



Latvia's Informative Inventory Report 2017

Submitted under the Convention on Long-Range Transboundary Air Pollution



Data sheet

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Authors

Asnate Skrebele, Vita Ratniece, Līga Rubene, Intars Čakars, Lauris Siņics

Latvian Environment, Geology and Meteorology Centre

Gaidis Klāvs, Larisa Gračkova

Institute of Physical Energetics

Laima Bērziņa, Olga Frolova

Latvia University of Agriculture

Andis Lazdiņš, Arta Bārdule

Latvian State Forest Research Institute "Silava"

Editing

Ieva Griķe

Latvian Environment, Geology and Meteorology Centre

Lana Maslova

Ministry of the Environmental Protection and Regional Development

Environmental Protection Department

Agita Gancone

Ministry of the Environmental Protection and Regional Development

Climate Change Department

Ineta Lavrinoviča, Ieva Braņicka, Iveta Ozoliņa

Ministry of Agriculture

Lāsma Černovska

Central Statistical Bureau

Cover design

Kaspars Kadiķis

Cover photo

Normunds Rustanovičs, [Gārsenes parks](#)

Contact

Asnate Skrebele

Latvian Environment, Geology and Meteorology Centre

Maskavas street 165, Riga, LV-1019, Latvia

E-mail: asnate.skrebele@lvgmc.lv

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Abbreviations

CSB – Central Statistical Bureau of Latvia

EMEP – Co-operative Programme for Monitoring and Evaluation of the Long Range Transmission of Air Pollutants in Europe

EMEP/CORINAIR – Atmospheric emission inventory guidebook, Co-operative Programme for Monitoring and Evaluation on the Long Range Transmission of Air Pollutants in Europe, The Core Inventory of Air Emissions in Europe

EMEP/EEA 2013 – EMEP/EEA air pollutant emission inventory guidebook 2013

EMEP/EEA 2016 – EMEP/EEA air pollutant emission inventory guidebook 2016

GHG – Greenhouse gases

IPCC – Intergovernmental Panel on Climate Change

IPCC GPG 2000 – IPCC Good Practice Guidance and Uncertainty management in national Greenhouse Gas Inventories (2000)

IPCC GPG LULUCF 2003 – IPCC Good Practice Guidance for Land Use, Land Use Change and Forestry (2003)

2006 IPCC Guidelines - 2006 IPCC Guidelines for National Greenhouse Gas Inventories

IPPU – Industrial processes and Product use

LEGMC – Latvian Environment, Geology and Meteorology Centre

LULUCF – Land Use, Land Use Change and Forestry

MEPRD - Ministry of the Environmental Protection and Regional Development

MoA - Ministry of Agriculture

NCV – Net calorific value

NFR – Nomenclature For Reporting

REBs – Regional Environmental Boards

RTSD – Road Traffic Safety Department

SFS – State Forest Service

UN – United Nations

UNFCCC – United Nations Framework Convention on Climate Change

Pollutants

Main pollutants (from 1990)

NO_x – nitrogen oxides, expressed as NO₂

NMVOC – non-methane volatile organic compounds

NH₃ – ammonia

SO₂ – sulphur dioxide

Other (from 1990)

CO – carbon monoxide

POPs - persistent organic pollutants (from 1990)

PCDD/PCDF – polychlorinated dibenzodioxins/furans

HCB – hexachlorobenzene

PCB – polychlorinated biphenyls

PAHs – polycyclic aromatic hydrocarbons, includes:

benzo(a)pyrene

benzo(b)fluoranthene

benzo(k)fluoranthene

indeno(1,2,3-cd)pyrene)

PM - particulate matter (from 1990)

PM_{2.5} – particulate matter, particle size <2.5 µm

PM₁₀ - particulate matter, particle size <10 µm

TSP – total suspended particulates

BC – black carbon

HM - heavy metals (from 1990)

Pb – lead

Cd – cadmium

Hg – mercury

As – arsenic

Cr – chromium

Cu – copper

Ni – nickel

Se – selenium

Zn – zinc

Executive summary

Latvia's inventory report of air pollution has been prepared by Latvian Environment, Geology and Meteorology Centre in collaboration with Ministry of the Environmental Protection and Regional Development (MEPRD), Central Statistical Bureau (CSB), Institute of Physical Energetics, Latvian State Forest Research Institute "Silava", Latvia University of Agriculture, according to the 2014 Reporting Guidelines and revised Gothenburg Protocol and NEC directive. The Informative Inventory Report (IIR) is submitted to the UNECE Secretariat and EEA annually.

