Sulphite Semi-Chemical process)	2.D.1	SO2	5	kg/t
3813	2.D.1_Paper pulp (Neutral Sulphite Semi-Chemical process)	2.D.1	NOX	0.5	kg/t
3813	2.D.1_Paper pulp (Neutral Sulphite Semi-Chemical process)	2.D.1	NMVOC	0.1	kg/t
3815	White wine	2.D.2	NMVOC	0.035	kg/hl
3816	Wine (unspecified color)	2.D.2	NMVOC	0.08	kg/hl
3817	2.D.2_Beer	2.D.2	NMVOC	35	g/hl
3818	2.D.2_Spirits	2.D.2	NMVOC	15000	g/hl
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
5128	2.A.2_Tier 2_EMEP/EEA2013	2.A.2	TSP	400	g/t
5128	2.A.2_Tier 2_EMEP/EEA2013	2.A.2	PM25	30	g/t
5128	2.A.2_Tier 2_EMEP/EEA2013	2.A.2	PM10	200	g/t
5128	2.A.2_Tier 2_EMEP/EEA2013	2.A.2	BC	0.138	g/t
5154	Open fireplaces, biomass	1.A.4.b.1	Pb	27	mg/GJ
5154	Open fireplaces, biomass	1.A.4.b.1	Se	0.5	mg/GJ
5154	Open fireplaces, biomass	1.A.4.b.1	Zn	512	mg/GJ
5154	Open fireplaces, biomass	1.A.4.b.1	DIOX	800	ng/GJ
5154	Open fireplaces, biomass	1.A.4.b.1	Benzo(b)	111	mg/GJ
5154	Open fireplaces, biomass	1.A.4.b.1	Benzo(k)	42	mg/GJ
5154	Open fireplaces, biomass	1.A.4.b.1	Benzo(a)	121	mg/GJ
5154	Open fireplaces, biomass	1.A.4.b.1	Indeno	71	mg/GJ
5154	Open fireplaces, biomass	1.A.4.b.1	SO2	11	g/GJ
5154	Open fireplaces, biomass	1.A.4.b.1	NOX	50	g/GJ
5154	Open fireplaces, biomass	1.A.4.b.1	NH3	74	g/GJ
5154	Open fireplaces, biomass	1.A.4.b.1	NMVOC	600	g/GJ
5154	Open fireplaces, biomass	1.A.4.b.1	CO	4000	g/GJ
5154	Open fireplaces, biomass	1.A.4.b.1	TSP	880	g/GJ
5154	Open fireplaces, biomass	1.A.4.b.1	PM25	820	g/GJ
5154	Open fireplaces, biomass	1.A.4.b.1	PM10	840	g/GJ
5154	Open fireplaces, biomass	1.A.4.b.1	BC	57.4	g/GJ
5154	Open fireplaces, biomass	1.A.4.b.1	PCBs	0.06	µg/GJ
5154	Open fireplaces, biomass	1.A.4.b.1	HCB	5	µg/GJ
5154	Open fireplaces, biomass	1.A.4.b.1	As	0.19	mg/GJ
5154	Open fireplaces, biomass	1.A.4.b.1	Cd	13	mg/GJ
5154	Open fireplaces, biomass	1.A.4.b.1	Cr	23	mg/GJ
5154	Open fireplaces, biomass	1.A.4.b.1	Cu	6	mg/GJ
5154	Open fireplaces, biomass	1.A.4.b.1	Hg	0.56	mg/GJ
5154	Open fireplaces, biomass	1.A.4.b.1	Ni	2	mg/GJ
5156	Domestic stoves, biomass	1.A.4.b.1	Pb	27	mg/GJ

Tech. ID	Technology Name	Category	Pollutant	Emission Factor	Unit
5156	Domestic stoves, biomass	1.A.4.b.1	Se	0.5	mg/GJ
5156	Domestic stoves, biomass	1.A.4.b.1	Zn	512	mg/GJ
5156	Domestic stoves, biomass	1.A.4.b.1	DIOX	800	ng/GJ
5156	Domestic stoves, biomass	1.A.4.b.1	Benzo(b)	111	mg/GJ
5156	Domestic stoves, biomass	1.A.4.b.1	Benzo(k)	42	mg/GJ
5156	Domestic stoves, biomass	1.A.4.b.1	Benzo(a)	121	mg/GJ
5156	Domestic stoves, biomass	1.A.4.b.1	Indeno	71	mg/GJ
5156	Domestic stoves, biomass	1.A.4.b.1	SO2	11	g/GJ
5156	Domestic stoves, biomass	1.A.4.b.1	NOX	50	g/GJ
5156	Domestic stoves, biomass	1.A.4.b.1	NH3	70	g/GJ
5156	Domestic stoves, biomass	1.A.4.b.1	NMVOC	600	g/GJ
5156	Domestic stoves, biomass	1.A.4.b.1	CO	4000	g/GJ
5156	Domestic stoves, biomass	1.A.4.b.1	TSP	800	g/GJ
5156	Domestic stoves, biomass	1.A.4.b.1	PM25	740	g/GJ
5156	Domestic stoves, biomass	1.A.4.b.1	PM10	760	g/GJ
5156	Domestic stoves, biomass	1.A.4.b.1	BC	74	g/GJ
5156	Domestic stoves, biomass	1.A.4.b.1	PCBs	0.06	µg/GJ
5156	Domestic stoves, biomass	1.A.4.b.1	HCB	5	µg/GJ
5156	Domestic stoves, biomass	1.A.4.b.1	As	0.19	mg/GJ
5156	Domestic stoves, biomass	1.A.4.b.1	Cd	13	mg/GJ
5156	Domestic stoves, biomass	1.A.4.b.1	Cr	23	mg/GJ
5156	Domestic stoves, biomass	1.A.4.b.1	Cu	6	mg/GJ
5156	Domestic stoves, biomass	1.A.4.b.1	Hg	0.56	mg/GJ
5156	Domestic stoves, biomass	1.A.4.b.1	Ni	2	mg/GJ
5287	Biomass	1.A.2.f.1	PM25	140	g/GJ
5287	Biomass	1.A.2.f.1	PM10	143	g/GJ
5287	Biomass	1.A.2.f.1	BC	39.2	g/GJ
5287	Biomass	1.A.2.f.1	PCBs	0.06	µg/GJ
5287	Biomass	1.A.2.f.1	HCB	5	µg/GJ
5287	Biomass	1.A.2.f.1	As	0.19	mg/GJ
5287	Biomass	1.A.2.f.1	Cd	13	mg/GJ
5287	Biomass	1.A.2.f.1	Cr	23	mg/GJ
5287	Biomass	1.A.2.f.1	Cu	6	mg/GJ
5287	Biomass	1.A.2.f.1	Hg	0.56	mg/GJ
5287	Biomass	1.A.2.f.1	Ni	2	mg/GJ
5287	Biomass	1.A.2.f.1	Pb	27	mg/GJ
5287	Biomass	1.A.2.f.1	Se	0.5	mg/GJ
5287	Biomass	1.A.2.f.1	Zn	512	mg/GJ
5287	Biomass	1.A.2.f.1	DIOX	100	ng/GJ
5287	Biomass	1.A.2.f.1	Benzo(b)	16	µg/GJ
5287	Biomass	1.A.2.f.1	Benzo(k)	5	µg/GJ
5287	Biomass	1.A.2.f.1	Benzo(a)	10	µg/GJ
5287	Biomass	1.A.2.f.1	Indeno	4	µg/GJ
5287	Biomass	1.A.2.f.1	SO2	11	g/GJ
5287	Biomass	1.A.2.f.1	NOX	91	g/GJ

Tech. ID	Technology Name	Category	Pollutant	Emission Factor	Unit
5287	Biomass	1.A.2.f.1	NH3	37	g/GJ
5287	Biomass	1.A.2.f.1	NMVOC	300	g/GJ
5287	Biomass	1.A.2.f.1	CO	570	g/GJ
5287	Biomass	1.A.2.f.1	TSP	150	g/GJ
5288	Solid fuels (coals)	1.A.2.f.1	PM25	108	g/GJ
5288	Solid fuels (coals)	1.A.2.f.1	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.f.1	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.f.1	As	4	mg/GJ
5288	Solid fuels (coals)	1.A.2.f.1	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.f.1	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.f.1	Ni	13	mg/GJ
5288	Solid fuels (coals)	1.A.2.f.1	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.f.1	Zn	200	mg/GJ
5288	Solid fuels (coals)	1.A.2.f.1	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.f.1	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.f.1	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.f.1	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.f.1	CO	931	g/GJ
5288	Solid fuels (coals)	1.A.2.f.1	TSP	124	g/GJ
5289	Petroleum coke	1.A.2.f.1	Pb	0.08	mg/GJ
5289	Petroleum coke	1.A.2.f.1	Se	0.11	mg/GJ
5289	Petroleum coke	1.A.2.f.1	Zn	29	mg/GJ
5289	Petroleum coke	1.A.2.f.1	DIOX	1.4	ng/GJ
5289	Petroleum coke	1.A.2.f.1	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.f.1	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.f.1	SO2	47	g/GJ
5289	Petroleum coke	1.A.2.f.1	NOX	513	g/GJ
5289	Petroleum coke	1.A.2.f.1	NMVOC	25	g/GJ
5289	Petroleum coke	1.A.2.f.1	CO	66	g/GJ
5289	Petroleum coke	1.A.2.f.1	TSP	20	g/GJ
5289	Petroleum coke	1.A.2.f.1	PM25	20	g/GJ
5289	Petroleum coke	1.A.2.f.1	PM10	20	g/GJ
5289	Petroleum coke	1.A.2.f.1	BC	11.2	g/GJ
5289	Petroleum coke	1.A.2.f.1	As	0.03	mg/GJ

Tech. ID	Technology Name	Category	Pollutant	Emission Factor	Unit
5289	Petroleum coke	1.A.2.f.1	Cd	0.006	mg/GJ
5289	Petroleum coke	1.A.2.f.1	Cr	0.2	mg/GJ
5289	Petroleum coke	1.A.2.f.1	Cu	0.22	mg/GJ
5289	Petroleum coke	1.A.2.f.1	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	Pb	0.08	mg/GJ
5289	Petroleum coke	1.A.2.a	Se	0.11	mg/GJ
5289	Petroleum coke	1.A.2.a	Zn	29	mg/GJ
5289	Petroleum coke	1.A.2.a	DIOX	1.4	mg/GJ
5289	Petroleum coke	1.A.2.a	Benzo(b)	15	mg/GJ
5289	Petroleum coke	1.A.2.a	Benzo(k)	1.7	mg/GJ
5289	Petroleum coke	1.A.2.a	Benzo(a)	1.9	mg/GJ
5289	Petroleum coke	1.A.2.a	Indeno	1.5	mg/GJ
5289	Petroleum coke	1.A.2.a	SO2	47	mg/GJ
5289	Petroleum coke	1.A.2.a	NOX	513	mg/GJ
5289	Petroleum coke	1.A.2.a	NMVOC	25	mg/GJ
5289	Petroleum coke	1.A.2.a	CO	66	mg/GJ
5289	Petroleum coke	1.A.2.a	TSP	20	mg/GJ
5289	Petroleum coke	1.A.2.a	PM25	20	mg/GJ
5289	Petroleum coke	1.A.2.a	PM10	20	mg/GJ
5289	Petroleum coke	1.A.2.a	BC	11.2	mg/GJ
5289	Petroleum coke	1.A.2.a	As	0.03	mg/GJ
5289	Petroleum coke	1.A.2.a	Cd	0.006	mg/GJ
5289	Petroleum coke	1.A.2.a	Cr	0.2	mg/GJ
5289	Petroleum coke	1.A.2.a	Cu	0.22	mg/GJ
5289	Petroleum coke	1.A.2.a	Hg	0.12	mg/GJ
5289	Petroleum coke	1.A.2.a	Ni	0.008	mg/GJ
5240	Gaseous fuels	1.A.2.a	Pb	0.011	mg/GJ
5240	Gaseous fuels	1.A.2.a	Se	0.058	mg/GJ
5240	Gaseous fuels	1.A.2.a	Zn	0.73	mg/GJ
5240	Gaseous fuels	1.A.2.a	DIOX	0.52	mg/GJ
5240	Gaseous fuels	1.A.2.a	Benzo(b)	2.9	mg/GJ
5240	Gaseous fuels	1.A.2.a	Benzo(k)	1.1	mg/GJ
5240	Gaseous fuels	1.A.2.a	Benzo(a)	0.72	mg/GJ
5240	Gaseous fuels	1.A.2.a	Indeno	1.08	mg/GJ
5240	Gaseous fuels	1.A.2.a	SO2	0.67	mg/GJ
5240	Gaseous fuels	1.A.2.a	NOX	74	mg/GJ
5240	Gaseous fuels	1.A.2.a	NMVOC	23	mg/GJ
5240	Gaseous fuels	1.A.2.a	CO	29	mg/GJ
5240	Gaseous fuels	1.A.2.a	TSP	0.78	mg/GJ
5240	Gaseous fuels	1.A.2.a	PM25	0.78	mg/GJ
5240	Gaseous fuels	1.A.2.a	PM10	0.78	mg/GJ
5240	Gaseous fuels	1.A.2.a	BC	0.0312	mg/GJ
5240	Gaseous fuels	1.A.2.a	As	0.1	mg/GJ
5240	Gaseous fuels	1.A.2.a	Cd	0.0009	mg/GJ

Tech. ID	Technology Name	Category	Pollutant	Emission Factor	Unit
5240	Gaseous fuels	1.A.2.a	Cr	0.013	mg/GJ
5240	Gaseous fuels	1.A.2.a	Cu	0.0026	mg/GJ
5240	Gaseous fuels	1.A.2.a	Hg	0.54	mg/GJ
5240	Gaseous fuels	1.A.2.a	Ni	0.013	mg/GJ
5288	Solid fuels (coals)	1.A.2.a	PM25	108	mg/GJ
5288	Solid fuels (coals)	1.A.2.a	PM10	117	mg/GJ
5288	Solid fuels (coals)	1.A.2.a	BC	6.912	mg/GJ
5288	Solid fuels (coals)	1.A.2.a	PCBs	170	mg/GJ
5288	Solid fuels (coals)	1.A.2.a	HCB	0.62	mg/GJ
5288	Solid fuels (coals)	1.A.2.a	As	4	mg/GJ
5288	Solid fuels (coals)	1.A.2.a	Cd	1.8	mg/GJ
5288	Solid fuels (coals)	1.A.2.a	Cr	13.5	mg/GJ
5288	Solid fuels (coals)	1.A.2.a	Cu	17.5	mg/GJ
5288	Solid fuels (coals)	1.A.2.a	Hg	0.56	mg/GJ
5288	Solid fuels (coals)	1.A.2.a	Ni	13	mg/GJ
5288	Solid fuels (coals)	1.A.2.a	Pb	27	mg/GJ
5288	Solid fuels (coals)	1.A.2.a	Se	1.8	mg/GJ
5288	Solid fuels (coals)	1.A.2.a	Zn	200	mg/GJ
5288	Solid fuels (coals)	1.A.2.a	DIOX	203	mg/GJ
5288	Solid fuels (coals)	1.A.2.a	Benzo(b)	58.9	mg/GJ
5288	Solid fuels (coals)	1.A.2.a	Benzo(k)	23.7	mg/GJ
5288	Solid fuels (coals)	1.A.2.a	Benzo(a)	45.5	mg/GJ
5288	Solid fuels (coals)	1.A.2.a	Indeno	18.5	mg/GJ
5288	Solid fuels (coals)	1.A.2.a	SO2	900	mg/GJ
5288	Solid fuels (coals)	1.A.2.a	NOX	173	mg/GJ
5288	Solid fuels (coals)	1.A.2.a	NMVOC	88.8	mg/GJ
5288	Solid fuels (coals)	1.A.2.a	CO	931	mg/GJ
5288	Solid fuels (coals)	1.A.2.a	TSP	124	mg/GJ
5287	Biomass	1.A.2.a	PM25	140	mg/GJ
5287	Biomass	1.A.2.a	PM10	143	mg/GJ
5287	Biomass	1.A.2.a	BC	39.2	mg/GJ
5287	Biomass	1.A.2.a	PCBs	0.06	mg/GJ
5287	Biomass	1.A.2.a	HCB	5	mg/GJ
5287	Biomass	1.A.2.a	As	0.19	mg/GJ
5287	Biomass	1.A.2.a	Cd	13	mg/GJ
5287	Biomass	1.A.2.a	Cr	23	mg/GJ
5287	Biomass	1.A.2.a	Cu	6	mg/GJ
5287	Biomass	1.A.2.a	Hg	0.56	mg/GJ
5287	Biomass	1.A.2.a	Ni	2	mg/GJ
5287	Biomass	1.A.2.a	Pb	27	mg/GJ
5287	Biomass	1.A.2.a	Se	0.5	mg/GJ
5287	Biomass	1.A.2.a	Zn	512	mg/GJ
5287	Biomass	1.A.2.a	DIOX	100	mg/GJ
5287	Biomass	1.A.2.a	Benzo(b)	16	mg/GJ
5287	Biomass	1.A.2.a	Benzo(k)	5	mg/GJ

Tech. ID	Technology Name	Category	Pollutant	Emission Factor	Unit
5287	Biomass	1.A.2.a	Benzo(a)	10	mg/GJ
5287	Biomass	1.A.2.a	Indeno	4	mg/GJ
5287	Biomass	1.A.2.a	SO2	11	mg/GJ
5287	Biomass	1.A.2.a	NOX	91	mg/GJ
5287	Biomass	1.A.2.a	NH3	37	mg/GJ
5287	Biomass	1.A.2.a	NMVOC	300	mg/GJ
5287	Biomass	1.A.2.a	CO	570	mg/GJ
5287	Biomass	1.A.2.a	TSP	150	mg/GJ
5287	Biomass	1.A.2.b	PM25	140	mg/GJ
5287	Biomass	1.A.2.b	PM10	143	mg/GJ
5287	Biomass	1.A.2.b	BC	39.2	mg/GJ
5287	Biomass	1.A.2.b	PCBs	0.06	mg/GJ
5287	Biomass	1.A.2.b	HCB	5	mg/GJ
5287	Biomass	1.A.2.b	As	0.19	mg/GJ
5287	Biomass	1.A.2.b	Cd	13	mg/GJ
5287	Biomass	1.A.2.b	Cr	23	mg/GJ
5287	Biomass	1.A.2.b	Cu	6	mg/GJ
5287	Biomass	1.A.2.b	Hg	0.56	mg/GJ
5287	Biomass	1.A.2.b	Ni	2	mg/GJ
5287	Biomass	1.A.2.b	Pb	27	mg/GJ
5287	Biomass	1.A.2.b	Se	0.5	mg/GJ
5287	Biomass	1.A.2.b	Zn	512	mg/GJ
5287	Biomass	1.A.2.b	DIOX	100	mg/GJ
5287	Biomass	1.A.2.b	Benzo(b)	16	mg/GJ
5287	Biomass	1.A.2.b	Benzo(k)	5	mg/GJ
5287	Biomass	1.A.2.b	Benzo(a)	10	mg/GJ
5287	Biomass	1.A.2.b	Indeno	4	mg/GJ
5287	Biomass	1.A.2.b	SO2	11	mg/GJ
5287	Biomass	1.A.2.b	NOX	91	mg/GJ
5287	Biomass	1.A.2.b	NH3	37	mg/GJ
5287	Biomass	1.A.2.b	NMVOC	300	mg/GJ
5287	Biomass	1.A.2.b	CO	570	mg/GJ
5287	Biomass	1.A.2.b	TSP	150	mg/GJ
5240	Gaseous fuels	1.A.2.b	Pb	0.011	mg/GJ
5240	Gaseous fuels	1.A.2.b	Se	0.058	mg/GJ
5240	Gaseous fuels	1.A.2.b	Zn	0.73	mg/GJ
5240	Gaseous fuels	1.A.2.b	DIOX	0.52	mg/GJ
5240	Gaseous fuels	1.A.2.b	Benzo(b)	2.9	mg/GJ
5240	Gaseous fuels	1.A.2.b	Benzo(k)	1.1	mg/GJ
5240	Gaseous fuels	1.A.2.b	Benzo(a)	0.72	mg/GJ
5240	Gaseous fuels	1.A.2.b	Indeno	1.08	mg/GJ
5240	Gaseous fuels	1.A.2.b	SO2	0.67	mg/GJ
5240	Gaseous fuels	1.A.2.b	NOX	74	mg/GJ
5240	Gaseous fuels	1.A.2.b	NMVOC	23	mg/GJ
5240	Gaseous fuels	1.A.2.b	CO	29	mg/GJ

Tech. ID	Technology Name	Category	Pollutant	Emission Factor	Unit
5240	Gaseous fuels	1.A.2.b	TSP	0.78	mg/GJ
5240	Gaseous fuels	1.A.2.b	PM25	0.78	mg/GJ
5240	Gaseous fuels	1.A.2.b	PM10	0.78	mg/GJ
5240	Gaseous fuels	1.A.2.b	BC	0.0312	mg/GJ
5240	Gaseous fuels	1.A.2.b	As	0.1	mg/GJ
5240	Gaseous fuels	1.A.2.b	Cd	0.0009	mg/GJ
5240	Gaseous fuels	1.A.2.b	Cr	0.013	mg/GJ
5240	Gaseous fuels	1.A.2.b	Cu	0.0026	mg/GJ
5240	Gaseous fuels	1.A.2.b	Hg	0.54	mg/GJ
5240	Gaseous fuels	1.A.2.b	Ni	0.013	mg/GJ
5240	Gaseous fuels	1.A.2.c	Pb	0.011	mg/GJ
5240	Gaseous fuels	1.A.2.c	Se	0.058	mg/GJ
5240	Gaseous fuels	1.A.2.c	Zn	0.73	mg/GJ
5240	Gaseous fuels	1.A.2.c	DIOX	0.52	mg/GJ
5240	Gaseous fuels	1.A.2.c	Benzo(b)	2.9	mg/GJ
5240	Gaseous fuels	1.A.2.c	Benzo(k)	1.1	mg/GJ
5240	Gaseous fuels	1.A.2.c	Benzo(a)	0.72	mg/GJ
5240	Gaseous fuels	1.A.2.c	Indeno	1.08	mg/GJ
5240	Gaseous fuels	1.A.2.c	SO2	0.67	mg/GJ
5240	Gaseous fuels	1.A.2.c	NOX	74	mg/GJ
5240	Gaseous fuels	1.A.2.c	NMVOC	23	mg/GJ
5240	Gaseous fuels	1.A.2.c	CO	29	mg/GJ
5240	Gaseous fuels	1.A.2.c	TSP	0.78	mg/GJ
5240	Gaseous fuels	1.A.2.c	PM25	0.78	mg/GJ
5240	Gaseous fuels	1.A.2.c	PM10	0.78	mg/GJ
5240	Gaseous fuels	1.A.2.c	BC	0.0312	mg/GJ
5240	Gaseous fuels	1.A.2.c	As	0.1	mg/GJ
5240	Gaseous fuels	1.A.2.c	Cd	0.0009	mg/GJ
5240	Gaseous fuels	1.A.2.c	Cr	0.013	mg/GJ
5240	Gaseous fuels	1.A.2.c	Cu	0.0026	mg/GJ
5240	Gaseous fuels	1.A.2.c	Hg	0.54	mg/GJ
5240	Gaseous fuels	1.A.2.c	Ni	0.013	mg/GJ
5287	Biomass	1.A.2.c	PM25	140	mg/GJ
5287	Biomass	1.A.2.c	PM10	143	mg/GJ
5287	Biomass	1.A.2.c	BC	39.2	mg/GJ
5287	Biomass	1.A.2.c	PCBs	0.06	mg/GJ
5287	Biomass	1.A.2.c	HCB	5	mg/GJ
5287	Biomass	1.A.2.c	As	0.19	mg/GJ
5287	Biomass	1.A.2.c	Cd	13	mg/GJ
5287	Biomass	1.A.2.c	Cr	23	mg/GJ
5287	Biomass	1.A.2.c	Cu	6	mg/GJ
5287	Biomass	1.A.2.c	Hg	0.56	mg/GJ
5287	Biomass	1.A.2.c	Ni	2	mg/GJ
5287	Biomass	1.A.2.c	Pb	27	mg/GJ
5287	Biomass	1.A.2.c	Se	0.5	mg/GJ

Tech. ID	Technology Name	Category	Pollutant	Emission Factor	Unit
5287	Biomass	1.A.2.c	Zn	512	mg/GJ
5287	Biomass	1.A.2.c	DIOX	100	mg/GJ
5287	Biomass	1.A.2.c	Benzo(b)	16	mg/GJ
5287	Biomass	1.A.2.c	Benzo(k)	5	mg/GJ
5287	Biomass	1.A.2.c	Benzo(a)	10	mg/GJ
5287	Biomass	1.A.2.c	Indeno	4	mg/GJ
5287	Biomass	1.A.2.c	SO2	11	mg/GJ
5287	Biomass	1.A.2.c	NOX	91	mg/GJ
5287	Biomass	1.A.2.c	NH3	37	mg/GJ
5287	Biomass	1.A.2.c	NMVOC	300	mg/GJ
5287	Biomass	1.A.2.c	CO	570	mg/GJ
5287	Biomass	1.A.2.c	TSP	150	mg/GJ
5240	Gaseous fuels	1.A.2.d	Pb	0.011	mg/GJ
5240	Gaseous fuels	1.A.2.d	Se	0.058	mg/GJ
5240	Gaseous fuels	1.A.2.d	Zn	0.73	mg/GJ
5240	Gaseous fuels	1.A.2.d	DIOX	0.52	mg/GJ
5240	Gaseous fuels	1.A.2.d	Benzo(b)	2.9	mg/GJ
5240	Gaseous fuels	1.A.2.d	Benzo(k)	1.1	mg/GJ
5240	Gaseous fuels	1.A.2.d	Benzo(a)	0.72	mg/GJ
5240	Gaseous fuels	1.A.2.d	Indeno	1.08	mg/GJ
5240	Gaseous fuels	1.A.2.d	SO2	0.67	mg/GJ
5240	Gaseous fuels	1.A.2.d	NOX	74	mg/GJ
5240	Gaseous fuels	1.A.2.d	NMVOC	23	mg/GJ
5240	Gaseous fuels	1.A.2.d	CO	29	mg/GJ
5240	Gaseous fuels	1.A.2.d	TSP	0.78	mg/GJ
5240	Gaseous fuels	1.A.2.d	PM25	0.78	mg/GJ
5240	Gaseous fuels	1.A.2.d	PM10	0.78	mg/GJ
5240	Gaseous fuels	1.A.2.d	BC	0.0312	mg/GJ
5240	Gaseous fuels	1.A.2.d	As	0.1	mg/GJ
5240	Gaseous fuels	1.A.2.d	Cd	0.0009	mg/GJ
5240	Gaseous fuels	1.A.2.d	Cr	0.013	mg/GJ
5240	Gaseous fuels	1.A.2.d	Cu	0.0026	mg/GJ
5240	Gaseous fuels	1.A.2.d	Hg	0.54	mg/GJ
5240	Gaseous fuels	1.A.2.d	Ni	0.013	mg/GJ
5881	Residual oil_2014	1.A.1.b	DIOX	2.5	mg/GJ
5881	Residual oil_2014	1.A.1.b	As	3.98	mg/GJ
5881	Residual oil_2014	1.A.1.b	Cd	1.2	mg/GJ
5881	Residual oil_2014	1.A.1.b	Cr	14.8	mg/GJ
5881	Residual oil_2014	1.A.1.b	Cu	11.9	mg/GJ
5881	Residual oil_2014	1.A.1.b	Hg	0.3	mg/GJ
5881	Residual oil_2014	1.A.1.b	Ni	1030	mg/GJ
5881	Residual oil_2014	1.A.1.b	Pb	4.6	mg/GJ
5881	Residual oil_2014	1.A.1.b	Benzo(b)	3.7	mg/GJ
5881	Residual oil_2014	1.A.1.b	Benzo(k)	0.2	mg/GJ
5881	Residual oil_2014	1.A.1.b	Benzo(a)	0.6	mg/GJ

Tech. ID	Technology Name	Category	Pollutant	Emission Factor	Unit
5881	Residual oil_2014	1.A.1.b	Indeno	1.3	mg/GJ
5881	Residual oil_2014	1.A.1.b	SO2	472.75	mg/GJ
5881	Residual oil_2014	1.A.1.b	NOX	142	mg/GJ
5881	Residual oil_2014	1.A.1.b	NMVOC	2.3	mg/GJ
5881	Residual oil_2014	1.A.1.b	CO	15	mg/GJ
5881	Residual oil_2014	1.A.1.b	TSP	20	mg/GJ
5881	Residual oil_2014	1.A.1.b	PM25	9	mg/GJ
5881	Residual oil_2014	1.A.1.b	PM10	15	mg/GJ
5881	Residual oil_2014	1.A.1.b	BC	0.504	mg/GJ
5881	Residual oil_2014	1.A.1.b	Se	2.1	mg/GJ
5881	Residual oil_2014	1.A.1.b	Zn	49.3	mg/GJ
5882	LF-HFO_2014	1.A.2.a	Pb	0.08	mg/GJ
5882	LF-HFO_2014	1.A.2.a	Se	0.11	mg/GJ
5882	LF-HFO_2014	1.A.2.a	Zn	29	mg/GJ
5882	LF-HFO_2014	1.A.2.a	DIOX	1.4	mg/GJ
5882	LF-HFO_2014	1.A.2.a	Benzo(b)	15	mg/GJ
5882	LF-HFO_2014	1.A.2.a	Benzo(k)	1.7	mg/GJ
5882	LF-HFO_2014	1.A.2.a	Benzo(a)	1.9	mg/GJ
5882	LF-HFO_2014	1.A.2.a	Indeno	1.5	mg/GJ
5882	LF-HFO_2014	1.A.2.a	SO2	472.75	mg/GJ
5882	LF-HFO_2014	1.A.2.a	NOX	513	mg/GJ
5882	LF-HFO_2014	1.A.2.a	NMVOC	25	mg/GJ
5882	LF-HFO_2014	1.A.2.a	CO	66	mg/GJ
5882	LF-HFO_2014	1.A.2.a	TSP	20	mg/GJ
5882	LF-HFO_2014	1.A.2.a	PM25	20	mg/GJ
5882	LF-HFO_2014	1.A.2.a	PM10	20	mg/GJ
5882	LF-HFO_2014	1.A.2.a	BC	11.2	mg/GJ
5882	LF-HFO_2014	1.A.2.a	As	0.03	mg/GJ
5882	LF-HFO_2014	1.A.2.a	Cd	0.006	mg/GJ
5882	LF-HFO_2014	1.A.2.a	Cr	0.2	mg/GJ
5882	LF-HFO_2014	1.A.2.a	Cu	0.22	mg/GJ
5882	LF-HFO_2014	1.A.2.a	Hg	0.12	mg/GJ
5882	LF-HFO_2014	1.A.2.a	Ni	0.008	mg/GJ
5883	Gas oil_2014	1.A.2.a	Pb	0.08	mg/GJ
5883	Gas oil_2014	1.A.2.a	Se	0.11	mg/GJ
5883	Gas oil_2014	1.A.2.a	Zn	29	mg/GJ
5883	Gas oil_2014	1.A.2.a	DIOX	1.4	mg/GJ
5883	Gas oil_2014	1.A.2.a	Benzo(b)	15	mg/GJ
5883	Gas oil_2014	1.A.2.a	Benzo(k)	1.7	mg/GJ
5883	Gas oil_2014	1.A.2.a	Benzo(a)	1.9	mg/GJ
5883	Gas oil_2014	1.A.2.a	Indeno	1.5	mg/GJ
5883	Gas oil_2014	1.A.2.a	SO2	37.46	mg/GJ
5883	Gas oil_2014	1.A.2.a	NOX	513	mg/GJ
5883	Gas oil_2014	1.A.2.a	NMVOC	25	mg/GJ
5883	Gas oil_2014	1.A.2.a	CO	66	mg/GJ

Tech. ID	Technology Name	Category	Pollutant	Emission Factor	Unit
5883	Gas oil_2014	1.A.2.a	TSP	20	mg/GJ
5883	Gas oil_2014	1.A.2.a	PM25	20	mg/GJ
5883	Gas oil_2014	1.A.2.a	PM10	20	mg/GJ
5883	Gas oil_2014	1.A.2.a	BC	11.2	mg/GJ
5883	Gas oil_2014	1.A.2.a	As	0.03	mg/GJ
5883	Gas oil_2014	1.A.2.a	Cd	0.006	mg/GJ
5883	Gas oil_2014	1.A.2.a	Cr	0.2	mg/GJ
5883	Gas oil_2014	1.A.2.a	Cu	0.22	mg/GJ
5883	Gas oil_2014	1.A.2.a	Hg	0.12	mg/GJ
5883	Gas oil_2014	1.A.2.a	Ni	0.008	mg/GJ
5883	Gas oil_2014	1.A.2.b	Pb	0.08	mg/GJ
5883	Gas oil_2014	1.A.2.b	Se	0.11	mg/GJ
5883	Gas oil_2014	1.A.2.b	Zn	29	mg/GJ
5883	Gas oil_2014	1.A.2.b	DIOX	1.4	mg/GJ
5883	Gas oil_2014	1.A.2.b	Benzo(b)	15	mg/GJ
5883	Gas oil_2014	1.A.2.b	Benzo(k)	1.7	mg/GJ
5883	Gas oil_2014	1.A.2.b	Benzo(a)	1.9	mg/GJ
5883	Gas oil_2014	1.A.2.b	Indeno	1.5	mg/GJ
5883	Gas oil_2014	1.A.2.b	SO2	37.46	mg/GJ
5883	Gas oil_2014	1.A.2.b	NOX	513	mg/GJ
5883	Gas oil_2014	1.A.2.b	NMVOC	25	mg/GJ
5883	Gas oil_2014	1.A.2.b	CO	66	mg/GJ
5883	Gas oil_2014	1.A.2.b	TSP	20	mg/GJ
5883	Gas oil_2014	1.A.2.b	PM25	20	mg/GJ
5883	Gas oil_2014	1.A.2.b	PM10	20	mg/GJ
5883	Gas oil_2014	1.A.2.b	BC	11.2	mg/GJ
5883	Gas oil_2014	1.A.2.b	As	0.03	mg/GJ
5883	Gas oil_2014	1.A.2.b	Cd	0.006	mg/GJ
5883	Gas oil_2014	1.A.2.b	Cr	0.2	mg/GJ
5883	Gas oil_2014	1.A.2.b	Cu	0.22	mg/GJ
5883	Gas oil_2014	1.A.2.b	Hg	0.12	mg/GJ
5883	Gas oil_2014	1.A.2.b	Ni	0.008	mg/GJ
5882	LF-HFO_2014	1.A.2.b	Pb	0.08	mg/GJ
5882	LF-HFO_2014	1.A.2.b	Se	0.11	mg/GJ
5882	LF-HFO_2014	1.A.2.b	Zn	29	mg/GJ
5882	LF-HFO_2014	1.A.2.b	DIOX	1.4	mg/GJ
5882	LF-HFO_2014	1.A.2.b	Benzo(b)	15	mg/GJ
5882	LF-HFO_2014	1.A.2.b	Benzo(k)	1.7	mg/GJ
5882	LF-HFO_2014	1.A.2.b	Benzo(a)	1.9	mg/GJ
5882	LF-HFO_2014	1.A.2.b	Indeno	1.5	mg/GJ
5882	LF-HFO_2014	1.A.2.b	SO2	472.75	mg/GJ
5882	LF-HFO_2014	1.A.2.b	NOX	513	mg/GJ
5882	LF-HFO_2014	1.A.2.b	NMVOC	25	mg/GJ
5882	LF-HFO_2014	1.A.2.b	CO	66	mg/GJ
5882	LF-HFO_2014	1.A.2.b	TSP	20	mg/GJ

Tech. ID	Technology Name	Category	Pollutant	Emission Factor	Unit
5882	LF-HFO_2014	1.A.2.b	PM25	20	mg/GJ
5882	LF-HFO_2014	1.A.2.b	PM10	20	mg/GJ
5882	LF-HFO_2014	1.A.2.b	BC	11.2	mg/GJ
5882	LF-HFO_2014	1.A.2.b	As	0.03	mg/GJ
5882	LF-HFO_2014	1.A.2.b	Cd	0.006	mg/GJ
5882	LF-HFO_2014	1.A.2.b	Cr	0.2	mg/GJ
5882	LF-HFO_2014	1.A.2.b	Cu	0.22	mg/GJ
5882	LF-HFO_2014	1.A.2.b	Hg	0.12	mg/GJ
5882	LF-HFO_2014	1.A.2.b	Ni	0.008	mg/GJ
5883	Gas oil_2014	1.A.2.c	Pb	0.08	mg/GJ
5883	Gas oil_2014	1.A.2.c	Se	0.11	mg/GJ
5883	Gas oil_2014	1.A.2.c	Zn	29	mg/GJ
5883	Gas oil_2014	1.A.2.c	DIOX	1.4	mg/GJ
5883	Gas oil_2014	1.A.2.c	Benzo(b)	15	mg/GJ
5883	Gas oil_2014	1.A.2.c	Benzo(k)	1.7	mg/GJ
5883	Gas oil_2014	1.A.2.c	Benzo(a)	1.9	mg/GJ
5883	Gas oil_2014	1.A.2.c	Indeno	1.5	mg/GJ
5883	Gas oil_2014	1.A.2.c	SO2	37.46	mg/GJ
5883	Gas oil_2014	1.A.2.c	NOX	513	mg/GJ
5883	Gas oil_2014	1.A.2.c	NMVOC	25	mg/GJ
5883	Gas oil_2014	1.A.2.c	CO	66	mg/GJ
5883	Gas oil_2014	1.A.2.c	TSP	20	mg/GJ
5883	Gas oil_2014	1.A.2.c	PM25	20	mg/GJ
5883	Gas oil_2014	1.A.2.c	PM10	20	mg/GJ
5883	Gas oil_2014	1.A.2.c	BC	11.2	mg/GJ
5883	Gas oil_2014	1.A.2.c	As	0.03	mg/GJ
5883	Gas oil_2014	1.A.2.c	Cd	0.006	mg/GJ
5883	Gas oil_2014	1.A.2.c	Cr	0.2	mg/GJ
5883	Gas oil_2014	1.A.2.c	Cu	0.22	mg/GJ
5883	Gas oil_2014	1.A.2.c	Hg	0.12	mg/GJ
5883	Gas oil_2014	1.A.2.c	Ni	0.008	mg/GJ
5882	LF-HFO_2014	1.A.2.c	Pb	0.08	mg/GJ
5882	LF-HFO_2014	1.A.2.c	Se	0.11	mg/GJ
5882	LF-HFO_2014	1.A.2.c	Zn	29	mg/GJ
5882	LF-HFO_2014	1.A.2.c	DIOX	1.4	mg/GJ
5882	LF-HFO_2014	1.A.2.c	Benzo(b)	15	mg/GJ
5882	LF-HFO_2014	1.A.2.c	Benzo(k)	1.7	mg/GJ
5882	LF-HFO_2014	1.A.2.c	Benzo(a)	1.9	mg/GJ
5882	LF-HFO_2014	1.A.2.c	Indeno	1.5	mg/GJ
5882	LF-HFO_2014	1.A.2.c	SO2	472.75	mg/GJ
5882	LF-HFO_2014	1.A.2.c	NOX	513	mg/GJ
5882	LF-HFO_2014	1.A.2.c	NMVOC	25	mg/GJ
5882	LF-HFO_2014	1.A.2.c	CO	66	mg/GJ
5882	LF-HFO_2014	1.A.2.c	TSP	20	mg/GJ
5882	LF-HFO_2014	1.A.2.c	PM25	20	mg/GJ

Tech. ID	Technology Name	Category	Pollutant	Emission Factor	Unit
5882	LF-HFO_2014	1.A.2.c	PM10	20	mg/GJ
5882	LF-HFO_2014	1.A.2.c	BC	11.2	mg/GJ
5882	LF-HFO_2014	1.A.2.c	As	0.03	mg/GJ
5882	LF-HFO_2014	1.A.2.c	Cd	0.006	mg/GJ
5882	LF-HFO_2014	1.A.2.c	Cr	0.2	mg/GJ
5882	LF-HFO_2014	1.A.2.c	Cu	0.22	mg/GJ
5882	LF-HFO_2014	1.A.2.c	Hg	0.12	mg/GJ
5882	LF-HFO_2014	1.A.2.c	Ni	0.008	mg/GJ
5883	Gas oil_2014	1.A.2.d	Pb	0.08	mg/GJ
5883	Gas oil_2014	1.A.2.d	Se	0.11	mg/GJ
5883	Gas oil_2014	1.A.2.d	Zn	29	mg/GJ
5883	Gas oil_2014	1.A.2.d	DIOX	1.4	mg/GJ
5883	Gas oil_2014	1.A.2.d	Benzo(b)	15	mg/GJ
5883	Gas oil_2014	1.A.2.d	Benzo(k)	1.7	mg/GJ
5883	Gas oil_2014	1.A.2.d	Benzo(a)	1.9	mg/GJ
5883	Gas oil_2014	1.A.2.d	Indeno	1.5	mg/GJ
5883	Gas oil_2014	1.A.2.d	SO2	37.46	mg/GJ
5883	Gas oil_2014	1.A.2.d	NOX	513	mg/GJ
5883	Gas oil_2014	1.A.2.d	NMVOC	25	mg/GJ
5883	Gas oil_2014	1.A.2.d	CO	66	mg/GJ
5883	Gas oil_2014	1.A.2.d	TSP	20	mg/GJ
5883	Gas oil_2014	1.A.2.d	PM25	20	mg/GJ
5883	Gas oil_2014	1.A.2.d	PM10	20	mg/GJ
5883	Gas oil_2014	1.A.2.d	BC	11.2	mg/GJ
5883	Gas oil_2014	1.A.2.d	As	0.03	mg/GJ
5883	Gas oil_2014	1.A.2.d	Cd	0.006	mg/GJ
5883	Gas oil_2014	1.A.2.d	Cr	0.2	mg/GJ
5883	Gas oil_2014	1.A.2.d	Cu	0.22	mg/GJ
5883	Gas oil_2014	1.A.2.d	Hg	0.12	mg/GJ
5883	Gas oil_2014	1.A.2.d	Ni	0.008	mg/GJ
5882	LF-HFO_2014	1.A.2.d	Pb	0.08	mg/GJ
5882	LF-HFO_2014	1.A.2.d	Se	0.11	mg/GJ
5882	LF-HFO_2014	1.A.2.d	Zn	29	mg/GJ
5882	LF-HFO_2014	1.A.2.d	DIOX	1.4	mg/GJ
5882	LF-HFO_2014	1.A.2.d	Benzo(b)	15	mg/GJ
5882	LF-HFO_2014	1.A.2.d	Benzo(k)	1.7	mg/GJ
5882	LF-HFO_2014	1.A.2.d	Benzo(a)	1.9	mg/GJ
5882	LF-HFO_2014	1.A.2.d	Indeno	1.5	mg/GJ
5882	LF-HFO_2014	1.A.2.d	SO2	472.75	mg/GJ
5882	LF-HFO_2014	1.A.2.d	NOX	513	mg/GJ
5882	LF-HFO_2014	1.A.2.d	NMVOC	25	mg/GJ
5882	LF-HFO_2014	1.A.2.d	CO	66	mg/GJ
5882	LF-HFO_2014	1.A.2.d	TSP	20	mg/GJ
5882	LF-HFO_2014	1.A.2.d	PM25	20	mg/GJ
5882	LF-HFO_2014	1.A.2.d	PM10	20	mg/GJ

Tech. ID	Technology Name	Category	Pollutant	Emission Factor	Unit
5882	LF-HFO_2014	1.A.2.d	BC	11.2	mg/GJ
5882	LF-HFO_2014	1.A.2.d	As	0.03	mg/GJ
5882	LF-HFO_2014	1.A.2.d	Cd	0.006	mg/GJ
5882	LF-HFO_2014	1.A.2.d	Cr	0.2	mg/GJ
5882	LF-HFO_2014	1.A.2.d	Cu	0.22	mg/GJ
5882	LF-HFO_2014	1.A.2.d	Hg	0.12	mg/GJ
5882	LF-HFO_2014	1.A.2.d	Ni	0.008	mg/GJ
5883	Gas oil_2014	1.A.2.e	Pb	0.08	mg/GJ
5883	Gas oil_2014	1.A.2.e	Se	0.11	mg/GJ
5883	Gas oil_2014	1.A.2.e	Zn	29	mg/GJ
5883	Gas oil_2014	1.A.2.e	DIOX	1.4	mg/GJ
5883	Gas oil_2014	1.A.2.e	Benzo(b)	15	mg/GJ
5883	Gas oil_2014	1.A.2.e	Benzo(k)	1.7	mg/GJ
5883	Gas oil_2014	1.A.2.e	Benzo(a)	1.9	mg/GJ
5883	Gas oil_2014	1.A.2.e	Indeno	1.5	mg/GJ
5883	Gas oil_2014	1.A.2.e	SO2	37.46	mg/GJ
5883	Gas oil_2014	1.A.2.e	NOX	513	mg/GJ
5883	Gas oil_2014	1.A.2.e	NMVOC	25	mg/GJ
5883	Gas oil_2014	1.A.2.e	CO	66	mg/GJ
5883	Gas oil_2014	1.A.2.e	TSP	20	mg/GJ
5883	Gas oil_2014	1.A.2.e	PM25	20	mg/GJ
5883	Gas oil_2014	1.A.2.e	PM10	20	mg/GJ
5883	Gas oil_2014	1.A.2.e	BC	11.2	mg/GJ
5883	Gas oil_2014	1.A.2.e	As	0.03	mg/GJ
5883	Gas oil_2014	1.A.2.e	Cd	0.006	mg/GJ
5883	Gas oil_2014	1.A.2.e	Cr	0.2	mg/GJ
5883	Gas oil_2014	1.A.2.e	Cu	0.22	mg/GJ
5883	Gas oil_2014	1.A.2.e	Hg	0.12	mg/GJ
5883	Gas oil_2014	1.A.2.e	Ni	0.008	mg/GJ
5882	LF-HFO_2014	1.A.2.e	Pb	0.08	mg/GJ
5882	LF-HFO_2014	1.A.2.e	Se	0.11	mg/GJ
5882	LF-HFO_2014	1.A.2.e	Zn	29	mg/GJ
5882	LF-HFO_2014	1.A.2.e	DIOX	1.4	mg/GJ
5882	LF-HFO_2014	1.A.2.e	Benzo(b)	15	mg/GJ
5882	LF-HFO_2014	1.A.2.e	Benzo(k)	1.7	mg/GJ
5882	LF-HFO_2014	1.A.2.e	Benzo(a)	1.9	mg/GJ
5882	LF-HFO_2014	1.A.2.e	Indeno	1.5	mg/GJ
5882	LF-HFO_2014	1.A.2.e	SO2	472.75	mg/GJ
5882	LF-HFO_2014	1.A.2.e	NOX	513	mg/GJ
5882	LF-HFO_2014	1.A.2.e	NMVOC	25	mg/GJ
5882	LF-HFO_2014	1.A.2.e	CO	66	mg/GJ
5882	LF-HFO_2014	1.A.2.e	TSP	20	mg/GJ
5882	LF-HFO_2014	1.A.2.e	PM25	20	mg/GJ
5882	LF-HFO_2014	1.A.2.e	PM10	20	mg/GJ
5882	LF-HFO_2014	1.A.2.e	BC	11.2	mg/GJ