Emission inventories for years from 1990 to 2015 for anthropogenic emissions of – NO_x, NMVOC, SO₂, NH₃ (Main pollutants), CO (Other), TSP, PM₁₀, PM_{2.5}, BC (particulate matter), Pb, Cd, Hg, As, Cr, Cu, Ni, Se, Zn (heavy metals) and PCDD/PCDF, PAHs, PCB, HCB (persistent organic pollutants) are included.

Latvia's IIR 2017 includes detailed information about air pollutant sectors (Energy, Industrial Processes and Product Use, Agriculture, Waste, Other and natural emissions) and their subsectors. Each subsector is described with following chapters – an overview, trends in emissions, methods, emission factors, activity data, uncertainties, QA/QC and verification, recalculations and planned improvements. Activity data used for emission calculation was obtained by CSB, EU ETS, national database "2-Air", "2-Water", "3-Waste" and other different databases and from enterprises and institutions.

This report includes information about most recent estimates of emissions for 1990-2015. Most of the emissions have decreased during this period, with exception of TSP (26.1%), BC (0.3%) and HCB (47.7%) emissions which have increased. Detailed information about pollutants produced in sectors can be found in appropriate sectors and subsectors.

Comparing emissions for Submission 2016 and Submission 2017, there can be seen some changes. The recalculations are done due to switching from EMEP/EEA 2013 Guidebook to EMEP/EEA 2016 Guidebook, hence the changes in methodology in several sectors and subsectors (e.g., Energy, Industrial Processes and Product Use, Agriculture), as well as due to updated activity data and emission factors. Detailed information about recalculations done in IIR Submission 2017 can be found in Chapter 8.1

Improvements are planned according to key category analysis as well as implementation of national projects to improve report quality.

1 Introduction

1.1 Background information on emission inventories

The Republic of Latvia has ratified the Convention on Long-Range Transboundary Air Pollution (Geneva, 1979) by Resolution Nr. 63 of 7 July 1994 of the Cabinet of Ministers of Latvia. Later on, Latvia has signed following Protocols of Convention:

- The 1998 Protocol on Persistent Organic Pollutants (POPs);
- The 1998 Protocol on Heavy Metals;
- The 1999 Gothenburg Protocol to Abate Acidification, Eutrophication and Ground-level Ozone.

On 31 December 2016 Directive (EU) 2016/2284 of the European Parliament and 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 or NEC directive entered into force. Directive sets out new emission reduction commitments for Latvia regarding sulphur dioxide, nitrogen oxides, non-methane volatile organic compounds, ammonia and fine particulate matter. In order to follow the progress towards attainment of emission reduction commitments Latvia shall also provide national emission inventories, emission projections and informative inventory report that describes in more detail the emission calculations made.

Local legislation acts regarding air quality monitoring:

- No. 419 of Cabinet on Ministers (31.05.2011) - Regarding the Maximum Permissible Emission into the Air in the State;
- No. 217 of Cabinet on Ministers (27.03.2012) - Regarding the National Inventory System of Greenhouse Gas Emission Units.

According to the revised Guidelines for Reporting Emission Data under the Convention on Long-range Transboundary Air Pollution ([ECE/EB.AIR/125](#), revised 13 March 2014 hereinafter referred to as the Reporting Guidelines) Party shall annually submit emission inventory to the secretariat of the Convention on Long-Range Transboundary Air Pollution (CLRTAP).

Latvian Informative Inventory Report (IIR) submitted on 15th March 2017 contains information on Latvia's inventories for 1990 – 2015 and covers information on trends in emissions, descriptions of each NFR category, recalculations and planned improvements.

The annual emission inventory for Latvia is reported in the Nomenclature for Reporting ([NFR14](#)) format as requested in the Reporting Guidelines.

The latest recalculations in emission inventory were done for the time period from 1990 to 2014. These were done because of the change of activity data in all sectors, as well as changes in emission factors due to adoption of EMEP/EEA 2016 and 2006 IPCC Guidelines.

This report is prepared based on emission data submitted on 15th March 2017. It contains information on Latvia's emission inventories for years from 1990 to 2015 for anthropogenic emissions of:

Main pollutants: NO_x, NMVOC, SO₂, NH₃ (kt)

Other: CO (kt)

Particulate matter: TSP, PM₁₀, PM_{2.5}, BC (kt)

Heavy metals: Pb, Cd, Hg, As, Cr, Cu, Ni, Se, Zn (t)

POPs: PCDD/PCDF (g i-Teq), PAHs (t), PCB, HCB (kg)

1.2 Description of the institutional arrangement for inventory preparation

Latvian IIR is prepared by the state Ltd "Latvian Environment, Geology and Meteorology Centre" (LEGMC) in cooperation with other institutions. The purpose of LEGMC is to collect and process environmental

information, to carry out environmental monitoring and inform the public of the status of the environment, to provide geological supervision and rational use of natural resources, to implement the state policies in geology, meteorology, climatology, hydrology, and air quality and the impact of transboundary air pollution.

The experts at LEGMC have created emission inventory using expert publications evaluations and in co-operation with following institutions:

- Ministry of the Environmental Protection and Regional Development (MEPRD);
- Central Statistical Bureau (CSB);
- Institute of Physical Energetics;
- Latvian State Forest Research Institute "Silava";
- Latvia University of Agriculture;
- Ministry of Agriculture (MoA).

1.3 Description of the process of inventory preparation

The process of inventory compilation consists of inventory planning that includes decision making of methodological and organisational issues and time frame for inventory preparation.

In the first stage specific responsibilities are defined and allocated. In the second stage, the inventory preparation process, activity data, emission factors and all relevant information needed for final emission estimation is collected.

Latvia's emission inventory generally is based on the EMEP/EEA 2016 with a few exceptions in particular sectors where previous versions of EMEP emission inventory guidebooks and data and methodologies from 2006 IPCC Guidelines are used.

NFR 2014-2 format is used to prepare inventory for years 1990–2015. For all sectors, except for Road transport supplemental databases in Ms Excel format have been developed and used for emission calculations. For transport emission calculations special *COMputer Programme to calculate Emissions from Road Transport* (COPERT IV), which is proposed to be used by EEA member countries for the compilation of EMEP/EEA emission inventories, is used. Additional research in different source categories was made, to compile data and investigate appropriate approach to fulfil Convention obligations.

Activity data are obtained from CSB, Ministry of Agriculture, Ministry of Economics, Ministry of Transport and other different enterprises and institutions.

The deadline for submitting the activity data and its description for all institutions involved in inventory process is 1st of November. Regarding fuel consumption deadline of data submission is 30th of November when CSB prepares Energy balances for EUROSTAT according to additional agreement.

More detailed information on methodologies and activity data is given in the description of the sectors in Chapters 3-7.

1.4 Description of key source categories

The Key category analysis (KCA) for years 1990 and 2015 was done by LEGMC according to EMEP/EEA 2016 Level and Trend assessment. According to EMEP/EEA 2016, key categories are emission sources that all together contribute to 80% of the total national emissions. KCA was performed for each reported pollutant separately using Approach 1 – Level assessment and Approach 1 - Trend assessment. The level assessment key categories for 1990 and 2015 are shown in Table 1.1 and Table 1.2.