Tech. ID	Technology Name	Category	Pollutant	Emission Factor	Unit
5882	LF-HFO_2014	1.A.2.e	As	0.03	mg/GJ
5882	LF-HFO_2014	1.A.2.e	Cd	0.006	mg/GJ
5882	LF-HFO_2014	1.A.2.e	Cr	0.2	mg/GJ
5882	LF-HFO_2014	1.A.2.e	Cu	0.22	mg/GJ
5882	LF-HFO_2014	1.A.2.e	Hg	0.12	mg/GJ
5882	LF-HFO_2014	1.A.2.e	Ni	0.008	mg/GJ
5883	Gas oil_2014	1.A.2.f.1	Pb	0.08	mg/GJ
5883	Gas oil_2014	1.A.2.f.1	Se	0.11	mg/GJ
5883	Gas oil_2014	1.A.2.f.1	Zn	29	mg/GJ
5883	Gas oil_2014	1.A.2.f.1	DIOX	1.4	ng/GJ
5883	Gas oil_2014	1.A.2.f.1	Benzo(b)	15	μg/GJ
5883	Gas oil_2014	1.A.2.f.1	Benzo(k)	1.7	μg/GJ
5883	Gas oil_2014	1.A.2.f.1	Benzo(a)	1.9	μg/GJ
5883	Gas oil_2014	1.A.2.f.1	Indeno	1.5	μg/GJ
5883	Gas oil_2014	1.A.2.f.1	SO2	37.46	g/GJ
5883	Gas oil_2014	1.A.2.f.1	NOX	513	g/GJ
5883	Gas oil_2014	1.A.2.f.1	NMVOC	25	g/GJ
5883	Gas oil_2014	1.A.2.f.1	CO	66	g/GJ
5883	Gas oil_2014	1.A.2.f.1	TSP	20	g/GJ
5883	Gas oil_2014	1.A.2.f.1	PM25	20	g/GJ
5883	Gas oil_2014	1.A.2.f.1	PM10	20	g/GJ
5883	Gas oil_2014	1.A.2.f.1	BC	11.2	g/GJ
5883	Gas oil_2014	1.A.2.f.1	As	0.03	mg/GJ
5883	Gas oil_2014	1.A.2.f.1	Cd	0.006	mg/GJ
5883	Gas oil_2014	1.A.2.f.1	Cr	0.2	mg/GJ
5883	Gas oil_2014	1.A.2.f.1	Cu	0.22	mg/GJ
5883	Gas oil_2014	1.A.2.f.1	Hg	0.12	mg/GJ
5883	Gas oil_2014	1.A.2.f.1	Ni	0.008	mg/GJ
5882	LF-HFO_2014	1.A.2.f.1	Pb	0.08	mg/GJ
5882	LF-HFO_2014	1.A.2.f.1	Se	0.11	mg/GJ
5882	LF-HFO_2014	1.A.2.f.1	Zn	29	mg/GJ
5882	LF-HFO_2014	1.A.2.f.1	DIOX	1.4	ng/GJ
5882	LF-HFO_2014	1.A.2.f.1	Benzo(b)	15	μg/GJ
5882	LF-HFO_2014	1.A.2.f.1	Benzo(k)	1.7	μg/GJ
5882	LF-HFO_2014	1.A.2.f.1	Benzo(a)	1.9	μg/GJ
5882	LF-HFO_2014	1.A.2.f.1	Indeno	1.5	μg/GJ
5882	LF-HFO_2014	1.A.2.f.1	SO2	472.75	g/GJ
5882	LF-HFO_2014	1.A.2.f.1	NOX	513	g/GJ
5882	LF-HFO_2014	1.A.2.f.1	NMVOC	25	g/GJ
5882	LF-HFO_2014	1.A.2.f.1	CO	66	g/GJ
5882	LF-HFO_2014	1.A.2.f.1	TSP	20	g/GJ
5882	LF-HFO_2014	1.A.2.f.1	PM25	20	g/GJ
5882	LF-HFO_2014	1.A.2.f.1	PM10	20	g/GJ
5882	LF-HFO_2014	1.A.2.f.1	BC	11.2	g/GJ
5882	LF-HFO_2014	1.A.2.f.1	As	0.03	mg/GJ

Tech. ID	Technology Name	Category	Pollutant	Emission Factor	Unit
5882	LF-HFO_2014	1.A.2.f.1	Cd	0.006	mg/GJ
5882	LF-HFO_2014	1.A.2.f.1	Cr	0.2	mg/GJ
5882	LF-HFO_2014	1.A.2.f.1	Cu	0.22	mg/GJ
5882	LF-HFO_2014	1.A.2.f.1	Hg	0.12	mg/GJ
5882	LF-HFO_2014	1.A.2.f.1	Ni	0.008	mg/GJ
5980	International navigation, diesel oil	1.A.3.d.1	As	0.94	mg/GJ
5980	International navigation, diesel oil	1.A.3.d.1	Hg	0.7	mg/GJ
5980	International navigation, diesel oil	1.A.3.d.1	Pb	3.04	mg/GJ
5980	International navigation, diesel oil	1.A.3.d.1	HCB	1.87	µg/GJ
5980	International navigation, diesel oil	1.A.3.d.1	DIOX	3.04	µg/GJ
5980	International navigation, diesel oil	1.A.3.d.1	PCBs	0.89	ng/GJ
5980	International navigation, diesel oil	1.A.3.d.1	Cd	0.234	mg/GJ
5980	International navigation, diesel oil	1.A.3.d.1	Cr	1.171	mg/GJ
5980	International navigation, diesel oil	1.A.3.d.1	Cu	20.604	mg/GJ
5980	International navigation, diesel oil	1.A.3.d.1	Ni	23.414	mg/GJ
5980	International navigation, diesel oil	1.A.3.d.1	Se	2.341	mg/GJ
5980	International navigation, diesel oil	1.A.3.d.1	Zn	28.096	mg/GJ
5980	International navigation, diesel oil	1.A.3.d.1	Benzo(b)	1170.686	µg/GJ
5980	International navigation, diesel oil	1.A.3.d.1	Benzo(a)	702.412	µg/GJ
5980	International navigation, diesel oil	1.A.3.d.1	SO2	46.83	g/GJ
5980	International navigation, diesel oil	1.A.3.d.1	NOX	1837.98	g/GJ
5980	International navigation, diesel oil	1.A.3.d.1	NH3	0.164	g/GJ
5980	International navigation, diesel oil	1.A.3.d.1	NMVOC	65.56	g/GJ
5980	International navigation, diesel oil	1.A.3.d.1	CO	173.26	g/GJ
5980	International navigation, diesel oil	1.A.3.d.1	TSP	35.12	g/GJ
5980	International navigation, diesel oil	1.A.3.d.1	PM10	35.12	g/GJ
5980	International navigation, diesel oil	1.A.3.d.1	PM25	32.78	g/GJ
5980	International navigation, diesel oil	1.A.3.d.1	BC	0.102	g/GJ
6066	Sulfuric acid-2015	2.B.5.a	SO2	1.59	kg/t
5287	Biomass	1.A.2.d	PM25	140	g/GJ
5287	Biomass	1.A.2.d	PM10	143	g/GJ
5287	Biomass	1.A.2.d	BC	39.2	g/GJ
5287	Biomass	1.A.2.d	PCBs	0.06	g/GJ
5287	Biomass	1.A.2.d	HCB	5	g/GJ
5287	Biomass	1.A.2.d	As	0.19	mg/GJ
5287	Biomass	1.A.2.d	Cd	13	mg/GJ
5287	Biomass	1.A.2.d	Cr	23	mg/GJ
5287	Biomass	1.A.2.d	Cu	6	mg/GJ
5287	Biomass	1.A.2.d	Hg	0.56	mg/GJ
5287	Biomass	1.A.2.d	Ni	2	mg/GJ
5287	Biomass	1.A.2.d	Pb	27	mg/GJ
5287	Biomass	1.A.2.d	Se	0.5	mg/GJ
5287	Biomass	1.A.2.d	Zn	512	mg/GJ
5287	Biomass	1.A.2.d	DIOX	100	ng/GJ
5287	Biomass	1.A.2.d	Benzo(b)	16	µg/GJ

Tech. ID	Technology Name	Category	Pollutant	Emission Factor	Unit
5287	Biomass	1.A.2.d	Benzo(k)	5	µg/GJ
5287	Biomass	1.A.2.d	Benzo(a)	10	µg/GJ
5287	Biomass	1.A.2.d	Indeno	4	µg/GJ
5287	Biomass	1.A.2.d	SO2	11	g/GJ
5287	Biomass	1.A.2.d	NOX	91	g/GJ
5287	Biomass	1.A.2.d	NH3	37	g/GJ
5287	Biomass	1.A.2.d	NMVOC	300	g/GJ
5287	Biomass	1.A.2.d	CO	570	g/GJ
5287	Biomass	1.A.2.d	TSP	150	g/GJ
5288	Solid fuels (coals)	1.A.2.e	PM25	108	g/GJ
5288	Solid fuels (coals)	1.A.2.e	PM10	117	g/GJ
5288	Solid fuels (coals)	1.A.2.e	BC	6.912	g/GJ
5288	Solid fuels (coals)	1.A.2.e	PCBs	170	µg/GJ
5288	Solid fuels (coals)	1.A.2.e	HCB	0.62	µg/GJ
5288	Solid fuels (coals)	1.A.2.e	As	4	mg/GJ
5288	Solid fuels (coals)	1.A.2.e	Cd	1.8	mg/GJ
5288	Solid fuels (coals)	1.A.2.e	Cr	13.5	mg/GJ
5288	Solid fuels (coals)	1.A.2.e	Cu	17.5	mg/GJ
5288	Solid fuels (coals)	1.A.2.e	Hg	0.56	mg/GJ
5288	Solid fuels (coals)	1.A.2.e	Ni	13	mg/GJ
5288	Solid fuels (coals)	1.A.2.e	Pb	27	mg/GJ
5288	Solid fuels (coals)	1.A.2.e	Se	1.8	mg/GJ
5288	Solid fuels (coals)	1.A.2.e	Zn	200	mg/GJ
5288	Solid fuels (coals)	1.A.2.e	DIOX	203	ng/GJ
5288	Solid fuels (coals)	1.A.2.e	Benzo(b)	58.9	µg/GJ
5288	Solid fuels (coals)	1.A.2.e	Benzo(k)	23.7	µg/GJ
5288	Solid fuels (coals)	1.A.2.e	Benzo(a)	45.5	µg/GJ
5288	Solid fuels (coals)	1.A.2.e	Indeno	18.5	µg/GJ
5288	Solid fuels (coals)	1.A.2.e	SO2	900	g/GJ
5288	Solid fuels (coals)	1.A.2.e	NOX	173	g/GJ
5288	Solid fuels (coals)	1.A.2.e	NMVOC	88.8	g/GJ
5288	Solid fuels (coals)	1.A.2.e	CO	931	g/GJ
5288	Solid fuels (coals)	1.A.2.e	TSP	124	g/GJ
5240	Gaseous fuels	1.A.2.e	Pb	0.011	mg/GJ
5240	Gaseous fuels	1.A.2.e	Se	0.058	mg/GJ
5240	Gaseous fuels	1.A.2.e	Zn	0.73	mg/GJ
5240	Gaseous fuels	1.A.2.e	DIOX	0.52	ng/GJ
5240	Gaseous fuels	1.A.2.e	Benzo(b)	2.9	µg/GJ
5240	Gaseous fuels	1.A.2.e	Benzo(k)	1.1	µg/GJ
5240	Gaseous fuels	1.A.2.e	Benzo(a)	0.72	µg/GJ
5240	Gaseous fuels	1.A.2.e	Indeno	1.08	µg/GJ
5240	Gaseous fuels	1.A.2.e	SO2	0.67	g/GJ
5240	Gaseous fuels	1.A.2.e	NOX	74	g/GJ
5240	Gaseous fuels	1.A.2.e	NMVOC	23	g/GJ
5240	Gaseous fuels	1.A.2.e	CO	29	g/GJ

Tech. ID	Technology Name	Category	Pollutant	Emission Factor	Unit
5240	Gaseous fuels	1.A.2.e	TSP	0.78	g/GJ
5240	Gaseous fuels	1.A.2.e	PM25	0.78	g/GJ
5240	Gaseous fuels	1.A.2.e	PM10	0.78	g/GJ
5240	Gaseous fuels	1.A.2.e	BC	0.0312	g/GJ
5240	Gaseous fuels	1.A.2.e	As	0.1	mg/GJ
5240	Gaseous fuels	1.A.2.e	Cd	0.0009	mg/GJ
5240	Gaseous fuels	1.A.2.e	Cr	0.013	mg/GJ
5240	Gaseous fuels	1.A.2.e	Cu	0.0026	mg/GJ
5240	Gaseous fuels	1.A.2.e	Hg	0.54	mg/GJ
5240	Gaseous fuels	1.A.2.e	Ni	0.013	mg/GJ
5287	Biomass	1.A.2.e	PM25	140	g/GJ
5287	Biomass	1.A.2.e	PM10	143	g/GJ
5287	Biomass	1.A.2.e	BC	39.2	g/GJ
5287	Biomass	1.A.2.e	PCBs	0.06	μg/GJ
5287	Biomass	1.A.2.e	HCB	5	μg/GJ
5287	Biomass	1.A.2.e	As	0.19	mg/GJ
5287	Biomass	1.A.2.e	Cd	13	mg/GJ
5287	Biomass	1.A.2.e	Cr	23	mg/GJ
5287	Biomass	1.A.2.e	Cu	6	mg/GJ
5287	Biomass	1.A.2.e	Hg	0.56	mg/GJ
5287	Biomass	1.A.2.e	Ni	2	mg/GJ
5287	Biomass	1.A.2.e	Pb	27	mg/GJ
5287	Biomass	1.A.2.e	Se	0.5	mg/GJ
5287	Biomass	1.A.2.e	Zn	512	mg/GJ
5287	Biomass	1.A.2.e	DIOX	100	ng/GJ
5287	Biomass	1.A.2.e	Benzo(b)	16	μg/GJ
5287	Biomass	1.A.2.e	Benzo(k)	5	μg/GJ
5287	Biomass	1.A.2.e	Benzo(a)	10	μg/GJ
5287	Biomass	1.A.2.e	Indeno	4	μg/GJ
5287	Biomass	1.A.2.e	SO2	11	g/GJ
5287	Biomass	1.A.2.e	NOX	91	g/GJ
5287	Biomass	1.A.2.e	NH3	37	g/GJ
5287	Biomass	1.A.2.e	NMVOC	300	g/GJ
5287	Biomass	1.A.2.e	CO	570	g/GJ
5287	Biomass	1.A.2.e	TSP	150	g/GJ
5353	Pharmaceutical products	3.D.2	NMVOC	48	g/inhabitant
5352	Cosmetics and toiletries	3.D.2	NMVOC	127	g/kg product
5347	Household products	3.D.2	NMVOC	16.2	g/kg product
5348	Car care product	3.D.2	NMVOC	183	g/kg product
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
5351	Various_Hg (fluorescent tubes)	3.D.2	Hg	5.6	mg/inhabitant
5354	2.D.3.i, 2.G Use of shoes	3.D.3	NMVOC	60	g/pair
5355	Various_Pesticide use incl. fungicides	3.D.2	NMVOC	152	kg/t

Tech. ID	Technology Name	Category	Pollutant	Emission Factor	Unit
5356	Car dewaxing	3.D.3	NMVOC	1	kg/car
5358	2.D.3.i, 2.G Other, concrete aditive	3.D.3	NMVOC	915	g/t
5359	2.D.3.i, 2.G Other, Cooling lubricant	3.D.3	NMVOC	1000	g/t
5360	2.D.3.i, 2.G Other, Lubricant	3.D.3	NMVOC	28000	g/t
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
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
5422	Formaldehid	2.B.5.a	NMVOC	7	kg/t
5422	Formaldehid	2.B.5.a	CO	12	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
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
5825	Pellete stoves and boilers, biomass	1.A.4.b.1	Pb	27	mg/GJ
5825	Pellete stoves and boilers, biomass	1.A.4.b.1	Se	0.5	mg/GJ
5825	Pellete stoves and boilers, biomass	1.A.4.b.1	Zn	512	mg/GJ
5825	Pellete stoves and boilers, biomass	1.A.4.b.1	DIOX	100	ng/GJ
5825	Pellete stoves and boilers, biomass	1.A.4.b.1	Benzo(b)	16	mg/GJ
5825	Pellete stoves and boilers, biomass	1.A.4.b.1	Benzo(k)	5	mg/GJ
5825	Pellete stoves and boilers, biomass	1.A.4.b.1	Benzo(a)	10	mg/GJ
5825	Pellete stoves and boilers, biomass	1.A.4.b.1	Indeno	4	mg/GJ
5825	Pellete stoves and boilers, biomass	1.A.4.b.1	SO2	11	g/GJ

Tech. ID	Technology Name	Category	Pollutant	Emission Factor	Unit
5825	Pellete stoves and boilers, biomass	1.A.4.b.1	NOX	80	g/GJ
5825	Pellete stoves and boilers, biomass	1.A.4.b.1	NH3	12	g/GJ
5825	Pellete stoves and boilers, biomass	1.A.4.b.1	NMVOC	10	g/GJ
5825	Pellete stoves and boilers, biomass	1.A.4.b.1	CO	300	g/GJ
5825	Pellete stoves and boilers, biomass	1.A.4.b.1	TSP	31	g/GJ
5825	Pellete stoves and boilers, biomass	1.A.4.b.1	PM25	29	g/GJ
5825	Pellete stoves and boilers, biomass	1.A.4.b.1	PM10	29	g/GJ
5825	Pellete stoves and boilers, biomass	1.A.4.b.1	BC	4.35	g/GJ
5825	Pellete stoves and boilers, biomass	1.A.4.b.1	PCBs	0.01	µg/GJ
5825	Pellete stoves and boilers, biomass	1.A.4.b.1	HCB	5	µg/GJ
5825	Pellete stoves and boilers, biomass	1.A.4.b.1	As	0.19	mg/GJ
5825	Pellete stoves and boilers, biomass	1.A.4.b.1	Cd	13	mg/GJ
5825	Pellete stoves and boilers, biomass	1.A.4.b.1	Cr	23	mg/GJ
5825	Pellete stoves and boilers, biomass	1.A.4.b.1	Cu	6	mg/GJ
5825	Pellete stoves and boilers, biomass	1.A.4.b.1	Hg	0.56	mg/GJ
5825	Pellete stoves and boilers, biomass	1.A.4.b.1	Ni	2	mg/GJ
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
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
5877	Application of glues_2014	3.D.3	NMVOC	160794	g/t
5878	Advanced/ecolabelled stoves and boilers, biomass	1.A.4.b.1	Pb	27	mg/GJ
5878	Advanced/ecolabelled stoves and boilers, biomass	1.A.4.b.1	Se	0.5	mg/GJ
5878	Advanced/ecolabelled stoves and boilers, biomass	1.A.4.b.1	Zn	512	mg/GJ
5878	Advanced/ecolabelled stoves and boilers, biomass	1.A.4.b.1	DIOX	100	ng/GJ
5878	Advanced/ecolabelled stoves and boilers, biomass	1.A.4.b.1	Benzo(b)	16	mg/GJ
5878	Advanced/ecolabelled stoves and boilers, biomass	1.A.4.b.1	Benzo(k)	5	mg/GJ
5878	Advanced/ecolabelled stoves and boilers, biomass	1.A.4.b.1	Benzo(a)	10	mg/GJ
5878	Advanced/ecolabelled stoves and boilers, biomass	1.A.4.b.1	Indeno	4	mg/GJ
5878	Advanced/ecolabelled stoves and boilers, biomass	1.A.4.b.1	SO2	11	g/GJ
5878	Advanced/ecolabelled stoves and boilers, biomass	1.A.4.b.1	NOX	95	g/GJ

Tech. ID	Technology Name	Category	Pollutant	Emission Factor	Unit
5878	Advanced/ecolabelled stoves and boilers, biomass	1.A.4.b.1	NH3	37	g/GJ
5878	Advanced/ecolabelled stoves and boilers, biomass	1.A.4.b.1	NMVOC	250	g/GJ
5878	Advanced/ecolabelled stoves and boilers, biomass	1.A.4.b.1	CO	2000	g/GJ
5878	Advanced/ecolabelled stoves and boilers, biomass	1.A.4.b.1	TSP	100	g/GJ
5878	Advanced/ecolabelled stoves and boilers, biomass	1.A.4.b.1	PM25	93	g/GJ
5878	Advanced/ecolabelled stoves and boilers, biomass	1.A.4.b.1	PM10	95	g/GJ
5878	Advanced/ecolabelled stoves and boilers, biomass	1.A.4.b.1	BC	26.04	g/GJ
5878	Advanced/ecolabelled stoves and boilers, biomass	1.A.4.b.1	PCBs	0.007	µg/GJ
5878	Advanced/ecolabelled stoves and boilers, biomass	1.A.4.b.1	HCB	5	µg/GJ
5878	Advanced/ecolabelled stoves and boilers, biomass	1.A.4.b.1	As	0.19	mg/GJ
5878	Advanced/ecolabelled stoves and boilers, biomass	1.A.4.b.1	Cd	13	mg/GJ
5878	Advanced/ecolabelled stoves and boilers, biomass	1.A.4.b.1	Cr	23	mg/GJ
5878	Advanced/ecolabelled stoves and boilers, biomass	1.A.4.b.1	Cu	6	mg/GJ
5878	Advanced/ecolabelled stoves and boilers, biomass	1.A.4.b.1	Hg	0.56	mg/GJ
5878	Advanced/ecolabelled stoves and boilers, biomass	1.A.4.b.1	Ni	2	mg/GJ
6057	EL-TO Zg 2015	1.A.1.a	Cd	0.053	mg/GJ
6057	EL-TO Zg 2015	1.A.1.a	Hg	0.61	mg/GJ
6057	EL-TO Zg 2015	1.A.1.a	Ni	65.95	mg/GJ
6057	EL-TO Zg 2015	1.A.1.a	Pb	5.03	mg/GJ
6057	EL-TO Zg 2015	1.A.1.a	SO2	253.3	g/GJ
6057	EL-TO Zg 2015	1.A.1.a	NOX	482.07	g/GJ
6057	EL-TO Zg 2015	1.A.1.a	CO	22.99	g/GJ
6057	EL-TO Zg 2015	1.A.1.a	TSP	18	g/GJ
6057	EL-TO Zg 2015	1.A.1.a	PM25	4.5	g/GJ
6057	EL-TO Zg 2015	1.A.1.a	PM10	9	g/GJ
6057	EL-TO Zg 2015	1.A.1.a	BC	0.12	g/GJ
6059	KTE Jertovec 2015	1.A.1.a	Hg	0.0102	mg/GJ
6059	KTE Jertovec 2015	1.A.1.a	SO2	0	g/GJ
6059	KTE Jertovec 2015	1.A.1.a	NOX	14.9	g/GJ
6059	KTE Jertovec 2015	1.A.1.a	CO	0.563	g/GJ

Tech. ID	Technology Name	Category	Pollutant	Emission Factor	Unit
6059	KTE Jertovec 2015	1.A.1.a	TSP	0	g/GJ
6059	KTE Jertovec 2015	1.A.1.a	PM25	0	g/GJ
6059	KTE Jertovec 2015	1.A.1.a	PM10	0	g/GJ
6059	KTE Jertovec 2015	1.A.1.a	Cd	5.55E-05	mg/GJ
6059	KTE Jertovec 2015	1.A.1.a	Pb	0.0052	mg/GJ
6059	KTE Jertovec 2015	1.A.1.a	Ni	0.0685	mg/GJ
6059	KTE Jertovec 2015	1.A.1.a	BC	0	g/GJ
6058	TE-TO Zg 2015	1.A.1.a	Cd	0.174	mg/GJ
6058	TE-TO Zg 2015	1.A.1.a	Hg	0.846	mg/GJ
6058	TE-TO Zg 2015	1.A.1.a	Ni	215.116	mg/GJ
6058	TE-TO Zg 2015	1.A.1.a	Pb	16.421	mg/GJ
6058	TE-TO Zg 2015	1.A.1.a	SO2	1024.08	g/GJ
6058	TE-TO Zg 2015	1.A.1.a	NOX	417.24	g/GJ
6058	TE-TO Zg 2015	1.A.1.a	CO	62.22	g/GJ
6058	TE-TO Zg 2015	1.A.1.a	TSP	32.9	g/GJ
6058	TE-TO Zg 2015	1.A.1.a	PM25	8.225	g/GJ
6058	TE-TO Zg 2015	1.A.1.a	PM10	16.45	g/GJ
6058	TE-TO Zg 2015	1.A.1.a	BC	0.25	g/GJ
6060	TE Sisak 2015	1.A.1.a	Cd	0	mg/GJ
6060	TE Sisak 2015	1.A.1.a	Hg	0	mg/GJ
6060	TE Sisak 2015	1.A.1.a	BC	0.01	g/GJ
6060	TE Sisak 2015	1.A.1.a	Ni	0	mg/GJ
6060	TE Sisak 2015	1.A.1.a	Pb	0	mg/GJ
6060	TE Sisak 2015	1.A.1.a	SO2	7.84	g/GJ
6060	TE Sisak 2015	1.A.1.a	NOX	78.95	g/GJ
6060	TE Sisak 2015	1.A.1.a	CO	10.53	g/GJ
6060	TE Sisak 2015	1.A.1.a	TSP	1.26	g/GJ
6060	TE Sisak 2015	1.A.1.a	PM25	0.315	g/GJ
6060	TE Sisak 2015	1.A.1.a	PM10	0.63	g/GJ
6063	TE Plomin1-2015	1.A.1.a	Cd	1.93	mg/GJ
6063	TE Plomin1-2015	1.A.1.a	Hg	68.92	mg/GJ
6063	TE Plomin1-2015	1.A.1.a	Ni	93.73	mg/GJ
6063	TE Plomin1-2015	1.A.1.a	Pb	78.57	mg/GJ
6063	TE Plomin1-2015	1.A.1.a	SO2	2902.85	g/GJ
6063	TE Plomin1-2015	1.A.1.a	NOX	1861.15	g/GJ
6063	TE Plomin1-2015	1.A.1.a	CO	75.51	g/GJ
6063	TE Plomin1-2015	1.A.1.a	TSP	150.92	g/GJ
6063	TE Plomin1-2015	1.A.1.a	PM25	37.73	g/GJ
6063	TE Plomin1-2015	1.A.1.a	PM10	75.46	g/GJ
6063	TE Plomin1-2015	1.A.1.a	BC	0.83	g/GJ
6064	TE Plomin2-2015	1.A.1.a	Cd	2.96	mg/GJ
6064	TE Plomin2-2015	1.A.1.a	Hg	105.65	mg/GJ
6064	TE Plomin2-2015	1.A.1.a	Ni	143.69	mg/GJ
6064	TE Plomin2-2015	1.A.1.a	Pb	120.44	mg/GJ
6064	TE Plomin2-2015	1.A.1.a	SO2	242.02	g/GJ

Tech. ID	Technology Name	Category	Pollutant	Emission Factor	Unit
6064	TE Plomin2-2015	1.A.1.a	NOX	1550.19	g/GJ
6064	TE Plomin2-2015	1.A.1.a	CO	71.55	g/GJ
6064	TE Plomin2-2015	1.A.1.a	TSP	125.4202	g/GJ
6064	TE Plomin2-2015	1.A.1.a	PM25	31.35505	g/GJ
6064	TE Plomin2-2015	1.A.1.a	PM10	62.71	g/GJ
6064	TE Plomin2-2015	1.A.1.a	BC	0.69	g/GJ
6061	TE Rijeka 2015	1.A.1.a	PM10	9.8	g/GJ
6061	TE Rijeka 2015	1.A.1.a	Cd	0.072	mg/GJ
6061	TE Rijeka 2015	1.A.1.a	Hg	0	mg/GJ
6061	TE Rijeka 2015	1.A.1.a	Ni	88.502	mg/GJ
6061	TE Rijeka 2015	1.A.1.a	Pb	6.756	mg/GJ
6061	TE Rijeka 2015	1.A.1.a	SO2	433.19	g/GJ
6061	TE Rijeka 2015	1.A.1.a	NOX	69.13	g/GJ
6061	TE Rijeka 2015	1.A.1.a	CO	1.5	g/GJ
6061	TE Rijeka 2015	1.A.1.a	TSP	19.6	g/GJ
6061	TE Rijeka 2015	1.A.1.a	PM25	4.9	g/GJ
6061	TE Rijeka 2015	1.A.1.a	BC	0.27	g/GJ
6062	TE-TO Os-2015	1.A.1.a	Cd	0.02	mg/GJ
6062	TE-TO Os-2015	1.A.1.a	Hg	0.21	mg/GJ
6062	TE-TO Os-2015	1.A.1.a	Ni	19.24	mg/GJ
6062	TE-TO Os-2015	1.A.1.a	Pb	1.47	mg/GJ
6062	TE-TO Os-2015	1.A.1.a	SO2	70.52	g/GJ
6062	TE-TO Os-2015	1.A.1.a	NOX	101.86	g/GJ
6062	TE-TO Os-2015	1.A.1.a	CO	2.67	g/GJ
6062	TE-TO Os-2015	1.A.1.a	TSP	6.66	g/GJ
6062	TE-TO Os-2015	1.A.1.a	PM25	1.665	g/GJ
6062	TE-TO Os-2015	1.A.1.a	PM10	3.33	g/GJ
6062	TE-TO Os-2015	1.A.1.a	BC	0.04	g/GJ
6065	PTE Os-2015	1.A.1.a	Hg	0.00011	mg/GJ
6065	PTE Os-2015	1.A.1.a	NOX	0.38	g/GJ
6065	PTE Os-2015	1.A.1.a	CO	0.01	g/GJ
6065	PTE Os-2015	1.A.1.a	SO2	0.14	g/GJ
6065	PTE Os-2015	1.A.1.a	TSP	0.004	g/GJ
6065	PTE Os-2015	1.A.1.a	PM25	0.001	g/GJ
6065	PTE Os-2015	1.A.1.a	PM10	0.002	g/GJ
6065	PTE Os-2015	1.A.1.a	Cd	0.00011	mg/GJ
6065	PTE Os-2015	1.A.1.a	Pb	0.01065	mg/GJ
6065	PTE Os-2015	1.A.1.a	Ni	0.13957	mg/GJ
6065	PTE Os-2015	1.A.1.a	BC	2.5E-05	g/GJ
6067	Dairy cattle	4.B.01.a	NH3	29.88028508	kg/animal
6067	Dairy cattle	4.B.01.a	TSP	1.38	kg/animal
6067	Dairy cattle	4.B.01.a	PM25	0.41	kg/animal
6067	Dairy cattle	4.B.01.a	NOX	0.025512335	kg/animal
6067	Dairy cattle	4.B.01.a	NMVOC	15.959	kg/animal
6067	Dairy cattle	4.B.01.a	PM10	0.63	kg/animal

Tech. ID	Technology Name	Category	Pollutant	Emission Factor	Unit
6071	Calves (telad)	4.B.01.b	NH3	12.25643885	kg/animal
6071	Calves (telad)	4.B.01.b	TSP	0.34	kg/animal
6071	Calves (telad)	4.B.01.b	PM25	0.1	kg/animal
6071	Calves (telad)	4.B.01.b	NOX	0	kg/animal
6071	Calves (telad)	4.B.01.b	NMVOC	7.259	kg/animal
6071	Calves (telad)	4.B.01.b	PM10	0.16	kg/animal
6070	Non-dairy cattle	4.B.01.b	NH3	12.25643885	kg/animal
6070	Non-dairy cattle	4.B.01.b	TSP	0.59	kg/animal
6070	Non-dairy cattle	4.B.01.b	PM25	0.18	kg/animal
6070	Non-dairy cattle	4.B.01.b	NOX	0	kg/animal
6070	Non-dairy cattle	4.B.01.b	NMVOC	7.312	kg/animal
6070	Non-dairy cattle	4.B.01.b	PM10	0.27	kg/animal
6072	Sheep	4.B.03	PM25	0.0167	kg/animal
6072	Sheep	4.B.03	NOX	0	kg/animal
6072	Sheep	4.B.03	NMVOC	0.1701	kg/animal
6072	Sheep	4.B.03	PM10	0.0556	kg/animal
6072	Sheep	4.B.03	NH3	0.58487038	kg/animal
6072	Sheep	4.B.03	TSP	0.139	kg/animal
6073	Goats	4.B.04	NH3	0.58487038	kg/animal
6073	Goats	4.B.04	TSP	0.139	kg/animal
6073	Goats	4.B.04	PM25	0.0167	kg/animal
6073	Goats	4.B.04	NOX	0	kg/animal
6073	Goats	4.B.04	NMVOC	0.54282	kg/animal
6073	Goats	4.B.04	PM10	0.0556	kg/animal
6074	Horses	4.B.06	NH3	9.56994	kg/animal
6074	Horses	4.B.06	TSP	0.48	kg/animal
6074	Horses	4.B.06	PM25	0.14	kg/animal
6074	Horses	4.B.06	NOX	0	kg/animal
6074	Horses	4.B.06	NMVOC	4.275	kg/animal
6074	Horses	4.B.06	PM10	0.22	kg/animal
6075	Mules and asses	4.B.07	NH3	9.56994	kg/animal
6075	Mules and asses	4.B.07	TSP	0.34	kg/animal
6075	Mules and asses	4.B.07	PM25	0.1	kg/animal
6075	Mules and asses	4.B.07	NOX	0	kg/animal
6075	Mules and asses	4.B.07	NMVOC	1.47	kg/animal
6075	Mules and asses	4.B.07	PM10	0.16	kg/animal
6077	Swine: Fattng pigs	4.B.08	NH3	5.49245122	kg/animal
6077	Swine: Fattng pigs	4.B.08	TSP	0.75	kg/animal
6077	Swine: Fattng pigs	4.B.08	PM25	0.06	kg/animal
6077	Swine: Fattng pigs	4.B.08	NOX	0.005275426	kg/animal
6077	Swine: Fattng pigs	4.B.08	NMVOC	0.551	kg/animal
6077	Swine: Fattng pigs	4.B.08	PM10	0.34	kg/animal
6076	Swine: Sows	4.B.08	NH3	15.91269337	kg/animal
6076	Swine: Sows	4.B.08	TSP	1.53	kg/animal
6076	Swine: Sows	4.B.08	PM25	0.12	kg/animal

Tech. ID	Technology Name	Category	Pollutant	Emission Factor	Unit
6076	Swine: Sows	4.B.08	NOX	0	kg/animal
6076	Swine: Sows	4.B.08	NMVOC	1.704	kg/animal
6076	Swine: Sows	4.B.08	PM10	0.69	kg/animal
6078	Laying hens	4.B.09.a	NMVOC	0.165	kg/animal
6078	Laying hens	4.B.09.a	PM10	0.119	kg/animal
6078	Laying hens	4.B.09.a	NH3	0.39004761	kg/animal
6078	Laying hens	4.B.09.a	TSP	0.119	kg/animal
6078	Laying hens	4.B.09.a	PM25	0.023	kg/animal
6078	Laying hens	4.B.09.a	NOX	0	kg/animal
6079	Broilers	4.B.09.b	NMVOC	0.108	kg/animal
6079	Broilers	4.B.09.b	PM10	0.069	kg/animal
6079	Broilers	4.B.09.b	NH3	0.25960245	kg/animal
6079	Broilers	4.B.09.b	TSP	0.069	kg/animal
6079	Broilers	4.B.09.b	PM25	0.009	kg/animal
6079	Broilers	4.B.09.b	NOX	0	kg/animal
6080	Turkeys	4.B.09.c	NMVOC	0.489	kg/animal
6080	Turkeys	4.B.09.c	PM10	0.52	kg/animal
6080	Turkeys	4.B.09.c	NH3	0.98424325	kg/animal
6080	Turkeys	4.B.09.c	TSP	0.52	kg/animal
6080	Turkeys	4.B.09.c	PM25	0.07	kg/animal
6080	Turkeys	4.B.09.c	NOX	0	kg/animal
6081	Other poultry	4.B.09.d	NMVOC	0.489	kg/animal
6081	Other poultry	4.B.09.d	PM10	0.24	kg/animal
6081	Other poultry	4.B.09.d	NH3	0.72424707	kg/animal
6081	Other poultry	4.B.09.d	TSP	0.24	kg/animal
6081	Other poultry	4.B.09.d	PM25	0.03	kg/animal
6081	Other poultry	4.B.09.d	NOX	0	kg/animal
6082	Other poultry	4.B.09.d	NMVOC	0.489	kg/animal
6082	Other poultry	4.B.09.d	PM10	0.14	kg/animal
6082	Other poultry	4.B.09.d	NH3	0.41595123	kg/animal
6082	Other poultry	4.B.09.d	TSP	0.14	kg/animal
6082	Other poultry	4.B.09.d	PM25	0.02	kg/animal
6082	Other poultry	4.B.09.d	NOX	0	kg/animal
6083	Other poultry	4.B.09.d	NMVOC	0.489	kg/animal
6083	Other poultry	4.B.09.d	PM10	0.24	kg/animal
6083	Other poultry	4.B.09.d	NH3	0.72424707	kg/animal
6083	Other poultry	4.B.09.d	TSP	0.24	kg/animal
6083	Other poultry	4.B.09.d	PM25	0.03	kg/animal
6083	Other poultry	4.B.09.d	NOX	0	kg/animal
6085	1.A.3.c_diesel-2015	1.A.3.c	Ni	1.64	mg/GJ
6085	1.A.3.c_diesel-2015	1.A.3.c	NH3	0.16	g/GJ
6085	1.A.3.c_diesel-2015	1.A.3.c	Pb	0.08	mg/GJ
6085	1.A.3.c_diesel-2015	1.A.3.c	Se	0.23	mg/GJ
6085	1.A.3.c_diesel-2015	1.A.3.c	Zn	23.41	mg/GJ
6085	1.A.3.c_diesel-2015	1.A.3.c	DIOX	1.4	ng/GJ

Tech. ID	Technology Name	Category	Pollutant	Emission Factor	Unit
6085	1.A.3.c_diesel-2015	1.A.3.c	Benzo(b)	1.17	mg/GJ
6085	1.A.3.c_diesel-2015	1.A.3.c	Benzo(k)	1.7	µg/GJ
6085	1.A.3.c_diesel-2015	1.A.3.c	Benzo(a)	0.7	mg/GJ
6085	1.A.3.c_diesel-2015	1.A.3.c	Indeno	1.5	µg/GJ
6085	1.A.3.c_diesel-2015	1.A.3.c	SO2	0.29	g/GJ
6085	1.A.3.c_diesel-2015	1.A.3.c	NOX	1226.88	g/GJ
6085	1.A.3.c_diesel-2015	1.A.3.c	NMVOC	108.87	g/GJ
6085	1.A.3.c_diesel-2015	1.A.3.c	CO	250.53	g/GJ
6085	1.A.3.c_diesel-2015	1.A.3.c	TSP	35.59	g/GJ
6085	1.A.3.c_diesel-2015	1.A.3.c	PM25	32.08	g/GJ
6085	1.A.3.c_diesel-2015	1.A.3.c	PM10	33.72	g/GJ
6085	1.A.3.c_diesel-2015	1.A.3.c	BC	0.21	g/GJ
6085	1.A.3.c_diesel-2015	1.A.3.c	As	0.03	mg/GJ
6085	1.A.3.c_diesel-2015	1.A.3.c	Cd	0.23	mg/GJ
6085	1.A.3.c_diesel-2015	1.A.3.c	Cr	1.17	mg/GJ
6085	1.A.3.c_diesel-2015	1.A.3.c	Cu	39.8	mg/GJ
6085	1.A.3.c_diesel-2015	1.A.3.c	Hg	0.12	mg/GJ
6087	1.A.3.a_kerosene_LTO1_2015	1.A.3.a.1.1	PM25	1.93	g/GJ
6087	1.A.3.a_kerosene_LTO1_2015	1.A.3.a.1.1	PM10	1.93	g/GJ
6087	1.A.3.a_kerosene_LTO1_2015	1.A.3.a.1.1	Benzo(k)	1.7	mg/GJ
6087	1.A.3.a_kerosene_LTO1_2015	1.A.3.a.1.1	Indeno	1.5	mg/GJ
6087	1.A.3.a_kerosene_LTO1_2015	1.A.3.a.1.1	DIOX	1.4	ng/GJ
6087	1.A.3.a_kerosene_LTO1_2015	1.A.3.a.1.1	Hg	0.12	mg/GJ
6087	1.A.3.a_kerosene_LTO1_2015	1.A.3.a.1.1	As	0.03	mg/GJ
6087	1.A.3.a_kerosene_LTO1_2015	1.A.3.a.1.1	Cd	0.006	mg/GJ
6087	1.A.3.a_kerosene_LTO1_2015	1.A.3.a.1.1	Cr	0.2	mg/GJ
6087	1.A.3.a_kerosene_LTO1_2015	1.A.3.a.1.1	Cu	0.22	mg/GJ
6087	1.A.3.a_kerosene_LTO1_2015	1.A.3.a.1.1	Ni	0.008	mg/GJ
6087	1.A.3.a_kerosene_LTO1_2015	1.A.3.a.1.1	Pb	0.08	mg/GJ
6087	1.A.3.a_kerosene_LTO1_2015	1.A.3.a.1.1	Se	0.11	mg/GJ
6087	1.A.3.a_kerosene_LTO1_2015	1.A.3.a.1.1	Zn	29	mg/GJ
6087	1.A.3.a_kerosene_LTO1_2015	1.A.3.a.1.1	Benzo(b)	15	mg/GJ
6087	1.A.3.a_kerosene_LTO1_2015	1.A.3.a.1.1	BC	0.93	g/GJ
6087	1.A.3.a_kerosene_LTO1_2015	1.A.3.a.1.1	Benzo(a)	1.9	mg/GJ
6087	1.A.3.a_kerosene_LTO1_2015	1.A.3.a.1.1	SO2	66.12	g/GJ
6087	1.A.3.a_kerosene_LTO1_2015	1.A.3.a.1.1	NOX	228.86	g/GJ
6087	1.A.3.a_kerosene_LTO1_2015	1.A.3.a.1.1	NMVOC	13.79	g/GJ
6087	1.A.3.a_kerosene_LTO1_2015	1.A.3.a.1.1	CO	325.36	g/GJ
6087	1.A.3.a_kerosene_LTO1_2015	1.A.3.a.1.1	TSP	1.93	g/GJ
6088	1.A.3.a_kerosene_LTO2_2015	1.A.3.a.1.1	PM25	1.93	g/GJ
6088	1.A.3.a_kerosene_LTO2_2015	1.A.3.a.1.1	PM10	1.93	g/GJ
6088	1.A.3.a_kerosene_LTO2_2015	1.A.3.a.1.1	Benzo(k)	1.7	mg/GJ
6088	1.A.3.a_kerosene_LTO2_2015	1.A.3.a.1.1	Indeno	1.5	mg/GJ
6088	1.A.3.a_kerosene_LTO2_2015	1.A.3.a.1.1	DIOX	1.4	ng/GJ
6088	1.A.3.a_kerosene_LTO2_2015	1.A.3.a.1.1	Hg	0.12	mg/GJ

Tech. ID	Technology Name	Category	Pollutant	Emission Factor	Unit
6088	1.A.3.a_kerosene_LTO2_2015	1.A.3.a.1.1	As	0.03	mg/GJ
6088	1.A.3.a_kerosene_LTO2_2015	1.A.3.a.1.1	Cd	0.006	mg/GJ
6088	1.A.3.a_kerosene_LTO2_2015	1.A.3.a.1.1	Cr	0.2	mg/GJ
6088	1.A.3.a_kerosene_LTO2_2015	1.A.3.a.1.1	Cu	0.22	mg/GJ
6088	1.A.3.a_kerosene_LTO2_2015	1.A.3.a.1.1	Ni	0.008	mg/GJ
6088	1.A.3.a_kerosene_LTO2_2015	1.A.3.a.1.1	Pb	0.08	mg/GJ
6088	1.A.3.a_kerosene_LTO2_2015	1.A.3.a.1.1	Se	0.11	mg/GJ
6088	1.A.3.a_kerosene_LTO2_2015	1.A.3.a.1.1	Zn	29	mg/GJ
6088	1.A.3.a_kerosene_LTO2_2015	1.A.3.a.1.1	Benzo(b)	15	mg/GJ
6088	1.A.3.a_kerosene_LTO2_2015	1.A.3.a.1.1	BC	0.93	g/GJ
6088	1.A.3.a_kerosene_LTO2_2015	1.A.3.a.1.1	Benzo(a)	1.9	mg/GJ
6088	1.A.3.a_kerosene_LTO2_2015	1.A.3.a.1.1	SO2	66.12	g/GJ
6088	1.A.3.a_kerosene_LTO2_2015	1.A.3.a.1.1	NOX	228.86	g/GJ
6088	1.A.3.a_kerosene_LTO2_2015	1.A.3.a.1.1	NMVOC	13.79	g/GJ
6088	1.A.3.a_kerosene_LTO2_2015	1.A.3.a.1.1	CO	325.36	g/GJ
6088	1.A.3.a_kerosene_LTO2_2015	1.A.3.a.1.1	TSP	1.93	g/GJ
6089	1.A.3.a_kerosene_cruise2_2015	1.A.3.a.1.2	Hg	0.12	mg/GJ
6089	1.A.3.a_kerosene_cruise2_2015	1.A.3.a.1.2	As	0.03	mg/GJ
6089	1.A.3.a_kerosene_cruise2_2015	1.A.3.a.1.2	Cd	0.006	mg/GJ
6089	1.A.3.a_kerosene_cruise2_2015	1.A.3.a.1.2	Cr	0.2	mg/GJ
6089	1.A.3.a_kerosene_cruise2_2015	1.A.3.a.1.2	Cu	0.22	mg/GJ
6089	1.A.3.a_kerosene_cruise2_2015	1.A.3.a.1.2	Ni	0.008	mg/GJ
6089	1.A.3.a_kerosene_cruise2_2015	1.A.3.a.1.2	Pb	0.08	mg/GJ
6089	1.A.3.a_kerosene_cruise2_2015	1.A.3.a.1.2	Se	0.11	mg/GJ
6089	1.A.3.a_kerosene_cruise2_2015	1.A.3.a.1.2	Zn	29	mg/GJ
6089	1.A.3.a_kerosene_cruise2_2015	1.A.3.a.1.2	Benzo(b)	15	mg/GJ
6089	1.A.3.a_kerosene_cruise2_2015	1.A.3.a.1.2	Benzo(a)	1.9	mg/GJ
6089	1.A.3.a_kerosene_cruise2_2015	1.A.3.a.1.2	SO2	66.12	g/GJ
6089	1.A.3.a_kerosene_cruise2_2015	1.A.3.a.1.2	NOX	291.17	g/GJ
6089	1.A.3.a_kerosene_cruise2_2015	1.A.3.a.1.2	NMVOC	11.37	g/GJ
6089	1.A.3.a_kerosene_cruise2_2015	1.A.3.a.1.2	CO	25.02	g/GJ
6089	1.A.3.a_kerosene_cruise2_2015	1.A.3.a.1.2	TSP	4.55	g/GJ
6089	1.A.3.a_kerosene_cruise2_2015	1.A.3.a.1.2	PM25	4.55	g/GJ
6089	1.A.3.a_kerosene_cruise2_2015	1.A.3.a.1.2	PM10	4.55	g/GJ
6089	1.A.3.a_kerosene_cruise2_2015	1.A.3.a.1.2	Benzo(k)	1.7	mg/GJ
6089	1.A.3.a_kerosene_cruise2_2015	1.A.3.a.1.2	Indeno	1.5	mg/GJ
6089	1.A.3.a_kerosene_cruise2_2015	1.A.3.a.1.2	DIOX	1.4	ng/GJ
6089	1.A.3.a_kerosene_cruise2_2015	1.A.3.a.1.2	BC	2.18	g/GJ
6090	1.A.3.a_gasoline_2015	1.A.3.a.2.1	Cu	60.555	mg/GJ
6090	1.A.3.a_gasoline_2015	1.A.3.a.2.1	Ni	0.77	mg/GJ
6090	1.A.3.a_gasoline_2015	1.A.3.a.2.1	Pb	6140.899	mg/GJ
6090	1.A.3.a_gasoline_2015	1.A.3.a.2.1	Se	0.072	mg/GJ
6090	1.A.3.a_gasoline_2015	1.A.3.a.2.1	Zn	71.602	mg/GJ
6090	1.A.3.a_gasoline_2015	1.A.3.a.2.1	Benzo(b)	226.509	mg/GJ
6090	1.A.3.a_gasoline_2015	1.A.3.a.2.1	Benzo(a)	137.657	mg/GJ

Tech. ID	Technology Name	Category	Pollutant	Emission Factor	Unit
6090	1.A.3.a_gasoline_2015	1.A.3.a.2.1	SO2	0.236	g/GJ
6090	1.A.3.a_gasoline_2015	1.A.3.a.2.1	NOX	89.706	g/GJ
6090	1.A.3.a_gasoline_2015	1.A.3.a.2.1	NH3	7.04	g/GJ
6090	1.A.3.a_gasoline_2015	1.A.3.a.2.1	NMVOC	426.105	g/GJ
6090	1.A.3.a_gasoline_2015	1.A.3.a.2.1	CO	26911.864	g/GJ
6090	1.A.3.a_gasoline_2015	1.A.3.a.2.1	TSP	6.099	g/GJ
6090	1.A.3.a_gasoline_2015	1.A.3.a.2.1	PM25	3.626	g/GJ
6090	1.A.3.a_gasoline_2015	1.A.3.a.2.1	PM10	6.099	g/GJ
6090	1.A.3.a_gasoline_2015	1.A.3.a.2.1	Benzo(k)	92.881	mg/GJ
6090	1.A.3.a_gasoline_2015	1.A.3.a.2.1	Indeno	261.54	mg/GJ
6090	1.A.3.a_gasoline_2015	1.A.3.a.2.1	DIOX	0.006	ng/GJ
6090	1.A.3.a_gasoline_2015	1.A.3.a.2.1	Cd	0.276	mg/GJ
6090	1.A.3.a_gasoline_2015	1.A.3.a.2.1	Cr	3.008	mg/GJ
6090	1.A.3.a_gasoline_2015	1.A.3.a.2.1	BC	0.544	g/GJ
6087	1.A.3.a_kerosene_LTO1_2015	1.A.3.a.2.1	PM25	1.93	g/GJ
6087	1.A.3.a_kerosene_LTO1_2015	1.A.3.a.2.1	PM10	1.93	g/GJ
6087	1.A.3.a_kerosene_LTO1_2015	1.A.3.a.2.1	Benzo(k)	1.7	mg/GJ
6087	1.A.3.a_kerosene_LTO1_2015	1.A.3.a.2.1	Indeno	1.5	mg/GJ
6087	1.A.3.a_kerosene_LTO1_2015	1.A.3.a.2.1	DIOX	1.4	ng/GJ
6087	1.A.3.a_kerosene_LTO1_2015	1.A.3.a.2.1	Hg	0.12	mg/GJ
6087	1.A.3.a_kerosene_LTO1_2015	1.A.3.a.2.1	As	0.03	mg/GJ
6087	1.A.3.a_kerosene_LTO1_2015	1.A.3.a.2.1	Cd	0.006	mg/GJ
6087	1.A.3.a_kerosene_LTO1_2015	1.A.3.a.2.1	Cr	0.2	mg/GJ
6087	1.A.3.a_kerosene_LTO1_2015	1.A.3.a.2.1	Cu	0.22	mg/GJ
6087	1.A.3.a_kerosene_LTO1_2015	1.A.3.a.2.1	Ni	0.008	mg/GJ
6087	1.A.3.a_kerosene_LTO1_2015	1.A.3.a.2.1	Pb	0.08	mg/GJ
6087	1.A.3.a_kerosene_LTO1_2015	1.A.3.a.2.1	Se	0.11	mg/GJ
6087	1.A.3.a_kerosene_LTO1_2015	1.A.3.a.2.1	Zn	29	mg/GJ
6087	1.A.3.a_kerosene_LTO1_2015	1.A.3.a.2.1	Benzo(b)	15	mg/GJ
6087	1.A.3.a_kerosene_LTO1_2015	1.A.3.a.2.1	BC	0.93	g/GJ
6087	1.A.3.a_kerosene_LTO1_2015	1.A.3.a.2.1	Benzo(a)	1.9	mg/GJ
6087	1.A.3.a_kerosene_LTO1_2015	1.A.3.a.2.1	SO2	66.12	g/GJ
6087	1.A.3.a_kerosene_LTO1_2015	1.A.3.a.2.1	NOX	228.86	g/GJ
6087	1.A.3.a_kerosene_LTO1_2015	1.A.3.a.2.1	NMVOC	13.79	g/GJ
6087	1.A.3.a_kerosene_LTO1_2015	1.A.3.a.2.1	CO	325.36	g/GJ
6087	1.A.3.a_kerosene_LTO1_2015	1.A.3.a.2.1	TSP	1.93	g/GJ
6091	1.A.3.a_kerosene_cruise1_2015	1.A.3.a.2.2	Benzo(b)	15	mg/GJ
6091	1.A.3.a_kerosene_cruise1_2015	1.A.3.a.2.2	Benzo(a)	1.9	mg/GJ
6091	1.A.3.a_kerosene_cruise1_2015	1.A.3.a.2.2	SO2	66.12	g/GJ
6091	1.A.3.a_kerosene_cruise1_2015	1.A.3.a.2.2	NOX	234.3	g/GJ
6091	1.A.3.a_kerosene_cruise1_2015	1.A.3.a.2.2	NMVOC	2.27	g/GJ
6091	1.A.3.a_kerosene_cruise1_2015	1.A.3.a.2.2	CO	45.5	g/GJ
6091	1.A.3.a_kerosene_cruise1_2015	1.A.3.a.2.2	TSP	4.55	g/GJ
6091	1.A.3.a_kerosene_cruise1_2015	1.A.3.a.2.2	PM25	4.55	g/GJ
6091	1.A.3.a_kerosene_cruise1_2015	1.A.3.a.2.2	PM10	4.55	g/GJ

Tech. ID	Technology Name	Category	Pollutant	Emission Factor	Unit
6091	1.A.3.a_kerosene_cruise1_2015	1.A.3.a.2.2	Benzo(k)	1.7	mg/GJ
6091	1.A.3.a_kerosene_cruise1_2015	1.A.3.a.2.2	Indeno	1.5	mg/GJ
6091	1.A.3.a_kerosene_cruise1_2015	1.A.3.a.2.2	DIOX	1.4	ng/GJ
6091	1.A.3.a_kerosene_cruise1_2015	1.A.3.a.2.2	Hg	0.12	mg/GJ
6091	1.A.3.a_kerosene_cruise1_2015	1.A.3.a.2.2	As	0.03	mg/GJ
6091	1.A.3.a_kerosene_cruise1_2015	1.A.3.a.2.2	Cd	0.006	mg/GJ
6091	1.A.3.a_kerosene_cruise1_2015	1.A.3.a.2.2	Cr	0.2	mg/GJ
6091	1.A.3.a_kerosene_cruise1_2015	1.A.3.a.2.2	Cu	0.22	mg/GJ
6091	1.A.3.a_kerosene_cruise1_2015	1.A.3.a.2.2	Ni	0.008	mg/GJ
6091	1.A.3.a_kerosene_cruise1_2015	1.A.3.a.2.2	Pb	0.08	mg/GJ
6091	1.A.3.a_kerosene_cruise1_2015	1.A.3.a.2.2	Se	0.11	mg/GJ
6091	1.A.3.a_kerosene_cruise1_2015	1.A.3.a.2.2	Zn	29	mg/GJ
6091	1.A.3.a_kerosene_cruise1_2015	1.A.3.a.2.2	BC	2.18	g/GJ
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
4503	Catalytic Cracking unit regenerators-Partial burn without CO boiler	1.B.2.a.4	TSP	0.7	kg/m3
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

Tech. ID	Technology Name	Category	Pollutant	Emission Factor	Unit
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
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
6069	Gas distribution networks	1.B.2.b.2	NMVOC	14.34	kg/1000 m3
6097	1.A.3.d.ii_gas oil/diesel_2015, Conventional small boats	1.A.3.d.2	Pb	3.04	mg/GJ
6097	1.A.3.d.ii_gas oil/diesel_2015, Conventional small boats	1.A.3.d.2	HCB	1.87	µg/GJ
6097	1.A.3.d.ii_gas oil/diesel_2015, Conventional small boats	1.A.3.d.2	DIOX	3.04	ng/GJ
6097	1.A.3.d.ii_gas oil/diesel_2015, Conventional small boats	1.A.3.d.2	PCBs	0.89	µg/GJ
6097	1.A.3.d.ii_gas oil/diesel_2015, Conventional small boats	1.A.3.d.2	As	0.94	mg/GJ
6097	1.A.3.d.ii_gas oil/diesel_2015, Conventional small boats	1.A.3.d.2	Cd	0.234	mg/GJ
6097	1.A.3.d.ii_gas oil/diesel_2015, Conventional small boats	1.A.3.d.2	Cr	1.171	mg/GJ
6097	1.A.3.d.ii_gas oil/diesel_2015, Conventional small boats	1.A.3.d.2	Cu	20.604	mg/GJ
6097	1.A.3.d.ii_gas oil/diesel_2015, Conventional small boats	1.A.3.d.2	Ni	23.414	mg/GJ
6097	1.A.3.d.ii_gas oil/diesel_2015, Conventional small boats	1.A.3.d.2	Se	2.341	mg/GJ
6097	1.A.3.d.ii_gas oil/diesel_2015, Conventional small boats	1.A.3.d.2	BC	0.59	g/GJ
6097	1.A.3.d.ii_gas oil/diesel_2015, Conventional small boats	1.A.3.d.2	Zn	28.096	mg/GJ
6097	1.A.3.d.ii_gas oil/diesel_2015, Conventional small boats	1.A.3.d.2	SO2	0.29	g/GJ
6097	1.A.3.d.ii_gas oil/diesel_2015, Conventional small boats	1.A.3.d.2	NOX	899.09	g/GJ
6097	1.A.3.d.ii_gas oil/diesel_2015, Conventional small boats	1.A.3.d.2	NH3	0.164	g/GJ
6097	1.A.3.d.ii_gas oil/diesel_2015,	1.A.3.d.2	NMVOC	174.43	g/GJ

Tech. ID	Technology Name	Category	Pollutant	Emission Factor	Unit
	Conventional small boats				
6097	1.A.3.d.ii_gas oil/diesel_2015, Conventional small boats	1.A.3.d.2	CO	463.59	g/GJ
6097	1.A.3.d.ii_gas oil/diesel_2015, Conventional small boats	1.A.3.d.2	TSP	107.7	g/GJ
6097	1.A.3.d.ii_gas oil/diesel_2015, Conventional small boats	1.A.3.d.2	PM10	107.7	g/GJ
6097	1.A.3.d.ii_gas oil/diesel_2015, Conventional small boats	1.A.3.d.2	PM25	107.7	g/GJ
6097	1.A.3.d.ii_gas oil/diesel_2015, Conventional small boats	1.A.3.d.2	Hg	0.7	mg/GJ
6098	1.A.3.d.2_diesel_2015	1.A.3.d.2	As	0.94	mg/GJ
6098	1.A.3.d.2_diesel_2015	1.A.3.d.2	Cd	0.234	mg/GJ
6098	1.A.3.d.2_diesel_2015	1.A.3.d.2	Cr	1.171	mg/GJ
6098	1.A.3.d.2_diesel_2015	1.A.3.d.2	Cu	39.803	mg/GJ
6098	1.A.3.d.2_diesel_2015	1.A.3.d.2	Ni	1.639	mg/GJ
6098	1.A.3.d.2_diesel_2015	1.A.3.d.2	Se	0.234	mg/GJ
6098	1.A.3.d.2_diesel_2015	1.A.3.d.2	Zn	23.414	mg/GJ
6098	1.A.3.d.2_diesel_2015	1.A.3.d.2	Benzo(b)	1170.686	µg/GJ
6098	1.A.3.d.2_diesel_2015	1.A.3.d.2	Benzo(a)	702.412	µg/GJ
6098	1.A.3.d.2_diesel_2015	1.A.3.d.2	SO2	0.29	g/GJ
6098	1.A.3.d.2_diesel_2015	1.A.3.d.2	NOX	899.09	g/GJ
6098	1.A.3.d.2_diesel_2015	1.A.3.d.2	NH3	163.9	mg/GJ
6098	1.A.3.d.2_diesel_2015	1.A.3.d.2	NMVOC	174.43	g/GJ
6098	1.A.3.d.2_diesel_2015	1.A.3.d.2	CO	463.59	g/GJ
6098	1.A.3.d.2_diesel_2015	1.A.3.d.2	TSP	107.7	g/GJ
6098	1.A.3.d.2_diesel_2015	1.A.3.d.2	PM10	107.7	g/GJ
6098	1.A.3.d.2_diesel_2015	1.A.3.d.2	PM25	107.7	g/GJ
6098	1.A.3.d.2_diesel_2015	1.A.3.d.2	Hg	0.7	mg/GJ
6098	1.A.3.d.2_diesel_2015	1.A.3.d.2	Pb	3.04	mg/GJ
6098	1.A.3.d.2_diesel_2015	1.A.3.d.2	HCB	1.87	µg/GJ
6098	1.A.3.d.2_diesel_2015	1.A.3.d.2	DIOX	3.04	ng/GJ
6098	1.A.3.d.2_diesel_2015	1.A.3.d.2	PCBs	8.9	µg/GJ
6098	1.A.3.d.2_diesel_2015	1.A.3.d.2	BC	0.59	g/GJ
6099	1.A.4.a_LF-gas oil_2015	1.A.4.a.1	Pb	0.08	mg/GJ
6099	1.A.4.a_LF-gas oil_2015	1.A.4.a.1	Se	0.11	mg/GJ
6099	1.A.4.a_LF-gas oil_2015	1.A.4.a.1	Zn	29	mg/GJ
6099	1.A.4.a_LF-gas oil_2015	1.A.4.a.1	DIOX	1.4	ng/GJ
6099	1.A.4.a_LF-gas oil_2015	1.A.4.a.1	Benzo(b)	15	µg/GJ
6099	1.A.4.a_LF-gas oil_2015	1.A.4.a.1	Benzo(k)	1.7	µg/GJ
6099	1.A.4.a_LF-gas oil_2015	1.A.4.a.1	Benzo(a)	1.9	µg/GJ
6099	1.A.4.a_LF-gas oil_2015	1.A.4.a.1	Indeno	1.5	µg/GJ
6099	1.A.4.a_LF-gas oil_2015	1.A.4.a.1	SO2	37.46	g/GJ
6099	1.A.4.a_LF-gas oil_2015	1.A.4.a.1	NOX	513	g/GJ
6099	1.A.4.a_LF-gas oil_2015	1.A.4.a.1	NMVOC	25	g/GJ

Tech. ID	Technology Name	Category	Pollutant	Emission Factor	Unit
6099	1.A.4.a_LF-gas oil_2015	1.A.4.a.1	CO	66	g/GJ
6099	1.A.4.a_LF-gas oil_2015	1.A.4.a.1	TSP	20	g/GJ
6099	1.A.4.a_LF-gas oil_2015	1.A.4.a.1	PM25	20	g/GJ
6099	1.A.4.a_LF-gas oil_2015	1.A.4.a.1	PM10	20	g/GJ
6099	1.A.4.a_LF-gas oil_2015	1.A.4.a.1	BC	11.2	g/GJ
6099	1.A.4.a_LF-gas oil_2015	1.A.4.a.1	As	0.03	mg/GJ
6099	1.A.4.a_LF-gas oil_2015	1.A.4.a.1	Cd	0.006	mg/GJ
6099	1.A.4.a_LF-gas oil_2015	1.A.4.a.1	Cr	0.2	mg/GJ
6099	1.A.4.a_LF-gas oil_2015	1.A.4.a.1	Cu	0.22	mg/GJ
6099	1.A.4.a_LF-gas oil_2015	1.A.4.a.1	Hg	0.12	mg/GJ
6099	1.A.4.a_LF-gas oil_2015	1.A.4.a.1	Ni	0.008	mg/GJ
6099	1.A.4.a_LF-gas oil_2015	1.A.4.a.1	NH3	0.01	g/GJ
6100	1.A.4.a_LF-residual fuel_2015	1.A.4.a.1	Pb	0.08	mg/GJ
6100	1.A.4.a_LF-residual fuel_2015	1.A.4.a.1	Se	0.11	mg/GJ
6100	1.A.4.a_LF-residual fuel_2015	1.A.4.a.1	Zn	29	mg/GJ
6100	1.A.4.a_LF-residual fuel_2015	1.A.4.a.1	DIOX	1.4	ng/GJ
6100	1.A.4.a_LF-residual fuel_2015	1.A.4.a.1	Benzo(b)	15	µg/GJ
6100	1.A.4.a_LF-residual fuel_2015	1.A.4.a.1	Benzo(k)	1.7	µg/GJ
6100	1.A.4.a_LF-residual fuel_2015	1.A.4.a.1	Benzo(a)	1.9	µg/GJ
6100	1.A.4.a_LF-residual fuel_2015	1.A.4.a.1	Indeno	1.5	µg/GJ
6100	1.A.4.a_LF-residual fuel_2015	1.A.4.a.1	SO2	430.46	g/GJ
6100	1.A.4.a_LF-residual fuel_2015	1.A.4.a.1	NOX	513	g/GJ
6100	1.A.4.a_LF-residual fuel_2015	1.A.4.a.1	NMVOC	25	g/GJ
6100	1.A.4.a_LF-residual fuel_2015	1.A.4.a.1	CO	66	g/GJ
6100	1.A.4.a_LF-residual fuel_2015	1.A.4.a.1	TSP	20	g/GJ
6100	1.A.4.a_LF-residual fuel_2015	1.A.4.a.1	PM25	20	g/GJ
6100	1.A.4.a_LF-residual fuel_2015	1.A.4.a.1	PM10	20	g/GJ
6100	1.A.4.a_LF-residual fuel_2015	1.A.4.a.1	BC	11.2	g/GJ
6100	1.A.4.a_LF-residual fuel_2015	1.A.4.a.1	As	0.03	mg/GJ
6100	1.A.4.a_LF-residual fuel_2015	1.A.4.a.1	Cd	0.006	mg/GJ
6100	1.A.4.a_LF-residual fuel_2015	1.A.4.a.1	Cr	0.2	mg/GJ
6100	1.A.4.a_LF-residual fuel_2015	1.A.4.a.1	Cu	0.22	mg/GJ
6100	1.A.4.a_LF-residual fuel_2015	1.A.4.a.1	Hg	0.12	mg/GJ
6100	1.A.4.a_LF-residual fuel_2015	1.A.4.a.1	Ni	0.008	mg/GJ
6100	1.A.4.a_LF-residual fuel_2015	1.A.4.a.1	NH3	0.01	g/GJ
6101	1.A.4.b.1_LF-HFO_2015	1.A.4.b.1	Cd	0.001	mg/GJ
6101	1.A.4.b.1_LF-HFO_2015	1.A.4.b.1	Cr	0.2	mg/GJ
6101	1.A.4.b.1_LF-HFO_2015	1.A.4.b.1	Cu	0.13	mg/GJ
6101	1.A.4.b.1_LF-HFO_2015	1.A.4.b.1	Hg	0.12	mg/GJ
6101	1.A.4.b.1_LF-HFO_2015	1.A.4.b.1	Ni	0.005	mg/GJ
6101	1.A.4.b.1_LF-HFO_2015	1.A.4.b.1	Pb	0.012	mg/GJ
6101	1.A.4.b.1_LF-HFO_2015	1.A.4.b.1	Se	0.002	mg/GJ
6101	1.A.4.b.1_LF-HFO_2015	1.A.4.b.1	Zn	0.42	mg/GJ
6101	1.A.4.b.1_LF-HFO_2015	1.A.4.b.1	DIOX	5.9	ng/GJ
6101	1.A.4.b.1_LF-HFO_2015	1.A.4.b.1	Benzo(b)	40	µg/GJ

Tech. ID	Technology Name	Category	Pollutant	Emission Factor	Unit
6101	1.A.4.b.1_LF-HFO_2015	1.A.4.b.1	Benzo(k)	70	µg/GJ
6101	1.A.4.b.1_LF-HFO_2015	1.A.4.b.1	Benzo(a)	80	µg/GJ
6101	1.A.4.b.1_LF-HFO_2015	1.A.4.b.1	Indeno	160	µg/GJ
6101	1.A.4.b.1_LF-HFO_2015	1.A.4.b.1	SO2	430.46	g/GJ
6101	1.A.4.b.1_LF-HFO_2015	1.A.4.b.1	NOX	51	g/GJ
6101	1.A.4.b.1_LF-HFO_2015	1.A.4.b.1	NMVOC	0.69	g/GJ
6101	1.A.4.b.1_LF-HFO_2015	1.A.4.b.1	CO	57	g/GJ
6101	1.A.4.b.1_LF-HFO_2015	1.A.4.b.1	TSP	1.9	g/GJ
6101	1.A.4.b.1_LF-HFO_2015	1.A.4.b.1	PM25	1.9	g/GJ
6101	1.A.4.b.1_LF-HFO_2015	1.A.4.b.1	PM10	1.9	g/GJ
6101	1.A.4.b.1_LF-HFO_2015	1.A.4.b.1	BC	0.16	g/GJ
6101	1.A.4.b.1_LF-HFO_2015	1.A.4.b.1	As	0.002	mg/GJ
6102	1.A.4.b.1_LF-GO_2015	1.A.4.b.1	TSP	1.9	g/GJ
6102	1.A.4.b.1_LF-GO_2015	1.A.4.b.1	PM25	1.9	g/GJ
6102	1.A.4.b.1_LF-GO_2015	1.A.4.b.1	PM10	1.9	g/GJ
6102	1.A.4.b.1_LF-GO_2015	1.A.4.b.1	BC	0.16	g/GJ
6102	1.A.4.b.1_LF-GO_2015	1.A.4.b.1	As	0.002	g/GJ
6102	1.A.4.b.1_LF-GO_2015	1.A.4.b.1	Cd	0.001	g/GJ
6102	1.A.4.b.1_LF-GO_2015	1.A.4.b.1	Cr	0.2	g/GJ
6102	1.A.4.b.1_LF-GO_2015	1.A.4.b.1	Cu	0.13	g/GJ
6102	1.A.4.b.1_LF-GO_2015	1.A.4.b.1	Hg	0.12	g/GJ
6102	1.A.4.b.1_LF-GO_2015	1.A.4.b.1	Ni	0.005	g/GJ
6102	1.A.4.b.1_LF-GO_2015	1.A.4.b.1	Pb	0.012	g/GJ
6102	1.A.4.b.1_LF-GO_2015	1.A.4.b.1	Se	0.002	g/GJ
6102	1.A.4.b.1_LF-GO_2015	1.A.4.b.1	Zn	0.42	g/GJ
6102	1.A.4.b.1_LF-GO_2015	1.A.4.b.1	DIOX	5.9	ng/GJ
6102	1.A.4.b.1_LF-GO_2015	1.A.4.b.1	Benzo(b)	40	µg/GJ
6102	1.A.4.b.1_LF-GO_2015	1.A.4.b.1	Benzo(k)	70	µg/GJ
6102	1.A.4.b.1_LF-GO_2015	1.A.4.b.1	Benzo(a)	80	µg/GJ
6102	1.A.4.b.1_LF-GO_2015	1.A.4.b.1	Indeno	160	µg/GJ
6102	1.A.4.b.1_LF-GO_2015	1.A.4.b.1	SO2	37.46	g/GJ
6102	1.A.4.b.1_LF-GO_2015	1.A.4.b.1	NOX	51	g/GJ
6102	1.A.4.b.1_LF-GO_2015	1.A.4.b.1	NMVOC	0.69	g/GJ
6102	1.A.4.b.1_LF-GO_2015	1.A.4.b.1	CO	57	g/GJ
6103	1.A.4.b.1_LF-KER_2015	1.A.4.b.1	PM10	1.9	g/GJ
6103	1.A.4.b.1_LF-KER_2015	1.A.4.b.1	BC	0.16	g/GJ
6103	1.A.4.b.1_LF-KER_2015	1.A.4.b.1	As	0.002	mg/GJ
6103	1.A.4.b.1_LF-KER_2015	1.A.4.b.1	Cd	0.001	mg/GJ
6103	1.A.4.b.1_LF-KER_2015	1.A.4.b.1	Cr	0.2	mg/GJ
6103	1.A.4.b.1_LF-KER_2015	1.A.4.b.1	Cu	0.13	mg/GJ
6103	1.A.4.b.1_LF-KER_2015	1.A.4.b.1	Hg	0.12	mg/GJ
6103	1.A.4.b.1_LF-KER_2015	1.A.4.b.1	Ni	0.005	mg/GJ
6103	1.A.4.b.1_LF-KER_2015	1.A.4.b.1	Pb	0.012	mg/GJ
6103	1.A.4.b.1_LF-KER_2015	1.A.4.b.1	Se	0.002	mg/GJ
6103	1.A.4.b.1_LF-KER_2015	1.A.4.b.1	Zn	0.42	mg/GJ

Tech. ID	Technology Name	Category	Pollutant	Emission Factor	Unit
6103	1.A.4.b.1_LF-KER_2015	1.A.4.b.1	DIOX	5.9	ng/GJ
6103	1.A.4.b.1_LF-KER_2015	1.A.4.b.1	Benzo(b)	40	µg/GJ
6103	1.A.4.b.1_LF-KER_2015	1.A.4.b.1	Benzo(k)	70	µg/GJ
6103	1.A.4.b.1_LF-KER_2015	1.A.4.b.1	Benzo(a)	80	µg/GJ
6103	1.A.4.b.1_LF-KER_2015	1.A.4.b.1	Indeno	160	µg/GJ
6103	1.A.4.b.1_LF-KER_2015	1.A.4.b.1	SO2	66.12	g/GJ
6103	1.A.4.b.1_LF-KER_2015	1.A.4.b.1	NOX	51	g/GJ
6103	1.A.4.b.1_LF-KER_2015	1.A.4.b.1	NMVOC	0.69	g/GJ
6103	1.A.4.b.1_LF-KER_2015	1.A.4.b.1	CO	57	g/GJ
6103	1.A.4.b.1_LF-KER_2015	1.A.4.b.1	TSP	1.9	g/GJ
6103	1.A.4.b.1_LF-KER_2015	1.A.4.b.1	PM25	1.9	g/GJ
6099	1.A.4.a_LF-gas oil_2015	1.A.4.c.1	Pb	0.08	mg/GJ
6099	1.A.4.a_LF-gas oil_2015	1.A.4.c.1	Se	0.11	mg/GJ
6099	1.A.4.a_LF-gas oil_2015	1.A.4.c.1	Zn	29	mg/GJ
6099	1.A.4.a_LF-gas oil_2015	1.A.4.c.1	DIOX	1.4	ng/GJ
6099	1.A.4.a_LF-gas oil_2015	1.A.4.c.1	Benzo(b)	15	µg/GJ
6099	1.A.4.a_LF-gas oil_2015	1.A.4.c.1	Benzo(k)	1.7	µg/GJ
6099	1.A.4.a_LF-gas oil_2015	1.A.4.c.1	Benzo(a)	1.9	µg/GJ
6099	1.A.4.a_LF-gas oil_2015	1.A.4.c.1	Indeno	1.5	µg/GJ
6099	1.A.4.a_LF-gas oil_2015	1.A.4.c.1	SO2	37.46	g/GJ
6099	1.A.4.a_LF-gas oil_2015	1.A.4.c.1	NOX	513	g/GJ
6099	1.A.4.a_LF-gas oil_2015	1.A.4.c.1	NMVOC	25	g/GJ
6099	1.A.4.a_LF-gas oil_2015	1.A.4.c.1	CO	66	g/GJ
6099	1.A.4.a_LF-gas oil_2015	1.A.4.c.1	TSP	20	g/GJ
6099	1.A.4.a_LF-gas oil_2015	1.A.4.c.1	PM25	20	g/GJ
6099	1.A.4.a_LF-gas oil_2015	1.A.4.c.1	PM10	20	g/GJ
6099	1.A.4.a_LF-gas oil_2015	1.A.4.c.1	BC	11.2	g/GJ
6099	1.A.4.a_LF-gas oil_2015	1.A.4.c.1	As	0.03	mg/GJ
6099	1.A.4.a_LF-gas oil_2015	1.A.4.c.1	Cd	0.006	mg/GJ
6099	1.A.4.a_LF-gas oil_2015	1.A.4.c.1	Cr	0.2	mg/GJ
6099	1.A.4.a_LF-gas oil_2015	1.A.4.c.1	Cu	0.22	mg/GJ
6099	1.A.4.a_LF-gas oil_2015	1.A.4.c.1	Hg	0.12	mg/GJ
6099	1.A.4.a_LF-gas oil_2015	1.A.4.c.1	Ni	0.008	mg/GJ
6099	1.A.4.a_LF-gas oil_2015	1.A.4.c.1	NH3	0.01	g/GJ
6100	1.A.4.a_LF-residual fuel_2015	1.A.4.c.1	Pb	0.08	mg/GJ
6100	1.A.4.a_LF-residual fuel_2015	1.A.4.c.1	Se	0.11	mg/GJ
6100	1.A.4.a_LF-residual fuel_2015	1.A.4.c.1	Zn	29	mg/GJ
6100	1.A.4.a_LF-residual fuel_2015	1.A.4.c.1	DIOX	1.4	ng/GJ
6100	1.A.4.a_LF-residual fuel_2015	1.A.4.c.1	Benzo(b)	15	µg/GJ
6100	1.A.4.a_LF-residual fuel_2015	1.A.4.c.1	Benzo(k)	1.7	µg/GJ
6100	1.A.4.a_LF-residual fuel_2015	1.A.4.c.1	Benzo(a)	1.9	µg/GJ
6100	1.A.4.a_LF-residual fuel_2015	1.A.4.c.1	Indeno	1.5	µg/GJ
6100	1.A.4.a_LF-residual fuel_2015	1.A.4.c.1	SO2	430.46	g/GJ
6100	1.A.4.a_LF-residual fuel_2015	1.A.4.c.1	NOX	513	g/GJ
6100	1.A.4.a_LF-residual fuel_2015	1.A.4.c.1	NMVOC	25	g/GJ

Tech. ID	Technology Name	Category	Pollutant	Emission Factor	Unit
6100	1.A.4.a_LF-residual fuel_2015	1.A.4.c.1	CO	66	g/GJ
6100	1.A.4.a_LF-residual fuel_2015	1.A.4.c.1	TSP	20	g/GJ
6100	1.A.4.a_LF-residual fuel_2015	1.A.4.c.1	PM25	20	g/GJ
6100	1.A.4.a_LF-residual fuel_2015	1.A.4.c.1	PM10	20	g/GJ
6100	1.A.4.a_LF-residual fuel_2015	1.A.4.c.1	BC	11.2	g/GJ
6100	1.A.4.a_LF-residual fuel_2015	1.A.4.c.1	As	0.03	mg/GJ
6100	1.A.4.a_LF-residual fuel_2015	1.A.4.c.1	Cd	0.006	mg/GJ
6100	1.A.4.a_LF-residual fuel_2015	1.A.4.c.1	Cr	0.2	mg/GJ
6100	1.A.4.a_LF-residual fuel_2015	1.A.4.c.1	Cu	0.22	mg/GJ
6100	1.A.4.a_LF-residual fuel_2015	1.A.4.c.1	Hg	0.12	mg/GJ
6100	1.A.4.a_LF-residual fuel_2015	1.A.4.c.1	Ni	0.008	mg/GJ
6100	1.A.4.a_LF-residual fuel_2015	1.A.4.c.1	NH3	0.01	g/GJ
6111	Rockwool_2015, DE	2.A.7.1	NH3	91.95	t
6111	Rockwool_2015, DE	2.A.7.1	NMVOC	15.25	t
6111	Rockwool_2015, DE	2.A.7.1	TSP	38.18	t
6111	Rockwool_2015, DE	2.A.7.1	PM25	29.62	t
6111	Rockwool_2015, DE	2.A.7.1	PM10	33.61	t
6111	Rockwool_2015, DE	2.A.7.1	BC	0.0163	t
6112	Ammonia-2015	2.B.1	NOX	1.723	kg/t
6112	Ammonia-2015	2.B.1	NH3	0.01	kg/t
6112	Ammonia-2015	2.B.1	CO	0.008	kg/t
6113	Nitric acid-2015	2.B.2	NOX	0.68	kg/t
6114	NPK-2015	2.B.5.a	NOX	0.09	kg/t
6114	NPK-2015	2.B.5.a	NH3	4.74	kg/t
6114	NPK-2015	2.B.5.a	TSP	0.88	kg/t
6115	Urea-2015	2.B.5.a	NH3	1.61	kg/t
6115	Urea-2015	2.B.5.a	TSP	1.5	kg/t
6115	Urea-2015	2.B.5.a	PM25	0.9	kg/t
6115	Urea-2015	2.B.5.a	PM10	1.2	kg/t
6115	Urea-2015	2.B.5.a	BC	0.0162	kg/t
6117	Holcim_2015	1.A.2.f.1	Benzo(k)	7.7E-05	µg/GJ
6117	Holcim_2015	1.A.2.f.1	Indeno	4.3E-05	µg/GJ
6117	Holcim_2015	1.A.2.f.1	SO2	360.8	g/GJ
6117	Holcim_2015	1.A.2.f.1	NOX	1833.6	g/GJ
6117	Holcim_2015	1.A.2.f.1	NMVOC	45.5	g/GJ
6117	Holcim_2015	1.A.2.f.1	CO	1059.2	g/GJ
6117	Holcim_2015	1.A.2.f.1	Pb	0.098	mg/GJ
6117	Holcim_2015	1.A.2.f.1	Cd	0.008	mg/GJ
6117	Holcim_2015	1.A.2.f.1	Hg	0.049	mg/GJ
6117	Holcim_2015	1.A.2.f.1	As	0.0265	mg/GJ
6117	Holcim_2015	1.A.2.f.1	Cr	0.041	mg/GJ
6117	Holcim_2015	1.A.2.f.1	Cu	0.0647	mg/GJ
6117	Holcim_2015	1.A.2.f.1	Ni	0.049	mg/GJ
6117	Holcim_2015	1.A.2.f.1	Se	0.0253	mg/GJ
6117	Holcim_2015	1.A.2.f.1	Zn	0.424	mg/GJ

Tech. ID	Technology Name	Category	Pollutant	Emission Factor	Unit
6117	Holcim_2015	1.A.2.f.1	HCB	4.6	µg/GJ
6117	Holcim_2015	1.A.2.f.1	PCBs	103	µg/GJ
6117	Holcim_2015	1.A.2.f.1	DIOX	4.1	µg/GJ
6117	Holcim_2015	1.A.2.f.1	Benzo(a)	6.5E-05	µg/GJ
6117	Holcim_2015	1.A.2.f.1	Benzo(b)	0.00028	µg/GJ
6118	CALUCEM_2015	1.A.2.f.1	Pb	0.098	mg/GJ
6118	CALUCEM_2015	1.A.2.f.1	Cd	0.008	mg/GJ
6118	CALUCEM_2015	1.A.2.f.1	Hg	0.049	mg/GJ
6118	CALUCEM_2015	1.A.2.f.1	As	0.0265	mg/GJ
6118	CALUCEM_2015	1.A.2.f.1	Cr	0.041	mg/GJ
6118	CALUCEM_2015	1.A.2.f.1	Cu	0.0647	mg/GJ
6118	CALUCEM_2015	1.A.2.f.1	Ni	0.049	mg/GJ
6118	CALUCEM_2015	1.A.2.f.1	Se	0.0253	mg/GJ
6118	CALUCEM_2015	1.A.2.f.1	Zn	0.424	mg/GJ
6118	CALUCEM_2015	1.A.2.f.1	HCB	4.6	µg/GJ
6118	CALUCEM_2015	1.A.2.f.1	PCBs	103	µg/GJ
6118	CALUCEM_2015	1.A.2.f.1	DIOX	4.1	µg/GJ
6118	CALUCEM_2015	1.A.2.f.1	Benzo(a)	6.5E-05	µg/GJ
6118	CALUCEM_2015	1.A.2.f.1	Benzo(b)	0.00028	µg/GJ
6118	CALUCEM_2015	1.A.2.f.1	Benzo(k)	7.7E-05	µg/GJ
6118	CALUCEM_2015	1.A.2.f.1	Indeno	4.3E-05	µg/GJ
6118	CALUCEM_2015	1.A.2.f.1	SO2	3723.3	g/GJ
6118	CALUCEM_2015	1.A.2.f.1	NOX	2951.81	g/GJ
6118	CALUCEM_2015	1.A.2.f.1	NMVOC	18	g/GJ
6118	CALUCEM_2015	1.A.2.f.1	CO	22178.4	g/GJ
6119	Cemex_2015	1.A.2.f.1	Cd	0.008	mg/GJ
6119	Cemex_2015	1.A.2.f.1	Hg	0.049	mg/GJ
6119	Cemex_2015	1.A.2.f.1	As	0.0265	mg/GJ
6119	Cemex_2015	1.A.2.f.1	Cr	0.041	mg/GJ
6119	Cemex_2015	1.A.2.f.1	Cu	0.0647	mg/GJ
6119	Cemex_2015	1.A.2.f.1	Ni	0.049	mg/GJ
6119	Cemex_2015	1.A.2.f.1	Se	0.0253	mg/GJ
6119	Cemex_2015	1.A.2.f.1	Zn	0.424	mg/GJ
6119	Cemex_2015	1.A.2.f.1	HCB	4.6	µg/GJ
6119	Cemex_2015	1.A.2.f.1	PCBs	103	µg/GJ
6119	Cemex_2015	1.A.2.f.1	DIOX	4.1	µg/GJ
6119	Cemex_2015	1.A.2.f.1	Benzo(a)	6.5E-05	µg/GJ
6119	Cemex_2015	1.A.2.f.1	Benzo(b)	0.00028	µg/GJ
6119	Cemex_2015	1.A.2.f.1	Benzo(k)	7.7E-05	µg/GJ
6119	Cemex_2015	1.A.2.f.1	Indeno	4.3E-05	µg/GJ
6119	Cemex_2015	1.A.2.f.1	SO2	23.3	g/GJ
6119	Cemex_2015	1.A.2.f.1	NOX	1428.3	g/GJ
6119	Cemex_2015	1.A.2.f.1	NMVOC	18	g/GJ
6119	Cemex_2015	1.A.2.f.1	CO	2217.66	g/GJ
6119	Cemex_2015	1.A.2.f.1	Pb	0.098	mg/GJ

Tech. ID	Technology Name	Category	Pollutant	Emission Factor	Unit
6120	Našicecement_2015	1.A.2.f.1	Pb	0.098	mg/GJ
6120	Našicecement_2015	1.A.2.f.1	Cd	0.008	mg/GJ
6120	Našicecement_2015	1.A.2.f.1	Hg	0.049	mg/GJ
6120	Našicecement_2015	1.A.2.f.1	As	0.0265	mg/GJ
6120	Našicecement_2015	1.A.2.f.1	Cr	0.041	mg/GJ
6120	Našicecement_2015	1.A.2.f.1	Cu	0.0647	mg/GJ
6120	Našicecement_2015	1.A.2.f.1	Ni	0.049	mg/GJ
6120	Našicecement_2015	1.A.2.f.1	Se	0.0253	mg/GJ
6120	Našicecement_2015	1.A.2.f.1	Zn	0.424	mg/GJ
6120	Našicecement_2015	1.A.2.f.1	HCB	4.6	µg/GJ
6120	Našicecement_2015	1.A.2.f.1	PCBs	103	µg/GJ
6120	Našicecement_2015	1.A.2.f.1	DIOX	4.1	µg/GJ
6120	Našicecement_2015	1.A.2.f.1	Benzo(a)	6.5E-05	µg/GJ
6120	Našicecement_2015	1.A.2.f.1	Benzo(b)	0.00028	µg/GJ
6120	Našicecement_2015	1.A.2.f.1	Benzo(k)	7.7E-05	µg/GJ
6120	Našicecement_2015	1.A.2.f.1	Indeno	4.3E-05	µg/GJ
6120	Našicecement_2015	1.A.2.f.1	SO2	945.5	g/GJ
6120	Našicecement_2015	1.A.2.f.1	NOX	1114.6	g/GJ
6120	Našicecement_2015	1.A.2.f.1	NMVOC	314	g/GJ
6120	Našicecement_2015	1.A.2.f.1	CO	2926.5	g/GJ
6095	1.A.2.f.1_DE_Rockwool_2015	1.A.2.f.1	NOX	60.2895539	g/GJ
6095	1.A.2.f.1_DE_Rockwool_2015	1.A.2.f.1	CO	26.4066569	g/GJ
6095	1.A.2.f.1_DE_Rockwool_2015	1.A.2.f.1	SO2	314.97445	g/GJ
5879	gas oil_2014	1.A.1.a	Pb	0.08	mg/GJ
5879	gas oil_2014	1.A.1.a	Se	0.11	mg/GJ
5879	gas oil_2014	1.A.1.a	Zn	29	mg/GJ
5879	gas oil_2014	1.A.1.a	DIOX	1.4	ng/GJ
5879	gas oil_2014	1.A.1.a	Benzo(b)	15	µg/GJ
5879	gas oil_2014	1.A.1.a	Benzo(k)	1.7	µg/GJ
5879	gas oil_2014	1.A.1.a	Benzo(a)	1.9	µg/GJ
5879	gas oil_2014	1.A.1.a	Indeno	1.5	µg/GJ
5879	gas oil_2014	1.A.1.a	SO2	37.46	g/GJ
5879	gas oil_2014	1.A.1.a	NOX	513	g/GJ
5879	gas oil_2014	1.A.1.a	NMVOC	25	g/GJ
5879	gas oil_2014	1.A.1.a	CO	66	g/GJ
5879	gas oil_2014	1.A.1.a	TSP	20	g/GJ
5879	gas oil_2014	1.A.1.a	PM25	20	g/GJ
5879	gas oil_2014	1.A.1.a	PM10	20	g/GJ
5879	gas oil_2014	1.A.1.a	BC	11.2	g/GJ
5879	gas oil_2014	1.A.1.a	As	0.03	mg/GJ
5879	gas oil_2014	1.A.1.a	Cd	0.006	mg/GJ
5879	gas oil_2014	1.A.1.a	Cr	0.2	mg/GJ
5879	gas oil_2014	1.A.1.a	Cu	0.22	mg/GJ
5879	gas oil_2014	1.A.1.a	Hg	0.12	mg/GJ
5879	gas oil_2014	1.A.1.a	Ni	0.008	mg/GJ