Table 1.1 Level assessment key categories in 1990¹

Component	Key categories (Sorted from high to low from left to right)												Total (%)
NO _x	1A3biii 12%	1A3bi 12%	1A1a 11%	1A3c 9%	1A4ai 8%	1A2e 6%	1A2gviii 6%	3Da1 6%	1A4cii 4%	1A4ciii 4%	1A4bi 3%		81.0%

¹ Full list of NFR codes can be seen on Annex IV.

Component	Key categories (Sorted from high to low from left to right)														Total (%)
NMVOC	1A3bi 19%	1A4bi 12%	3B1a 11%	2D3d 6%	1A3biii 5%	2H2 4%	1A4ai 4%	1A3bv 4%	1A4cii 4%	2D3g 3%	3B1b 3%	1B2b 3%	2D3a 2%	1A3bii 2%	82.1%
SO ₂	1A1a 36%	1A4ai 23%	1A4bi 9%	1A2e 8%	1A2gviii 8%										83.5%
NH ₃	3B1a 21%	3B3 20%	3Da1 20%	3Da2a 20%											80.6%
PM _{2.5}	1A4bi 59%	1A4ai 13%	6A 6%	1A1a 4%											81.7%
PM ₁₀	1A4bi 50%	1A4ai 11%	6A 6%	3Dc 5%	1A1a 4%	2A2 3%									80.4%
TSP	1A4bi 40%	1A4ai 9%	3Dc 8%	6A 7%	2A2 6%	3B4gi 5%	3B3 4%	1A1a 4%							82.6%
CO	1A3bi 41%	1A4bi 29%	1A4cii 7%	1A4ai 5%											82.7%
Pb	2C1 63%	1A3bi 21%													83.8%
Cd	2C1 47%	1A4bi 30%	1A4ai 11%												87.5%
Hg	1A4ai 49%	1A4bi 19%	1A1a 12%												80.1%
PCDD/ PCDF	1A4bi 62%	1A4ai 16%	5C1biii 14%												91.6%
PAHs	1A4bi 69%	1A4ai 14%													83.2%
HCB	1A4bi 53%	1A4ai 18%	1A1a 14%												85.4%
PCBs	1A4ai 62%	1A4bi 27%													89.2%

In 1990, Energy sector was a key source for the largest part of pollutants. For SO₂, PM_{2.5}, PM₁₀, TSP, Hg, PCDD/PCDF, PAHs, HCB and PCBs emissions the main contributor was Stationary combustion (NFR 1A1, 1A2, 1A4), especially Residential subsector (NFR 1A4b). For NO_x, NMVOC, CO and Cu emissions – Transport subsector (NFR 1A3), particularly Road transport (NFR 1A3b). The main contributor for NH₃ emissions in 1990 was Agriculture sector (NFR 3), and for Pb, Cd emissions the main contributors were IPPU (NFR 2C).

Table 1.2 Level assessment key categories in 2015

Component	Key categories (Sorted from high to low from left to right)												Total (%)
NO _x	1A3biii 19%	1A1a 11%	1A3bi 10%	1A3c 10%	1A4cii 9%	3Da1 8%	1A4bi 6%	1A2gviii 6%	2A1 5%				83.3%
NMVOC	1A4bi 21%	1A2gviii 11%	2D3d 10%	3B1a 10%	2D3g 7%	2D3i 5%	1B2b 4%	1A3bi 4%	1A4ai 4%	2H2 3%	3B1b 3%		80.6%
SO ₂	1A4bi 31%	1A2gviii 20%	1A1a 17%	1A4ai 12%	1A4cii 5%								85.2%
NH ₃	3Da1 27%	3B1a 18%	3Da2a 17%	3B3 8%	1A4bi 8%	3B1b 4%							81.7%
PM _{2.5}	1A4bi 61%	1A2gviii 12%	1A1a 9%										82.1%
PM ₁₀	1A4bi 47%	2D3b 17%	1A2gviii 9%	1A1a 8%									81.7%
TSP	2D3b 45%	1A4bi 28%	1A2gviii 6%	1A1a 5%									84.0%
CO	1A4bi 67%	1A3bi 8%	1A2gviii 7%										81.3%
Pb	1A3bi 36%	1A4bi 23%	1A2gviii 13%	1A1a 8%	1A3biii 5%								85.1%
Cd	1A4bi 49%	1A2gviii 31%											80.7%
Hg	1A1a 29%	1A4bi 22%	1A2gviii 13%	1A4ai 11%	2A1 10%								85.8%