Tech. ID	Technology Name	Category	Pollutant	Emission Factor	Unit
5879	gas oil_2014	1.A.1.a	NH3	0.01	g/GJ
5294	gaseous fuel	1.A.1.a	Pb	0.011	mg/GJ
5294	gaseous fuel	1.A.1.a	Se	0.058	mg/GJ
5294	gaseous fuel	1.A.1.a	Zn	0.73	mg/GJ
5294	gaseous fuel	1.A.1.a	DIOX	0.52	ng/GJ
5294	gaseous fuel	1.A.1.a	Benzo(b)	2.9	µg/GJ
5294	gaseous fuel	1.A.1.a	Benzo(k)	1.1	µg/GJ
5294	gaseous fuel	1.A.1.a	Benzo(a)	0.72	µg/GJ
5294	gaseous fuel	1.A.1.a	Indeno	1.08	µg/GJ
5294	gaseous fuel	1.A.1.a	SO2	0.67	g/GJ
5294	gaseous fuel	1.A.1.a	NOX	74	g/GJ
5294	gaseous fuel	1.A.1.a	NMVOC	23	g/GJ
5294	gaseous fuel	1.A.1.a	CO	29	g/GJ
5294	gaseous fuel	1.A.1.a	TSP	0.78	g/GJ
5294	gaseous fuel	1.A.1.a	PM25	0.78	g/GJ
5294	gaseous fuel	1.A.1.a	PM10	0.78	g/GJ
5294	gaseous fuel	1.A.1.a	BC	0.0312	g/GJ
5294	gaseous fuel	1.A.1.a	As	0.1	mg/GJ
5294	gaseous fuel	1.A.1.a	Cd	1.8	mg/GJ
5294	gaseous fuel	1.A.1.a	Cr	0.013	mg/GJ
5294	gaseous fuel	1.A.1.a	Cu	0.0026	mg/GJ
5294	gaseous fuel	1.A.1.a	Hg	0.54	mg/GJ
5294	gaseous fuel	1.A.1.a	Ni	0.013	mg/GJ
5294	gaseous fuel	1.A.1.a	NH3	0.15	g/GJ
5975	1.B.2.b.1 - NG production processing	1.B.2.b.1	NMVOC	0.1	kg/1000 m3
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

Tech. ID	Technology Name	Category	Pollutant	Emission Factor	Unit
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
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
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

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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
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
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
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

Tech. ID	Technology Name	Category	Pollutant	Emission Factor	Unit
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
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
5157	Gaseous fuels, gas work gas	1.A.4.b.1	Pb	0.0015	mg/GJ
5157	Gaseous fuels, gas work gas	1.A.4.b.1	Se	0.011	mg/GJ
5157	Gaseous fuels, gas work gas	1.A.4.b.1	Zn	0.0015	mg/GJ
5157	Gaseous fuels, gas work gas	1.A.4.b.1	DIOX	1.5	ng/GJ
5157	Gaseous fuels, gas work gas	1.A.4.b.1	Benzo(b)	0.84	µg/GJ
5157	Gaseous fuels, gas work gas	1.A.4.b.1	Benzo(k)	0.84	µg/GJ
5157	Gaseous fuels, gas work gas	1.A.4.b.1	Benzo(a)	0.56	µg/GJ
5157	Gaseous fuels, gas work gas	1.A.4.b.1	Indeno	0.84	µg/GJ
5157	Gaseous fuels, gas work gas	1.A.4.b.1	SO2	0.3	g/GJ
5157	Gaseous fuels, gas work gas	1.A.4.b.1	NOX	51	g/GJ
5157	Gaseous fuels, gas work gas	1.A.4.b.1	NMVOC	1.9	g/GJ
5157	Gaseous fuels, gas work gas	1.A.4.b.1	CO	26	g/GJ
5157	Gaseous fuels, gas work gas	1.A.4.b.1	TSP	1.2	g/GJ
5157	Gaseous fuels, gas work gas	1.A.4.b.1	PM25	1.2	g/GJ
5157	Gaseous fuels, gas work gas	1.A.4.b.1	PM10	1.2	g/GJ
5157	Gaseous fuels, gas work gas	1.A.4.b.1	BC	0.06	g/GJ
5157	Gaseous fuels, gas work gas	1.A.4.b.1	As	0.12	mg/GJ

Tech. ID	Technology Name	Category	Pollutant	Emission Factor	Unit
5157	Gaseous fuels, gas work gas	1.A.4.b.1	Cd	0.00025	mg/GJ
5157	Gaseous fuels, gas work gas	1.A.4.b.1	Cr	0.00076	mg/GJ
5157	Gaseous fuels, gas work gas	1.A.4.b.1	Cu	7.6E-05	mg/GJ
5157	Gaseous fuels, gas work gas	1.A.4.b.1	Hg	0.68	mg/GJ
5157	Gaseous fuels, gas work gas	1.A.4.b.1	Ni	0.00051	mg/GJ
5157	Gaseous fuels, LPG	1.A.4.b.1	Pb	0.0015	mg/GJ
5157	Gaseous fuels, LPG	1.A.4.b.1	Se	0.011	mg/GJ
5157	Gaseous fuels, LPG	1.A.4.b.1	Zn	0.0015	mg/GJ
5157	Gaseous fuels, LPG	1.A.4.b.1	DIOX	1.5	ng/GJ
5157	Gaseous fuels, LPG	1.A.4.b.1	Benzo(b)	0.84	µg/GJ
5157	Gaseous fuels, LPG	1.A.4.b.1	Benzo(k)	0.84	µg/GJ
5157	Gaseous fuels, LPG	1.A.4.b.1	Benzo(a)	0.56	µg/GJ
5157	Gaseous fuels, LPG	1.A.4.b.1	Indeno	0.84	µg/GJ
5157	Gaseous fuels, LPG	1.A.4.b.1	SO2	0.3	g/GJ
5157	Gaseous fuels, LPG	1.A.4.b.1	NOX	51	g/GJ
5157	Gaseous fuels, LPG	1.A.4.b.1	NMVOC	1.9	g/GJ
5157	Gaseous fuels, LPG	1.A.4.b.1	CO	26	g/GJ
5157	Gaseous fuels, LPG	1.A.4.b.1	TSP	1.2	g/GJ
5157	Gaseous fuels, LPG	1.A.4.b.1	PM25	1.2	g/GJ
5157	Gaseous fuels, LPG	1.A.4.b.1	PM10	1.2	g/GJ
5157	Gaseous fuels, LPG	1.A.4.b.1	BC	0.06	g/GJ
5157	Gaseous fuels, LPG	1.A.4.b.1	As	0.12	mg/GJ
5157	Gaseous fuels, LPG	1.A.4.b.1	Cd	0.00025	mg/GJ
5157	Gaseous fuels, LPG	1.A.4.b.1	Cr	0.00076	mg/GJ
5157	Gaseous fuels, LPG	1.A.4.b.1	Cu	7.6E-05	mg/GJ
5157	Gaseous fuels, LPG	1.A.4.b.1	Hg	0.68	mg/GJ
5157	Gaseous fuels, LPG	1.A.4.b.1	Ni	0.00051	mg/GJ
5157	Gaseous fuels, NG	1.A.4.b.1	Pb	0.0015	mg/GJ
5157	Gaseous fuels, NG	1.A.4.b.1	Se	0.011	mg/GJ
5157	Gaseous fuels, NG	1.A.4.b.1	Zn	0.0015	mg/GJ
5157	Gaseous fuels, NG	1.A.4.b.1	DIOX	1.5	ng/GJ
5157	Gaseous fuels, NG	1.A.4.b.1	Benzo(b)	0.84	µg/GJ
5157	Gaseous fuels, NG	1.A.4.b.1	Benzo(k)	0.84	µg/GJ
5157	Gaseous fuels, NG	1.A.4.b.1	Benzo(a)	0.56	µg/GJ
5157	Gaseous fuels, NG	1.A.4.b.1	Indeno	0.84	µg/GJ
5157	Gaseous fuels, NG	1.A.4.b.1	SO2	0.3	g/GJ
5157	Gaseous fuels, NG	1.A.4.b.1	NOX	51	g/GJ
5157	Gaseous fuels, NG	1.A.4.b.1	NMVOC	1.9	g/GJ
5157	Gaseous fuels, NG	1.A.4.b.1	CO	26	g/GJ
5157	Gaseous fuels, NG	1.A.4.b.1	TSP	1.2	g/GJ
5157	Gaseous fuels, NG	1.A.4.b.1	PM25	1.2	g/GJ
5157	Gaseous fuels, NG	1.A.4.b.1	PM10	1.2	g/GJ
5157	Gaseous fuels, NG	1.A.4.b.1	BC	0.06	g/GJ
5157	Gaseous fuels, NG	1.A.4.b.1	As	0.12	mg/GJ
5157	Gaseous fuels, NG	1.A.4.b.1	Cd	0.00025	mg/GJ

Tech. ID	Technology Name	Category	Pollutant	Emission Factor	Unit
5157	Gaseous fuels, NG	1.A.4.b.1	Cr	0.00076	mg/GJ
5157	Gaseous fuels, NG	1.A.4.b.1	Cu	7.6E-05	mg/GJ
5157	Gaseous fuels, NG	1.A.4.b.1	Hg	0.68	mg/GJ
5157	Gaseous fuels, NG	1.A.4.b.1	Ni	0.00051	mg/GJ
5409	Crop production and agricultural soils	4.D.1.a	PM25	0.06	kg/ha
5409	Crop production and agricultural soils	4.D.1.a	PM10	1.56	kg/ha
5409	Crop production and agricultural soils	4.D.1.a	NMVOC	0.86	kg/ha
5409	Crop production and agricultural soils	4.D.1.a	TSP	1.56	kg/ha
3833	3.B.1	3.B.1	NMVOC	0.85	kg/inhabitant
3834	3.B.2	3.B.2	NMVOC	0.25	kg/inhabitant
3836	3.C_PVC process.	3.C	NMVOC	40	kg/t
3837	Polyurethane_Solid foam	3.C	NMVOC	15	kg/t
3838	Polyurethane_Soft foam	3.C	NMVOC	25	kg/t
3840	3.C_Rubber manufac.	3.C	NMVOC	15	kg/t
3841	3.C_Pharmaceuticals products manufac.	3.C	NMVOC	0.014	kg/inhabitant
3842	3.C_Paints manufac.	3.C	NMVOC	15	kg/t
3843	3.C_Inks manufac.	3.C	NMVOC	30	kg/t
3844	3.C_Glues manufac.	3.C	NMVOC	20	kg/t
3845	3.D.1_flexografija	3.D.1	NMVOC	800	kg/t
3846	3.D.1_offset (litografija)	3.D.1	NMVOC	310	kg/t
3847	3.D.1_rotogravure	3.D.1	NMVOC	361	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
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
103	Mineral Industry, Asfalt Roofing	2.A.5	TSP	1600	g/t
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
198	1.B.2.c.2_Venting and flaring (gas)	1.B.2.c.2	NOX	1.4	kg/t waste gas
198	1.B.2.c.2_Venting and flaring (gas)	1.B.2.c.2	NMVOC	1.8	kg/t waste gas
198	1.B.2.c.2_Venting and flaring (gas)	1.B.2.c.2	CO	6.3	kg/t waste gas
198	1.B.2.c.2_Venting and flaring (gas)	1.B.2.c.2	SO2	0.013	kg/t waste gas
198	1.B.2.c.2_Venting and flaring (gas)	1.B.2.c.2	TSP	2.6	kg/t waste gas
198	1.B.2.c.2_Venting and flaring (gas)	1.B.2.c.2	PM25	2.6	kg/t waste gas
198	1.B.2.c.2_Venting and flaring (gas)	1.B.2.c.2	PM10	2.6	kg/t waste gas
198	1.B.2.c.2_Venting and flaring (gas)	1.B.2.c.2	BC	0.624	kg/t waste

Tech. ID	Technology Name	Category	Pollutant	Emission Factor	Unit
					gas
198	1.B.2.c.2_Venting and flaring (gas)	1.B.2.c.2	Pb	4.9	mg/t waste gas
198	1.B.2.c.2_Venting and flaring (gas)	1.B.2.c.2	Cd	20	mg/t waste gas
198	1.B.2.c.2_Venting and flaring (gas)	1.B.2.c.2	Hg	4.7	mg/t waste gas
198	1.B.2.c.2_Venting and flaring (gas)	1.B.2.c.2	As	3.8	mg/t waste gas
198	1.B.2.c.2_Venting and flaring (gas)	1.B.2.c.2	Cr	1.3	mg/t waste gas
198	1.B.2.c.2_Venting and flaring (gas)	1.B.2.c.2	Cu	1.6	mg/t waste gas
198	1.B.2.c.2_Venting and flaring (gas)	1.B.2.c.2	Ni	38	mg/t waste gas
198	1.B.2.c.2_Venting and flaring (gas)	1.B.2.c.2	Zn	520	mg/t waste gas
198	1.B.2.c.2_Venting and flaring (gas)	1.B.2.c.2	Se	0.43	mg/t waste gas
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
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
14	Gas oil	1.A.1.a	As	1.17	mg/GJ
14	Gas oil	1.A.1.a	Cr	0.47	mg/GJ

Tech. ID	Technology Name	Category	Pollutant	Emission Factor	Unit
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
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
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
4469	Solid waste disposal on land	6.A.1	NMVOC	1.56	kg/t
4469	Solid waste disposal on land	6.A.1	TSP	0.463	g/t
4469	Solid waste disposal on land	6.A.1	PM25	0.033	g/t
4469	Solid waste disposal on land	6.A.1	PM10	0.219	g/t
4470	Latrines	6.B.3	NH3	1.65	kg/inhabitant
4448	Forest Fires	11.B	SO2	20	kg/ha
4448	Forest Fires	11.B	NOX	100	kg/ha
4448	Forest Fires	11.B	NH3	20	kg/ha
4448	Forest Fires	11.B	NMVOC	300	kg/ha
4448	Forest Fires	11.B	CO	3000	kg/ha
4449	Consumption of POPs and HMs	2.F.8	Hg	0.01	g/inhabitant

Tech. ID	Technology Name	Category	Pollutant	Emission Factor	Unit
4449	Consumption of POPs and HMs	2.F.8	PCBs	0.1	g/inhabitant
4471	Waste water treatment in industry	6.B.1	NMVOC	15	mg/1000 m3
4472	Waste water treatment in residental / commercial sector	6.B.2	NMVOC	15	mg/1000 m3
4487	Rolling mills - cold	2.C.1.5	TSP	96	g/t
4493	Coffee roasting	2.D.2	NMVOC	0.55	kg/t
4488	Meat, fish etc. frying / curing	2.D.2	NMVOC	0.3	kg/t
4489	Sugar	2.D.2	NMVOC	10	kg/t
4492	Animal feed	2.D.2	NMVOC	1	kg/t
4649	Industrial coating application	3.A.2	NMVOC	400	kg/t
4650	Other coating application	3.A.3	NMVOC	200	kg/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
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
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
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
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
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
4725	1.A.3.b.7-Passenger Cars	1.A.3.b.7	TSP	15	g/k(veh*km)
4725	1.A.3.b.7-Passenger Cars	1.A.3.b.7	PM25	4.1	g/k(veh*km)
4725	1.A.3.b.7-Passenger Cars	1.A.3.b.7	PM10	7.5	g/k(veh*km)
4726	1.A.3.b.7-Two-wheelers	1.A.3.b.7	TSP	6	g/k(veh*km)
4726	1.A.3.b.7-Two-wheelers	1.A.3.b.7	PM25	1.6	g/k(veh*km)
4726	1.A.3.b.7-Two-wheelers	1.A.3.b.7	PM10	3	g/k(veh*km)
4797	Expandible PS	3.C	NMVOC	60	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

Tech. ID	Technology Name	Category	Pollutant	Emission Factor	Unit
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
196	Incineration of industrial waste	6.C.b	BC	0.00014	kg/t
6123	Road tanker, bottom loading, VRU	1.B.2.a.5	NMVOC	0.247	kg/kt*kPa
6122	Road tanker, top loading	1.B.2.a.5	NMVOC	12.33	kg/kt*kPa
6124	Rail tanker, uncontrolled	1.B.2.a.5	NMVOC	15.07	kg/kt*kPa
4723	1.A.3.b.7-Heavy Duty Vehicles	1.A.3.b.7	TSP	76	g/k(veh*km)
4723	1.A.3.b.7-Heavy Duty Vehicles	1.A.3.b.7	PM25	20.5	g/k(veh*km)
4723	1.A.3.b.7-Heavy Duty Vehicles	1.A.3.b.7	PM10	38	g/k(veh*km)
4724	1.A.3.b.7-Light Duty Vehicles	1.A.3.b.7	TSP	15	g/k(veh*km)
4724	1.A.3.b.7-Light Duty Vehicles	1.A.3.b.7	PM25	4.1	g/k(veh*km)
4724	1.A.3.b.7-Light Duty Vehicles	1.A.3.b.7	PM10	7.5	g/k(veh*km)
6	Natural gas	1.A.1.a	DIOX	0.5	g/GJ
6	Natural gas	1.A.1.a	NH3	0.15	g/GJ
6	Natural gas	1.A.1.a	NMVOC	4	g/GJ
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
5880	residual fuel_2014	1.A.1.a	Pb	0.08	mg/GJ
5880	residual fuel_2014	1.A.1.a	Se	0.11	mg/GJ
5880	residual fuel_2014	1.A.1.a	Zn	29	mg/GJ
5880	residual fuel_2014	1.A.1.a	DIOX	1.4	ng/GJ
5880	residual fuel_2014	1.A.1.a	Benzo(b)	15	μg/GJ
5880	residual fuel_2014	1.A.1.a	Benzo(k)	1.7	μg/GJ
5880	residual fuel_2014	1.A.1.a	Benzo(a)	1.9	μg/GJ
5880	residual fuel_2014	1.A.1.a	Indeno	1.5	μg/GJ
5880	residual fuel_2014	1.A.1.a	SO2	472.75	g/GJ
5880	residual fuel_2014	1.A.1.a	NOX	513	g/GJ
5880	residual fuel_2014	1.A.1.a	NMVOC	25	g/GJ
5880	residual fuel_2014	1.A.1.a	CO	66	g/GJ
5880	residual fuel_2014	1.A.1.a	TSP	20	g/GJ
5880	residual fuel_2014	1.A.1.a	PM25	20	g/GJ
5880	residual fuel_2014	1.A.1.a	PM10	20	g/GJ
5880	residual fuel_2014	1.A.1.a	BC	11.2	g/GJ
5880	residual fuel_2014	1.A.1.a	As	0.03	mg/GJ
5880	residual fuel_2014	1.A.1.a	Cd	0.006	mg/GJ
5880	residual fuel_2014	1.A.1.a	Cr	0.2	mg/GJ
5880	residual fuel_2014	1.A.1.a	Cu	0.22	mg/GJ
5880	residual fuel_2014	1.A.1.a	Hg	0.12	mg/GJ
5880	residual fuel_2014	1.A.1.a	Ni	0.008	mg/GJ

Tech. ID	Technology Name	Category	Pollutant	Emission Factor	Unit
5880	residual fuel_2014	1.A.1.a	NH3	0.01	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	7.6E-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
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
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
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
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
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
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
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
1	Plomin	1.A.1.a	NMVOC	3	g/GJ

Tech. ID	Technology Name	Category	Pollutant	Emission Factor	Unit
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
1	Plomin	1.A.1.a	PCBs	170	µg/GJ
1	Plomin	1.A.1.a	HCB	0.62	µg/GJ
1	Plomin	1.A.1.a	NMVOC	3	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
1	Plomin	1.A.1.a	PCBs	170	µg/GJ
1	Plomin	1.A.1.a	HCB	0.62	µg/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
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

Tech. ID	Technology Name	Category	Pollutant	Emission Factor	Unit
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
6124	Rail tanker, uncontrolled	1.B.2.a.5	NMVOC	15.07	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	32.2	g/GJ
6132	INA-RNS	1.B.2.c.1	CO	177	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	0.3	mg/GJ
6132	INA-RNS	1.B.2.c.1	Cd	0.7	mg/GJ
6132	INA-RNS	1.B.2.c.1	Cr	3	mg/GJ
6132	INA-RNS	1.B.2.c.1	Hg	0.09	mg/GJ
6132	INA-RNS	1.B.2.c.1	Cu	2	mg/GJ
6132	INA-RNS	1.B.2.c.1	Ni	4	mg/GJ
6132	INA-RNS	1.B.2.c.1	Pb	2	mg/GJ
6132	INA-RNS	1.B.2.c.1	Zn	26	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
6133	INA-RNS	1.B.2.c.1	SO2	77	g/m3
6133	INA-RNS	1.B.2.c.1	NMVOC	2	g/m3
6134	INA-RNR	1.B.2.c.1	SO2	77	g/m3
6134	INA-RNR	1.B.2.c.1	NMVOC	2	g/m3
6135	INA-RNR	1.B.2.c.1	NOX	32.2	g/GJ
6135	INA-RNR	1.B.2.c.1	CO	177	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	0.3	mg/GJ
6135	INA-RNR	1.B.2.c.1	Cd	0.7	mg/GJ
6135	INA-RNR	1.B.2.c.1	Cr	3	mg/GJ
6135	INA-RNR	1.B.2.c.1	Hg	0.09	mg/GJ
6135	INA-RNR	1.B.2.c.1	Cu	2	mg/GJ

Tech. ID	Technology Name	Category	Pollutant	Emission Factor	Unit
6135	INA-RNR	1.B.2.c.1	Ni	4	mg/GJ
6135	INA-RNR	1.B.2.c.1	Pb	2	mg/GJ
6135	INA-RNR	1.B.2.c.1	Zn	26	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

APPENDIX 5. CROATIAN ENERGY BALANCE FOR REPUBLIC OF CROATIA 2015

PJ	Anthracite	Hard coal	Brown coal	Lignite	Crude oil	Natural gas	Hydro energy	Fuel wood	Wind energy	Solar energy	Geothermal energy
Production	-	-	-	-	28.62	61.605	61.63	53.895	7.486	0.974	0.449
Import	0.03	25.15	0.86	0.07	99.41	36.333	-	0.30	-	-	-
Export	-	0.71	0.00	-	-	12.712	-	6.20	-	-	-
Import-processing	-	-	-	-	-	-	-	-	-	-	-
Export-processing	-	-	-	-	-	-	-	-	-	-	-
Stock change	-	- 0.58	- 0.21	-	- 3.60	1.938	-	-	-	-	-
Bunkers	-	-	-	-	-	-	-	-	-	-	-
Energy supplied	**0.03**	**23.87**	**0.64**	**0.07**	**124.42**	**87.16**	**61.63**	**47.99**	**7.49**	**0.97**	**0.45**
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	**0.03**	**23.87**	**0.64**	**0.07**	**124.42**	**87.16**	**61.63**	**47.99**	**7.49**	**0.97**	**0.45**
Transformation sector	-	-	-	-	-	-	-	-	-	-	-
hydro power plants	-	-	-	-	-	-	61.63	-	-	-	-
– small HPP	-	-	-	-	-	-	0.95	-	-	-	-
Wind power plants	-	-	-	-	-	-	-	-	7.49	-	-
Solar power plants	-	-	-	-	-	-	-	-	-	0.54	-
Geothermal power plants	-	-	-	-	-	-	-	-	-	-	-
thermal power plants	-	21.82	-	-	-	1.82	-	-	-	-	-
public cogeneration plants	-	-	-	-	-	11.89	-	-	-	-	-
public heating plants	-	-	-	-	-	2.51	-	-	-	-	-
industrial cogeneration plants	-	-	0.58	-	-	8.91	-	-	-	-	-
– in rafineries	-	-	-	-	-	1.52	-	-	-	-	-
– in gas production	-	-	-	-	-	1.40	-	-	-	-	-
Industrial heating plants	-	-	-	-	-	1.89	-	-	-	-	-
Petroleum refineries	-	-	-	-	122.22	3.06	-	-	-	-	-
NGL-plant	-	-	-	-	2.19	0.42	-	-	-	-	-
Coke plant	-	-	-	-	-	-	-	-	-	-	-
Gas works	-	-	-	-	-	0.01	-	-	-	-	-
Total transformation sector	**-**	**21.82**	**0.58**	**-**	**124.42**	**30.50**	**61.63**	**-**	**7.49**	**0.54**	**-**
Energy sector own use	-	-	-	-	-	-	-	-	-	-	-
Oil and gas extraction	-	-	-	-	-	2.63	-	-	-	-	-
Coal production	-	-	-	-	-	-	-	-	-	-	-
Electric energy supply industry	-	-	-	-	-	-	-	-	-	-	-
hydro power plants	-	-	-	-	-	-	-	-	-	-	-
thermal power plants	-	-	-	-	-	-	-	-	-	-	-
public cogeneration plants	-	-	-	-	-	-	-	-	-	-	-
industrial cogeneration plants	-	-	-	-	-	-	-	-	-	-	-
Industrial heating plants	-	-	-	-	-	-	-	-	-	-	-
Petroleum refineries	-	-	-	-	-	1.66	-	-	-	-	-
NGL-plant	-	-	-	-	-	0.17	-	-	-	-	-
Gas works	-	-	-	-	-	-	-	-	-	-	-
Total energy sector own use	**-**	**-**	**-**	**-**	**-**	**4.46**	**-**	**-**	**-**	**-**	**-**
Losses	-	-	-	-	-	1.10	-	-	-	-	-
Final energy demand	**0.03**	**2.04**	**0.07**	**0.07**	**-**	**51.10**	**-**	**47.99**	**-**	**0.44**	**0.45**
Non energy use	**-**	**-**	**-**	**-**	**-**	**17.15**	**-**	**-**	**-**	**-**	**-**
Energy sector	-	-	-	-	-	-	-	-	-	-	-
Petrochemical industry	-	-	-	-	-	17.15	-	-	-	-	-
Other industry	-	-	-	-	-	-	-	-	-	-	-
Construction	-	-	-	-	-	-	-	-	-	-	-
Transport	-	-	-	-	-	-	-	-	-	-	-
Agriculture	-	-	-	-	-	-	-	-	-	-	-
Energy consumption	**0.03**	**2.04**	**0.07**	**0.07**	**-**	**33.95**	**-**	**47.99**	**-**	**0.44**	**0.45**
Industry	**0.03**	**2.04**	**0.05**	**-**	**-**	**7.30**	**-**	**0.38**	**-**	**-**	**-**
Iron and steel	0.03	0.05	-	-	-	0.57	-	0.00	-	-	-
Non-ferrous metals	-	-	-	-	-	0.09	-	0.00	-	-	-
Non-metallic minerals	-	-	-	-	-	1.34	-	-	-	-	-
Chemical	-	-	-	-	-	0.40	-	-	-	-	-
Construction materials	-	1.99	0.05	-	-	1.41	-	0.01	-	-	-
Pulp and paper	-	-	-	-	-	0.23	-	0.00	-	-	-
Food production	-	-	-	-	-	1.98	-	0.12	-	-	-
Not elsewhere specified	-	-	-	-	-	1.28	-	0.25	-	-	-
Transport	**-**	**-**	**-**	**-**	**-**	**0.14**	**-**	**-**	**-**	**-**	**-**
Rail	-	-	-	-	-	-	-	-	-	-	-
Road	-	-	-	-	-	0.01	-	-	-	-	-
Air	-	-	-	-	-	-	-	-	-	-	-
– international	-	-	-	-	-	-	-	-	-	-	-
– domestic	-	-	-	-	-	-	-	-	-	-	-
Sea and River	-	-	-	-	-	-	-	-	-	-	-
Public transport	-	-	-	-	-	0.13	-	-	-	-	-
Not elsewhere specified	-	-	-	-	-	-	-	-	-	-	-
Other sectors	**-**	**-**	**0.02**	**0.07**	**-**	**26.51**	**-**	**47.61**	**-**	**0.44**	**0.45**
Households	-	-	0.02	0.07	-	18.68	-	47.49	-	0.44	-
Services	-	-	-	0.00	-	7.09	-	0.12	-	-	0.28
Agriculture	-	-	-	-	-	0.74	-	-	-	-	0.17
Construction	-	-	-	-	-	-	-	-	-	-	-

PJ	Landfill gas	Biofuels	Other biomass	Coke oven coke	Liquefied petroleum gases	Unleaded motor gasoline	Standard motor gasoline	Petroleum	Jet fuel	Diesel oil	Light heating oil
Production	1.5066	0.648	10.299	-	-	-	-	-	-	-	-
Import	-	0.40	0.49	0.77	1.68	9.69	0.02	0.11	1.06	45.02	2.12
Export	-	0.03	6.25	0.03	6.70	23.13	-	-	0.27	23.51	2.08
Import-processing	-	-	-	-	-	-	-	-	-	-	-
Export-processing	-	-	-	-	-	-	-	-	-	-	-
Stock change	-	-	0.16	-	-0.04	-0.45	-	-	-0.08	-1.96	-0.00
Bunkers	-	-	-	-	-	-	-	-	-	0.06	-
Energy supplied	**1.5066**	**1.02**	**4.70**	**0.74**	**-5.05**	**-13.89**	**0.02**	**0.11**	**0.71**	**19.48**	**0.04**
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	-	-	-	-	9.80	37.58	-	-	4.59	46.22	7.15
NGL-plant	-	-	-	-	1.81	-	-	-	-	-	-
Coke plant	-	-	-	-	-	-	-	-	-	-	-
Gas works	-	-	-	-	-	-	-	-	-	-	-
Total production	**-**	**-**	**-**	**-**	**11.62**	**37.58**	**-**	**-**	**4.59**	**46.22**	**7.15**
Gross production	**1.5066**	**1.02**	**4.70**	**0.74**	**6.56**	**23.70**	**0.02**	**0.11**	**5.30**	**65.70**	**7.19**
Transformation sector	-	-	-	-	-	-	-	-	-	-	-
hydro power plants	-	-	-	-	-	-	-	-	-	-	-
– small HPP	-	-	-	-	-	-	-	-	-	-	-
Wind power plants	-	-	-	-	-	-	-	-	-	-	-
Solar power plants	-	-	-	-	-	-	-	-	-	-	-
Geothermal power plants	-	-	-	-	-	-	-	-	-	-	-
thermal power plants	0.2487	-	-	-	-	-	-	-	-	-	0.09
public cogeneration plants	1.0724	-	2.19	-	-	-	-	-	-	-	-
public heating plants	-	-	-	-	-	-	-	-	-	-	0.17
industrial cogeneration plants	0.1431	-	-	-	-	-	-	-	-	-	-
– in rafineries	-	-	-	-	-	-	-	-	-	-	-
– in gas production	-	-	-	-	-	-	-	-	-	-	-
Industrial heating plants	-	-	0.49	-	-	-	-	-	-	-	0.02
Petroleum refineries	-	-	-	-	-	-	-	-	-	-	-
NGL-plant	-	-	-	-	-	-	-	-	-	-	-
Coke plant	-	-	-	-	-	-	-	-	-	-	-
Gas works	-	-	-	-	-	-	-	-	-	-	-
Total transformation sector	**1.4642**	**-**	**2.68**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**0.27**
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	0.0424	-	-	-	-	-	-	-	-	-	-
Final energy demand	**0.0000**	**1.02**	**2.01**	**0.74**	**6.56**	**23.70**	**0.02**	**0.11**	**5.30**	**65.70**	**6.92**
Non energy use	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Energy sector	-	-	-	-	-	-	-	-	-	-	-
Petrochemical industry	-	-	-	-	-	-	-	-	-	-	-
Other industry	-	-	-	-	-	-	-	-	-	-	-
Construction	-	-	-	-	-	-	-	-	-	-	-
Transport	-	-	-	-	-	-	-	-	-	-	-
Agriculture	-	-	-	-	-	-	-	-	-	-	-
Energy consumption	**0.0000**	**1.02**	**2.01**	**0.74**	**6.56**	**23.70**	**0.02**	**0.11**	**5.30**	**65.70**	**6.92**
Industry	**-**	**-**	**0.78**	**0.74**	**0.41**	**-**	**-**	**0.11**	**-**	**0.47**	**0.69**
Iron and steel	-	-	-	0.02	0.04	-	-	-	-	-	0.03
Non-ferrous metals	-	-	-	-	0.04	-	-	0.01	-	-	0.04
Non-metallic minerals	-	-	-	-	0.01	-	-	-	-	-	-
Chemical	-	-	-	-	-	-	-	0.11	-	-	0.02
Construction materials	-	-	0.68	0.60	0.08	-	-	-	-	0.47	0.12
Pulp and paper	-	-	0.01	-	0.00	-	-	-	-	-	-
Food production	-	-	-	0.12	0.07	-	-	-	-	-	0.35
Not elsewhere specified	-	-	0.09	-	0.18	-	-	-	-	-	0.14
Transport	**-**	**1.02**	**-**	**-**	**3.14**	**23.19**	**0.02**	**-**	**5.30**	**54.52**	**-**
Rail	-	-	-	-	-	-	-	-	-	0.75	-
Road	-	0.98	-	-	3.14	23.19	-	-	-	51.06	-
Air	-	-	-	-	-	-	0.02	-	5.30	-	-
– international	-	-	-	-	-	-	0.00	-	4.88	-	-
– domestic	-	-	-	-	-	-	0.01	-	0.42	-	-
Sea and River	-	-	-	-	-	-	-	-	-	1.76	-
Public transport	-	0.04	-	-	-	-	-	-	-	0.96	-
Not elsewhere specified	-	-	-	-	-	-	-	-	-	-	-
Other sectors	**-**	**-**	**1.23**	**-**	**3.02**	**0.51**	**-**	**-**	**-**	**10.70**	**6.23**
Households	-	-	1.13	-	2.23	-	-	-	-	-	3.61
Services	-	-	0.10	-	0.58	-	-	-	-	-	1.90
Agriculture	-	-	-	-	0.12	0.33	-	-	-	7.32	0.48
Construction	-	-	-	-	0.09	0.18	-	-	-	3.38	0.23

PJ	Low sulphur fuel oil	Standard fuel oil	Naphta	White spirit	Bitumen	Lubricants	Paraffin and wax	Petroleum coke	Etan	Other derivates	Refinery gas
Production	-	-	-	-	-	-	-	-	-	-	-
Import	0.33	1.91	-	0.10	3.61	0.94	0.26	5.24	-	-	-
Export	0.06	15.10	2.20	0.01	0.02	0.31	0.00	0.47	-	5.61	-
Import-processing	-	-	-	-	-	-	-	-	-	-	-
Export-processing	-	-	-	-	-	-	-	-	-	-	-
Stock change	-	1.96	-0.14	-	-	-0.01	-	-0.26	-	0.79	-
Bunkers	-	0.01	-	-	-	-	-	-	-	-	-
Energy supplied	**0.27**	**-11.23**	**-2.34**	**0.09**	**3.59**	**0.63**	**0.26**	**4.51**	**-**	**-4.82**	**-**
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	-	19.66	2.34	-	-	0.45	-	1.65	-	4.83	8.87
NGL-plant	-	-	0.78	-	-	-	-	-	-	-	-
Coke plant	-	-	-	-	-	-	-	-	-	-	-
Gas works	-	-	-	-	-	-	-	-	-	-	-
Total production	**-**	**19.66**	**3.12**	**-**	**-**	**0.45**	**-**	**1.65**	**-**	**4.83**	**8.87**
Gross production	**0.27**	**8.43**	**0.78**	**0.09**	**3.59**	**1.08**	**0.26**	**6.16**	**-**	**0.01**	**8.87**
Transformation sector	-	-	-	-	-	-	-	-	-	-	-
hydro power plants	-	-	-	-	-	-	-	-	-	-	-
– small HPP	-	-	-	-	-	-	-	-	-	-	-
Wind power plants	-	-	-	-	-	-	-	-	-	-	-
Solar power plants	-	-	-	-	-	-	-	-	-	-	-
Geothermal power plants	-	-	-	-	-	-	-	-	-	-	-
thermal power plants	-	0.43	-	-	-	-	-	-	-	-	-
public cogeneration plants	-	1.44	-	-	-	-	-	-	-	-	-
public heating plants	-	0.15	-	-	-	-	-	-	-	-	-
industrial cogeneration plants	-	2.76	-	-	-	-	-	-	-	-	0.72
– in rafineries	-	2.72	-	-	-	-	-	-	-	-	0.72
– in gas production	-	-	-	-	-	-	-	-	-	-	-
Industrial heating plants	-	2.23	-	-	-	-	-	-	-	-	0.21
Petroleum refineries	-	-	0.78	-	-	-	-	-	-	-	-
NGL-plant	-	-	-	-	-	-	-	-	-	-	-
Coke plant	-	-	-	-	-	-	-	-	-	-	-
Gas works	-	-	-	-	-	-	-	-	-	-	-
Total transformation sector	**-**	**7.01**	**0.78**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**0.92**
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	-	0.82	-	-	-	-	-	0.97	-	-	7.94
NGL-plant	-	-	-	-	-	-	-	-	-	-	-
Gas works	-	-	-	-	-	-	-	-	-	-	-
Total energy sector own use	**-**	**0.82**	**-**	**-**	**-**	**-**	**-**	**0.97**	**-**	**-**	**7.94**
Losses	-	-	-	-	-	-	-	-	-	-	-
Final energy demand	**0.27**	**0.59**	**-0.00**	**0.09**	**3.59**	**1.08**	**0.26**	**5.19**	**-**	**0.01**	**0.00**
Non energy use	**-**	**-**	**-**	**0.0905**	**3.5912**	**1.0787**	**0.2580**	**-**	**-**	**0.0080**	**-**
Energy sector	-	-	-	-	-	0.07	-	-	-	-	-
Petrochemical industry	-	-	-	-	-	-	-	-	-	-	-
Other industry	-	-	-	0.09	0.33	0.21	0.26	-	-	0.01	-
Construction	-	-	-	-	3.26	0.04	-	-	-	-	-
Transport	-	-	-	-	-	0.72	-	-	-	-	-
Agriculture	-	-	-	-	-	0.05	-	-	-	-	-
Energy consumption	**0.27**	**0.59**	**-0.00**	**-**	**-**	**-**	**-**	**5.19**	**-**	**-**	**0.00**
Industry	**0.27**	**0.23**	**-**	**-**	**-**	**-**	**-**	**5.19**	**-**	**-**	**-**
Iron and steel	0.01	0.01	-	-	-	-	-	0.01	-	-	-
Non-ferrous metals	-	-	-	-	-	-	-	-	-	-	-
Non-metallic minerals	-	-	-	-	-	-	-	-	-	-	-
Chemical	-	-	-	-	-	-	-	-	-	-	-
Construction materials	0.14	0.02	-	-	-	-	-	5.18	-	-	-
Pulp and paper	-	-	-	-	-	-	-	-	-	-	-
Food production	0.08	0.17	-	-	-	-	-	-	-	-	-
Not elsewhere specified	0.03	0.03	-	-	-	-	-	-	-	-	-
Transport	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Rail	-	-	-	-	-	-	-	-	-	-	-
Road	-	-	-	-	-	-	-	-	-	-	-
Air	-	-	-	-	-	-	-	-	-	-	-
– international	-	-	-	-	-	-	-	-	-	-	-
– domestic	-	-	-	-	-	-	-	-	-	-	-
Sea and River	-	-	-	-	-	-	-	-	-	-	-
Public transport	-	-	-	-	-	-	-	-	-	-	-
Not elsewhere specified	-	-	-	-	-	-	-	-	-	-	-
Other sectors	**-**	**0.37**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Households	-	0.17	-	-	-	-	-	-	-	-	-
Services	-	0.11	-	-	-	-	-	-	-	-	-
Agriculture	-	0.08	-	-	-	-	-	-	-	-	-
Construction	-	-	-	-	-	-	-	-	-	-	-

PJ	Refinery semiproducts	Aditives	Gas works gas	Electricity	Steam and hot water	Industrial waste, non renewable
Production	-	-	-	-	0.64	0.39
Import	16.35	2.28	-	31.93	-	-
Export	-	-	-	7.49	-	-
Import-processing	-	-	-	-	-	-
Export-processing	-	-	-	-	-	-
Stock change	0.01	-	-	-	-	-
Bunkers	-	-	-	-	-	-
Energy supplied	**16.36**	**2.28**	**-**	**24.44**	**0.64**	**0.39**
Production	-	-	-	-	-	-
hydro power plants	-	-	-	23.60	-	-
– small HPP	-	-	-	0.36	-	-
Wind power plants	-	-	-	2.87	-	-
Solar power plants	-	-	-	0.21	-	-
Geothermal power plants	-	-	-	-	-	-
thermal power plants	-	-	-	9.35	-	-
public cogeneration plants	-	-	-	3.92	8.83	-
public heating plants	-	-	-	-	2.27	-
industrial cogeneration plants	-	-	-	1.11	9.61	-
– in rafineries	-	-	-	0.33	3.78	-
– in gas production	-	-	-	0.30	0.70	-
Industrial heating plants	-	-	-	-	4.01	-
Petroleum refineries	-	-	-	-	-	-
NGL-plant	-	-	-	-	-	-
Coke plant	-	-	-	-	-	-
Gas works	-	-	0.01	-	-	-
Total production	**-**	**-**	**0.01**	**41.05**	**24.72**	**-**
Gross production	**16.36**	**2.28**	**0.01**	**65.49**	**25.36**	**0.39**
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	16.36	2.28	-	-	-	-
NGL-plant	-	-	-	-	-	-
Coke plant	-	-	-	-	-	-
Gas works	-	-	-	-	-	-
Total transformation sector	**16.36**	**2.28**	**-**	**-**	**-**	**-**
Energy sector own use	-	-	-	-	-	-
Oil and gas extraction	-	-	-	0.45	0.42	-
Coal production	-	-	-	-	0.12	-
Electric energy supply industry	-	-	-	0.11	-	-
hydro power plants	-	-	-	0.97	-	-
thermal power plants	-	-	-	0.85	-	-
public cogeneration plants	-	-	-	0.47	0.54	-
industrial cogeneration plants	-	-	-	-	-	-
Industrial heating plants	-	-	-	0.01	-	-
Petroleum refineries	-	-	-	0.92	5.57	-
NGL-plant	-	-	-	0.07	0.28	-
Gas works	-	-	-	-	-	-
Total energy sector own use	**-**	**-**	**-**	**3.85**	**6.94**	**-**
Losses	-	-	0.00	6.49	1.59	-
Final energy demand	**-**	**-**	**0.01**	**55.15**	**16.84**	**0.39**
Non energy use	**-**	**-**	**-**	**-**	**-**	**-**
Energy sector	-	-	-	-	-	-
Petrochemical industry	-	-	-	-	-	-
Other industry	-	-	-	-	-	-
Construction	-	-	-	-	-	-
Transport	-	-	-	-	-	-
Agriculture	-	-	-	-	-	-
Energy consumption	**-**	**-**	**0.01**	**55.15**	**16.84**	**0.39**
Industry	**-**	**-**	**-**	**12.09**	**9.62**	**0.39**
Iron and steel	-	-	-	1.31	0.06	-
Non-ferrous metals	-	-	-	0.13	-	-
Non-metallic minerals	-	-	-	0.48	0.09	-
Chemical	-	-	-	1.11	4.24	-
Construction materials	-	-	-	1.76	-	0.39
Pulp and paper	-	-	-	0.68	0.82	-
Food production	-	-	-	2.52	2.63	-
Not elsewhere specified	-	-	-	4.09	1.78	-
Transport	**-**	**-**	**-**	**1.05**	**-**	**-**
Rail	-	-	-	0.55	-	-
Road	-	-	-	-	-	-
Air	-	-	-	0.09	-	-
– international	-	-	-	-	-	-
– domestic	-	-	-	0.09	-	-
Sea and River	-	-	-	0.08	-	-
Public transport	-	-	-	0.22	-	-
Not elsewhere specified	-	-	-	0.11	-	-
Other sectors	**-**	**-**	**0.01**	**42.01**	**7.21**	**-**
Households	-	-	0.00	22.33	5.65	-
Services	-	-	0.01	19.18	1.39	-
Agriculture	-	-	-	0.22	0.18	-
Construction	-	-	-	0.27	-	-

ENERGY BALANCE 2015 *natural units*	Anthracite	Hard coal	Brown coal	Lignite	Crude oil	Natural gas	Hydro energy	Fuel wood	Wind energy	Solar energy	Geothermal energy
	10^3 t	10^3 t	10^3 t	10^3 t	10^3 t	10^6 m^3	TJ	10^3 m^3	TJ	TJ	TJ
Production					670.2	1780.5	61625.7	5988.3	7485.8	973.8	449.3
Import	0.9	1000.5	50.3	7.1	2328.0	1050.1		33.2			
Export		28.2	0.2			367.4		689.1			
Import-processing											
Export-processing											
Stock change		-22.9	-12.2		-84.4	56.0					
Bunkers											
Energy supplied	**0.9**	**949.4**	**37.9**	**7.1**	**2913.8**	**2519.2**	**61625.7**	**5332.4**	**7485.8**	**973.8**	**449.3**
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											
NGL-plant											
Coke plant											
Gas works											
Total production											
Transformation sector											
hydro power plants							61625.7				
– small HPP							947.6				
Wind power plants									7485.8		
Solar power plants										538.7	
Geothermal power plants											
thermal power plants		872.9				52.5					
public cogeneration plants						343.7					
public heating plants						72.4					
industrial cogeneration plants			34.0			257.5					
– in rafineries						43.8					
– in gas production						40.4					
Industrial heating plants						54.6					
Petroleum refineries					2862.4	88.4					
NGL-plant					51.4	12.2					
Coke plant											
Gas works						0.3					
Total transformation sector		**872.9**	**34.0**		**2913.8**	**881.6**	**61625.7**		**7485.8**	**538.7**	
Energy sector own use											
Oil and gas extraction						75.9					
Coal production											
Electric energy supply industry											
hydro power plants											
thermal power plants											
public cogeneration plants											
industrial cogeneration plants											
Wind power											
Petroleum refineries						48.1					
NGL-plant						5.0					
Gas works											
Total energy sector own use						**129.0**					
Losses						**31.7**					
Final energy demand	**0.9**	**76.5**	**3.9**	**7.1**	**0.0**	**1476.9**		**5332.4**		**435.1**	**449.3**
Non energy use						**495.6**					
Energy sector											
Petrochemical industry						495.6					
Other industry											
Construction											
Transport											
Agriculture											
Energy consumption	**0.9**	**76.5**	**3.9**	**7.1**	**0.0**	**981.3**		**5332.4**		**435.1**	**449.3**
Industry	**0.9**	**76.5**	**2.7**			**211.1**		**42.6**			
Iron and steel	0.9	1.8				16.5		0.5			
Non-ferrous metals						2.6		0.2			
Non-metallic minerals						38.7					
Chemical						11.5					
Construction materials		74.7	2.7			40.7		0.9			
Pulp and paper						6.7		0.1			
Food production						57.3		13.5			
Not elsewhere specified						37.1		27.4			
Transport						**4.0**					
Rail											
Road						0.2					
Air											
– international											
– domestic											
Sea and River											
Public transport						3.8					
Not elsewhere specified											
Other sectors			**1.2**	**7.1**		**766.2**		**5289.8**		**435.1**	**449.3**
Households			1.2	7.0		540.0		5277.0		435.1	
Services				0.1		204.8		12.8			280.0
Agriculture						21.4					169.3
Construction											

ENERGY BALANCE 2015 *natural units*	Landfill gas	Biofuels	Other biomass	Coke oven coke	petroleum gases	motor gasoline	motor gasoline	Petroleum	Jet fuel	Diesel oil	Light heating oil
	10^3 m^3	10^3 t	TJ	10^3 t	10^3 t	10^3 t	10^3 t	10^3 t	10^3 t	10^3 t	10^3 t
Production	84873.0	17.4	10299.1		247.8	842.9			104.3	1082.1	167.5
Import		10.7	486.4	26.2	35.9	217.4	0.4	2.6	24.2	1054.0	49.7
Export		0.7	6251.3	1.0	142.8	518.8			6.1	550.4	48.7
Import-processing											
Export-processing											
Stock change			160.8		-0.9	-10.0			-1.9	-46.0	-0.1
Bunkers										1.5	
Energy supplied	**84873.0**	**27.4**	**4695.0**	**25.2**	**140.0**	**531.5**	**0.4**	**2.6**	**120.5**	**1538.2**	**168.4**
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					209.1	842.9			104.3	1082.1	167.5
NGL-plant					38.7						
Coke plant											
Gas works											
Total production					**247.8**	**842.9**			**104.3**	**1082.1**	**167.5**
Transformation sector											
hydro power plants											
– small HPP											
Wind power plants											
Solar power plants											
Geothermal power plants											
thermal power plants	14409.0										2.1
public cogeneration plants	60968.0		2189.0								
public heating plants											3.9
industrial cogeneration plants	7037.0										
– in rafineries											
– in gas production											
Industrial heating plants			494.4								0.4
Petroleum refineries											
NGL-plant											
Coke plant											
Gas works											
Total transformation sector	**82414.0**		**2683.4**								**6.4**
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	**2459.0**										
Final energy demand		**27.4**	**2011.6**	**25.2**	**140.0**	**531.5**	**0.4**	**2.6**	**120.5**	**1538.2**	**162.0**
Non energy use											
Energy sector											
Petrochemical industry											
Other industry											
Construction											
Transport											
Agriculture											
Energy consumption		**27.4**	**2011.6**	**25.2**	**140.0**	**531.5**	**0.4**	**2.6**	**120.5**	**1538.2**	**162.0**
Industry			**783.6**	**25.2**	**8.7**			**2.6**		**11.1**	**16.2**
Iron and steel				0.6	0.8						0.6
Non-ferrous metals					0.8			0.2			0.9
Non-metallic minerals					0.2						
Chemical								2.4			0.5
Construction materials			679.0	20.6	1.6					11.1	2.7
Pulp and paper			14.0		0.1						
Food production				4.0	1.4						8.3
Not elsewhere specified			90.6		3.8						3.2
Transport		**27.4**			**67.0**	**520.0**	**0.4**		**120.5**	**1276.5**	
Rail										17.5	
Road		26.3			67.0	520.0				1195.4	
Air							0.4		120.5		
– international							0.1		111.0		
– domestic							0.3		9.5		
Sea and River										41.2	
Public transport		1.1								22.4	
Not elsewhere specified											
Other sectors			**1228.0**		**64.3**	**11.5**				**250.6**	**145.8**
Households			1129.7		47.6						84.5
Services			98.3		12.3						44.6
Agriculture					2.5	7.5				171.4	11.2
Construction					1.9	4.0				79.2	5.5

ENERGY BALANCE 2015 *natural units*	Low sulphur fuel oil	Standard fuel oil	Naphta	White spirit	Bitumen	Other oils	Lubricants	Petroleum coke	Etan	Other derivates	Refinery gas
	10^3 t	10^3 t	10^3 t	10^3 t	10^3 t	10^3 t	10^3 t	10^3 t	10^3 t	10^3 t	10^3 t
Production		489.2	69.9			13.5		53.3		120.1	208.1
Import	8.2	47.6		2.9	107.8	28.1	7.8	169.0			
Export	1.5	375.7	49.4	0.2	0.6	9.2	0.1	15.2		139.6	
Import-processing											
Export-processing											
Stock change		48.8	-3.1			-0.2		-8.3		19.7	
Bunkers		0.2									
Energy supplied	**6.7**	**209.7**	**17.4**	**2.7**	**107.2**	**32.2**	**7.7**	**198.8**		**0.2**	**208.1**
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		489.2	52.5			13.5		53.3		120.1	208.1
NGL-plant			17.4								
Coke plant											
Gas works											
Total production		**489.2**	**69.9**			**13.5**		**53.3**		**120.1**	**208.1**
Transformation sector											
hydro power plants											
– small HPP											
Wind power plants											
Solar power plants											
Geothermal power plants											
thermal power plants		10.6									
public cogeneration plants		35.8									
public heating plants		3.7									
industrial cogeneration plants		68.7									16.8
– in rafineries		67.6									16.8
– in gas production											
Industrial heating plants		55.6									4.9
Petroleum refineries			17.4								
NGL-plant											
Coke plant											
Gas works											
Total transformation sector		**174.4**	**17.4**								**21.7**
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		20.5						31.3			186.4
NGL-plant											
Gas works											
Total energy sector own use		**20.5**						**31.3**			**186.4**
Losses											
Final energy demand	**6.7**	**14.8**	**0.0**	**2.7**	**107.2**	**32.2**	**7.7**	**167.5**		**0.2**	**0.0**
Non energy use				**2.7**	**107.2**	**32.2**	**7.7**			**0.2**	
Energy sector						2.1					
Petrochemical industry											
Other industry				2.7	9.8	6.2	7.7			0.2	
Construction					97.4	1.1					
Transport						21.4					
Agriculture						1.4					
Energy consumption	**6.7**	**14.8**	**0.0**					**167.5**		**0.0**	**0.0**
Industry	**6.7**	**5.7**						**167.5**			
Iron and steel	0.3	0.3						0.3			
Non-ferrous metals											
Non-metallic minerals											
Chemical											
Construction materials	3.5	0.4						167.2			
Pulp and paper											
Food production	2.1	4.2									
Not elsewhere specified	0.8	0.8									
Transport											
Rail											
Road											
Air											
– international											
– domestic											
Sea and River											
Public transport											
Not elsewhere specified											
Other sectors		**9.1**									
Households		4.3									
Services		2.7									
Agriculture		2.1									
Construction											

ENERGY BALANCE 2015 *natural units*	Refinery semiproducts	Aditives	Gas works gas	Electricity	Steam and hot water	waste, non renewable
	10^3 t	10^3 t	10^3 m^3	GWh	TJ	TJ
Production			600.0	11402.0	25363.6	390.0
Import	382.8	53.4		8868.5		
Export				2080.1		
Import-processing						
Export-processing						
Stock change	0.3					
Bunkers						
Energy supplied	**383.1**	**53.4**	**600.0**	**18190.4**	**25363.6**	**390.0**
Production						
hydro power plants				6555.4		
– small HPP				100.8		
Wind power plants				796.3		
Solar power plants				57.3		
Geothermal power plants						
thermal power plants				2595.9		
public cogeneration plants				1087.6	8832.6	
public heating plants					2272.7	
industrial cogeneration plants				309.5	9611.3	
– in rafineries				90.8	3777.0	
– in gas production				84.4	702.4	
Industrial heating plants					4006.9	
Petroleum refineries						
NGL-plant						
Coke plant						
Gas works			600.0			
Total production			**600.0**	**11402.0**	**24723.5**	
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	383.1	53.4				
NGL-plant						
Coke plant						
Gas works						
Total transformation sector	**383.1**	**53.4**				
Energy sector own use						
Oil and gas extraction				125.2	420.0	
Coal production					120.9	
Electric energy supply industry				31.1		
hydro power plants				269.7		
thermal power plants				236.4		
public cogeneration plants				129.8	543.1	
industrial cogeneration plants						
Wind power				3.9		
Petroleum refineries				255.7	5573.5	
NGL-plant				18.7	282.4	
Gas works						
Total energy sector own use				**1070.5**	**6939.9**	
Losses			**13.9**	**1801.5**	**1588.1**	
Final energy demand			**586.1**	**15318.4**	**16835.6**	**390.0**
Non energy use						
Energy sector						
Petrochemical industry						
Other industry						
Construction						
Transport						
Agriculture						
Energy consumption			**586.1**	**15318.4**	**16835.6**	**390.0**
Industry				**3358.6**	**9621.4**	**390.0**
Iron and steel				365.1	59.2	
Non-ferrous metals				35.7		
Non-metallic minerals				132.5	92.6	
Chemical				309.5	4238.6	
Construction materials				489.9		390.0
Pulp and paper				189.9	816.6	
Food production				699.6	2634.4	
Not elsewhere specified				1136.4	1780.0	
Transport				**290.7**		
Rail				152.4		
Road						
Air				24.6		
– international						
– domestic				24.6		
Sea and River				21.5		
Public transport				61.8		
Not elsewhere specified				30.4		
Other sectors			**586.1**	**11669.1**	**7214.2**	
Households			193.5	6202.5	5646.8	
Services			392.6	5328.0	1392.0	
Agriculture				62.3	175.4	
Construction				76.3		

APPENDIX 6. NFR 2015

HR: 14.02.2017: 2015	***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**	**Longname**	**Notes**	**kt**	**kt**	**kt**	**kt**	**kt**	**kt**	**kt**	**kt**
A_PublicPower	1A1a	Public electricity and heat production		4.922977496	0.19275	5.01216	0.00925	0.09695	0.185641	0.363024	0.00581923
B_Industry	1A1b	Petroleum refining		1.38624	0.04091	2.14781	NE	0.051133	0.0782	0.100755	0.00393631
B_Industry	1A1c	Manufacture of solid fuels and other energy industries		0.3051908	0.09486	0.00276	0.00062	0.003217	0.003217	0.003217	0.00012868
B_Industry	1A2a	Stationary combustion in manufacturing industries and construction: Iron and steel		0.104508968	0.02629	0.1056	0.00017	0.012653	0.013495	0.01417	0.00171885
B_Industry	1A2b	Stationary combustion in manufacturing industries and construction: Non-ferrous metals		0.034026431	0.00531	0.0019	0.00015	0.001604	0.001616	0.001644	0.00068976
B_Industry	1A2c	Stationary combustion in manufacturing industries and construction: Chemicals		0.122107145	0.05148	0.0049	NE	0.002976	0.002976	0.002976	0.00132273
B_Industry	1A2d	Stationary combustion in manufacturing industries and construction: Pulp, Paper and Print		0.18012677	0.03357	0.09967	0.00077	0.007854	0.007917	0.008063	0.00318989
B_Industry	1A2e	Stationary combustion in manufacturing industries and construction: Food processing, beverages and tobacco		0.808106682	0.20941	0.81657	0.0045	0.109989	0.11661	0.122328	0.017952
B_Industry	1A2f	Stationary combustion in manufacturing industries and construction: Non-metallic minerals		4.177439428	0.71867	1.89559	0.04154	0.224245	0.231618	0.242592	0.05588829
I_Offroad	1A2gvii	Mobile Combustion in manufacturing industries and construction: (please specify in the IIR)		1.58	0.32	0.06604	0.00	0.09	0.09	0.09	0.06
B_Industry	1A2gviii	Stationary combustion in manufacturing industries and construction: Other (please specify in the IIR)		NO	NO	NO	NO	NO	NO	NO	NO
H_Aviation	1A3ai(i)	International aviation LTO (civil)		0.194414053	0.01171	0.05617	NE	0.00164	0.00164	0.00164	0.00079002
H_Aviation	1A3aii(i)	Domestic aviation LTO (civil)		0.0586818	0.01104	0.0165	0.00013	0.000546	0.00059	0.00059	0.00024166
F_RoadTransport	1A3bi	Road transport: Passenger cars		11.24288975	2.94639	0.0143	0.49699	0.69937	0.69937	0.69937	0.49449582
F_RoadTransport	1A3bii	Road transport: Light duty vehicles		2.475989284	0.22598	0.00256	0.00855	0.198896	0.198896	0.198896	0.14295632
F_RoadTransport	1A3biii	Road transport: Heavy duty vehicles and buses		9.23326358	0.45703	0.00431	0.00566	0.201971	0.201971	0.201971	0.12533189
F_RoadTransport	1A3biv	Road transport: Mopeds & motorcycles		0.165366	1.6069	0.00046	0.00152	0.027108	0.027108	0.027108	0.00437385
F_RoadTransport	1A3bv	Road transport: Gasoline evaporation		NA	1.25	NA	NA	NA	NA	NA	NA
F_RoadTransport	1A3bvi	Road transport: Automobile tyre and brake wear		NA	NA	NA	NA	0.291097	0.546482	0.546482	0.09787496
F_RoadTransport	1A3bvii	Road transport: Automobile road abrasion		NA	NA	NA	NA	0.126991	0.233009	0.466019	NE
I_Offroad	1A3c	Railways		0.917000784	0.08137	0.00022	0.00012	0.023977	0.025203	0.026601	0.00015696
G_Shipping	1A3di(ii)	International inland waterways		IE	IE	IE	IE	IE	IE	IE	IE
G_Shipping	1A3dii	National navigation (shipping)		1.582085517	0.30694	0.00051	0.00029	0.189515	0.189515	0.189515	0.00103819
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		1.370540682	0.25141	0.11602	0.00762	0.063389	0.063923	0.065169	0.02576017
I_Offroad	1A4aii	Commercial/institutional: Mobile		IE	IE	IE	IE	IE	IE	IE	IE
C_OtherStationaryComb	1A4bi	Residential: Stationary		5.181414142	17.5575	0.96582	2.422	15.57528	15.96254	16.76951	2.09248408
I_Offroad	1A4bii	Residential: Household and gardening (mobile)		0.042720469	0.30793	0.00007	3E-05	0.008929	0.008929	0.008929	0.00044645
C_OtherStationaryComb	1A4ci	Agriculture/Forestry/Fishing: Stationary		0.352158473	0.0338	0.05482	0.00013	0.011924	0.011924	0.011924	0.00632957
I_Offroad	1A4cii	Agriculture/Forestry/Fishing: Off-road vehicles and other machinery		3.11	0.29	0.12528	0.00	0.13	0.13	0.13	0.08
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	0.06367	NE	NA	NA	NA	NA	NA
D_Fugitive	1B2aiv	Fugitive emissions oil: Refining / storage		0.1048622	0.9341	3.19231	0.08389	0.155529	0.357659	0.501994	0.00016359
D_Fugitive	1B2av	Distribution of oil products		NA	2.20409	NE	NA	NA	NA	NA	NA

HR: 14.02.2017: 2015	***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**	**Longname**	**Notes**	**kt**	**kt**	**kt**	**kt**	**kt**	**kt**	**kt**	**kt**
D_Fugitive	1B2b	Fugitive emissions from natural gas (exploration, production, processing, transmission, storage, distribution and other)		NA	0.21809	NE	NA	NA	NA	NA	NA
D_Fugitive	1B2c	Venting and flaring (oil, gas, combined oil and gas)		0.049920434	0.02175	0.2143	NE	0.024408	0.024408	0.024408	0.00561038
D_Fugitive	1B2d	Other fugitive emissions from energy production	(a)	NO	NO	NO	NO	NO	NO	NO	NO
B_Industry	2A1	Cement production		IE	IE	IE	IE	0.168376	0.333384	0.039288	0.00841879
B_Industry	2A2	Lime production		IE	IE	IE	IE	0.004027	0.026847	0.053694	1.8524E-05
B_Industry	2A3	Glass production		IE	0.01525	IE	0.09195	0.086692	0.097816	0.10952	5.1685E-05
B_Industry	2A5a	Quarrying and mining of minerals other than coal		NA	NA	NA	NA	0.121468	1.21468	2.477946	NA
B_Industry	2A5b	Construction and demolition		NA	NA	NA	NA	0.01563	0.156301	0.311831	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		0.784369905	NE	NE	0.00455	NE	NA	NA	NA
B_Industry	2B2	Nitric acid production		0.234353568	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)		0.031034421	0.00148	0.05618	2.35565	0.403152	0.537536	0.975368	0.00725674
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		0.01931579	0.00701	0.00891	IE	0.00312	0.003566	0.004681	1.1233E-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	2.11014	NA	NA	NA	NA	NA	NA
E_Solvents	2D3b	Road paving with asphalt		NA	0.01222	NA	NA	0.305558	2.291688	10.69454	0.01741683
B_Industry	2D3c	Asphalt roofing		NA	0.005	NA	NA	0.003079	0.015396	0.061586	4.0031E-07
B_Industry	2D3d	Coating applications		NA	3.63878	NA	NA	NA	NA	NA	NA
E_Solvents	2D3e	Degreasing		NA	3.57306	NA	NA	NA	NA	NA	NA
E_Solvents	2D3f	Dry cleaning		NA	1.0509	NA	NA	NA	NA	NA	NA
E_Solvents	2D3g	Chemical products		NA	1.13478	NA	NA	NA	NA	NA	NA
E_Solvents	2D3h	Printing		NA	0.13776	NA	NA	NA	NA	NA	NA
E_Solvents	2D3i	Other solvent use (please specify in the IIR)		0.0146826	4.48583	NA	0.03385	0.250842	0.266144	0.276345	0.09910755
E_Solvents	2G	Other product use (please specify in the IIR)		IE	IE	IE	IE	IE	IE	IE	IE
B_Industry	2H1	Pulp and paper industry		0.0159785	0.0032	0.15979	NE	NE	NE	NE	NA

HR: 14.02.2017: 2015	***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**	**Longname**	**Notes**	**kt**	**kt**	**kt**	**kt**	**kt**	**kt**	**kt**	**kt**
B_Industry	2H2	Food and beverages industry		NA	4.42187	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	0.134552	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	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		0.004459684	2.78971	NA	5.22322	0.07167	0.110127	0.241231	NA
K_AgriLivestock	3B1b	Manure management - Non-dairy cattle		NO	2.20134	NA	3.71088	0.035606	0.055771	0.119595	NA
K_AgriLivestock	3B2	Manure management - Sheep		NO	0.10337	NA	0.35543	0.010149	0.033789	0.084472	NA
K_AgriLivestock	3B3	Manure management - Swine		0.002474354	0.51468	NA	4.96905	0.046187	0.263232	0.581852	NA
K_AgriLivestock	3B4a	Manure management - Buffalo		NO	NO	NO	NO	NO	NO	NO	NO
K_AgriLivestock	3B4d	Manure management - Goats		NO	0.03369	NA	0.0363	0.001036	0.00345	0.008626	NA
K_AgriLivestock	3B4e	Manure management - Horses		NO	0.09349	NA	0.20928	0.003062	0.004811	0.010497	NA
K_AgriLivestock	3B4f	Manure management - Mules and asses		NO	0.00363	NA	0.02362	0.000247	0.000395	0.000839	NA
K_AgriLivestock	3B4gi	Manure mangement - Laying hens		NO	0.49787	NA	1.17693	0.0694	0.359069	0.359069	NA
K_AgriLivestock	3B4gii	Manure mangement - Broilers		NO	0.08839	NA	0.21247	0.007366	0.056473	0.056473	NA
K_AgriLivestock	3B4giii	Manure mangement - Turkeys		NO	0.15917	NA	0.32037	0.022785	0.169261	0.169261	NA
K_AgriLivestock	3B4giv	Manure management - Other poultry		NO	0.31977	NA	0.46229	0.019251	0.153271	0.153271	NA
K_AgriLivestock	3B4h	Manure management - Other animals (please specify in IIR)		NO	NO	NO	NO	NO	NO	NO	NO
L_AgriOther	3Da1	Inorganic N-fertilizers (includes also urea application)		2.281133322	0.58657	NA	6.86963	0.040923	1.064003	1.064003	NA
L_AgriOther	3Da2a	Animal manure applied to soils		IE	NA	NA	IE	NA	NA	NA	NA
L_AgriOther	3Da2b	Sewage sludge applied to soils		NA	NA	NA	IE	NA	NA	NA	NA
L_AgriOther	3Da2c	Other organic fertilisers applied to soils (including compost)		NO	NO	NO	NO	NO	NO	NO	NO
L_AgriOther	3Da3	Urine and dung deposited by grazing animals		NA	NA	NA	IE	NA	NA	NA	NA
L_AgriOther	3Da4	Crop residues applied to soils		IE	IE	NA	IE	IE	IE	IE	NA
L_AgriOther	3Db	Indirect emissions from managed soils		NA	NA	NA	NA	IE	IE	IE	NA
L_AgriOther	3Dc	Farm-level agricultural operations including storage, handling and transport of agricultural products		NA	NA	NA	NA	IE	IE	IE	NA
L_AgriOther	3Dd	Off-farm storage, handling and transport of bulk agricultural products		NA	NA	NA	NA	IE	IE	IE	NA
L_AgriOther	3De	Cultivated crops	(b)	IE	IE	NA	IE	IE	IE	IE	NA
L_AgriOther	3Df	Use of pesticides		NA	NA	NA	NO	NA	NA	NA	NA
L_AgriOther	3F	Field burning of agricultural residues		NO	NO	NO	NO	NO	NO	NO	NO
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	2.12302	NA	NA	4.49E-05	0.000298	0.00063	NA
J_Waste	5B1	Biological treatment of waste - Composting		NA	NA	NA	NE	NA	NA	NA	NA
J_Waste	5B2	Biological treatment of waste - Anaerobic digestion at biogas facilities		NA	NA	NA	NA	NA	NA	NA	NA
J_Waste	5C1a	Municipal waste incineration	(c)	NO	NO	NO	NO	NO	NO	NO	NO
J_Waste	5C1bi	Industrial waste incineration	(c)	IE	IE	IE	IE	IE	IE	IE	IE
J_Waste	5C1bii	Hazardous waste incineration	(c)	IE	IE	IE	IE	IE	IE	IE	IE
J_Waste	5C1biii	Clinical waste incineration	(c)	1.19E-04	3.6E-05	2.8E-05	NE	NE	NE	8.8E-07	2.025E-08
J_Waste	5C1biv	Sewage sludge incineration	(c)	NO	NO	NO	NO	NO	NO	NO	NO
J_Waste	5C1bv	Cremation	(c)	0.004432725	7E-05	0.00061	NA	0.000186	0.000186	0.000207	NE

HR: 14.02.2017: 2015	***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**	**Longname**	**Notes**	**kt**	**kt**	**kt**	**kt**	**kt**	**kt**	**kt**	**kt**
J_Waste	5C1bvi	Other waste incineration (please specify in the IIR)	(c)	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	3.85E-06	NA	NA	NA	NA	NA	NA
J_Waste	5D2	Industrial wastewater handling		NA	1.9E-07	NA	NA	NA	NA	NA	NA
J_Waste	5D3	Other wastewater handling		NA	NA	NA	0.6233	NA	NA	NA	NA
J_Waste	5E	Other waste (please specify in IIR)	(d)	NA	NA	NA	NA	0.001142	0.001142	0.001142	NA
M_Other	6A	Other (included in national total for entire territory) (please specify in IIR)		NO	NO	NO	NO	NO	NO	NO	NO
	NATIONAL TOTAL	**National total for the entire territory (based on fuel sold)**		53.101	60.581	15.142	29.765	20.031	26.642	38.818	3.364
	ADJUSTMENTS (Net total)	Sum of adjustments (negative value) from Annex VII		NE	NE	NE	NE	NE	NE	NE	NE
	NATIONAL TOTAL FOR COMPLIANCE	**National total for compliance assessment (please specify all details in the IIR)**	(e)	NE	NE	NE	NE	NE	NE	NE	NE
'MEMO' ITEMS - NOT TO BE INCLUDED IN NATIONAL TOTALS											
O_AviCruise	1A3ai(ii)	International aviation cruise (civil)		1.133749593	0.04427	0.25746	NE	0.017717	0.017717	0.017717	0.00848842
O_AviCruise	1A3aii(ii)	Domestic aviation cruise (civil)		0.071344584	0.00069	0.02013	NE	0.001385	0.001385	0.001385	0.00066381
P_IntShipping	1A3di(i)	International maritime navigation		0.117750189	0.0042	0.003	1.1E-05	0.0021	0.00225	0.00225	6.5346E-06
z_Memo	1A5c	Multilateral operations		NA	NA	NA	NA	NA	NA	NA	NA
z_Memo	1A3	Transport (fuel used)		NE	NE	NE	NE	NE	NE	NE	NE
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		0.6064	1.8192	0.12128	0.12128	NE	NE	NE	NE
N_Natural	11C	Other natural emissions (please specify in the IIR)		NO	NO	NO	NO	NO	NO	NO	NO

HR: 14.02.2017: 2015	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**	**Longname**	**Notes**	**kt**	**t**	**t**	**t**	**t**	**t**	**t**	**t**	**t**	**t**
A_PublicPower	1A1a	Public electricity and heat production		0.341	0.22876	0.00972	0.17764	0.09583	0.15646	0.13621	0.62647	0.00851	0.27567
B_Industry	1A1b	Petroleum refining		0.53282	0.03625	0.01158	0.00242	0.0213	0.09048	0.0729	4.67753	0.01314	0.44314
B_Industry	1A1c	Manufacture of solid fuels and other energy industries		0.1196	4.5E-05	0.00742	0.00223	0.00041	5.4E-05	1.1E-05	5.4E-05	0.00024	0.00301
B_Industry	1A2a	Stationary combustion in manufacturing industries and construction: Iron and steel		0.11211	0.00262	0.00023	0.00041	0.00044	0.00137	0.00166	0.00121	0.00021	0.02347
B_Industry	1A2b	Stationary combustion in manufacturing industries and construction: Non-ferrous metals		0.00909	0.00011	5.2E-05	7.7E-05	1.5E-05	0.0001	3.5E-05	1E-05	1.5E-05	0.00351
B_Industry	1A2c	Stationary combustion in manufacturing industries and construction: Chemicals		0.03222	0.00419	0.00321	0.00297	0.0033	0.00805	0.00324	0.11228	0.00022	0.00718
B_Industry	1A2d	Stationary combustion in manufacturing industries and construction: Pulp, Paper and Print		0.05354	0.00059	0.00027	0.00055	0.00011	0.00053	0.00017	5.6E-05	8.9E-05	0.01746
B_Industry	1A2e	Stationary combustion in manufacturing industries and construction: Food processing, beverages and tobacco		0.88218	0.02216	0.00284	0.00272	0.00323	0.01238	0.01307	0.00934	0.00163	0.22558
B_Industry	1A2f	Stationary combustion in manufacturing industries and construction: Non-metallic minerals		8.43405	0.3064	0.03342	0.11212	0.06115	0.12579	0.16104	0.11892	0.05692	1.68378
I_Offroad	1A2gvii	Mobile Combustion in manufacturing industries and construction: (please specify in the IIR)		3.80	0.02	0.00094	NE	NE	0.00	0.16	0.01	0.00	0.09
B_Industry	1A2gviii	Stationary combustion in manufacturing industries and construction: Other (please specify in the IIR)		NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
H_Aviation	1A3ai(i)	International aviation LTO (civil)		0.27639	6.8E-05	5.1E-06	0.0001	2.5E-05	0.00017	0.00019	6.8E-06	9.3E-05	0.02464
H_Aviation	1A3aii(i)	Domestic aviation LTO (civil)		0.56115	0.10955	6.4E-06	3E-05	7.5E-06	0.0001	0.00113	1.6E-05	2.9E-05	0.00851
F_RoadTransport	1A3bi	Road transport: Passenger cars		28.0005	3.11851	0.01211	0.00770	0.00021	0.02955	0.03783	0.01326	0.00017	2.42389
F_RoadTransport	1A3bii	Road transport: Light duty vehicles		1.8101	0.05913	0.0018	0.00113	0.00002	0.00601	0.00454	0.00184	2.1E-05	0.35989
F_RoadTransport	1A3biii	Road transport: Heavy duty vehicles and buses		2.03099	0.00307	0.00302	0.00183	0.00003	0.01033	0.00741	0.00306	3.4E-05	0.60394
F_RoadTransport	1A3biv	Road transport: Mopeds & motorcycles		4.8095	0.11472	0.00025	0.00020	0.00001	0.00036	0.00096	0.0003	4.6E-06	0.04965
F_RoadTransport	1A3bv	Road transport: Gasoline evaporation		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
F_RoadTransport	1A3bvi	Road transport: Automobile tyre and brake wear		NA	0.76158	0.0035	NE	NE	0.28249	6.18765	0.0445	0.00582	2.31365
F_RoadTransport	1A3bvii	Road transport: Automobile road abrasion		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
I_Offroad	1A3c	Railways		0.18725	6E-05	0.00017	9E-05	2.2E-05	0.00087	0.02975	0.00123	0.00017	0.0175
G_Shipping	1A3di(ii)	International inland waterways		IE	IE	IE	IE	IE	IE	IE	IE	IE	IE
G_Shipping	1A3dii	National navigation (shipping)		0.81576	0.00535	0.00041	0.00123	0.00165	0.00206	0.03831	0.03887	0.00389	0.04894
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		0.40829	0.00501	0.01458	0.00397	0.00076	0.00451	0.00145	0.00046	0.00067	0.14418
I_Offroad	1A4aii	Commercial/institutional: Mobile		IE	IE	IE	IE	IE	IE	IE	IE	IE	IE
C_OtherStationaryComb	1A4bi	Residential: Stationary		134.433	1.32702	0.63234	0.04242	0.01206	1.12027	0.29458	0.09869	0.02474	24.92
I_Offroad	1A4bii	Residential: Household and gardening (mobile)		5.79334	0.02813	7.5E-05	NE	NE	0.00038	0.01275	0.00053	7.5E-05	0.0075
C_OtherStationaryComb	1A4ci	Agriculture/Forestry/Fishing: Stationary		0.06201	5.4E-05	0.00155	0.00053	0.0001	0.00012	0.00013	1.6E-05	0.00011	0.01695
I_Offroad	1A4cii	Agriculture/Forestry/Fishing: Off-road vehicles and other machinery		1.33	NA	0.00	NE	NE	0.01	0.29	0.01	0.00	0.17
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 / storage		20.4767	0.17183	0.03303	0.0394	0.20531	0.17302	0.07475	0.37112	0.01004	0.06697
D_Fugitive	1B2av	Distribution of oil products		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

HR: 14.02.2017: 2015	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	Longname	Notes	kt	t	t	t	t	t	t	t	t	t
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)		0.26186	0.00236	0.00099	0.00015	0.00038	0.00349	0.00233	0.00498	3.9E-06	0.03482
D_Fugitive	1B2d	Other fugitive emissions from energy production	(a)	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	0.40426	0.03091	0.00071	0.04518	0.05469	0.00166	0.11652	0.19024	0.08799
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		0.00364	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)		2.4E-05	NA	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	NA	NA
B_Industry	2C1	Iron and steel production		0.25259	0.38632	0.02972	0.00743	0.00223	0.01486	0.00297	0.10401	IE	0.5349
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	0.02354	NA	NA	NA	NA	NA	NA
E_Solvents	2D3b	Road paving with asphalt		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
B_Industry	2D3c	Asphalt roofing		0.00037	NA	NA	NA	NA	NA	NA	NA	NA	NA
B_Industry	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)		0.44945	NA	0.04405	NA	NA	NA	0.04405	0.02202	NA	0.02202
E_Solvents	2G	Other product use (please specify in the IIR)		IE	IE	IE	IE	IE	IE	IE	IE	IE	IE
B_Industry	2H1	Pulp and paper industry		NE	NA	NA	NA	NA	NA	NA	NA	NA	NA

HR: 14.02.2017: 2015	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	Longname	Notes	kt	t	t	t	t	t	t	t	t	t
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		NA	NA	NA	NA	NA	NA	NA	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	NA	NA	0.04204	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	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		NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
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 mangement - Laying hens		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
K_AgriLivestock	3B4gii	Manure mangement - Broilers		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
K_AgriLivestock	3B4giii	Manure mangement - 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 IIR)		NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
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)		NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
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	(b)	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		NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
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		NA	NA	NA	NA	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		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
J_Waste	5C1a	Municipal waste incineration	(c)	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
J_Waste	5C1bi	Industrial waste incineration	(c)	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE
J_Waste	5C1bii	Hazardous waste incineration	(c)	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE

HR: 14.02.2017: 2015	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	Longname	Notes	kt	t	t	t	t	t	t	t	t	t
J_Waste	5C1biii	Clinical waste incineration	(c)	9.8E-06	0.00321	0.00041	0.00223	1E-05	0.0001	0.00508	0.0001	NE	NE
J_Waste	5C1biv	Sewage sludge incineration	(c)	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
J_Waste	5C1bv	Cremation	(c)	0.00075	0.00016	2.7E-05	0.00801	7.3E-05	7.3E-05	6.7E-05	9.3E-05	0.00011	0.00086
J_Waste	5C1bvi	Other waste incineration (please specify in the IIR)	(c)	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	NA	NA	NA	NA	NA	NA	NA	NA	NA
J_Waste	5D2	Industrial wastewater handling		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
J_Waste	5D3	Other wastewater handling		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
J_Waste	5E	Other waste (please specify in IIR)	(d)	NA	4.3E-07	8.7E-07	8.7E-07	1.4E-06	1.3E-06	1.7E-06	NA	NA	NA
M_Other	6A	Other (included in national total for entire territory) (please specify in IIR)		NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
	NATIONAL TOTAL	National total for the entire territory (based on fuel sold)		216.280	7.117	0.880	0.484	0.454	2.112	7.588	6.386	0.320	34.635
	ADJUSTMENTS (Net total)	Sum of adjustments (negative value) from Annex VII		NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
	NATIONAL TOTAL FOR COMPLIANCE	National total for compliance assessment (please specify all details in the IIR)	(e)	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
'MEMO' ITEMS - NOT TO BE INCLUDED IN NATIONAL TOTALS													
O_AviCruise	1A3ai(ii)	International aviation cruise (civil)		0.09742	0.00031	2.3E-05	0.00047	0.00012	0.00078	0.00086	3.1E-05	0.00043	0.11292
O_AviCruise	1A3aii(ii)	Domestic aviation cruise (civil)		0.01385	2.4E-05	1.8E-06	3.7E-05	9.1E-06	6.1E-05	6.7E-05	2.4E-06	3.3E-05	0.00883
P_IntShipping	1A3di(i)	International maritime navigation		0.0111	0.00019	1.5E-05	4.5E-05	6E-05	7.5E-05	0.00132	0.0015	0.00015	0.0018
z_Memo	1A5c	Multilateral operations		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
z_Memo	1A3	Transport (fuel used)		NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
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		18.192	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

HR: 14.02.2017: 2015	NFR sectors to be reported			POPs (1) (from 1990)							
				PCDD/ PCDF (dioxins/ furans)	PAHs					HCB	PCBs
					benzo(a) pyrene	benzo(b) fluoranth ene	benzo(k) fluoranth ene	Indeno (1,2,3-cd) pyrene	Total 1-4		
NFR Aggregation for Gridding and LPS (GNFR)	NFR Code	Longname	Notes	g I-TEQ	t	t	t	t	t	kg	kg
A_PublicPower	1A1a	Public electricity and heat production		0.23186	0.00025	0.00107	0.00022	0.00041	0.00195	0.01352	3.70774
B_Industry	1A1b	Petroleum refining		0.01287	1E-05	2.9E-05	9E-06	1.4E-05	6.3E-05	NE	NE
B_Industry	1A1c	Manufacture of solid fuels and other energy industries		0.00214	3E-06	1.2E-05	4.5E-06	4.5E-06	2.4E-05	NE	NE
B_Industry	1A2a	Stationary combustion in manufacturing industries and construction: Iron and steel		0.01958	0.00485	0.00854	0.00305	0.00253	0.01897	8E-05	0.01564
B_Industry	1A2b	Stationary combustion in manufacturing industries and construction: Non-ferrous metals		0.00053	0.00022	0.00114	0.00024	0.00022	0.00183	0.00002	2.4E-07
B_Industry	1A2c	Stationary combustion in manufacturing industries and construction: Chemicals		0.00105	0.00084	0.0042	0.00114	0.00111	0.00729	NE	NE
B_Industry	1A2d	Stationary combustion in manufacturing industries and construction: Pulp, Paper and Print		0.00288	0.0013	0.00625	0.00152	0.00143	0.0105	0.0001	1.3E-06
B_Industry	1A2e	Stationary combustion in manufacturing industries and construction: Food processing, beverages and tobacco		0.15641	0.03715	0.06565	0.02278	0.01881	0.14439	0.00104	0.1182
B_Industry	1A2f	Stationary combustion in manufacturing industries and construction: Non-metallic minerals		0.29519	0.05437	0.09286	0.03209	0.02628	0.2056	0.01604	0.36462
I_Offroad	1A2gvii	Mobile Combustion in manufacturing industries and construction: (please specify in the IIR)		NE	0.00	0.00	NE	NE	0.01	NE	NE
B_Industry	1A2gviii	Stationary combustion in manufacturing industries and construction: Other (please specify in the IIR)		NO	NO	NO	NO	NO	NO	NO	NO
H_Aviation	1A3ai(i)	International aviation LTO (civil)		0.00119	0.00161	0.01274	0.00144	0.00127	0.01707	NE	NE
H_Aviation	1A3aii(i)	Domestic aviation LTO (civil)		0.00046	0.00048	0.00375	0.00043	0.00038	0.00503	NE	NE
F_RoadTransport	1A3bi	Road transport: Passenger cars		0.78798	0.02469	0.02786	0.02147	0.02403	0.09805	NE	NE
F_RoadTransport	1A3bii	Road transport: Light duty vehicles		0.1212	0.00438	0.00492	0.00385	0.0041	0.01725	NE	NE
F_RoadTransport	1A3biii	Road transport: Heavy duty vehicles and buses		0.11977	0.00171	0.01036	0.01158	0.00266	0.02631	NE	NE
F_RoadTransport	1A3biv	Road transport: Mopeds & motorcycles		0.011	0.0002	0.00025	0.00016	0.00027	0.00088	NE	NE
F_RoadTransport	1A3bv	Road transport: Gasoline evaporation		NA	NA	NA	NA	NA	NA	NA	NA
F_RoadTransport	1A3bvi	Road transport: Automobile tyre and brake wear		NE	NE	NE	NE	NE	NE	NE	NE
F_RoadTransport	1A3bvii	Road transport: Automobile road abrasion		NE	NE	NE	NE	NE	NE	NE	NE
I_Offroad	1A3c	Railways		0.00105	0.00052	0.00087	1.3E-06	1.1E-06	0.0014	NE	NE
G_Shipping	1A3di(ii)	International inland waterways		IE	IE	IE	IE	IE	IE	IE	IE
G_Shipping	1A3dii	National navigation (shipping)		0.3308	7.5E-05	0.00013	NE	NE	0.0002	0.00329	0.00242
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		0.02366	0.00179	0.00289	0.0009	0.00072	0.0063	0.00089	1.1E-05
I_Offroad	1A4aii	Commercial/institutional: Mobile		IE	IE	IE	IE	IE	IE	IE	IE
C_OtherStationaryComb	1A4bi	Residential: Stationary		16.7999	2.55332	2.56409	0.94955	1.44823	7.51519	0.24317	0.01727
I_Offroad	1A4bii	Residential: Household and gardening (mobile)		NE	0.0003	0.0003	NE	NE	0.0006	NE	NE
C_OtherStationaryComb	1A4ci	Agriculture/Forestry/Fishing: Stationary		0.00123	1.7E-06	1.1E-05	1.9E-06	1.8E-06	1.6E-05	NE	NE
I_Offroad	1A4cii	Agriculture/Forestry/Fishing: Off-road vehicles and other machinery		NE	0.01	0.01	NE	NE	0.01	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 / storage		0.00996	0.00037	0.00063	0.00043	0.00033	0.00176	NE	NE
D_Fugitive	1B2av	Distribution of oil products		NE	NA	NA	NA	NA	NA	NA	NA

HR: 14.02.2017: 2015	NFR sectors to be reported			POPs (1) (from 1990)							
				PCDD/ PCDF (dioxins/ furans)	PAHs					HCB	PCBs
					benzo(a) pyrene	benzo(b) fluoranthene	benzo(k) fluoranthene	Indeno (1,2,3-cd) pyrene	Total 1-4		
NFR Aggregation for Gridding and LPS (GNFR)	NFR Code	Longname	Notes	g I-TEQ	t	t	t	t	t	kg	kg
D_Fugitive	1B2b	Fugitive emissions from natural gas (exploration, production, processing, transmission, storage, distribution and other)		NE	NA	NA	NA	NA	NA	NA	NA
D_Fugitive	1B2c	Venting and flaring (oil, gas, combined oil and gas)		NE	7.8E-07	1.3E-06	7.3E-07	7.3E-07	3.6E-06	NE	NE
D_Fugitive	1B2d	Other fugitive emissions from energy production	(a)	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		0.44575	IE	IE	IE	IE	0.07132	NA	0.37146
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
E_Solvents	2D3b	Road paving with asphalt		NA	NA	NA	NA	NA	NA	NA	NA
B_Industry	2D3c	Asphalt roofing		NA	NA	NA	NA	NA	NA	NA	NA
B_Industry	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)		0.00082	0.06569	0.00069	0.00069	0.00069	0.06777	NA	NA
E_Solvents	2G	Other product use (please specify in the IIR)		IE	IE	IE	IE	IE	IE	IE	IE
B_Industry	2H1	Pulp and paper industry		NA	NA	NE	NE	NE	NE	NE	NA

HR: 14.02.2017: 2015	NFR sectors to be reported			POPs (1) (from 1990)							
				PCDD/ PCDF (dioxins/ furans)	PAHs					HCB	PCBs
					benzo(a) pyrene	benzo(b) fluoranthene	benzo(k) fluoranthene	Indeno (1,2,3-cd) pyrene	Total 1-4		
NFR Aggregation for Gridding and LPS (GNFR)	NFR Code	Longname	Notes	g I-TEQ	t	t	t	t	t	kg	kg
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	NA	420.36
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		NO	NO	NO	NO	NO	NO	NO	NO
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 mangement - Laying hens		NA	NA	NA	NA	NA	NA	NA	NA
K_AgriLivestock	3B4gii	Manure mangement - Broilers		NA	NA	NA	NA	NA	NA	NA	NA
K_AgriLivestock	3B4giii	Manure mangement - 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 IIR)		NO	NO	NO	NO	NO	NO	NO	NO
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)		NO	NO	NO	NO	NO	NO	NO	NO
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	(b)	NA	NA	NA	NA	NA	NA	NA	NA
L_AgriOther	3Df	Use of pesticides		NA	NA	NA	NA	NA	NA	NO	NA
L_AgriOther	3F	Field burning of agricultural residues		NO	NO	NO	NO	NO	NO	NO	NO
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		NA	NA	NA	NA	NA	NA	NA	NA
J_Waste	5C1a	Municipal waste incineration	(c)	NO	NO	NO	NO	NO	NO	NO	NO
J_Waste	5C1bi	Industrial waste incineration	(c)	IE	IE	IE	IE	IE	IE	IE	IE
J_Waste	5C1bii	Hazardous waste incineration	(c)	IE	IE	IE	IE	IE	IE	IE	IE

HR: 14.02.2017: 2015	NFR sectors to be reported			POPs [1] (from 1990)							
				PCDD/ PCDF (dioxins/ furans)	PAHs					HCB	PCBs
					benzo(a) pyrene	benzo(b) fluoranthene	benzo(k) fluoranthene	Indeno (1,2,3-cd) pyrene	Total 1-4		
NFR Aggregation for Gridding and LPS (GNFR)	NFR Code	Longname	Notes	g I-TEQ	t	t	t	t	t	kg	kg
J_Waste	5C1biii	Clinical waste incineration	(c)	2.0716	IE	IE	IE	IE	2.07E-09	0.00518	0.00104
J_Waste	5C1biv	Sewage sludge incineration	(c)	NO	NO	NO	NO	NO	NO	NO	NO
J_Waste	5C1bv	Cremation	(c)	0.00015	7.09E-08	3.87E-08	3.46E-08	3.76E-08	#######	0.00081	0.0022
J_Waste	5C1bvi	Other waste incineration (please specify in the IIR)	(c)	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 IIR)	(d)	0.00146	NA	NA	NA	NA	NA	NA	NA
M_Other	6A	Other (included in national total for entire territory) (please specify in IIR)		NO	NO	NO	NO	NO	NO	NO	NO
	NATIONAL TOTAL	National total for the entire territory (based on fuel sold)		21.450	2.762	2.822	1.052	1.534	8.241	0.284	424.961
	ADJUSTMENTS (Net total)	Sum of adjustments (negative value) from Annex VII		NE	NE	NE	NE	NE	NE	NE	NE
	NATIONAL TOTAL FOR COMPLIANCE	National total for compliance assessment (please specify all details in the IIR)	(e)	NE	NE	NE	NE	NE	NE	NE	NE
'MEMO' ITEMS - NOT TO BE INCLUDED IN NATIONAL TOTALS											
O_AviCruise	1A3ai(ii)	International aviation cruise (civil)		0.00545	0.0074	0.05841	0.00662	0.00584	0.07826	NE	NE
O_AviCruise	1A3aii(ii)	Domestic aviation cruise (civil)		0.00043	0.00058	0.00457	0.00052	0.00046	0.00612	NE	NE
P_IntShipping	1A3di(i)	International maritime navigation		0.00019	4.5E-05	7.5E-05	NE	NE	0.00012	0.00012	5.7E-05
z_Memo	1A5c	Multilateral operations		NA	NA	NA	NA	NA	NA	NA	NA
z_Memo	1A3	Transport (fuel used)		NE	NE	NE	NE	NE	NE	NE	NE
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