Component	Key categories (Sorted from high to low from left to right)											Total (%)
PCDD/ PCDF	1A4bi 75%	1A2gviii 10%										84.7%
PAHs	1A4bi 78%	6A 8%										85.9%
HCB	1A4bi 41%	1A2gviii 26%	1A1a 22%									88.8%
PCBs	1A4bi 41%	1A4ai 26%	1A1a 20%									87.5%

As it can be seen in tables above, the key sources have slightly changed in 2015 in comparison with 1990. The main source for the majority of pollutants has remained the Energy sector, (NFR 1) especially the Residential subsector (NFR 1A4b). Also, the Road transport (NFR 1A3b) have remained as a key category for NO_x, and Agriculture sector for NH₃ emissions. In comparison with key categories from 1990 main contributor for NMVOC emissions in 2015 is Residential sector (NFR 1A4b) as well as for CO emissions. For TSP emissions, main contributor is Road paving with asphalt (NFR 2D3b).

The trend assessment key categories for 2015 can be seen in Table 1.3.

Table 1.3 Trend assessment key categories in 2015

Component	Key categories (Sorted from high to low from left to right)															Total (%)
NO _x	1A3bi 12.0%	1A1a 10.7%	1A4ai 9.3%	1A3biii 9.3%	1A3c 9.2%	1A2e 7.8%	1A2gviii 6.1%	3Da1 4.6%	1A4cii 4.2%	2C1 3.9%	1A2f 2.9%					80.1%
NMVOC	1A3bi 24.0%	3B1a 9.8%	1A3biii 6.5%	1A4bi 6.1%	1A3bv 5.1%	1A2gviii 4.7%	1A4cii 4.4%	2H2 4.1%	1A4ai 3.6%	3B1b 3.3%	2D3d 3.1%	1A3bii 3.0%	1A2gvii 2.2%	2D3a 2.2%		82.1%
SO ₂	1A1a 36.1%	1A4ai 23.3%	1A2e 8.4%	1A4bi 8.2%	1A2gviii 7.6%											83.6%
NH ₃	3B3 23.9%	3B1a 21.1%	3Da2a 19.8%	3Da1 16.3%												81.1%
PM _{2.5}	1A4bi 20.5%	1A4ai 18.3%	1A2gviii 16.0%	6A 8.5%	1A1a 8.5%	2D3b 4.4%	2C1 3.1%	1A2e 3.0%								82.3%
PM ₁₀	2D3b 24.3%	1A4ai 13.2%	1A2gviii 11.9%	1A4bi 10.3%	6A 6.9%	1A1a 6.2%	2A2 4.8%	2C1 2.8%								80.3%
TSP	2D3b 59.9%	1A4bi 6.5%	1A2gviii 6.4%	2A2 4.7%	1A4ai 4.6%											82.1%
CO	1A3bi 47.9%	1A4bi 18.8%	1A4cii 8.5%	1A3bii 5.4%												80.7%
Pb	2C1 63.3%	1A3bi 20.6%														84.0%
Cd	2C1 54.1%	1A2gviii 17.8%	1A4bi 11.4%													83.3%
Hg	1A4ai 53.8%	1A4bi 18.0%	1A1a 8.8%													80.5%
PCDD/ PCDF	1A4bi 38.2%	1A4ai 23.0%	5C1biii 19.0%													80.2%
PAHs	1A4bi 56.7%	1A4ai 20.3%	6A 15.8%													92.7%
HCB	1A2gviii 51.3%	1A4bi 25.0%	1A1a 15.9%													92.3%
PCBs	1A4ai 62.3%	1A4bi 26.6%														88.8%

In trend assessment key categories, main contributor remains Energy sector (includes public and industrial heat and power plants, as well as residential installations) and Transport. For PM₁₀, TSP, Pb and Cd main contributor is Industrial Processes and Product Use (NFR 2) sector with road paving with asphalt (2D3b) and iron and steel production (2C1) accordingly. Agriculture (NFR 3) is main contributor for NH₃ emissions.