HR: 14.02.2017: 2015	***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**	**Longname**	**Notes**	**TJ NCV**	**TJ NCV**	**TJ NCV**	**TJ NCV**	**TJ NCV**		
A_PublicPower	1A1a	Public electricity and heat production		2373	21810	16416	NO	NO	*NA*	*TJ NCV*
B_Industry	1A1b	Petroleum refining		13167	NA	3180	NO	NO	*NA*	*TJ NCV*
B_Industry	1A1c	Manufacture of solid fuels and other energy industries		NO	NO	4124	NO	NO	*NA*	*TJ NCV*
B_Industry	1A2a	Stationary combustion in manufacturing industries and construction: Iron and steel		79	92	643	5	NO	*NA*	*TJ NCV*
B_Industry	1A2b	Stationary combustion in manufacturing industries and construction: Non-ferrous metals		47	NO	127	4	NO	*NA*	*TJ NCV*
B_Industry	1A2c	Stationary combustion in manufacturing industries and construction: Chemicals		127	NO	5083	NO	NO	*NA*	*TJ NCV*
B_Industry	1A2d	Stationary combustion in manufacturing industries and construction: Pulp, Paper and Print		209	NO	960	21	NO	*NA*	*TJ NCV*
B_Industry	1A2e	Stationary combustion in manufacturing industries and construction: Food processing, beverages and tobacco		737	695	4034	122	NO	*NA*	*TJ NCV*
B_Industry	1A2f	Stationary combustion in manufacturing industries and construction: Non-metallic minerals		5980	2644	4738	1123	101	*NA*	*TJ NCV*
I_Offroad	1A2gvii	Mobile Combustion in manufacturing industries and construction: (please specify in the IIR)		4035	NA	NA	NA	NA	*NA*	*TJ NCV*
B_Industry	1A2gviii	Stationary combustion in manufacturing industries and construction: Other (please specify in the IIR)		NO	NO	NO	NO	NO	*NA*	*TJ NCV*
H_Aviation	1A3ai(i)	International aviation LTO (civil)		267	NO	NO	NO	NO	*NA*	*TJ NCV*
H_Aviation	1A3aii(i)	Domestic aviation LTO (civil)		849	NO	NO	NO	NO	*NA*	*TJ NCV*
F_RoadTransport	1A3bi	Road transport: Passenger cars		53931.25	NA	5.79	579.75	NA	NA	*TJ NCV*
F_RoadTransport	1A3bii	Road transport: Light duty vehicles		8572.69	NA	NO	160.38	NA	NA	*TJ NCV*
F_RoadTransport	1A3biii	Road transport: Heavy duty vehicles and buses		14367.95	NA	134.56	281.90	NA	NA	*TJ NCV*
F_RoadTransport	1A3biv	Road transport: Mopeds & motorcycles		1004.35	NA	NO	NO	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	25671	*10^6 km*
F_RoadTransport	1A3bvii	Road transport: Automobile road abrasion		NA	NA	NA	NA	NA	25671	*10^6 km*
I_Offroad	1A3c	Railways		747	NO	NO	NO	NO	*NA*	*TJ NCV*
G_Shipping	1A3di(ii)	International inland waterways		IE	NO	NA	NA	NA	*NA*	*TJ NCV*
G_Shipping	1A3dii	National navigation (shipping)		1760	NO	NA	NA	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		2221	NO	6244	178	NO	*NA*	*TJ NCV*
I_Offroad	1A4aii	Commercial/institutional: Mobile		IE	IE	IE	IE	IE	IE	*TJ NCV*
C_OtherStationaryComb	1A4bi	Residential: Stationary		6014	94	18687	48623	NO	*NA*	*TJ NCV*
I_Offroad	1A4bii	Residential: Household and gardening (mobile)		334	NO	NO	NO	NO	*NA*	*TJ NCV*
C_OtherStationaryComb	1A4ci	Agriculture/Forestry/Fishing: Stationary		680	NO	740	NO	NO	*NA*	*TJ NCV*
I_Offroad	1A4cii	Agriculture/Forestry/Fishing: Off-road vehicles and other machinery		7320	NO	NO	NO	NO	*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*
D_Fugitive	1B2ai	Fugitive emissions oil: Exploration, production, transport		NA	NA	NA	NA	NA	*670.2*	*Crude oil produced [Mt]*
D_Fugitive	1B2aiv	Fugitive emissions oil: Refining / storage		NA	NA	NA	NA	NA	*2998.2*	*Crude oil refined [Mt]*
D_Fugitive	1B2av	Distribution of oil products		NA	NA	NA	NA	NA	*1066.62*	*Oil consumed [Mt]*

HR: 14.02.2017: 2015	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**	**Longname**	**Notes**	**TJ NCV**	**TJ NCV**	**TJ NCV**	**TJ NCV**	**TJ NCV**		
D_Fugitive	1B2b	Fugitive emissions from natural gas (exploration, production, processing, transmission, storage, distribution and other)		NA	NA	NA	NA	NA	*1.783E+09*	*Gas throughput [Mn3]*
D_Fugitive	1B2c	Venting and flaring (oil, gas, combined oil and gas)		NA	NA	NA	NA	NA	*399978.86*	*Gas vented flared [TJ]*
D_Fugitive	1B2d	Other fugitive emissions from energy production	(a)	NA	NA	NA	NA	NA	NO	
B_Industry	2A1	Cement production		NA	NA	NA	NA	NA	*2158.664*	*Clinker produced [kt]*
B_Industry	2A2	Lime production		NA	NA	NA	NA	NA	*134.2351*	*Lime produced [kt]*
B_Industry	2A3	Glass production		NA	NA	NA	NA	NA	*334.80*	*Glass produced [t]*
B_Industry	2A5a	Quarrying and mining of minerals other than coal		NA	NA	NA	NA	NA	*24.29*	*Material quarried [Mt]*
B_Industry	2A5b	Construction and demolition		NA	NA	NA	NA	NA	*1924884*	*floor space constructed/demolished [M3]*
B_Industry	2A5c	Storage, handling and transport of mineral products		NA	NA	NA	NA	NA	IE	*Amount [Mt]*
B_Industry	2A6	Other mineral products (please specify in the IIR)		NA	NA	NA	NA	NA	NO	*Please specify*
B_Industry	2B1	Ammonia production		NA	NA	NA	NA	NA	*455.235*	*Ammonia produced [kt]*
B_Industry	2B2	Nitric acid production		NA	NA	NA	NA	NA	*344.6376*	*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	*828.7058*	*Please specify*
B_Industry	2B10b	Storage, handling and transport of chemical products (please specify in the IIR)		NA	NA	NA	NA	NA	IE	*Please specify*
B_Industry	2C1	Iron and steel production		NA	NA	NA	NA	NA	*148.58333*	*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*
B_Industry	2C7d	Storage, handling and transport of metal products (please specify in the IIR)		NA	NA	NA	NA	NA	*31.96*	*Amount (kt)*
E_Solvents	2D3a	Domestic solvent use including fungicides		NA	NA	NA	NA	NA	NA	
E_Solvents	2D3b	Road paving with asphalt		NA	NA	NA	NA	NA	NA	
B_Industry	2D3c	Asphalt roofing		NA	NA	NA	NA	NA	NA	
B_Industry	2D3d	Coating applications		NA	NA	NA	NA	NA	*14.555*	*Paint applied [kt]*
E_Solvents	2D3e	Degreasing		NA	NA	NA	NA	NA	*NA*	*Solvents used [kt]*
E_Solvents	2D3f	Dry cleaning		NA	NA	NA	NA	NA	*NA*	*Solvents used [kt]*
E_Solvents	2D3g	Chemical products		NA	NA	NA	NA	NA	*NA*	*NA*
E_Solvents	2D3h	Printing		NA	NA	NA	NA	NA	*NA*	*NA*
E_Solvents	2D3i	Other solvent use (please specify in the IIR)		NA	NA	NA	NA	NA	*NA*	
E_Solvents	2G	Other product use (please specify in the IIR)		NA	NA	NA	NA	NA	IE	*Please specify*
B_Industry	2H1	Pulp and paper industry		NA	NA	NA	NA	NA	*31.957276*	*Pulp production [kt]*

HR: 14.02.2017: 2015	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	Longname	Notes	TJ NCV	TJ NCV	TJ NCV	TJ NCV	TJ NCV		
B_Industry	2H2	Food and beverages industry		NA	NA	NA	NA	NA	1535.8083	Bread, Wine, Beer, Spirits production [kt]
B_Industry	2H3	Other industrial processes (please specify in the IIR)		NA	NA	NA	NA	NA	NO	
B_Industry	2I	Wood processing		NA	NA	NA	NA	NA	134.55	Please specify
B_Industry	2J	Production of POPs		NA	NA	NA	NA	NA	NA	NA
B_Industry	2K	Consumption of POPs and heavy metals (e.g. electrical and scientific equipment)		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)		NA	NA	NA	NA	NA	NA	NA
K_AgriLivestock	3B1a	Manure management - Dairy cattle		NA	NA	NA	NA	NA	174.81	Population size (1000 head)
K_AgriLivestock	3B1b	Manure management - Non-dairy cattle		NA	NA	NA	NA	NA	301.00	Population size (1000 head)
K_AgriLivestock	3B2	Manure management - Sheep		NA	NA	NA	NA	NA	608.00	Population size (1000 head)
K_AgriLivestock	3B3	Manure management - Swine		NA	NA	NA	NA	NA	591.25	Population size (1000 head)
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	62.00	Population size (1000 head)
K_AgriLivestock	3B4e	Manure management - Horses		NA	NA	NA	NA	NA	21.87	Population size (1000 head)
K_AgriLivestock	3B4f	Manure management - Mules and asses		NA	NA	NA	NA	NA	2.50	Population size (1000 head)
K_AgriLivestock	3B4gi	Manure mangement - Laying hens		NA	NA	NA	NA	NA	3100.79	Population size (1000 head)
K_AgriLivestock	3B4gii	Manure mangement - Broilers		NA	NA	NA	NA	NA	818.49	Population size (1000 head)
K_AgriLivestock	3B4giii	Manure mangement - Turkeys		NA	NA	NA	NA	NA	325.48	Population size (1000 head)
K_AgriLivestock	3B4giv	Manure management - Other poultry		NA	NA	NA	NA	NA	570.55	Population size (1000 head)
K_AgriLivestock	3B4h	Manure management - Other animals (please specify in 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	73129920	Use of inorganic fertilizers (kg N/yr)
L_AgriOther	3Da2a	Animal manure applied to soils		NA	NA	NA	NA	NA	NA	
L_AgriOther	3Da2b	Sewage sludge applied to soils		NA	NA	NA	NA	NA	NA	
L_AgriOther	3Da2c	Other organic fertilisers applied to soils (including compost)		NA	NA	NA	NA	NA	NO	
L_AgriOther	3Da3	Urine and dung deposited by grazing animals		NA	NA	NA	NA	NA	NA	
L_AgriOther	3Da4	Crop residues applied to soils		NA	NA	NA	NA	NA	NA	
L_AgriOther	3Db	Indirect emissions from managed soils		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	
L_AgriOther	3Dd	Off-farm storage, handling and transport of bulk agricultural products		NA	NA	NA	NA	NA	NA	
L_AgriOther	3De	Cultivated crops	(b)	NA	NA	NA	NA	NA	NA	
L_AgriOther	3Df	Use of pesticides		NA	NA	NA	NA	NA	NA	
L_AgriOther	3F	Field burning of agricultural residues		NA	NA	NA	NA	NA	NO	Area burned [k ha/yr]
L_AgriOther	3I	Agriculture other (please specify in the IIR)		NA	NA	NA	NA	NA	NO	NA
J_Waste	5A	Biological treatment of waste - Solid waste disposal on land		NA	NA	NA	NA	NA	1360.91	Annual deposition of MSW at the SWDS [kt]
J_Waste	5B1	Biological treatment of waste - Composting		NA	NA	NA	NA	NA	NA	
J_Waste	5B2	Biological treatment of waste - Anaerobic digestion at biogas facilities		NA	NA	NA	NA	NA	NA	
J_Waste	5C1a	Municipal waste incineration	(c)	NA	NA	NA	NA	NA	NO	MSW incinerated [kt]
J_Waste	5C1bi	Industrial waste incineration	(c)	NA	NA	NA	NA	NA	NO	Waste incinerated [kt]
J_Waste	5C1bii	Hazardous waste incineration	(c)	NA	NA	NA	NA	NA	IE	Waste incinerated [kt]

HR: 14.02.2017: 2015	***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**	**Longname**	**Notes**	**TJ NCV**	**TJ NCV**	**TJ NCV**	**TJ NCV**	**TJ NCV**		
J_Waste	5C1biii	Clinical waste incineration	(c)	NA	NA	NA	NA	NA	*0.05*	*Waste incinerated [kt]*
J_Waste	5C1biv	Sewage sludge incineration	(c)	NA	NA	NA	NA	NA	NO	
J_Waste	5C1bv	Cremation	(c)	NA	NA	NA	NA	NA	*5373*	*Incineration of corpses [Number]*
J_Waste	5C1bvi	Other waste incineration (please specify in the IIR)	(c)	NA	NA	NA	NA	NA	NO	
J_Waste	5C2	Open burning of waste		NA	NA	NA	NA	NA	NO	
J_Waste	5D1	Domestic wastewater handling		NA	NA	NA	NA	NA	*NE*	*Total organic product [Gg DC/yr]*
J_Waste	5D2	Industrial wastewater handling		NA	NA	NA	NA	NA	*NE*	*Total organic product [Gg DC/yr]*
J_Waste	5D3	Other wastewater handling		NA	NA	NA	NA	NA	*NE*	*Total organic product [Gg DC/yr]*
J_Waste	5E	Other waste (please specify in IIR)	(d)	NA	NA	NA	NA	NA	NA	*Please specify*
M_Other	6A	Other (included in national total for entire territory) (please specify in IIR)		NA	NA	NA	NA	NA	NO	*NA*
	NATIONAL TOTAL	**National total for the entire territory (based on fuel sold)**		#######	25335.57	65118.03	51096.30	100.72	NA	*NA*
	ADJUSTMENTS (Net total)	Sum of adjustments (negative value) from Annex VII		NE	NE	NE	NE	NE	NE	*NA*
	NATIONAL TOTAL FOR COMPLIANCE	**National total for compliance assessment (please specify all details in the IIR)**	(e)	NE	NE	NE	NE	NE	NE	*NA*
'MEMO' ITEMS - NOT TO BE INCLUDED IN NATIONAL TOTALS										
O_AviCruise	1A3ai(ii)	International aviation cruise (civil)		3894	NO	NO	NO	NO	NA	*TJ NCV*
O_AviCruise	1A3aii(ii)	Domestic aviation cruise (civil)		305	NO	NO	NO	NO	NA	*TJ NCV*
P_IntShipping	1A3di(i)	International maritime navigation		72	NO	NO	NO	NO	NA	*TJ NCV*
z_Memo	1A5c	Multilateral operations		NA	NA	NA	NA	NA	NA	
z_Memo	1A3	Transport (fuel used)		NE	NE	NE	NE	NE	NA	
z_Memo	6B	Other not included in national total of the entire territory (please specify in the IIR)		NA	NA	NA	NA	NA	NO	*NA*
N_Natural	11A	Volcanoes		NA	NA	NA	NA	NA	NO	*Please specify*
N_Natural	11B	Forest fires		NA	NA	NA	NA	NA	*191*	*Area of forest burned [ha]*
N_Natural	11C	Other natural emissions (please specify in the IIR)		NA	NA	NA	NA	NA	NO	

APPENDIX 7. UNCERTAINTY ANALYSIS

NFR Source	Pollutant	Emissions 1990	Emissions 2015	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
		kt	kt	%	%	%	%	%	%	%	%	%
1 A 1 Energy Industries	SO2	99.23	7.16	3.0	10.0	10.44	4.93861	-0.00953	0.04195	-0.09533	0.17797	0.20189
Construction	SO2	37.02	2.99	3.0	10.0	10.44	2.06175	-0.00171	0.01751	-0.01710	0.07430	0.07624
1 A 3 b Road Transport	SO2	4.42	0.02	3.0	20.0	20.22	0.02889	-0.00217	0.00013	-0.04336	0.00054	0.04336
1 A 3 Other mobile source and machinery	SO2	1.28	0.07	3.0	20.0	20.22	0.09802	-0.00023	0.00043	-0.00467	0.00182	0.00501
1 A 4 a Commercial, institutional combustion	SO2	6.88	0.12	5.0	20.0	20.62	0.15795	-0.00289	0.00068	-0.05789	0.00480	0.05809
1 A 4 b Residential combustion , 1 A 4 c Combustion in Agriculture/Forestry/ Fishing	SO2	17.82	1.15	3.0	20.0	20.22	1.53057	-0.00254	0.00671	-0.05083	0.02847	0.05826
1 B Extraction and distribution of fossil fuels	SO2	6.1E-01	2.1E-01	10.0	50.0	50.99	0.72163	0.00094	0.00126	0.04678	0.01775	0.05003
1 B 2 a iv Refining / storage	SO2	1.80	3.19	3.0	50.0	50.09	10.56009	0.01776	0.01870	0.88794	0.07932	0.89147
2 B 10 a, 2 H Chemical industry: Other, Pulp and Paper industry	SO2	1.23	0.22	3.0	20.0	20.22	0.28844	0.00063	0.00126	0.01256	0.00537	0.01365
2 C Metal production	SO2	0.46	8.9E-03	7.5	20.0	21.36	0.01258	-0.00018	0.00005	-0.00369	0.00055	0.00373
5 C Waste incineration	SO2	8.7E-05	2.8E-05	5.0	20.0	20.62	0.00004	0.00000	0.00000	0.00000	0.00000	0.00000
5 C 1 b v Cremation	SO2	1.7E-04	6.1E-04	5.0	20.0	20.62	0.00083	0.00000	0.00000	0.00007	0.00003	0.00007
TOTAL		170.75	15.14	% Uncertainty in total inventory			**11.96**			Trend uncertainty:		**0.92**

NFR Source	Pollutant	Emissions 1990	Emissions 2015	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
		kt	kt	%	%	%	%	%	%	%	%	%
1 A 1 Energy Industries	NO2	18.03	6.61	3.0	20.0	20.22	2.51915	-0.02304	0.06256	-0.46071	0.26544	0.53171
1 A 2 Manufacturing Industries and Construction	NO2	23.53	7.01	3.0	20.0	20.22	2.66927	-0.04538	0.06629	-0.90752	0.28126	0.95011
1 A 3 b Road Transport	NO2	37.13	23.12	3.0	20.0	20.22	8.80448	0.04211	0.21866	0.84212	0.92771	1.25292
1 A 3 Other mobile source and machinery	NO2	3.96	2.75	3.0	100.0	100.04	5.18530	0.00722	0.02603	0.72167	0.11045	0.73007
1 A 4 a Commercial, institutional combustion	NO2	3.90	1.37	5.0	50.0	50.25	1.29695	-0.00556	0.01296	-0.27800	0.09167	0.29272
1 A 4 b Residential combustion , 1 A 4 c Combustion in Agriculture/Forestry/ Fishing	NO2	13.23	8.69	3.0	50.0	50.09	8.19749	0.01932	0.08220	0.96582	0.34874	1.02685
1 B Extraction and distribution of fossil fuels	NO2	0.08	0.05	10.0	50.0	50.99	0.04794	0.00011	0.00047	0.00564	0.00668	0.00874
1 B 2 a iv Refining / storage	NO2	0.26	0.10	3.0	50.0	50.09	0.09892	-0.00023	0.00099	-0.01128	0.00421	0.01204
2 B 10 a, 2 H Chemical industry: Other, Pulp and Paper industry	NO2	0.57	0.05	3.0	50.0	50.09	0.04435	-0.00229	0.00044	-0.11426	0.00189	0.11428
2 B 1, 2 B 2 Ammonia and Nitric acid production	NO2	2.09	1.02	3.0	50.0	50.09	0.96097	-0.00030	0.00964	-0.01491	0.04088	0.04352
2 C Metal production	NO2	0.10	0.02	7.5	50.0	50.56	0.01839	-0.00028	0.00018	-0.01379	0.00194	0.01392
2 D 3 i Other solvent use	NO2	0.02	0.01	10.0	31.0	32.57	0.00901	0.00004	0.00014	0.00110	0.00196	0.00225
3 D a 1 Inorganic N-fertilizers	NO2	2.79	2.28	5.0	100.0	100.12	4.30124	0.00831	0.02158	0.83067	0.15257	0.84456
3B1, 3B2, 3B4d, 3B4e, 3B4f,	NO2	0.02	4.46E-03	10.0	100.0	100.50	0.00844	-0.00006	0.00004	-0.00601	0.00060	0.00604
3B3, 3B4g	NO2	0.01	2.47E-03	50.0	100.0	111.80	0.00521	-0.00005	0.00002	-0.00463	0.00165	0.00491
5 C 1 b v Cremation	NO2	1.2E-03	4.4E-03	5.0	20.0	20.62	0.00172	0.00004	0.00004	0.00072	0.00030	0.00078
5 C Waste incineration	NO2	5.4E-04	1.2E-04	30.0	20.0	36.06	0.00008	0.00000	0.00000	-0.00003	0.00005	0.00006
TOTAL		105.72	53.10	% Uncertainty in total inventory			**14.36**			Trend uncertainty:		**2.27**

NFR Source	Pollutant	Emissions 1990	Emissions 2015	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
		kt	kt	%	%	%	%	%	%	%	%	%
1 A 1 Energy Industries	NMVOC	0.99	0.33	3.0	50.0	50.09	0.27162	-0.00046	0.00217	-0.02289	0.00921	0.02467
Construction	NMVOC	4.60	1.36	3.0	50.0	50.09	1.12630	-0.00315	0.00900	-0.15773	0.03817	0.16229
1 A 3 b Road Transport	NMVOC	34.64	6.49	3.0	20.0	20.22	2.16594	-0.04858	0.04285	-0.97168	0.18181	0.98854
1 A 3 Other mobile source and machinery	NMVOC	0.52	0.41	3.0	100.0	100.04	0.67884	0.00133	0.00271	0.13335	0.01152	0.13385
1 A 4 a Commercial, institutional combustion	NMVOC	0.32	0.25	5.0	50.0	50.25	0.20853	0.00081	0.00166	0.04055	0.01174	0.04222
1 A 4 b Residential combustion , 1 A 4 c Combustion in Agriculture/Forestry/ Fishing	NMVOC	24.78	18.19	3.0	50.0	50.09	15.03658	0.05455	0.12011	2.72754	0.50960	2.77474
1 B Extraction and distribution of fossil fuels	NMVOC	4.22	2.51	10.0	50.0	50.99	2.11061	0.00542	0.01656	0.27076	0.23423	0.35801
1 B 2 a iv Refining / storage	NMVOC	2.18	0.93	3.0	50.0	50.09	0.77233	0.00041	0.00617	0.02049	0.02618	0.03324
2 B 10 a, 2 H 1, 2 H 2 Chemical industry: Other, Pulp and Paper industry, Food and beverages industry	NMVOC	23.4	4.43	3.0	50.0	50.09	3.65997	-0.03248	0.02924	-1.62419	0.12404	1.62892
2 A 1, 2 A 2, 2 A 3 Cement, Lime and glass production	NMVOC	0	0.02	3.0	20.0	20.22	0.00509	0.00010	0.00010	0.00201	0.00043	0.00206
2 C Metal production	NMVOC	9.6E-03	0.01	7.5	50.0	50.56	0.00585	0.00002	0.00005	0.00104	0.00049	0.00115
2D3b, 2D3c, 2D3d, 2D3g, 2D3h	NMVOC	11.27	4.93	30	20.0	36.06	2.93328	0.00276	0.03255	0.05515	1.38107	1.38217
2K, 2D3e, 2D3f	NMVOC	5.26	4.62	50	20.0	53.85	4.11033	0.01664	0.03054	0.33290	2.15953	2.18504
2D3a, 2D3i, 2G	NMVOC	26.20	6.60	10	20.0	22.36	2.43460	-0.02564	0.04357	-0.51270	0.61610	0.80153
3B	NMVOC	11.06	6.81	10.0	100	100.50	11.28908	0.01571	0.04495	1.57119	0.63564	1.69489
3D1a	NMVOC	1.06	0.59	5	100.0	100.12	0.96944	0.00107	0.00387	0.10706	0.02739	0.11051
5 A Biological treatment of waste - Solid waste disposal on land	NMVOC	0.92	2.12	5	50	50.25	1.76095	0.01159	0.01402	0.57945	0.09915	0.58787
5 C 1 b v Cremation	NMVOC	1.9E-05	6.98E-05	5.0	50	50.25	0.00006	0.00000	0.00000	0.00002	0.00000	0.00002
5 C Waste incineration	NMVOC	1.9E-03	3.63E-05	30.0	50	58.31	0.00003	0.00000	0.00000	-0.00025	0.00001	0.00025
5D1, 5D2	NMVOC	2.4E-06	4.04E-06	30.0	50	58.31	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
TOTAL		151.40	60.58	% Uncertainty in total inventory			**20.35**			Trend uncertainty:		**4.70**

NFR Source	Pollutant	Emissions 1990	Emissions 2015	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
		kt	kt	%	%	%	%	%	%	%	%	%
1 A 1 Energy Industries	CO	3.02	0.99	3.0	20.0	20.22	0.09289	-0.00032	0.00178	-0.00645	0.00757	0.00994
1 A 2 Manufacturing Industries and	CO	23.67	13.32	3.0	20.0	20.22	1.24554	0.00741	0.02392	0.14818	0.10147	0.17959
1 A 3 b Road Transport	CO	236.59	36.65	3.0	20.0	20.22	3.42715	-0.09874	0.06581	-1.97483	0.27920	1.99447
1 A 3 Other mobile source and machinery	CO	1.86	1.84	3.0	100.0	100.04	0.85139	0.00201	0.00330	0.20085	0.01402	0.20134
1 A 4 a Commercial, institutional combustion	CO	1.37	0.41	5.0	50.0	50.25	0.09486	-0.00023	0.00073	-0.01126	0.00518	0.01240
1 A 4 b Residential combustion , 1 A 4 c Combustion in Agriculture/Forestry/ Fishing	CO	199.16	141.62	3.0	50.0	50.09	32.79907	0.11501	0.25429	5.75030	1.07885	5.85063
1 B Extraction and distribution of fossil fuels	CO	0.65	2.6E-01	10.0	50.0	50.99	0.06174	0.00002	0.00047	0.00098	0.00665	0.00672
1 B 2 a iv Refining / storage	CO	50.04	20.48	3.0	50.0	50.09	4.74237	0.00187	0.03677	0.09361	0.15599	0.18192
2 B 10 a, 2 H Chemical industry: Other, Pulp and Paper industry, 2 B 1 Ammonia production	CO	30.71	3.7E-03	3.0	50.0	50.09	0.00085	-0.02139	0.00001	-1.06966	0.00003	1.06966
2 C Metal production	CO	9.20	0.25	7.5	50.0	50.56	0.05905	-0.00596	0.00045	-0.29805	0.00481	0.29809
2D3b, 2D3c, 2D3d, 2D3g, 2D3h	CO	2.3E-04	3.7E-04	30	100.0	104.40	0.00018	0.00000	0.00000	0.00005	0.00003	0.00006
2D3i	CO	0.67	0.45	5	100.0	100.12	0.20807	0.00034	0.00081	0.03425	0.00571	0.03472
5 C Waste incineration	CO	4.4E-05	9.8E-06	5.0	100.0	100.12	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
5 C 1 b v Cremation	CO	2.0E-04	7.5E-04	5.0	50.0	50.25	0.00017	0.00000	0.00000	0.00006	0.00001	0.00006
TOTAL		556.93	216.28	% Uncertainty in total inventory			**33.35**			Trend uncertainty:		**6.29**

NFR Source	Pollutant	Emissions 1990	Emissions 2015	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
		kt	kt	%	%	%	%	%	%	%	%	%
1 A 1 Energy Industries	NH3	9.0E-03	9.9E-03	3.0	1,000	1000.00	0.33147	0.00009	0.00021	0.08926	0.00088	0.08927
1 A 2 Manufacturing Industries and	NH3	0.13	0.05	3.0	1,000	1000.00	1.60747	-0.00076	0.00101	-0.76036	0.00427	0.76038
1 A 3 b Road Transport	NH3	0.03	0.51	3.0	400	400.01	6.89035	0.01038	0.01078	4.15359	0.04575	4.15384
1 A 3 Other mobile source and machinery	NH3	6.0E-04	5.3E-04	3.0	1,000	1000.00	0.01793	0.00000	0.00001	0.00326	0.00005	0.00326
1 A 4 a Commercial, institutional combustion	NH3	8.0E-04	7.6E-03	5.0	1,000	1000.01	0.25611	0.00015	0.00016	0.14982	0.00113	0.14982
1 A 4 b Residential combustion , 1 A 4 c Combustion in Agriculture/Forestry/ Fishing	NH3	3.03	2.42	3.0	1,000	1000.00	81.42296	0.01109	0.05097	11.08600	0.21623	11.08811
1 B Extraction and distribution of fossil fuels	NH3	2.1E-03	0	10.0	1,000	1000.05	0.00000	-0.00003	0.00000	-0.02708	0.00000	0.02708
1 B 2 a iv Refining / storage	NH3	0.21	0.08	3.0	1,000	1000.00	2.81844	-0.00093	0.00176	-0.93461	0.00748	0.93464
2 B 10 a, 2 H 1, 2 H 2 Chemical industry: Other, Pulp and Paper industry, Food and beverages	NH3	3.48	2.36	3.0	400	400.01	31.65783	0.00368	0.04954	1.47386	0.21018	1.48877
production	NH3	3.4E-03	0.10	3.0	400	400.01	1.29690	0.00198	0.00203	0.79361	0.00861	0.79366
2D3a, 2D3i, 2G	NH3	0.05	0.03	10	400	400.12	0.45506	0.00005	0.00071	0.02055	0.01007	0.02288
3B1, 3B2, 3B4d, 3B4e, 3B4f,	NH3	18.33	9.56	10.0	100	100.50	32.27441	-0.04014	0.20102	-4.01403	2.84285	4.91876
3B3, 3B4g	NH3	14.55	7.14	50.0	100	111.80	26.82366	-0.04127	0.15018	-4.12730	10.61912	11.39300
3D1a	NH3	7.00	6.87	5	100	100.12	23.10857	0.05220	0.14447	5.22008	1.02154	5.31909
5D3 Other wastewater handling	NH3	0.71	0.62	30.0	1,000	1000.45	20.95037	0.00370	0.01311	3.69601	0.55613	3.73762
TOTAL		47.55	29.76	% Uncertainty in total inventory			**102.11**			Trend uncertainty:		**18.46**

NFR Source	Pollutant	Emissions 1990	Emissions 2015	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
		kt	kt	%	%	%	%	%	%	%	%	%
1 A 1 Energy Industries	BC	0.11	0.01	3.0	50.0	50.09	0.14719	-0.01105	0.00182	-0.55242	0.00771	0.55247
1 A 2 Manufacturing Industries and Construction	BC	0.78	0.14	3.0	50.0	50.09	2.10171	-0.06213	0.02594	-3.10630	0.11004	3.10825
1 A 3 b Road Transport	BC	0.58	0.87	3.0	100.0	100.04	25.72921	0.09352	0.15898	9.35198	0.67448	9.37627
1 A 3 Other mobile source and machinery	BC	4.23E-03	2.23E-03	3.0	500.0	500.01	0.33103	-0.00007	0.00041	-0.03576	0.00174	0.03580
1 A 4 a Commercial, institutional combustion	BC	8.31E-02	2.58E-02	5.0	78.0	78.16	0.59859	-0.00470	0.00473	-0.36686	0.03348	0.36838
1 A 4 b Residential combustion , 1 A 4 c Combustion in Agriculture/Forestry/ Fishing	BC	3.68	2.18	3.0	76.0	76.06	49.32904	-0.01747	0.40091	-1.32789	1.70094	2.15788
1 B Extraction and distribution of fossil fuels	BC	2.68E-02	0.00561	10.0	50.0	50.99	0.08505	-0.00201	0.00103	-0.10066	0.01458	0.10171
1 B 2 a iv Refining / storage	BC	4.00E-04	1.64E-04	3.0	50.0	50.09	0.00244	-0.00002	0.00003	-0.00077	0.00013	0.00078
2 B 10 a, 2 H 1, 2 H 2 Chemical industry: Other, Pulp and Paper industry, Food and beverages industry	BC	6.22E-03	7.26E-03	3.0	50.0	50.09	0.10807	0.00063	0.00133	0.03136	0.00566	0.03186
2 A 1, 2 A 2, 2 A 3 Cement, Lime and glass production	BC	7.44E-03	8.49E-03	3.0	50.0	50.09	0.12642	0.00072	0.00156	0.03576	0.00662	0.03637
2 C Metal production	BC	0.01	1.1E-05	7.5	50.0	50.56	0.00017	-0.00151	0.00000	-0.07538	0.00002	0.07538
2D3b, 2D3c, 2D3d, 2D3g, 2D3h	BC	4.57E-03	1.74E-02	30	50.0	58.31	0.30194	0.00268	0.00320	0.13409	0.13580	0.19085
2D3a, 2D3i, 2G	BC	0.15	0.10	10	100.0	100.50	2.96119	0.00152	0.01821	0.15243	0.25759	0.29931
5 C Waste incineration	BC	3.5E-08	0	30.0	50.0	58.31	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
TOTAL		5.44	3.36	% Uncertainty in total inventory			**55.76**			Trend uncertainty:		**10.14**

NFR Source	Pollutant	Emissions 1990	Emissions 2015	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
		kt	kt	%	%	%	%	%	%	%	%	%
1 A 1 Energy Industries	PM2.5	0.91	0.15	3.0	50.0	50.09	0.37835	-0.00893	0.00403	-0.44647	0.01711	0.44679
1 A 2 Manufacturing Industries and Construction	PM2.5	2.94	0.45	3.0	50.0	50.09	1.13386	-0.02977	0.01209	-1.48849	0.05129	1.48937
1 A 3 b Road Transport	PM2.5	1.30	1.55	3.0	100.0	100.04	7.71879	0.02273	0.04120	2.27274	0.17481	2.27945
1 A 3 Other mobile source and machinery	PM2.5	0.27	0.22	3.0	500.0	500.01	5.38378	0.00194	0.00575	0.96895	0.02440	0.96926
1 A 4 a Commercial, institutional combustion	PM2.5	0.24	0.06	5.0	78.0	78.16	0.24735	-0.00167	0.00169	-0.13044	0.01195	0.13099
1 A 4 b Residential combustion , 1 A 4 c Combustion in Agriculture/Forestry/ Fishing	PM2.5	29.27	15.73	3.0	76.0	76.06	59.73090	0.00265	0.41940	0.20150	1.77935	1.79072
1 B Extraction and distribution of fossil fuels	PM2.5	0.08	0.024408	10.0	50.0	50.99	0.06213	-0.00047	0.00065	-0.02345	0.00920	0.02519
1 B 2 a iv Refining / storage	PM2.5	0.31	0.16	3.0	50.0	50.09	0.38893	-0.00023	0.00415	-0.01161	0.01759	0.02108
2 B 10 a, 2 H 1, 2 H 2 Chemical industry: Other, Pulp and Paper industry, Food and beverages industry	PM2.5	0.29	0.40	3.0	50.0	50.09	1.00815	0.00668	0.01075	0.33424	0.04560	0.33734
2 A 1, 2 A 2, 2 A 3 Cement, Lime and glass production	PM2.5	0.22	0.26	3.0	50.0	50.09	0.64791	0.00377	0.00691	0.18850	0.02931	0.19077
2 A 5 a, 2 A 5 b Quarrying and mining of mineral products, Construction and demolition	PM2.5	0.16	0.14	5.0	50.0	50.25	0.34393	0.00140	0.00366	0.07024	0.02585	0.07485
2 C Metal production	PM2.5	0.31	3.1E-03	7.5	50.0	50.56	0.00788	-0.00437	0.00008	-0.21861	0.00088	0.21861
2D3b, 2D3c, 2D3d, 2D3g, 2D3h	PM2.5	0.08	0.31	30	50.0	58.31	0.89845	0.00706	0.00823	0.35296	0.34911	0.49645
2D3a, 2D3i, 2G	PM2.5	0.40	0.25	10	100.0	100.50	1.25854	0.00100	0.00669	0.10044	0.09458	0.13796
3B1, 3B2, 3B4d, 3B4e, 3B4f,	PM2.5	0.26	0.12	10.0	100.0	100.50	0.61095	-0.00049	0.00325	-0.04919	0.04591	0.06729
3B3, 3B4g	PM2.5	0.40	0.16	50.0	100.0	111.80	0.92090	-0.00137	0.00440	-0.13658	0.31104	0.33971
3D1a	PM2.5	0.07	0.04	5	50.0	50.25	0.10266	0.00004	0.00109	0.00186	0.00771	0.00794
5 A Biological treatment of waste - Solid waste disposal on	PM2.5	1.95E-05	4.49E-05	5	100.0	100.12	0.00022	0.00000	0.00000	0.00009	0.00001	0.00009
5 C 1 b v Cremation	PM2.5	5.1E-05	1.9E-04	5.0	80.0	80.16	0.00075	0.00000	0.00000	0.00034	0.00004	0.00034
5 C Waste incineration	PM2.5	1.0E-06	0	30.0	50.0	58.31	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
5 E Other waste (Building and car fires)	PM2.5	9.7E-04	1.1E-03	10.0	700.0	700.07	0.03990	0.00002	0.00003	0.01162	0.00043	0.01163
TOTAL		37.51	20.03	% Uncertainty in total inventory			**60.52**			Trend uncertainty:		**3.52**

NFR Source	Pollutant	Emissions 1990	Emissions 2015	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
		kt	kt	%	%	%	%	%	%	%	%	%
1 A 1 Energy Industries	PM10	1.48	0.27	3.0	50.0	50.09	0.50211	-0.01269	0.00577	-0.63455	0.02449	0.63503
1 A 2 Manufacturing Industries and Construction	PM10	3.07	0.47	3.0	50.0	50.09	0.88053	-0.02809	0.01012	-1.40463	0.04295	1.40529
1 A 3 b Road Transport	PM10	1.54	1.91	3.0	100.0	100.04	7.16059	0.02207	0.04122	2.20721	0.17486	2.21413
1 A 3 Other mobile source and machinery	PM10	0.27	0.22	3.0	500.0	500.01	4.07167	0.00128	0.00469	0.64227	0.01989	0.64257
1 A 4 a Commercial, institutional combustion	PM10	0.24	0.06	5.0	78.0	78.16	0.18753	-0.00166	0.00138	-0.12931	0.00977	0.12968
1 A 4 b Residential combustion , 1 A 4 c Combustion in Agriculture/Forestry/ Fishing	PM10	29.99	16.12	3.0	76.0	76.06	46.01473	-0.02479	0.34838	-1.88390	1.47804	2.39451
1 B Extraction and distribution of fossil fuels	PM10	0.13	0.0244085	10.0	50.0	50.99	0.04672	-0.00112	0.00053	-0.05597	0.00746	0.05647
1 B 2 a iv Refining / storage	PM10	0.70	0.36	3.0	50.0	50.09	0.67245	-0.00104	0.00773	-0.05206	0.03280	0.06153
2 B 10 a, 2 H 1, 2 H 2 Chemical industry: Other, Pulp and	PM10	0.39	0.54	3.0	50.0	50.09	1.01064	0.00678	0.01162	0.33899	0.04929	0.34255
2 A 1, 2 A 2, 2 A 3 Cement, Lime and glass production	PM10	0.41	0.46	3.0	50.0	50.09	0.86119	0.00477	0.00990	0.23833	0.04200	0.24200
2 A 5 a, 2 A 5 b Quarrying and mining of mineral products, Construction and demolition	PM10	1.58	1.37	5.0	50.0	50.25	2.58584	0.00996	0.02963	0.49791	0.20954	0.54021
2 C Metal production	PM10	0.47	3.6E-03	7.5	50.0	50.56	0.00677	-0.00582	0.00008	-0.29108	0.00082	0.29108
2D3b, 2D3c, 2D3d, 2D3g, 2D3h	PM10	0.61	2.31	30	50.0	58.31	5.04944	0.04226	0.04987	2.11276	2.11565	2.98994
2D3a, 2D3i, 2G	PM10	0.44	0.27	10	100.0	100.50	1.00396	0.00033	0.00575	0.03321	0.08135	0.08787
3B1, 3B2, 3B4d, 3B4e, 3B4f,	PM10	0.43	0.21	10.0	100.0	100.50	0.78592	-0.00089	0.00450	-0.08870	0.06369	0.10920
3B3, 3B4g	PM10	2.56	1.00	50.0	100.0	111.80	4.20206	-0.01024	0.02164	-1.02449	1.53037	1.84163
3D1a	PM10	1.92	1.06	5	50.0	50.25	2.00684	-0.00095	0.02300	-0.04762	0.16262	0.16945
5 A Biological treatment of waste - Solid waste disposal on land	PM10	1.29E-04	3.0E-04	5	100.0	100.12	0.00112	0.00000	0.00001	0.00048	0.00005	0.00049
5 C 1 b v Cremation	PM10	5.1E-05	1.9E-04	5.0	80.0	80.16	0.00056	0.00000	0.00000	0.00027	0.00003	0.00027
5 C Waste incineration	PM10	1.8E-06	0	30.0	50.0	58.31	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
5 E Other waste (Building and car fires)	PM10	9.7E-04	1.1E-03	10.0	700.0	700.07	0.03000	0.00001	0.00002	0.00881	0.00035	0.00881
TOTAL		46.27	26.64	% Uncertainty in total inventory			**47.37**			Trend uncertainty:		**5.14**

NFR Source	Pollutant	Emissions 1990	Emissions 2015	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
		kt	kt	%	%	%	%	%	%	%	%	%
1 A 1 Energy Industries	TSP	2.52	0.47	3.0	50.0	50.09	0.60260	-0.02409	0.00853	-1.20456	0.03619	1.20510
1 A 2 Manufacturing Industries and Construction	TSP	3.19	0.49	3.0	50.0	50.09	0.62696	-0.03243	0.00888	-1.62145	0.03766	1.62189
1 A 3 b Road Transport	TSP	1.71	2.14	3.0	100.0	100.04	5.51500	0.01690	0.03909	1.68989	0.16585	1.69801
1 A 3 Other mobile source and machinery	TSP	0.28	0.22	3.0	500.0	500.01	2.81248	0.00039	0.00399	0.19367	0.01692	0.19441
1 A 4 a Commercial, institutional combustion	TSP	0.25	0.07	5.0	78.0	78.16	0.13122	-0.00205	0.00119	-0.16022	0.00842	0.16044
1 A 4 b Residential combustion , 1 A 4 c Combustion in Agriculture/Forestry/ Fishing	TSP	31.54	16.92	3.0	76.0	76.06	33.16208	-0.09885	0.30918	-7.51234	1.31173	7.62600
1 B Extraction and distribution of fossil fuels	TSP	0.25	0	10.0	50.0	50.99	0.03206	-0.00282	0.00045	-0.14108	0.00631	0.14122
1 B 2 a iv Refining / storage	TSP	0.90	0.50	3.0	50.0	50.09	0.64776	-0.00245	0.00917	-0.12243	0.03891	0.12847
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	TSP	0.84	1.11	3.0	50.0	50.09	1.43222	0.00945	0.02028	0.47257	0.08602	0.48034
2 A 1, 2 A 2, 2 A 3 Cement, Lime and glass production	TSP	0.21	0.20	3.0	50.0	50.09	0.26130	0.00098	0.00370	0.04899	0.01569	0.05144
2 A 5 a, 2 A 5 b Quarrying and mining of mineral products, Construction and demolition	TSP	3.21	2.79	5.0	50.0	50.25	3.61134	0.00933	0.05096	0.46628	0.36036	0.58930
2 C Metal production	TSP	0.66	4.7E-03	7.5	50.0	50.56	0.00610	-0.00848	0.00009	-0.42388	0.00091	0.42388
2D3b, 2D3c, 2D3d, 2D3g, 2D3h	TSP	2.85	10.76	30	50.0	58.31	16.15710	0.15955	0.19649	7.97760	8.33639	11.53853
2D3a, 2D3i, 2G	TSP	0.46	0.28	10	100.0	100.50	0.71545	-0.00091	0.00505	-0.09071	0.07139	0.11543
3B1, 3B2, 3B4d, 3B4e, 3B4f,	TSP	0.96	0.47	10.0	100.0	100.50	1.20455	-0.00395	0.00850	-0.39476	0.12020	0.41265
3B3, 3B4g	TSP	2.99	1.32	50.0	100.0	111.80	3.80166	-0.01459	0.02411	-1.45862	1.70499	2.24378
3D1a	TSP	1.92	1.06	5	50.0	50.25	1.37734	-0.00549	0.01944	-0.27441	0.13744	0.30691
5 A Biological treatment of waste - Solid waste disposal on land	TSP	2.7E-04	6.3E-04	5	100.0	100.12	0.00163	0.00001	0.00001	0.00080	0.00008	0.00080
5 C 1 b v Cremation	TSP	5.6E-05	2.1E-04	5.0	80.0	80.16	0.00043	0.00000	0.00000	0.00024	0.00003	0.00025
5 C Waste incineration	TSP	4.9E-06	8.8E-07	30.0	50.0	58.31	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
5 E Other waste (Building and car fires)	TSP	9.7E-04	1.1E-03	10.0	700.0	700.07	0.02059	0.00001	0.00002	0.00579	0.00029	0.00579
TOTAL		54.74	38.82	% Uncertainty in total inventory			**37.87**			Trend uncertainty:		**14.30**

NFR Source	Pollutant	Emissions 1990	Emissions 2015	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
		t	t	%	%	%	%	%	%	%	%	%
1 A 1 Energy Industries	PAH	0.03	2.04E-03	3.0	100.0	100.04	0.02471	-0.00029	0.00009	-0.02916	0.00036	0.02916
Construction	PAH	2.65	0.40	3.0	100.0	100.04	4.80891	-0.02222	0.01672	-2.22168	0.07095	2.22281
1 A 3 b Road Transport	PAH	0.06	0.14	3.0	400.0	400.01	6.91654	0.00511	0.00602	2.04596	0.02552	2.04612
1 A 3 Other mobile source and machinery	PAH	0.06	0.02	3.0	400.0	400.01	1.15046	0.00010	0.00100	0.03951	0.00425	0.03974
1 A 4 a Commercial, institutional combustion	PAH	0.13	0.01	5.0	400.0	400.03	0.30591	-0.00166	0.00027	-0.66500	0.00188	0.66500
1 A 4 b Residential combustion , 1 A 4 c Combustion in Agriculture/Forestry/ Fishing	PAH	18.25	7.53	3.0	400.0	400.01	365.47536	0.04944	0.31787	19.77732	1.34859	19.82324
1 B Extraction and distribution of fossil fuels	PAH	0.29	0	10.0	400.0	400.12	0.00000	-0.00433	0.00000	-1.73099	0.00000	1.73099
1 B 2 a iv Refining / storage	PAH	4.3E-03	1.8E-03	3.0	400.0	400.01	0.08526	0.00001	0.00007	0.00444	0.00031	0.00445
2 C Metal production	PAH	2.17	0.07	7.5	400.0	400.07	3.46231	-0.02879	0.00301	-11.51685	0.03193	11.51689
2 D 3 i	PAH	3.9E-02	6.8E-02	10	400.0	400.12	3.29055	0.00229	0.00286	0.91728	0.04046	0.91817
5 C Waste incineration	PAH	5.0E-06	2.1E-09	5.0	100	100.12	0.00000	0.00000	0.00000	-0.00001	0.00000	0.00001
5 C 1 b v Cremation	PAH	5.0E-08	1.8E-07	5.0	100	100.12	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
TOTAL		23.69	8.24	% Uncertainty in total inventory			**365.61**			Trend uncertainty:		**23.22**

NFR Source	Pollutant	Emissions 1990	Emissions 2015	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 in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into the trend in total national emissions
		kg	kg	%	%	%	%	%	%	%	%	%
1 A 1 Energy Industries	HCB	0.004	0.01	3.0	100.0	100.04	4.76109	0.03459	0.04985	3.45887	0.21148	3.46533
1 A 2 Manufacturing Industries and Construction	HCB	0.03	0.02	3.0	100.0	100.04	6.08620	-0.07102	0.06372	-7.10249	0.27034	7.10763
1 A 3 Other mobile source and machinery	HCB	3.5E-03	3.3E-03	3.0	400.0	400.01	4.63234	-0.00145	0.01213	-0.58053	0.05146	0.58281
1 A 4 a Commercial, institutional combustion	HCB	5.5E-04	8.9E-04	5.0	400.0	400.03	1.25282	0.00114	0.00328	0.45543	0.02320	0.45602
1 A 4 b Residential combustion , 1 A 4 c Combustion in Agriculture/Forestry/ Fishing	HCB	0.21	0.24	3.0	400.0	400.01	342.32984	0.07105	0.89640	28.41951	3.80311	28.67285
5 C Waste incineration	HCB	1.5E-02	5.2E-03	5.0	100	100.12	1.82494	-0.03688	0.01909	-3.68761	0.13500	3.69008
5 C 1 b v Cremation	HCB	2.2E-04	8.1E-04	5.0	100	100.12	0.28399	0.00212	0.00297	0.21230	0.02101	0.21334
TOTAL		0.27	0.28	% Uncertainty in total inventory			**342.46**			Trend uncertainty:		**29.98**

NFR Source	Pollutant	Emissions 1990	Emissions 2015	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
		g I-TEQ	g I-TEQ	%	%	%	%	%	%	%	%	%
1 A 1 Energy Industries	PCDD/PCDF	0.20	0.25	3.0	100.0	100.04	1.15140	0.00331	0.00541	0.33103	0.02295	0.33182
1 A 2 Manufacturing Industries and Construction	PCDD/PCDF	3.11	0.48	3.0	100.0	100.04	2.21838	-0.02156	0.01042	-2.15644	0.04422	2.15689
1 A 3 b Road Transport	PCDD/PCDF	0.41	1.04	3.0	400.0	400.01	19.39328	0.01856	0.02279	7.42498	0.09667	7.42561
1 A 3 Other mobile source and machinery	PCDD/PCDF	0.36	0.33	3.0	400.0	400.01	6.21899	0.00361	0.00731	1.44254	0.03100	1.44287
1 A 4 a Commercial, institutional combustion	PCDD/PCDF	0.19	0.02	5.0	400.0	400.03	0.44122	-0.00147	0.00052	-0.58687	0.00367	0.58688
1 A 4 b Residential combustion , 1 A 4 c Combustion in Agriculture/Forestry/ Fishing	PCDD/PCDF	33.08	16.80	3.0	400.0	400.01	313.30952	0.02727	0.36813	10.90673	1.56183	11.01799
1 B Extraction and distribution of fossil fuels	PCDD/PCDF	1.67	0	10.0	400.0	400.12	0.00000	-0.01717	0.00000	-6.86838	0.00000	6.86838
1 B 2 a iv Refining / storage	PCDD/PCDF	0.02	0.01	3.0	400.0	400.01	0.18577	-0.00003	0.00022	-0.01298	0.00093	0.01301
2 C Metal production	PCDD/PCDF	0.90	0.45	7.5	400.0	400.07	8.31362	0.00048	0.00977	0.19097	0.10359	0.21726
2 D 3 i	PCDD/PCDF	1.2E-03	8.2E-04	10	400.0	400.12	0.01522	0.00001	0.00002	0.00217	0.00025	0.00218
5 C Waste incineration	PCDD/PCDF	5.69	2.07	5.0	100	100.12	9.66967	-0.01316	0.04539	-1.31634	0.32096	1.35490
5 C 1 b v Cremation	PCDD/PCDF	4.0E-05	1.5E-04	5.0	100	100.12	0.00068	0.00000	0.00000	0.00028	0.00002	0.00028
5 E Other waste (Building and car fires)	PCDD/PCDF	2.7E-03	1.5E-03	5.0	100	100.12	0.00681	0.00000	0.00003	0.00044	0.00023	0.00049
TOTAL		45.64	21.45	% Uncertainty in total inventory			**314.24**			Trend uncertainty:		**15.26**

NFR Source	Pollutant	Emissions 1990	Emissions 2015	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
		t	t	%	%	%	%	%	%	%	%	%
1 A 1 Energy Industries	Pb	0.57	0.27	3.0	100.0	100.04	3.72737	0.00048	0.00049	0.04781	0.00209	0.04785
1 A 2 Manufacturing Industries and Construction	Pb	0.77	0.35	3.0	100.0	100.04	4.93708	0.00063	0.00065	0.06329	0.00277	0.06335
1 A 3 b Road Transport	Pb	456.13	4.06	3.0	200.0	200.02	114.06749	-0.00362	0.00753	-0.72448	0.03196	0.72518
1 A 3 Other mobile source and machinery	Pb	0.03	0.12	3.0	400.0	400.01	6.46764	0.00021	0.00021	0.08509	0.00091	0.08509
1 A 4 a Commercial, institutional combustion	Pb	0.12	5.01E-03	5.0	400.0	400.03	0.28188	0.00001	0.00001	0.00254	0.00007	0.00254
1 A 4 b Residential combustion , 1 A 4 c Combustion in Agriculture/Forestry/ Fishing	Pb	3.50	1.4	3.0	400.0	400.01	76.19938	0.00243	0.00252	0.97202	0.01067	0.97208
1 B Extraction and distribution of fossil fuels	Pb	0.21	0	10.0	400.0	400.12	0.00000	-0.00001	0.00000	-0.00207	0.00000	0.00207
1 B 2 a iv Refining / storage	Pb	0.41	0.17	3.0	400.0	400.01	9.66152	0.00031	0.00032	0.12358	0.00135	0.12359
2 A 3 Glass production	Pb	0.47	0.40	3.0								
2 C Metal production	Pb	76.4	0.39	7.5	400.0	400.07	21.72481	-0.00115	0.00072	-0.46179	0.00761	0.46185
5 C Waste incineration	Pb	9.0E-03	3.2E-03	5.0	100	100.12	0.04519	0.00001	0.00001	0.00057	0.00004	0.00058
5 C 1 b v Cremation	Pb	4.4E-05	1.6E-04	5.0	700	700.02	0.01588	0.00000	0.00000	0.00021	0.00000	0.00021
5 E Other waste (Building and car fires)	Pb	8.0E-07	4.3E-07	5.0	700	700.02	0.00004	7.80E-10	7.99E-10	5.46E-07	5.65E-09	5.46E-07
TOTAL		538.62	7.11	% Uncertainty in total inventory			**139.51**			Trend uncertainty:		**1.31**

NFR Source	Pollutant	Emissions 1990	Emissions 2015	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
		t	t	%	%	%	%	%	%	%	%	%
1 A 1 Energy Industries	Cd	0.08	0.03	3.0	100.0	100.04	3.26757	-0.02824	0.02436	-2.82360	0.10335	2.82549
Construction	Cd	0.09	0.04	3.0	100.0	100.04	4.66013	-0.02049	0.03474	-2.04918	0.14740	2.05447
1 A 3 b Road Transport	Cd	0.01	0.02	3.0	200.0	200.02	4.70528	0.00894	0.01755	1.78866	0.07444	1.79021
1 A 3 Other mobile source and machinery	Cd	1.2E-03	6.0E-04	3.0	400.0	400.01	0.27074	-0.00025	0.00050	-0.09898	0.00214	0.09901
1 A 4 a Commercial, institutional combustion	Cd	7.2E-03	0.01	5.0	400.0	400.03	6.63092	0.00783	0.01236	3.13019	0.08742	3.13142
1 A 4 b Residential combustion , 1 A 4 c Combustion in Agriculture/Forestry/ Fishing	Cd	0.56	0.64	3.0	400.0	400.01	289.15936	0.18219	0.53917	72.87800	2.28750	72.91389
1 B Extraction and distribution of fossil fuels	Cd	3.9E-03	0	10.0	400.0	400.12	0.00000	-0.00246	0.00000	-0.98484	0.00000	0.98484
1 B 2 a iv Refining / storage	Cd	0.08	3.30E-02	3.0	400.0	400.01	15.02556	-0.02304	0.02802	-9.21512	0.11887	9.21589
2 A 3 Glass production	Cd	0.04	0.03	3.0	400.0	400.01	14.06236	0.00356	0.02622	1.42519	0.11125	1.42952
2 C Metal production	Cd	0.24	0.03	7.5	400.0	400.07	13.51962	-0.12432	0.02521	-49.72955	0.26734	49.73027
2 D 3 i	Cd	0.07	0.04	10	400.0	400.12	20.04236	-0.00394	0.03736	-1.57698	0.52836	1.66313
5 C Waste incineration	Cd	1.1E-03	4.1E-04	5.0	100	100.12	0.04717	-0.00037	0.00035	-0.03729	0.00248	0.03738
5 C 1 b v Cremation	Cd	7.4E-06	2.7E-05	5.0	100	100.12	0.00308	0.00002	0.00002	0.00183	0.00016	0.00183
5 E Other waste (Building and car fires)	Cd	1.6E-06	8.7E-07	5.0	700	700.02	0.00069	0.00000	0.00000	-0.00020	0.00001	0.00020
TOTAL		1.18	0.88	% Uncertainty in total inventory			**291.07**			Trend uncertainty:		**88.91**

NFR Source	Pollutant	Emissions 1990	Emissions 2015	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
		t	t	%	%	%	%	%	%	%	%	%
1 A 1 Energy Industries	Hg	0.07	0.18	3.0	100	100.04	37.69583	0.13014	0.15657	13.01390	0.66428	13.03084
1 A 2 Manufacturing Industries and Construction	Hg	0.12	0.12	3.0	100	100.04	24.58031	0.05889	0.10210	5.88945	0.43316	5.90535
1 A 3 b Road Transport	Hg	8.5E-03	1.1E-02	3.0	200	200.02	4.48820	0.00627	0.00932	1.25462	0.03956	1.25524
1 A 3 Other mobile source and machinery	Hg	3.2E-03	1.5E-03	3.0	400	400.01	1.20169	0.00009	0.00125	0.03622	0.00530	0.03660
1 A 4 a Commercial, institutional combustion	Hg	9.5E-03	4.0E-03	5.0	400	400.03	3.28649	0.00001	0.00341	0.00249	0.02414	0.02427
1 A 4 b Residential combustion , 1 A 4 c Combustion in Agriculture/Forestry/ Fishing	Hg	0.06	0.04	3.0	400	400.01	35.51791	0.01597	0.03690	6.38874	0.15654	6.39066
1 B Extraction and distribution of fossil fuels	Hg	7.1E-01	4.1E-05	10.0	400	400.12	0.03391	-0.25105	0.00004	-100.41877	0.00050	100.41877
1 B 2 a iv Refining / storage	Hg	0.09	0.04	3.0	400	400.01	32.57935	0.00183	0.03384	0.73070	0.14359	0.74468
2 A 3 Glass production	Hg	8.26E-04	7.13E-04	3.0	400	400.01	0.58988	0.00032	0.00061	0.12712	0.00260	0.12714
2 C Metal production	Hg	8.58E-03	7.43E-03	7.5	400	400.07	6.14377	0.00332	0.00638	1.32776	0.06768	1.32948
2K	Hg	0.05	0.04	50	400	403.11	35.02743	0.01905	0.03611	7.61809	2.55318	8.03456
2D3a	Hg	2.7E-02	2.4E-02	10	400	400.12	19.46997	0.01067	0.02022	4.26690	0.28596	4.27647
5 C Waste incineration	Hg	6.0E-03	2.2E-03	5.0	100	100.12	0.46091	-0.00024	0.00191	-0.02409	0.01353	0.02762
5 C 1 b v Cremation	Hg	2.2E-03	8.0E-03	5.0	100	100.12	1.65693	0.00610	0.00688	0.60980	0.04863	0.61173
5 E Other waste (Building and car fires)	Hg	1.6E-06	8.7E-07	5.0	700	700.02	0.00126	0.00000	0.00000	0.00012	0.00001	0.00012
TOTAL		1.16	0.48	% Uncertainty in total inventory			**77.64**			Trend uncertainty:		**102.06**

NFR Source	Pollutant	Emissions 1990	Emissions 2015	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
		t	t	%	%	%	%	%	%	%	%	%
1 A 1 Energy Industries	As	0.78	0.12	3.0	100.0	100.04	25.93173	0.00890	0.01368	0.89048	0.05805	0.89237
Construction	As	0.11	0.07	3.0	100.0	100.04	15.05215	0.00728	0.00794	0.72808	0.03370	0.72886
1 A 3 b Road Transport	As	2.6E-04	2.7E-04	3.0	200.0	200.02	0.12077	0.00003	0.00003	0.00605	0.00014	0.00605
1 A 3 Other mobile source and machinery	As	3.9E-03	1.7E-03	3.0	400.0	400.01	1.50788	0.00017	0.00020	0.06995	0.00084	0.06995
1 A 4 a Commercial, institutional combustion	As	4.1E-03	7.6E-04	5.0	400.0	400.03	0.67418	0.00006	0.00009	0.02553	0.00063	0.02554
1 A 4 b Residential combustion , 1 A 4 c Combustion in Agriculture/Forestry/ Fishing	As	0.02	0.01	3.0	400.0	400.01	10.73091	0.00127	0.00142	0.50867	0.00601	0.50870
1 B Extraction and distribution of fossil fuels	As	7.2E-03	0	10.0	400.0	400.12	0.00000	-0.00004	0.00000	-0.01777	0.00000	0.01777
1 B 2 a iv Refining / storage	As	0.02	0.21	3.0	400.0	400.01	181.09535	0.02379	0.02390	9.51533	0.10140	9.51587
2 A 3 Glass production	As	0.05	0.05	3.0	100	100.04	9.96777	0.00494	0.00526	0.49376	0.02231	0.49426
2 C Metal production	As	7.60	2.23E-03	7.5	400	400.07	1.96622	-0.04602	0.00026	-18.40805	0.00275	18.40805
5 C Waste incineration	As	3.2E-05	1.0E-05	5.0	100	100.12	0.00229	0.00000	0.00000	0.00010	0.00001	0.00010
5 C 1 b v Cremation	As	2.0E-05	7.3E-05	5.0	100	100.12	0.01615	0.00001	0.00001	0.00084	0.00006	0.00084
5 E Other waste (Building and car fires)	As	2.6E-06	1.4E-06	5.0	700	700.02	0.00219	0.00000	0.00000	0.00010	0.00000	0.00010
TOTAL		8.59	0.45	% Uncertainty in total inventory			**184.16**			Trend uncertainty:		**20.77**

NFR Source	Pollutant	Emissions 1990	Emissions 2015	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
		t	t	%	%	%	%	%	%	%	%	%
1 A 1 Energy Industries	Cr	2.03	0.25	3.0	100	100.04	11.71983	-0.10495	0.04659	-10.49538	0.19765	10.49724
Construction	Cr	0.35	0.15	3.0	100	100.04	7.25692	0.00254	0.02885	0.25403	0.12239	0.28198
1 A 3 b Road Transport	Cr	0.20	0.33	3.0	200	200.02	31.18634	0.04667	0.06201	9.33465	0.26307	9.33835
1 A 3 Other mobile source and machinery	Cr	8.5E-03	3.2E-03	3.0	400	400.01	0.60869	-0.00003	0.00061	-0.01213	0.00257	0.01240
1 A 4 a Commercial, institutional combustion	Cr	1.3E-02	4.5E-03	5.0	400	400.03	0.85633	-0.00016	0.00085	-0.06420	0.00602	0.06448
1 A 4 b Residential combustion , 1 A 4 c Combustion in Agriculture/Forestry/ Fishing	Cr	1.04	1.13	3.0	400	400.01	214.25044	0.13492	0.21301	53.96849	0.90371	53.97605
1 B Extraction and distribution of fossil fuels	Cr	0.09	0	10.0	400	400.12	0.00000	-0.00709	0.00000	-2.83545	0.00000	2.83545
1 B 2 a iv Refining / storage	Cr	0.42	0.17	3.0	400	400.01	32.82467	0.00092	0.03263	0.36607	0.13846	0.39138
2 A 3 Glass production	Cr	0.06	0.05	3.0	400	400.01	10.37621	0.00556	0.01032	2.22502	0.04377	2.22545
2 C Metal production	Cr	1.08	0.01	7.5	400	400.07	2.81923	-0.07811	0.00280	-31.24320	0.02972	31.24322
5 C Waste incineration	Cr	3.6E-04	1.0E-04	5.0	100	100.12	0.00492	-0.00001	0.00002	-0.00071	0.00014	0.00072
5 C 1 b v Cremation	Cr	2.0E-05	7.3E-05	5.0	100	100.12	0.00346	0.00001	0.00001	0.00123	0.00010	0.00123
5 E Other waste (Building and car fires)	Cr	2.5E-06	1.3E-06	5.0	700	700.02	0.00044	0.00000	0.00000	0.00005	0.00000	0.00005
TOTAL		5.30	2.11	% Uncertainty in total inventory			**219.68**			Trend uncertainty:		**64.03**

NFR Source	Pollutant	Emissions 1990	Emissions 2015	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
		t	t	%	%	%	%	%	%	%	%	%
1 A 1 Energy Industries	Cu	0.95	0.21	3.0	100	100.04	2.75816	-0.07181	0.02415	-7.18074	0.10245	7.18147
1 A 2 Manufacturing Industries and Construction	Cu	0.61	0.34	3.0	100	100.04	4.47804	-0.02289	0.03920	-2.28932	0.16633	2.29535
1 A 3 b Road Transport	Cu	5.88	6.24	3.0	200	200.02	164.50520	0.12451	0.72035	24.90281	3.05618	25.08964
1 A 3 Other mobile source and machinery	Cu	0.11	0.07	3.0	400	400.01	3.65891	-0.00272	0.00801	-1.08601	0.03399	1.08654
1 A 4 a Commercial, institutional combustion	Cu	1.7E-02	1.5E-03	5.0	400	400.03	0.07649	-0.00157	0.00017	-0.62775	0.00118	0.62775
1 A 4 b Residential combustion , 1 A 4 c Combustion in Agriculture/Forestry/ Fishing	Cu	0.72	0.60	3.0	400	400.01	31.57986	-0.00367	0.06915	-1.46888	0.29337	1.49789
1 B Extraction and distribution of fossil fuels	Cu	2.7E-02	0	10.0	400	400.12	0.00000	-0.00270	0.00000	-1.07963	0.00000	1.07963
1 B 2 a iv Refining / storage	Cu	0.18	0.07	3.0	400	400.01	3.94214	-0.00951	0.00863	-3.80390	0.03662	3.80408
2 A 3 Glass production	Cu	1.93E-03	1.66E-03	3.0	400	400.01	0.08778	0.00000	0.00019	-0.00113	0.00082	0.00139
2 C Metal production	Cu	8.25E-02	2.97E-03	7.5	400	400.07	0.15673	-0.00800	0.00034	-3.20042	0.00364	3.20042
2D3i	Cu	0.07	0.04	10	400	400.12	2.32353	-0.00152	0.00509	-0.60684	0.07193	0.61108
5 C Waste incineration	Cu	1.4E-02	5.1E-03	5.0	100	100.12	0.06700	-0.00088	0.00059	-0.08774	0.00414	0.08784
5 C 1 b v Cremation	Cu	1.8E-05	6.7E-05	5.0	100	100.12	0.00088	0.00001	0.00001	0.00059	0.00005	0.00059
5 E Other waste (Building and car fires)	Cu	3.0E-06	1.7E-06	5.0	700	700.02	0.00016	0.00000	0.00000	-0.00008	0.00000	0.00008
TOTAL		8.66	7.59	% Uncertainty in total inventory			**167.69**			Trend uncertainty:		**26.77**

NFR Source	Pollutant	Emissions 1990	Emissions 2015	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
		t	t	%	%	%	%	%	%	%	%	%
1 A 1 Energy Industries	Ni	21.86	5.30	3.0	100	100.04	83.15866	-0.00074	0.20245	-0.07378	0.85894	0.86210
Construction	Ni	0.28	0.25	3.0	100	100.04	3.89481	0.00685	0.00948	0.68543	0.04023	0.68661
1 A 3 b Road Transport	Ni	0.11	0.06	3.0	200	200.02	1.97352	0.00141	0.00240	0.28147	0.01020	0.28165
1 A 3 Other mobile source and machinery	Ni	0.11	0.04	3.0	400	400.01	2.51470	0.00052	0.00153	0.20669	0.00650	0.20679
1 A 4 a Commercial, institutional combustion	Ni	1.2E-02	4.6E-04	5.0	400	400.03	0.02869	-0.00009	0.00002	-0.03662	0.00012	0.03662
1 A 4 b Residential combustion , 1 A 4 c Combustion in Agriculture/Forestry/ Fishing	Ni	0.16	0.11	3.0	400	400.01	6.97242	0.00272	0.00425	1.08921	0.01801	1.08935
1 B Extraction and distribution of fossil fuels	Ni	6.7E-02	0	10.0	400	400.12	0.00000	-0.00062	0.00000	-0.24811	0.00000	0.24811
1 B 2 a iv Refining / storage	Ni	0.78	0.37	3.0	400	400.01	23.26436	0.00690	0.01417	2.75868	0.06010	2.75933
2 A 3 Glass production	Ni	1.35E-01	1.17E-01	3.0	400	400.01	7.30442	0.00319	0.00445	1.27699	0.01887	1.27713
2 C Metal production	Ni	2.65	0.10	7.5	400	400.07	6.52090	-0.02066	0.00397	-8.26343	0.04211	8.26354
2D3i	Ni	0.03	0.02	10	400	400.12	1.38100	0.00054	0.00084	0.21485	0.01189	0.21518
5 C Waste incineration	Ni	3.2E-04	1.0E-04	5.0	100	100.12	0.00163	0.00000	0.00000	0.00010	0.00003	0.00011
5 C 1 b v Cremation	Ni	2.5E-05	9.3E-05	5.0	100	100.12	0.00146	0.00000	0.00000	0.00033	0.00003	0.00033
TOTAL		26.20	6.38	% Uncertainty in total inventory			**87.34**			Trend uncertainty:		**8.95**

NFR Source	Pollutant	Emissions 1990	Emissions 2015	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
		t	t	%	%	%	%	%	%	%	%	%
1 A 1 Energy Industries	Se	0.08	0.02	3.0	100	100.04	6.84890	0.07267	0.04753	7.26657	0.20167	7.26937
Construction	Se	0.08	0.06	3.0	100	100.04	18.77708	0.01158	0.13032	1.15776	0.55289	1.28300
1 A 3 b Road Transport	Se	0.01	0.01	3.0	200	200.02	3.78359	0.00922	0.01313	1.84474	0.05572	1.84558
1 A 3 Other mobile source and machinery	Se	0.00	0.00	3.0	400	400.01	5.23699	0.00156	0.00909	0.62248	0.03857	0.62367
1 A 4 a Commercial, institutional combustion	Se	2.5E-03	6.7E-04	5.0	400	400.03	0.83318	0.00239	0.00145	0.95442	0.01023	0.95448
1 A 4 b Residential combustion , 1 A 4 c Combustion in Agriculture/Forestry/ Fishing	Se	0.03	0.03	3.0	400	400.01	33.31249	0.00893	0.05782	3.57156	0.24533	3.57998
1 B Extraction and distribution of fossil fuels	Se	8.9E-03	0	10.0	400	400.12	0.00000	0.01341	0.00000	5.36240	0.00000	5.36240
1 B 2 a iv Refining / storage	Se	0.02	0.01	3.0	400	400.01	12.55574	0.00524	0.02179	2.09720	0.09247	2.09924
2 A 3 Glass production	Se	0.22	0.19	3.0	400	400.01	237.91274	0.08040	0.41297	32.15898	1.75208	32.20668
5 C 1 b v Cremation	Se	2.9E-05	1.1E-04	5.0	100	100.12	0.03327	0.00019	0.00023	0.01871	0.00163	0.01878
TOTAL		0.46	0.32	% Uncertainty in total inventory			**241.48**			Trend uncertainty:		**33.80**

NFR Source	Pollutant	Emissions 1990	Emissions 2015	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
		t	t	%	%	%	%	%	%	%	%	%
1 A 1 Energy Industries	Zn	2.26	0.72	3.0	100	100.04	2.08709	0.03373	0.01871	3.37302	0.07940	3.37395
1 A 2 Manufacturing industries and Construction	Zn	6.02	2.06	3.0	100	100.04	5.94274	0.08665	0.05329	8.66526	0.22607	8.66821
1 A 3 b Road Transport	Zn	3.71	5.75	3.0	200	200.02	33.24621	0.06283	0.14910	12.56692	0.63259	12.58283
1 A 3 Other mobile source and machinery	Zn	0.17	0.10	3.0	400	400.01	1.15123	0.00132	0.00258	0.52623	0.01095	0.52635
1 A 4 a Commercial, institutional combustion	Zn	0.38	0.14	5.0	400	400.03	1.66693	0.00510	0.00374	2.04002	0.02643	2.04019
1 A 4 b Residential combustion , 1 A 4 c Combustion in Agriculture/Forestry/ Fishing	Zn	22.94	25.12	3.0	400	400.01	290.36074	0.11683	0.65116	46.73230	2.76265	46.81389
1 B Extraction and distribution of fossil fuels	Zn	0.12	0	10.0	400	400.12	0.00000	0.00284	0.00000	1.13792	0.00000	1.13792
1 B 2 a iv Refining / storage	Zn	0.15	0.07	3.0	400	400.01	0.77419	0.00184	0.00174	0.73599	0.00737	0.73603
2 A 3 Glass production	Zn	0.10	0.09	3.0	400	400.01	1.01720	0.00009	0.00228	0.03581	0.00968	0.03709
2 C Metal production	Zn	2.68	0.53	7.5	400	400.07	6.18481	0.04847	0.01387	19.38998	0.14709	19.39054
2D3i	Zn	0.03	0.02	10	400	400.12	0.25469	0.00019	0.00057	0.07530	0.00808	0.07574
5 C Waste incineration	Zn	5.3E-04	0	5.0	100	100.12	0.00000	0.00001	0.00000	0.00122	0.00000	0.00122
5 C 1 b v Cremation	Zn	2.3E-04	8.6E-04	5.0	100	100.12	0.00249	0.00002	0.00002	0.00169	0.00016	0.00169
TOTAL		38.57	34.60	% Uncertainty in total inventory			**292.40**			Trend uncertainty:		**53.09**

NFR Source	Pollutant	Emissions 1990	Emissions 2015	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
		kg	kg	%	%	%	%	%	%	%	%	%
1 A 1 Energy Industries	PCB	1.083	3.71	3.0	100.0	100.04	0.87288	0.00570	0.00767	0.57022	0.03256	0.57115
1 A 2 Manufacturing Industries and Construction	PCB	2.45	0.50	3.0	100.0	100.04	0.11735	-0.00343	0.00103	-0.34339	0.00438	0.34342
1 A 3 Other mobile source and machinery	PCB	4.0E-02	2.4E-03	3.0	400.0	400.01	0.00228	-0.00007	0.00001	-0.02705	0.00002	0.02705
1 A 4 a Commercial, institutional combustion	PCB	0.15	1.1E-05	5.0	400.0	400.03	0.00001	-0.00028	0.00000	-0.11075	0.00000	0.11075
1 A 4 b Residential combustion , 1 A 4 c Combustion in Agriculture/Forestry/ Fishing	PCB	0.75	0.02	3.0	400.0	400.01	0.01626	-0.00134	0.00004	-0.53503	0.00015	0.53503
2 C Metal production	PCB	0.85	0.37	7.5	400	400.07	0.34970	-0.00077	0.00077	-0.30888	0.00815	0.30899
2 K	PCB	477.80	420.36	50	400	403.11	398.74881	0.00018	0.87007	0.07352	61.52345	61.52350
5 C Waste incineration	PCB	2.8E-03	1.0E-03	5.0	100	100.12	0.00024	0.00000	0.00000	-0.00030	0.00002	0.00030
5 C 1 b v Cremation	PCB	6.0E-04	2.2E-03	5.0	100	100.12	0.00052	0.00000	0.00000	0.00035	0.00003	0.00035
TOTAL		483.13	424.96	% Uncertainty in total inventory			**398.75**			Trend uncertainty:		**61.53**

APPENDIX 8. INFLUENCE OF RECALCULATIONS 1990 – 2014 IN RESPECT TO POLLUTANT AND SNAP97 SECTOR

Pollutant	SO2										
SNAP sector	**01**	**02**	**03**	**04**	**05**	**06**	**07**	**08**	**09**	**10**	**11**	**TOTAL**
1990	0%	1%	0%	0%	0%	0%	0%	0%	70806%	0%	0%	**0.5%**
1991	0%	3%	0%	0%	0%	0%	0%	0%	58250%	0%	0%	**0.8%**
1992	0%	5%	0%	0%	0%	0%	0%	0%	50442%	0%	0%	**0.7%**
1993	0%	4%	0%	0%	0%	0%	0%	0%	52404%	0%	0%	**0.7%**
1994	0%	5%	0%	0%	0%	0%	0%	0%	50917%	0%	0%	**0.8%**
1995	0%	9%	0%	0%	0%	0%	0%	0%	52098%	0%	0%	**1.1%**
1996	0%	10%	0%	0%	0%	0%	0%	0%	49315%	0%	0%	**1.4%**
1997	0%	6%	0%	0%	0%	0%	0%	0%	46936%	0%	0%	**1.1%**
1998	0%	8%	0%	0%	0%	0%	0%	0%	44801%	0%	0%	**0.8%**
1999	0%	6%	0%	0%	0%	0%	0%	0%	46709%	0%	0%	**0.9%**
2000	0%	5%	0%	0%	0%	0%	0%	0%	43647%	0%	0%	**1.2%**
2001	0%	8%	0%	0%	0%	0%	0%	0%	41616%	0%	0%	**1.4%**
2002	0%	5%	0%	0%	0%	0%	0%	0%	43685%	0%	0%	**1.2%**
2003	0%	6%	0%	0%	0%	0%	0%	0%	46998%	0%	0%	**1.3%**
2004	0%	7%	0%	0%	0%	0%	0%	0%	48426%	0%	0%	**1.6%**
2005	0%	8%	0%	0%	0%	0%	0%	0%	46969%	0%	0%	**1.5%**
2006	0%	8%	0%	0%	0%	0%	0%	0%	44618%	0%	0%	**1.4%**
2007	0%	11%	0%	0%	0%	0%	0%	0%	44834%	0%	0%	**1.4%**
2008	0%	12%	0%	0%	0%	0%	0%	0%	42027%	0%	0%	**1.4%**
2009	0%	11%	0%	0%	0%	0%	0%	0%	43578%	0%	0%	**1.5%**
2010	0%	12%	0%	0%	0%	0%	0%	0%	42415%	0%	0%	**2.2%**
2011	0%	13%	0%	0%	0%	0%	0%	0%	37518%	0%	0%	**2.3%**
2012	0%	14%	0%	0%	0%	0%	0%	0%	31992%	0%	0%	**2.4%**
2013	0%	31%	0%	0%	0%	0%	0%	0%	33419%	0%	0%	**3.8%**
2014	-22%	0%	2%	0%	0%	0%	-39%	-21%	27293%	0%	0%	**-9.7%**

Pollutant	**NOx**											
SNAP sector	**01**	**02**	**03**	**04**	**05**	**06**	**07**	**08**	**09**	**10**	**11**	**TOTAL**
1990	0%	18%	0%	0%	0%	0%	0%	0%	-67%	0%	0%	**1.2%**
1991	0%	42%	0%	0%	0%	0%	0%	0%	-72%	0%	0%	**2.8%**
1992	0%	32%	0%	0%	0%	0%	0%	0%	-84%	0%	0%	**2.3%**
1993	0%	32%	0%	0%	0%	0%	0%	0%	-69%	0%	0%	**2.8%**
1994	0%	32%	0%	0%	0%	0%	0%	0%	-64%	0%	0%	**2.3%**
1995	0%	32%	0%	0%	0%	0%	0%	0%	-50%	0%	0%	**2.4%**
1996	0%	27%	0%	0%	0%	0%	0%	0%	-51%	0%	0%	**2.5%**
1997	0%	25%	0%	0%	0%	0%	0%	0%	83%	0%	0%	**2.3%**
1998	0%	32%	0%	0%	0%	0%	0%	0%	95%	0%	0%	**2.3%**
1999	0%	26%	0%	0%	0%	0%	0%	0%	-60%	0%	0%	**2.0%**
2000	0%	23%	0%	0%	0%	0%	0%	0%	147%	0%	0%	**1.9%**
2001	0%	31%	0%	0%	0%	0%	0%	0%	149%	0%	0%	**2.4%**
2002	0%	28%	0%	0%	0%	0%	0%	0%	177%	0%	0%	**2.2%**
2003	0%	28%	0%	0%	0%	0%	0%	0%	276%	0%	0%	**2.4%**
2004	0%	29%	0%	0%	0%	0%	0%	0%	123%	0%	0%	**2.4%**
2005	0%	33%	0%	0%	0%	0%	0%	0%	128%	0%	0%	**2.7%**
2006	0%	33%	0%	0%	0%	0%	0%	0%	118%	0%	0%	**2.5%**
2007	0%	40%	0%	0%	0%	0%	0%	0%	137%	0%	0%	**2.6%**
2008	0%	40%	0%	0%	0%	0%	0%	0%	120%	0%	0%	**2.7%**
2009	0%	43%	0%	0%	0%	0%	0%	0%	127%	0%	0%	**3.2%**
2010	0%	45%	0%	0%	0%	0%	0%	0%	214%	0%	0%	**3.9%**
2011	0%	43%	0%	0%	0%	0%	0%	0%	332%	0%	0%	**3.7%**
2012	0%	46%	0%	0%	0%	0%	0%	0%	334%	0%	0%	**4.0%**
2013	0%	53%	0%	-1%	0%	0%	0%	0%	320%	0%	0%	**4.3%**
2014	-2%	-2%	1%	0%	0%	0%	-2%	-19%	371%	13%	0%	**-4.2%**

Pollutant	**NMVOC**											
SNAP sector	**01**	**02**	**03**	**04**	**05**	**06**	**07**	**08**	**09**	**10**	**11**	**TOTAL**
1990	0%	98%	0%	0%	-17%	0%	0%	0%	5%	0%	0%	**7.7%**
1991	0%	258%	0%	0%	-22%	0%	0%	0%	4%	0%	0%	**17.4%**
1992	0%	277%	0%	0%	10%	0%	0%	0%	3%	0%	0%	**20.8%**
1993	0%	321%	0%	0%	-20%	0%	0%	0%	3%	0%	0%	**22.1%**
1994	0%	264%	0%	0%	-15%	0%	0%	0%	3%	0%	0%	**19.2%**
1995	0%	275%	0%	0%	-17%	0%	0%	0%	2%	0%	0%	**20.0%**
1996	0%	241%	0%	0%	-19%	0%	0%	0%	2%	0%	0%	**20.0%**
1997	0%	218%	0%	0%	-19%	0%	0%	0%	2%	0%	0%	**17.6%**
1998	0%	241%	0%	0%	-19%	0%	0%	0%	2%	0%	0%	**18.6%**
1999	0%	258%	0%	0%	-20%	0%	0%	0%	2%	0%	0%	**19.2%**
2000	0%	183%	0%	0%	-21%	0%	0%	0%	2%	0%	0%	**15.3%**
2001	0%	302%	0%	0%	-19%	0%	0%	0%	2%	0%	0%	**21.2%**
2002	0%	279%	0%	0%	-20%	0%	0%	0%	2%	0%	0%	**19.1%**
2003	0%	240%	0%	0%	-20%	0%	0%	0%	2%	0%	0%	**21.0%**
2004	0%	242%	0%	0%	-19%	0%	0%	0%	2%	0%	0%	**19.8%**
2005	0%	276%	0%	0%	-21%	0%	0%	0%	2%	0%	0%	**22.1%**
2006	0%	246%	0%	0%	-21%	0%	0%	0%	2%	0%	0%	**18.5%**
2007	0%	294%	0%	0%	-18%	0%	0%	0%	2%	0%	0%	**18.5%**
2008	0%	281%	0%	0%	-20%	0%	0%	0%	1%	0%	0%	**18.5%**
2009	0%	275%	0%	0%	-18%	0%	0%	0%	1%	0%	0%	**22.1%**
2010	0%	251%	0%	0%	-19%	0%	0%	0%	2%	0%	0%	**23.9%**
2011	0%	189%	0%	0%	-21%	0%	0%	0%	2%	0%	0%	**21.5%**
2012	0%	174%	0%	0%	-21%	0%	0%	0%	2%	0%	0%	**21.8%**
2013	0%	188%	0%	0%	-22%	0%	0%	0%	4%	0%	0%	**22.2%**
2014	3%	1%	-7%	0.18%	-24%	0%	-4%	-13%	4%	1%	0%	**-1.6%**

Pollutant	**CO**											
SNAP sector	**01**	**02**	**03**	**04**	**05**	**06**	**07**	**08**	**09**	**10**	**11**	**TOTAL**
1990	0%	92%	0%	0%	0%	0%	0%	0%	1905%	0%	0%	**20.0%**
1991	0%	244%	0%	0%	0%	0%	0%	0%	1541%	0%	0%	**44.5%**
1992	0%	276%	0%	0%	0%	0%	0%	0%	819%	0%	0%	**48.3%**
1993	0%	322%	0%	0%	0%	0%	0%	0%	1716%	0%	0%	**51.1%**
1994	0%	266%	0%	0%	0%	0%	0%	0%	1999%	0%	0%	**41.7%**
1995	0%	278%	0%	0%	0%	0%	0%	0%	2860%	0%	0%	**42.3%**
1996	0%	244%	0%	0%	0%	0%	0%	0%	2751%	0%	0%	**43.2%**
1997	0%	220%	0%	0%	0%	0%	0%	0%	9624%	0%	0%	**39.0%**
1998	0%	241%	0%	0%	0%	0%	0%	0%	10166%	0%	0%	**39.6%**
1999	0%	259%	0%	0%	0%	0%	0%	0%	2189%	0%	0%	**39.9%**
2000	0%	183%	0%	0%	0%	0%	0%	0%	12684%	0%	0%	**30.5%**
2001	0%	306%	0%	0%	0%	0%	0%	0%	12659%	0%	0%	**44.7%**
2002	0%	280%	0%	0%	0%	0%	0%	0%	13843%	0%	0%	**43.4%**
2003	0%	240%	0%	0%	0%	0%	0%	0%	18382%	0%	0%	**46.6%**
2004	0%	243%	0%	0%	0%	0%	0%	0%	11560%	0%	0%	**48.6%**
2005	0%	276%	0%	0%	0%	0%	0%	0%	11716%	0%	0%	**56.0%**
2006	0%	247%	0%	0%	0%	0%	0%	0%	11186%	0%	0%	**49.2%**
2007	0%	299%	0%	0%	0%	0%	0%	0%	12119%	0%	0%	**50.5%**
2008	0%	286%	0%	0%	0%	0%	0%	0%	11198%	0%	0%	**59.5%**
2009	0%	280%	0%	0%	0%	0%	0%	0%	11637%	0%	0%	**62.2%**
2010	0%	255%	0%	0%	0%	0%	0%	0%	12767%	0%	0%	**69.1%**
2011	0%	191%	0%	0%	0%	0%	0%	0%	17522%	0%	0%	**62.8%**
2012	0%	176%	0%	0%	0%	0%	0%	0%	17797%	0%	0%	**62.4%**
2013	0%	191%	0%	0%	0%	0%	0%	0%	16941%	0%	0%	**70.3%**
2014	2%	1%	1%	0%	0%	0%	-4%	-8%	18967%	0%	0%	**-0.4%**

Pollutant	**NH3**											
SNAP sector	**01**	**02**	**03**	**04**	**05**	**06**	**07**	**08**	**09**	**10**	**11**	**TOTAL**
1990	0%	121%	0%	0%	0%	0%	0%	0%	3%	4%	0%	**7.3%**
1991	0%	308%	0%	0%	0%	0%	0%	0%	3%	4%	0%	**9.7%**
1992	0%	308%	0%	0%	0%	0%	0%	0%	3%	3%	0%	**8.2%**
1993	0%	361%	0%	0%	0%	0%	0%	0%	3%	3%	0%	**9.5%**
1994	0%	286%	0%	0%	0%	0%	0%	0%	3%	3%	0%	**8.7%**
1995	0%	298%	0%	0%	0%	0%	0%	0%	3%	2%	0%	**8.8%**
1996	0%	260%	0%	0%	0%	0%	0%	0%	3%	2%	0%	**8.8%**
1997	0%	234%	0%	0%	0%	0%	0%	0%	3%	2%	0%	**7.8%**
1998	0%	260%	0%	0%	0%	0%	0%	0%	3%	1%	0%	**8.2%**
1999	0%	283%	0%	0%	0%	0%	0%	0%	3%	2%	0%	**9.1%**
2000	0%	196%	0%	0%	0%	0%	0%	0%	3%	2%	0%	**7.1%**
2001	0%	326%	0%	0%	0%	0%	0%	0%	3%	3%	0%	**9.0%**
2002	0%	303%	0%	0%	0%	0%	0%	0%	3%	2%	0%	**8.3%**
2003	0%	258%	0%	0%	0%	0%	0%	0%	3%	2%	0%	**9.0%**
2004	0%	258%	0%	0%	0%	0%	0%	0%	3%	2%	0%	**7.9%**
2005	0%	298%	0%	0%	0%	0%	0%	0%	3%	2%	0%	**9.5%**
2006	0%	263%	0%	0%	0%	0%	0%	0%	3%	2%	0%	**8.8%**
2007	0%	314%	0%	0%	0%	0%	0%	0%	3%	2%	0%	**8.7%**
2008	0%	302%	0%	0%	0%	0%	0%	0%	3%	2%	0%	**8.9%**
2009	0%	293%	0%	0%	0%	0%	0%	0%	3%	2%	0%	**8.9%**
2010	0%	268%	0%	0%	0%	0%	0%	0%	3%	1%	0%	**8.4%**
2011	0%	199%	0%	0%	0%	0%	-1%	0%	3%	0%	0%	**6.4%**
2012	0%	182%	0%	0%	0%	0%	-2%	0%	3%	1%	0%	**6.7%**
2013	0%	197%	0%	0%	0%	0%	-2%	0%	3%	0%	0%	**6.8%**
2014	0%	1%	18%	0%	0%	0%	-1%	-23%	3%	6%	0%	**5.2%**

Pollutant	TSP										
SNAP sector	01	02	03	04	05	06	07	08	09	10	11	TOTAL
1990	0%	105%	0%	0%	0%	0%	0%	0%	3357%	0%	0%	**40.8%**
1991	0%	274%	0%	0%	0%	0%	0%	0%	3290%	0%	0%	**93.6%**
1992	0%	290%	0%	0%	0%	0%	0%	0%	2016%	0%	0%	**101.0%**
1993	0%	337%	0%	0%	0%	0%	0%	0%	2797%	0%	0%	**114.8%**
1994	0%	274%	0%	0%	0%	0%	0%	0%	1893%	0%	0%	**84.5%**
1995	0%	286%	0%	0%	0%	0%	0%	0%	1309%	0%	0%	**88.7%**
1996	0%	250%	0%	0%	0%	0%	0%	0%	1191%	0%	0%	**86.5%**
1997	0%	226%	0%	0%	0%	0%	0%	0%	1422%	0%	0%	**70.0%**
1998	0%	250%	0%	0%	0%	0%	0%	0%	1159%	0%	0%	**72.3%**
1999	0%	269%	0%	0%	0%	0%	0%	0%	1345%	0%	0%	**72.5%**
2000	0%	189%	0%	0%	0%	0%	0%	0%	1103%	0%	0%	**60.9%**
2001	0%	315%	0%	0%	0%	0%	0%	0%	1432%	0%	0%	**86.0%**
2002	0%	291%	0%	0%	0%	0%	0%	0%	1530%	0%	0%	**67.5%**
2003	0%	249%	0%	0%	0%	0%	0%	0%	1450%	0%	0%	**59.0%**
2004	0%	250%	0%	0%	0%	0%	0%	0%	1527%	0%	0%	**54.4%**
2005	0%	288%	0%	0%	0%	0%	0%	0%	1590%	0%	0%	**63.3%**
2006	0%	255%	0%	0%	0%	0%	0%	0%	1808%	0%	0%	**55%**
2007	0%	307%	0%	0%	0%	0%	0%	0%	1973%	0%	0%	**54%**
2008	0%	294%	0%	0%	0%	0%	0%	0%	1825%	0%	0%	**47.7%**
2009	0%	287%	0%	0%	0%	0%	0%	0%	1654%	0%	0%	**51.5%**
2010	0%	262%	0%	0%	0%	0%	0%	0%	1136%	0%	0%	**56.9%**
2011	0%	195%	0%	0%	0%	0%	0%	0%	1404%	0%	0%	**46.7%**
2012	0%	179%	0%	0%	0%	0%	0%	0%	1163%	0%	0%	**44.6%**
2013	0%	194%	0%	0%	0%	0%	0%	0%	1160%	0%	0%	**49.3%**
2014	-14%	1%	14%	0%	0%	0%	0%	-19%	1440%	0%	0%	**0.2%**

Pollutant	**PM2.5**											
SNAP sector	**01**	**02**	**03**	**04**	**05**	**06**	**07**	**08**	**09**	**10**	**11**	**TOTAL**
1990	0%	106%	0%	0%	0%	0%	0%	0%	4204%	0%	0%	**64.9%**
1991	0%	276%	0%	0%	0%	0%	0%	0%	4262%	0%	0%	**158.0%**
1992	0%	290%	0%	0%	0%	0%	0%	0%	2516%	0%	0%	**164.5%**
1993	0%	338%	0%	0%	0%	0%	0%	0%	3634%	0%	0%	**189.5%**
1994	0%	274%	0%	0%	0%	0%	0%	0%	2361%	0%	0%	**156.7%**
1995	0%	286%	0%	0%	0%	0%	0%	0%	1595%	0%	0%	**160.5%**
1996	0%	250%	0%	0%	0%	0%	0%	0%	1465%	0%	0%	**153.2%**
1997	0%	226%	0%	0%	0%	0%	0%	0%	1787%	0%	0%	**128.5%**
1998	0%	250%	0%	0%	0%	0%	0%	0%	1444%	0%	0%	**135.9%**
1999	0%	269%	0%	0%	0%	0%	0%	0%	1687%	0%	0%	**147.2%**
2000	0%	189%	0%	0%	0%	0%	0%	0%	1358%	0%	0%	**112.5%**
2001	0%	315%	0%	0%	0%	0%	0%	0%	1824%	0%	0%	**164.1%**
2002	0%	291%	0%	0%	0%	0%	0%	0%	1983%	0%	0%	**151.1%**
2003	0%	248%	0%	0%	0%	0%	0%	0%	1855%	0%	0%	**141.5%**
2004	0%	250%	0%	0%	0%	0%	0%	0%	2014%	0%	0%	**140.9%**
2005	0%	287%	0%	0%	0%	0%	0%	0%	2139%	0%	0%	**160.3%**
2006	0%	255%	0%	0%	0%	0%	0%	0%	2503%	0%	0%	**136.8%**
2007	0%	306%	0%	0%	0%	0%	0%	0%	2881%	0%	0%	**145.7%**
2008	0%	294%	0%	0%	0%	0%	0%	0%	2732%	0%	0%	**142.4%**
2009	0%	286%	0%	0%	0%	0%	0%	0%	2533%	0%	0%	**143.9%**
2010	0%	261%	0%	0%	0%	0%	0%	0%	1721%	0%	0%	**141.1%**
2011	0%	195%	0%	0%	0%	0%	0%	0%	2104%	0%	0%	**115.8%**
2012	0%	179%	0%	0%	0%	0%	0%	0%	1716%	0%	0%	**107.8%**
2013	0%	194%	0%	0%	0%	0%	0%	0%	1756%	0%	0%	**114.3%**
2014	-10%	1%	14%	0%	0%	0%	-1%	-19%	2017%	0%	0%	**0.5%**

Pollutant	**PM10**											
SNAP sector	**01**	**02**	**03**	**04**	**05**	**06**	**07**	**08**	**09**	**10**	**11**	**TOTAL**
1990	0%	105%	0%	0%	0%	0%	0%	0%	3802%	0%	0%	0%
1991	0%	276%	0%	0%	0%	0%	0%	0%	3793%	0%	0%	0%
1992	0%	290%	0%	0%	0%	0%	0%	0%	2281%	0%	0%	0%
1993	0%	338%	0%	0%	0%	0%	0%	0%	3234%	0%	0%	0%
1994	0%	274%	0%	0%	0%	0%	0%	0%	2143%	0%	0%	0%
1995	0%	286%	0%	0%	0%	0%	0%	0%	1463%	0%	0%	0%
1996	0%	250%	0%	0%	0%	0%	0%	0%	1337%	0%	0%	0%
1997	0%	226%	0%	0%	0%	0%	0%	0%	1615%	0%	0%	0%
1998	0%	250%	0%	0%	0%	0%	0%	0%	1309%	0%	0%	0%
1999	0%	269%	0%	0%	0%	0%	0%	0%	1524%	0%	0%	0%
2000	0%	189%	0%	0%	0%	0%	0%	0%	1237%	0%	0%	0%
2001	0%	315%	0%	0%	0%	0%	0%	0%	1634%	0%	0%	0%
2002	0%	291%	0%	0%	0%	0%	0%	0%	1763%	0%	0%	0%
2003	0%	248%	0%	0%	0%	0%	0%	0%	1660%	0%	0%	0%
2004	0%	250%	0%	0%	0%	0%	0%	0%	1776%	0%	0%	0%
2005	0%	288%	0%	0%	0%	0%	0%	0%	1868%	0%	0%	0%
2006	0%	255%	0%	0%	0%	0%	0%	0%	2154%	0%	0%	0%
2007	0%	306%	0%	0%	0%	0%	0%	0%	2413%	0%	0%	0%
2008	0%	294%	0%	0%	0%	0%	0%	0%	2258%	0%	0%	0%
2009	0%	286%	0%	0%	0%	0%	0%	0%	2069%	0%	0%	0%
2010	0%	262%	0%	0%	0%	0%	0%	0%	1414%	0%	0%	0%
2011	0%	195%	0%	0%	0%	0%	0%	0%	1738%	0%	0%	0%
2012	0%	179%	0%	0%	0%	0%	0%	0%	1431%	0%	0%	0%
2013	0%	194%	0%	0%	0%	0%	0%	0%	1444%	0%	0%	0%
2014	-12%	1%	14%	0%	0%	0%	0%	-19%	1727%	0%	0%	-12%

Pollutant	**Cd**											
SNAP sector	**01**	**02**	**03**	**04**	**05**	**06**	**07**	**08**	**09**	**10**	**11**	**TOTAL**
1990	0%	112%	0%	0%	0%	0%	0%	0%	127%	0%	0%	**34.3%**
1991	0%	280%	0%	0%	0%	0%	0%	0%	94%	0%	0%	**85.7%**
1992	0%	286%	0%	0%	0%	0%	0%	0%	82%	0%	0%	**99.1%**
1993	0%	330%	0%	0%	0%	0%	0%	0%	96%	0%	0%	**108.1%**
1994	0%	267%	0%	0%	0%	0%	0%	0%	92%	0%	0%	**106.9%**
1995	0%	276%	0%	0%	0%	0%	0%	0%	106%	0%	0%	**102.6%**
1996	0%	244%	0%	0%	0%	0%	0%	0%	95%	0%	0%	**104.2%**
1997	0%	221%	0%	0%	0%	0%	0%	0%	89%	0%	0%	**90.0%**
1998	0%	243%	0%	0%	0%	0%	0%	0%	83%	0%	0%	**87.8%**
1999	0%	263%	0%	0%	0%	0%	0%	0%	88%	0%	0%	**89.0%**
2000	0%	185%	0%	0%	0%	0%	0%	0%	80%	0%	0%	**61.0%**
2001	0%	300%	0%	0%	0%	0%	0%	0%	71%	0%	0%	**86.4%**
2002	0%	279%	0%	0%	0%	0%	0%	0%	74%	0%	0%	**81.0%**
2003	0%	241%	0%	0%	0%	0%	0%	0%	86%	0%	0%	**78.8%**
2004	0%	240%	0%	0%	0%	0%	0%	0%	79%	0%	0%	**77.5%**
2005	0%	275%	0%	1%	0%	0%	0%	0%	78%	0%	0%	**84.0%**
2006	0%	243%	0%	0%	0%	0%	0%	0%	73%	0%	0%	**72.6%**
2007	0%	289%	0%	0%	0%	0%	0%	0%	75%	0%	0%	**86.1%**
2008	0%	276%	0%	0%	0%	0%	0%	0%	86%	0%	0%	**87.7%**
2009	0%	268%	0%	-1%	0%	0%	0%	0%	81%	0%	0%	**91.2%**
2010	0%	245%	0%	0%	0%	0%	0%	0%	136%	0%	0%	**92.9%**
2011	0%	185%	0%	0%	0%	0%	0%	0%	164%	0%	0%	**83.2%**
2012	0%	170%	0%	1%	0%	0%	0%	0%	107%	0%	0%	**81.7%**
2013	0%	182%	0%	-10%	0%	0%	0%	0%	191%	0%	0%	**85.2%**
2014	1%	0%	8%	9%	0%	0%	0%	-23%	204%	0%	0%	**1.7%**

Pollutant	**Hg**										
SNAP sector	**01**	**02**	**03**	**04**	**05**	**06**	**07**	**08**	**09**	**10**	**11**	**TOTAL**
1990	0%	23%	0%	0%	0%	0%	0%	0%	3%	0%	0%	**1.1%**
1991	0%	57%	0%	0%	0%	0%	0%	0%	2%	0%	0%	**1.9%**
1992	0%	77%	0%	0%	0%	0%	0%	0%	2%	0%	0%	**1.7%**
1993	0%	73%	0%	0%	0%	0%	0%	0%	2%	0%	0%	**6.2%**
1994	0%	74%	0%	0%	0%	0%	0%	0%	2%	0%	0%	**5.8%**
1995	0%	72%	0%	0%	0%	0%	0%	0%	2%	0%	0%	**6.3%**
1996	0%	68%	0%	0%	0%	0%	0%	0%	1%	0%	0%	**7.0%**
1997	0%	60%	0%	0%	0%	0%	0%	0%	1%	0%	0%	**5.3%**
1998	0%	61%	0%	0%	0%	0%	0%	0%	1%	0%	0%	**5.2%**
1999	0%	60%	0%	0%	0%	0%	0%	0%	2%	0%	0%	**4.8%**
2000	0%	51%	0%	0%	0%	0%	0%	0%	2%	0%	0%	**3.0%**
2001	0%	67%	0%	0%	0%	0%	0%	0%	2%	0%	0%	**3.8%**
2002	0%	61%	0%	0%	0%	0%	0%	0%	1%	0%	0%	**3.3%**
2003	0%	57%	0%	0%	0%	0%	0%	0%	1%	0%	0%	**3.5%**
2004	0%	59%	0%	0%	0%	0%	0%	0%	1%	0%	0%	**3.4%**
2005	0%	63%	0%	0%	0%	0%	0%	0%	1%	0%	0%	**3.6%**
2006	0%	58%	0%	0%	0%	0%	0%	0%	1%	0%	0%	**3.3%**
2007	0%	66%	0%	0%	0%	0%	0%	0%	1%	0%	0%	**3.2%**
2008	0%	61%	0%	0%	0%	0%	0%	0%	1%	0%	0%	**3.3%**
2009	0%	61%	0%	0%	0%	0%	0%	0%	1%	0%	0%	**3.8%**
2010	0%	59%	0%	0%	0%	0%	0%	0%	1%	0%	0%	**3.8%**
2011	0%	53%	0%	0%	0%	0%	0%	0%	1%	0%	0%	**3.6%**
2012	0%	54%	0%	0%	0%	0%	0%	0%	1%	0%	0%	**3.7%**
2013	0%	58%	0%	-5%	0%	0%	0%	0%	1%	0%	0%	**3.2%**
2014	0%	-3%	-1%	3%	0%	0%	0%	-2%	1%	0%	0%	**-0.3%**

Pollutant	Pb										
SNAP sector	01	02	03	04	05	06	07	08	09	10	11	TOTAL
1990	0%	49%	0%	0%	0%	0%	0%	0%	37%	0%	0%	**0.1%**
1991	0%	140%	0%	0%	0%	0%	0%	0%	26%	0%	0%	**0.3%**
1992	0%	219%	0%	0%	0%	0%	0%	0%	24%	0%	0%	**0.3%**
1993	0%	223%	0%	0%	0%	0%	0%	0%	28%	0%	0%	**0.3%**
1994	0%	221%	0%	0%	0%	0%	0%	0%	27%	0%	0%	**0.3%**
1995	0%	237%	0%	0%	0%	0%	0%	0%	34%	0%	0%	**0.3%**
1996	0%	214%	0%	0%	0%	0%	0%	0%	30%	0%	0%	**0.4%**
1997	0%	196%	0%	0%	0%	0%	0%	0%	26%	0%	0%	**0.3%**
1998	0%	198%	0%	0%	0%	0%	0%	0%	24%	0%	0%	**0.3%**
1999	0%	216%	0%	0%	0%	0%	0%	0%	24%	0%	0%	**0.3%**
2000	0%	158%	0%	0%	0%	0%	0%	0%	22%	0%	0%	**0.3%**
2001	0%	279%	0%	-1%	0%	0%	0%	0%	18%	0%	0%	**0.4%**
2002	0%	244%	0%	0%	0%	0%	0%	0%	20%	0%	0%	**0.6%**
2003	0%	207%	0%	-1%	0%	0%	0%	0%	25%	0%	0%	**1.4%**
2004	0%	225%	0%	0%	0%	0%	0%	0%	23%	0%	0%	**1.6%**
2005	0%	249%	0%	1%	0%	0%	0%	0%	23%	0%	0%	**2.0%**
2006	0%	227%	0%	0%	0%	0%	0%	0%	20%	0%	0%	**11.8%**
2007	0%	285%	0%	0%	0%	0%	0%	0%	21%	0%	0%	**11.7%**
2008	0%	272%	0%	0%	0%	0%	0%	0%	24%	0%	0%	**11.8%**
2009	0%	268%	0%	-2%	0%	0%	0%	0%	24%	0%	0%	**12.3%**
2010	0%	239%	0%	0%	0%	0%	0%	0%	38%	0%	0%	**14.0%**
2011	0%	182%	0%	0%	0%	0%	0%	0%	46%	0%	0%	**12.6%**
2012	0%	168%	0%	2%	0%	0%	0%	0%	32%	0%	0%	**13.4%**
2013	0%	182%	0%	-13%	0%	0%	0%	0%	58%	0%	0%	**11.4%**
2014	-8%	1%	2%	11%	0%	0%	0%	-1%	59%	0%	0%	**1.6%**

Pollutant	**PCDD/PCDF**										
SNAP sector	**01**	**02**	**03**	**04**	**05**	**06**	**07**	**08**	**09**	**10**	**11**	**TOTAL**
1990	0%	95%	0%	0%	0%	0%	0%	0%	0%	0%	0%	**55.0%**
1991	0%	253%	0%	0%	0%	0%	0%	0%	0%	0%	0%	**127.5%**
1992	0%	285%	0%	0%	0%	0%	0%	0%	0%	0%	0%	**134.1%**
1993	0%	332%	0%	0%	0%	0%	0%	0%	0%	0%	0%	**154.3%**
1994	0%	273%	0%	0%	0%	0%	0%	0%	0%	0%	0%	**133.8%**
1995	0%	285%	0%	0%	0%	0%	0%	0%	0%	0%	0%	**149.2%**
1996	0%	251%	0%	0%	0%	0%	0%	0%	0%	0%	0%	**144.3%**
1997	0%	226%	0%	0%	0%	0%	0%	0%	0%	0%	0%	**126.5%**
1998	0%	248%	0%	0%	0%	0%	0%	0%	0%	0%	0%	**132.3%**
1999	0%	268%	0%	-1%	0%	0%	0%	0%	0%	0%	0%	**138.9%**
2000	0%	188%	0%	-2%	0%	0%	0%	0%	0%	0%	0%	**100.7%**
2001	0%	315%	0%	-3%	0%	0%	0%	0%	0%	0%	0%	**142.9%**
2002	0%	290%	0%	-3%	0%	0%	0%	0%	0%	0%	0%	**136.9%**
2003	0%	247%	0%	-5%	0%	0%	0%	0%	0%	0%	0%	**136.3%**
2004	0%	250%	0%	0%	0%	0%	0%	0%	0%	0%	0%	**132.3%**
2005	0%	286%	0%	6%	0%	0%	0%	0%	0%	0%	0%	**148.6%**
2006	0%	254%	0%	0%	0%	0%	0%	0%	0%	0%	0%	**124.7%**
2007	0%	307%	0%	0%	0%	0%	0%	0%	0%	0%	0%	**126.6%**
2008	0%	294%	0%	0%	0%	0%	0%	0%	0%	0%	0%	**131.7%**
2009	0%	287%	0%	-13%	0%	0%	93%	0%	0%	0%	0%	**128.5%**
2010	0%	261%	0%	0%	0%	0%	87%	0%	0%	0%	0%	**171.9%**
2011	0%	195%	0%	0%	0%	0%	82%	0%	0%	0%	0%	**135.2%**
2012	0%	179%	0%	72%	0%	0%	98%	0%	0%	0%	0%	**113.3%**
2013	0%	193%	0%	-39%	0%	0%	83%	0%	0%	0%	0%	**129.2%**
2014	0%	1%	7%	17%	0%	0%	205%	-2%	0%	0%	0%	**4.7%**

Pollutant	PCB										
SNAP sector	**01**	**02**	**03**	**04**	**05**	**06**	**07**	**08**	**09**	**10**	**11**	**TOTAL**
1990	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	**0.0003%**
1991	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	**0.0005%**
1992	0%	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	**0.0004%**
1993	0%	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	**0.0005%**
1994	0%	2%	0%	0%	0%	0%	0%	0%	0%	0%	0%	**0.0004%**
1995	0%	2%	0%	0%	0%	0%	0%	0%	0%	0%	0%	**0.0004%**
1996	0%	2%	0%	0%	0%	0%	0%	0%	0%	0%	0%	**0.0005%**
1997	0%	2%	0%	0%	0%	0%	0%	0%	0%	0%	0%	**0.0004%**
1998	0%	2%	0%	0%	0%	0%	0%	0%	0%	0%	0%	**0.0004%**
1999	0%	2%	0%	-1%	0%	0%	0%	0%	0%	0%	0%	**-0.0001%**
2000	0%	2%	0%	-2%	0%	0%	0%	0%	0%	0%	0%	**-0.0004%**
2001	0%	4%	0%	-3%	0%	0%	0%	0%	0%	0%	0%	**-0.0006%**
2002	0%	2%	0%	-3%	0%	0%	0%	0%	0%	0%	0%	**-0.0002%**
2003	0%	2%	0%	-6%	0%	0%	0%	0%	0%	0%	0%	**-0.0009%**
2004	0%	4%	0%	0%	0%	0%	0%	0%	0%	0%	0%	**0.0005%**
2005	0%	3%	0%	7%	0%	0%	0%	0%	0%	0%	0%	**0.0032%**
2006	0%	3%	0%	0%	0%	0%	0%	0%	0%	0%	0%	**0.0004%**
2007	0%	6%	0%	0%	0%	0%	0%	0%	0%	0%	0%	**0.0004%**
2008	0%	5%	0%	0%	0%	0%	0%	0%	0%	0%	0%	**0.0004%**
2009	0%	5%	0%	-15%	0%	0%	0%	0%	0%	0%	0%	**-0.0042%**
2010	0%	4%	0%	0%	0%	0%	0%	0%	0%	0%	0%	**0.0004%**
2011	0%	3%	0%	0%	0%	0.0%	0%	0%	0%	0%	0%	**0.0003%**
2012	0%	3%	0%	469%	0%	0.0%	0%	0%	0%	0%	0%	**0.0031%**
2013	0%	4%	0%	-41%	0%	0.0%	0%	0%	0%	0%	0%	**-0.0258%**
2014	0%	15%	2%	17%	0%	0.0%	0%	-2%	0%	0%	0%	**0.01782%**

Pollutant	**PAHs**										
SNAP sector	**01**	**02**	**03**	**04**	**05**	**06**	**07**	**08**	**09**	**10**	**11**	**TOTAL**
1990	0%	77%	0%	0%	0%	0%	0%	0%	99%	0%	0%	**50.7%**
1991	0%	210%	0%	0%	0%	0%	0%	0%	69%	0%	0%	**136.7%**
1992	0%	264%	0%	0%	0%	0%	0%	0%	64%	0%	0%	**194.3%**
1993	0%	308%	0%	0%	0%	0%	0%	0%	74%	0%	0%	**228.4%**
1994	0%	261%	0%	0%	0%	0%	0%	0%	73%	0%	0%	**194.7%**
1995	0%	274%	0%	0%	0%	0%	0%	0%	90%	0%	0%	**213.4%**
1996	0%	242%	0%	0%	0%	0%	0%	0%	80%	0%	0%	**198.1%**
1997	0%	219%	0%	0%	0%	0%	0%	0%	19%	0%	0%	**179.2%**
1998	0%	236%	0%	0%	0%	0%	0%	0%	9%	0%	0%	**193.3%**
1999	0%	253%	0%	-1%	0%	0%	0%	0%	9%	0%	0%	**211.2%**
2000	0%	180%	0%	-2%	0%	0%	0%	0%	6%	0%	0%	**154.4%**
2001	0%	306%	0%	-3%	0%	0%	0%	0%	5%	0%	0%	**252.7%**
2002	0%	279%	0%	-2%	0%	0%	0%	0%	9%	0%	0%	**231.6%**
2003	0%	237%	0%	-5%	0%	0%	0%	0%	49%	0%	0%	**205.2%**
2004	0%	243%	0%	0%	0%	0%	0%	0%	149%	0%	0%	**202.8%**
2005	0%	273%	0%	6%	0%	0%	0%	0%	1691%	0%	0%	**228.7%**
2006	0%	245%	0%	0%	0%	0%	0%	0%	51%	0%	0%	**204.0%**
2007	0%	298%	0.0%	0%	0%	0%	0%	0%	69%	0%	0%	**229.3%**
2008	0%	283%	0.0%	0%	0%	0%	0%	0%	57%	0%	0%	**222.4%**
2009	0%	279%	0.0%	-13%	0%	0%	0%	0%	2842%	0%	0%	**217.3%**
2010	0%	250%	0.0%	0%	0%	0%	0%	0%	1322%	0%	0%	**191.9%**
2011	0%	189%	0.0%	0%	0%	0%	0%	0%	1683%	0%	0%	**154.9%**
2012	0%	174%	0.0%	66%	0%	0%	0%	0%	1857%	0%	0%	**141.9%**
2013	0%	186%	0.0%	-39%	0%	0%	0%	0%	1730%	0%	0%	**142.6%**
2014	0%	1%	1.7%	17%	0%	0%	-1%	-15%	1768%	0%	0%	**1.0%**

Pollutant	**As**											
SNAP sector	**01**	**02**	**03**	**04**	**05**	**06**	**07**	**08**	**09**	**10**	**11**	**TOTAL**
1990	0%	19%	0%	0%	0%	0%	0%	0%	1007%	0%	0%	**0.1%**
1991	0%	52%	0%	0%	0%	0%	0%	0%	685%	0%	0%	**0.2%**
1992	0%	90%	0%	0%	0%	0%	0%	0%	534%	0%	0%	**0.8%**
1993	0%	80%	0%	0%	0%	0%	0%	0%	583%	0%	0%	**0.9%**
1994	0%	91%	0%	0%	0%	0%	0%	0%	537%	0%	0%	**0.4%**
1995	0%	93%	0%	0%	0%	0%	0%	0%	630%	0%	0%	**0.6%**
1996	0%	87%	0%	0%	0%	0%	0%	0%	536%	0%	0%	**0.7%**
1997	0%	80%	0%	0%	0%	0%	0%	0%	453%	0%	0%	**0.6%**
1998	0%	76%	0%	0%	0%	0%	0%	0%	396%	0%	0%	**0.5%**
1999	0%	78%	0%	0%	0%	0%	0%	0%	410%	0%	0%	**0.4%**
2000	0%	65%	0%	0%	0%	0%	0%	0%	362%	0%	0%	**0.5%**
2001	0%	97%	0%	0%	0%	0%	0%	0%	324%	0%	0%	**0.6%**
2002	0%	84%	0%	0%	0%	0%	0%	0%	370%	0%	0%	**0.5%**
2003	0%	77%	0%	0%	0%	0%	0%	0%	499%	0%	0%	**0.5%**
2004	0%	85%	0%	0%	0%	0%	0%	0%	488%	0%	0%	**0.6%**
2005	0%	89%	0%	0%	0%	0%	0%	0%	475%	0%	0%	**0.7%**
2006	0%	83%	0%	0%	0%	0%	0%	0%	438%	0%	0%	**0.5%**
2007	0%	99%	0%	0%	0%	0%	0%	0%	471%	0%	0%	**0.6%**
2008	0%	91%	0%	0%	0%	0%	0%	0%	469%	0%	0%	**0.7%**
2009	0%	92%	0%	0%	0%	0%	0%	0%	482%	0%	0%	**0.7%**
2010	0%	87%	0%	0%	0%	0%	0%	0%	314%	0%	0%	**0.9%**
2011	0%	76%	0%	0%	0%	0%	0%	0%	394%	0%	0%	**1.1%**
2012	0%	76%	0%	0%	0%	0%	0%	0%	383%	0%	0%	**1.1%**
2013	0%	83%	0%	0%	0%	0%	0%	0%	400%	0%	0%	**1.3%**
2014	0%	-1%	0%	4%	0%	0%	0%	-2%	420%	0%	0%	**1.7%**

Pollutant	Cr										
SNAP sector	**01**	**02**	**03**	**04**	**05**	**06**	**07**	**08**	**09**	**10**	**11**	**TOTAL**
1990	0%	104%	0%	0%	0%	0%	0%	0%	1298%	0%	0%	**11.2%**
1991	0%	272%	0%	0%	0%	0%	0%	0%	905%	0%	0%	**29.6%**
1992	0%	292%	0%	0%	0%	0%	0%	0%	814%	0%	0%	**26.8%**
1993	0%	335%	0%	0%	0%	0%	0%	0%	934%	0%	0%	**30.0%**
1994	0%	275%	0%	0%	0%	0%	0%	0%	920%	0%	0%	**16.9%**
1995	0%	287%	0%	0%	0%	0%	0%	0%	1133%	0%	0%	**26.6%**
1996	0%	252%	0%	0%	0%	0%	0%	0%	999%	0%	0%	**32.0%**
1997	0%	227%	0%	0%	0%	0%	0%	0%	612%	0%	0%	**25.2%**
1998	0%	249%	0%	0%	0%	0%	0%	0%	413%	0%	0%	**21.6%**
1999	0%	271%	0%	0%	0%	0%	0%	0%	395%	0%	0%	**20.8%**
2000	0%	189%	0%	0%	0%	0%	0%	0%	310%	0%	0%	**23.3%**
2001	0%	316%	0%	0%	0%	0%	0%	0%	261%	0%	0%	**28.5%**
2002	0%	291%	0%	0%	0%	0%	0%	0%	366%	0%	0%	**26.5%**
2003	0%	248%	0%	0%	0%	0%	0%	0%	795%	0%	0%	**23.3%**
2004	0%	251%	0%	0%	0%	0%	0%	0%	859%	0%	0%	**30.1%**
2005	0%	289%	0%	0%	0%	0%	0%	0%	903%	0%	0%	**30.4%**
2006	0%	256%	0%	0%	0%	0%	0%	0%	670%	0%	0%	**26.5%**
2007	0%	307%	0%	0%	0%	0%	0%	0%	849%	0%	0%	**27.3%**
2008	0%	295%	0%	0%	0%	0%	0%	0%	929%	0%	0%	**29.7%**
2009	0%	286%	0%	0%	0%	0%	0%	0%	945%	0%	0%	**28.9%**
2010	0%	262%	0%	0%	0%	0%	0%	0%	1138%	0%	0%	**46.7%**
2011	0%	195%	0%	0%	0%	0%	0%	0%	1405%	0%	0%	**41.2%**
2012	0%	178%	0%	0%	0%	0%	0%	0%	1136%	0%	0%	**42.2%**
2013	0%	192%	0%	-2%	0%	0%	0%	0%	1670%	0%	0%	**51.8%**
2014	0%	0%	4%	3%	0%	0%	0%	-23%	1690%	0%	0%	**0.9%**

Pollutant	**Cu**											
SNAP sector	**01**	**02**	**03**	**04**	**05**	**06**	**07**	**08**	**09**	**10**	**11**	**TOTAL**
1990	0%	57%	0%	0%	0%	0%	0%	0%	23%	0%	0%	**1.7%**
1991	0%	161%	0%	0%	0%	0%	0%	0%	16%	0%	0%	**4.7%**
1992	0%	230%	0%	0%	0%	0%	0%	0%	15%	0%	0%	**4.4%**
1993	0%	247%	0%	0%	0%	0%	0%	0%	17%	0%	0%	**4.6%**
1994	0%	230%	0%	0%	0%	0%	0%	0%	17%	0%	0%	**3.3%**
1995	0%	245%	0%	0%	0%	0%	0%	0%	21%	0%	0%	**3.8%**
1996	0%	219%	0%	0%	0%	0%	0%	0%	19%	0%	0%	**4.0%**
1997	0%	199%	0%	0%	0%	0%	0%	0%	16%	0%	0%	**3.2%**
1998	0%	209%	0%	0%	0%	0%	0%	0%	13%	0%	0%	**3.0%**
1999	0%	224%	0%	0%	0%	0%	0%	0%	14%	0%	0%	**2.9%**
2000	0%	163%	0%	0%	0%	0%	0%	0%	12%	0%	0%	**2.4%**
2001	0%	281%	0%	0%	0%	0%	0%	0%	10%	0%	0%	**3.3%**
2002	0%	250%	0%	0%	0%	0%	0%	0%	11%	0%	0%	**2.9%**
2003	0%	213%	0%	0%	0%	0%	0%	0%	15%	0%	0%	**2.9%**
2004	0%	226%	0%	0%	0%	0%	0%	0%	14%	0%	0%	**2.9%**
2005	0%	252%	0%	0%	0%	0%	0%	0%	14%	0%	0%	**3.1%**
2006	0%	230%	0%	0%	0%	0%	0%	0%	12%	0%	0%	**2.5%**
2007	0%	284%	0%	0%	0%	0%	0%	0%	13%	0%	0%	**2.4%**
2008	0%	273%	0%	0%	0%	0%	0%	0%	15%	0%	0%	**2.4%**
2009	0%	269%	0%	0%	0%	0%	0%	0%	15%	0%	0%	**2.6%**
2010	0%	242%	0%	0%	0%	0%	0%	0%	24%	0%	0%	**2.9%**
2011	0%	184%	0%	0%	0%	0%	0%	0%	29%	0%	0%	**2.7%**
2012	0%	170%	0%	0%	0%	0%	0%	0%	21%	0%	0%	**2.6%**
2013	0%	183%	0%	-1%	0%	0%	0%	0%	38%	0%	0%	**2.6%**
2014	0%	1%	1%	1%	0%	0%	0%	-24%	38%	0%	0%	**-2.3%**

Pollutant	**Ni**										
SNAP sector	**01**	**02**	**03**	**04**	**05**	**06**	**07**	**08**	**09**	**10**	**11**	**TOTAL**
1990	0%	40%	0%	0%	0%	0%	0%	0%	2092%	0%	0%	**0.2%**
1991	0%	117%	0%	0%	0%	0%	0%	0%	1481%	0%	0%	**0.4%**
1992	0%	199%	0%	0%	0%	0%	0%	0%	1298%	0%	0%	**0.3%**
1993	0%	197%	0%	0%	0%	0%	0%	0%	1484%	0%	0%	**0.4%**
1994	0%	204%	0%	0%	0%	0%	0%	0%	1436%	0%	0%	**0.4%**
1995	0%	221%	0%	0%	0%	0%	0%	0%	1724%	0%	0%	**0.4%**
1996	0%	201%	0%	0%	0%	0%	0%	0%	1519%	0%	0%	**0.3%**
1997	0%	185%	0%	0%	0%	0%	0%	0%	1150%	0%	0%	**0.4%**
1998	0%	183%	0%	0%	0%	0%	0%	0%	891%	0%	0%	**0.3%**
1999	0%	199%	0%	0%	0%	0%	0%	0%	889%	0%	0%	**0.3%**
2000	0%	148%	0%	0%	0%	0%	0%	0%	734%	0%	0%	**0.3%**
2001	0%	265%	0%	0%	0%	0%	0%	0%	632%	0%	0%	**0.4%**
2002	0%	228%	0%	0%	0%	0%	0%	0%	799%	0%	0%	**0.3%**
2003	0%	193%	0%	0%	0%	0%	0%	0%	1294%	0%	0%	**0.3%**
2004	0%	215%	0%	0%	0%	0%	0%	0%	1277%	0%	0%	**0.4%**
2005	0%	234%	0%	0%	0%	0%	0%	0%	1288%	0%	0%	**0.4%**
2006	0%	216%	0%	0%	0%	0%	0%	0%	1096%	0%	0%	**0.3%**
2007	0%	275%	0%	0%	0%	0%	0%	0%	1228%	0%	0%	**0.4%**
2008	0%	262%	0%	0%	0%	0%	0%	0%	1349%	0%	0%	**0.5%**
2009	0%	260%	0%	-1%	0%	0%	0%	0%	1337%	0%	0%	**0.4%**
2010	0%	230%	0%	0%	0%	0%	0%	0%	1572%	0%	0%	**0.5%**
2011	0%	177%	0%	0%	0%	0%	0%	0%	1939%	0%	0%	**0.6%**
2012	0%	164%	0%	0%	0%	0%	0%	0%	1542%	0%	0%	**0.7%**
2013	0%	178%	0%	-5%	0%	0%	0%	0%	2193%	0%	0%	**0.5%**
2014	-5%	1%	0%	5%	0%	0%	0%	-12%	2271%	0%	0%	**-3.7%**

Pollutant	Se											
SNAP sector	**01**	**02**	**03**	**04**	**05**	**06**	**07**	**08**	**09**	**10**	**11**	**TOTAL**
1990	0%	54%	0%	0%	0%	0%	0%	0%	24%	0%	0%	**2.6%**
1991	0%	150%	0%	0%	0%	0%	0%	0%	18%	0%	0%	**5.4%**
1992	0%	201%	0%	0%	0%	0%	0%	0%	10%	0%	0%	**6.3%**
1993	0%	208%	0%	0%	0%	0%	0%	0%	10%	0%	0%	**7.2%**
1994	0%	199%	0%	0%	0%	0%	0%	0%	8%	0%	0%	**5.0%**
1995	0%	209%	0%	0%	0%	0%	0%	0%	6%	0%	0%	**6.0%**
1996	0%	187%	0%	0%	0%	0%	0%	0%	5%	0%	0%	**6.6%**
1997	0%	171%	0%	0%	0%	0%	0%	0%	6%	0%	0%	**6.3%**
1998	0%	182%	0%	0%	0%	0%	0%	0%	6%	0%	0%	**5.8%**
1999	0%	190%	0%	0%	0%	0%	0%	0%	7%	0%	0%	**5.7%**
2000	0%	143%	0%	0%	0%	0%	0%	0%	7%	0%	0%	**4.7%**
2001	0%	236%	0%	0%	0%	0%	0%	0%	8%	0%	0%	**5.7%**
2002	0%	210%	0%	0%	0%	0%	0%	0%	8%	0%	0%	**5.1%**
2003	0%	185%	0%	0%	0%	0%	0%	0%	8%	0%	0%	**5.0%**
2004	0%	195%	0%	0%	0%	0%	0%	0%	8%	0%	0%	**4.9%**
2005	0%	219%	0%	0%	0%	0%	0%	0%	8%	0%	0%	**5.1%**
2006	0%	200%	0%	0%	0%	0%	0%	0%	9%	0%	0%	**4.4%**
2007	0%	244%	0%	0%	0%	0%	0%	0%	9%	0%	0%	**4.4%**
2008	0%	233%	0%	0%	0%	0%	0%	0%	9%	0%	0%	**4.5%**
2009	0%	230%	0%	0%	0%	0%	0%	0%	7%	0%	0%	**4.8%**
2010	0%	212%	0%	0%	0%	0%	0%	0%	4%	0%	0%	**5.4%**
2011	0%	165%	0%	0%	0%	0%	0%	0%	5%	0%	0%	**4.9%**
2012	0%	154%	0%	0%	0%	0%	0%	0%	4%	0%	0%	**5.0%**
2013	0%	167%	0%	0%	0%	0%	0%	0%	4%	0%	0%	**5.0%**
2014	0%	0%	0%	10%	0%	0%	0%	-14%	5%	0%	0%	**6.0%**

Pollutant	Zn										
SNAP sector	01	02	03	04	05	06	07	08	09	10	11	TOTAL
1990	0%	105%	0%	0%	0%	0%	0%	0%	6680%	0%	0%	**44.4%**
1991	0%	273%	0%	0%	0%	0%	0%	0%	4594%	0%	0%	**109.5%**
1992	0%	286%	0%	0%	0%	0%	0%	0%	3676%	0%	0%	**116.9%**
1993	0%	328%	0%	0%	0%	0%	0%	0%	3993%	0%	0%	**131.8%**
1994	0%	270%	0%	0%	0%	0%	0%	0%	3686%	0%	0%	**105.8%**
1995	0%	281%	0%	0%	0%	0%	0%	0%	4278%	0%	0%	**114.5%**
1996	0%	246%	0%	0%	0%	0%	0%	0%	3668%	0%	0%	**112.2%**
1997	0%	222%	0%	0%	0%	0%	0%	0%	1430%	0%	0%	**96.3%**
1998	0%	246%	0%	0%	0%	0%	0%	0%	779%	0%	0%	**98.9%**
1999	0%	264%	0%	-1%	0%	0%	0%	0%	729%	0%	0%	**102.4%**
2000	0%	186%	0%	-1%	0%	0%	0%	0%	527%	0%	0%	**79.5%**
2001	0%	310%	0%	-2%	0%	0%	0%	0%	464%	0%	0%	**114.6%**
2002	0%	286%	0%	-1%	0%	0%	0%	0%	752%	0%	0%	**104.5%**
2003	0%	245%	0%	-2%	0%	0%	0%	0%	2925%	0%	0%	**99.8%**
2004	0%	247%	0%	0%	0%	0%	0%	0%	4831%	0%	0%	**97.8%**
2005	0%	284%	0%	3%	0%	0%	0%	0%	6487%	0%	0%	**109.4%**
2006	0%	253%	0%	0%	0%	0%	0%	0%	2962%	0%	0%	**93.8%**
2007	0%	302%	0%	0%	0%	0%	0%	0%	3475%	0%	0%	**97.6%**
2008	0%	291%	0%	0%	0%	0%	0%	0%	3040%	0%	0%	**100.0%**
2009	0%	283%	0%	-6%	0%	0%	0%	0%	6474%	0%	0%	**102.5%**
2010	0%	260%	0%	0%	0%	0%	0%	0%	3063%	0%	0%	**103.7%**
2011	0%	193%	0%	0%	0%	0%	0%	0%	3874%	0%	0%	**88.7%**
2012	0%	177%	0%	9%	0%	0%	0%	0%	3999%	0%	0%	**85.4%**
2013	0%	191%	0%	-29%	0%	0%	0%	0%	3693%	0%	0%	**87.8%**
2014	0%	0%	7%	15%	0%	0%	0%	-21%	3951%	0%	0%	**0.9%**

Pollutant	**HCB**											
SNAP sector	**01**	**02**	**03**	**04**	**05**	**06**	**07**	**08**	**09**	**10**	**11**	**TOTAL**
1990	0%	117%	0%	0%	0%	0%	0%	0%	0%	0%	0%	**74.1%**
1991	0%	300%	0%	0%	0%	0%	0%	0%	0%	0%	0%	**170.5%**
1992	0%	306%	0%	0%	0%	0%	0%	0%	0%	0%	0%	**163.6%**
1993	0%	356%	0%	0%	0%	0%	0%	0%	0%	0%	0%	**190.4%**
1994	0%	285%	0%	0%	0%	0%	0%	0%	0%	0%	0%	**167.6%**
1995	0%	297%	0%	0%	0%	0%	0%	0%	0%	0%	0%	**173.8%**
1996	0%	259%	0%	0%	0%	0%	0%	0%	0%	0%	0%	**162.8%**
1997	0%	233%	0%	0%	0%	0%	0%	0%	0%	0%	0%	**136.3%**
1998	0%	258%	0%	0%	0%	0%	0%	0%	0%	0%	0%	**145.9%**
1999	0%	281%	0%	0%	0%	0%	0%	0%	0%	0%	0%	**155.4%**
2000	0%	195%	0%	0%	0%	0%	0%	0%	0%	0%	0%	**106.0%**
2001	0%	326%	0%	0%	0%	0%	0%	0%	0%	0%	0%	**150.3%**
2002	0%	302%	0%	0%	0%	0%	0%	0%	0%	0%	0%	**139.9%**
2003	0%	257%	0%	0%	0%	0%	0%	0%	0%	0%	0%	**136.1%**
2004	0%	257%	0%	0%	0%	0%	0%	0%	0%	0%	0%	**134.2%**
2005	0%	297%	0%	0%	0%	0%	0%	0%	0%	0%	0%	**152.2%**
2006	0%	262%	0%	0%	0%	0%	0%	0%	0%	0%	0%	**131.1%**
2007	0%	312%	0%	0%	0%	0%	0%	0%	0%	0%	0%	**140.6%**
2008	0%	300%	0%	0%	0%	0%	0%	0%	0%	0%	0%	**146.5%**
2009	0%	291%	0%	0%	0%	0%	0%	0%	0%	0%	0%	**150.2%**
2010	0%	266%	0%	0%	0%	0%	0%	0%	0%	0%	0%	**157.0%**
2011	0%	197%	0%	0%	0%	0%	0%	0%	0%	0%	0%	**126.8%**
2012	0%	180%	0%	0%	0%	0%	0%	0%	0%	0%	0%	**114.9%**
2013	0%	193%	0%	0%	0%	0%	0%	0%	0%	0%	0%	**124.4%**
2014	0%	0%	7%	0%	0%	0%	0%	-2%	0%	0%	0%	**0.8%**

Pollutant	**BC**											
SNAP sector	**01**	**02**	**03**	**04**	**05**	**06**	**07**	**08**	**09**	**10**	**11**	**total**
1990	0%	106%	0%	0%	0%	0%	0%	0%	11341725%	0%	0%	**46.0%**
1991	0%	274%	0%	0%	0%	0%	0%	0%	10076898%	0%	0%	**107.1%**
1992	0%	272%	0%	0%	0%	0%	0%	0%	7236425%	0%	0%	**111.1%**
1993	0%	312%	0%	0%	0%	0%	0%	0%	9162523%	0%	0%	**121.6%**
1994	0%	257%	0%	0%	0%	0%	0%	0%	7547243%	0%	0%	**97.3%**
1995	0%	268%	0%	0%	0%	0%	0%	0%	6153082%	0%	0%	**96.6%**
1996	0%	232%	0%	0%	0%	0%	0%	0%	5740744%	0%	0%	**96.3%**
1997	0%	210%	0%	0%	0%	0%	0%	0%	3106209%	0%	0%	**83.7%**
1998	0%	238%	0%	0%	0%	0%	0%	0%	1578536%	0%	0%	**85.1%**
1999	0%	249%	0%	0%	0%	0%	0%	0%	1643688%	0%	0%	**87.4%**
2000	0%	178%	0%	0%	0%	0%	0%	0%	1041147%	0%	0%	**67.7%**
2001	0%	294%	0%	0%	0%	0%	0%	0%	1174397%	0%	0%	**91.5%**
2002	0%	271%	0%	0%	0%	0%	0%	0%	2058524%	0%	0%	**101.8%**
2003	0%	235%	0%	0%	0%	0%	0%	0%	6590515%	0%	0%	**81.8%**
2004	0%	236%	0%	0%	0%	0%	0%	0%	9361344%	0%	0%	**80.4%**
2005	0%	273%	0%	0%	0%	0%	0%	0%	11854692%	0%	0%	**88.3%**
2006	0%	243%	0%	0%	0%	0%	-13%	0%	7983118%	0%	0%	**63.0%**
2007	0%	290%	0%	0%	0%	0%	-17%	0%	12546186%	0%	0%	**61.6%**
2008	0%	279%	0%	0%	0%	0%	-13%	0%	9897136%	0%	0%	**65.8%**
2009	0%	272%	0%	0%	0%	0%	-13%	0%	11989348%	0%	0%	**69.3%**
2010	0%	251%	0%	0%	0%	0%	-3%	0%	25766286%	0%	0%	**80.7%**
2011	0%	188%	0%	0%	0%	0%	-6%	0%	30268081%	0%	0%	**68.5%**
2012	0%	174%	0%	0%	0%	0%	-2%	0%	14030619%	0%	0%	**68.4%**
2013	0%	189%	0%	0%	0%	0%	-1%	0%	26282609%	0%	0%	**73.6%**
2014	-9%	1%	23%	0%	0%	0%	-1%	-32%	34524105%	0%	0%	**-1.2%**