1.5 Quality assurance/Quality control

The following Quality control (QA/QC) activities were carried out in the inventory preparation process:

- Processing;
- Handling,

- Documentation;
- Recalculations;
- Cross – checking.

The inventory is archived each year and it is possible to regenerate information.

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 correctness and completeness;
- Identify and address errors and omissions;
- Document and archive inventory material.

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. These activities are implemented by sectoral experts and national inventory compiler.

Before submitting data to CEIP/EEA, NFR tables are checked with [RepDab](#), an electronic tool to check the format, completeness and internal consistency of submissions, provided by CEIP as well as emission data are compared with data reported in National Inventory Report (NIR) under UNFCCC and the Kyoto Protocol.

Quality meetings are held between sectoral experts in order to discuss problems and necessary improvements. Meeting together with external institutions are held in order to coordinate and adjust necessary data for reporting and introduce them with latest changes in emissions and report.

Before report submission it is sent to external organizations (MEPRD, CSB, MoA, MoT) for quality control. Comments received after external organizations' review are implemented in report.

Quality assurance (QA)

Quality Assurance (QA) activities include a system of review procedures conducted by personnel not directly involved in the inventory compilation/development process. In the inventory preparation process, general quality control procedures have been applied. Some specific quality control procedures related to check of activity data and emission factors were carried out.

1.6 General uncertainty evaluation

The calculation of uncertainty estimates was made according to Tier 1 method presented in EMEP/EEA 2016. Tier 1 method is based on emission estimates and uncertainty coefficients for activity data and emission factors (Table 1.4).

Uncertainty coefficients have been assigned based on expert judgement or on default uncertainty estimates according to IPCC GPG 2000, 2006 IPCC Guidelines, EMEP/EEA 2009, EMEP/EEA 2013 and EMEP/EEA 2016 Guidebook, because there is lack of information about background data to make actual calculations. For each source, the uncertainty for activity data and emission factors was estimated and given in percent. The uncertainty analysis was done for the all sectors: Energy, IPPU, Agriculture, Waste and LULUCF (reported as Other under NFR 6A). Uncertainties were estimated for main pollutants - NO_x, NMVOC, SO₂, NH₃ and CO, as well as for particulate matter (PM_{2.5}, PM₁₀, TSP, BC), priority heavy metals (Pb, Cd, Hg) and POPs (PCDD/F, PAHs, HCB, PCBs).

Table 1.4 Uncertainty assessment results in 2015

	Overall uncertainty, %	Trend uncertainty, %
NO _x	60.49%	28.16%
NMVOC	65.33%	41.22%
SO ₂	37.14%	7.38%
NH ₃	85.54%	34.16%

	Overall uncertainty, %	Trend uncertainty, %
CO	69.31%	38.91%
PM _{2.5}	76.97%	76.51%
PM ₁₀	77.57%	82.88%
TSP	81.80%	99.66%
BC	68.71%	50.27%
Pb	60.49%	28.16%
Cd	70.21%	51.51%
Hg	67.77%	34.90%
PCDD/F	73.36%	49.12%
PAHs	80.09%	47.69%
HCB	79.74%	84.48%
PCBs	71.01%	14.78%

Complete set of reporting tables for main pollutants can be found in Annex III.

1.7 General assessment of the completeness

The emission inventory covers all territory of Latvia. Emissions from almost all sectors and subsectors have been estimated. Where this is not the case, notation keys – NE (not estimated), IE (included elsewhere), NA (not applicable) or NO (not occurred), are used.

NE (not estimated):

“NE” is used for activity data and/or emissions by sources of pollutants which have not been estimated but for which a corresponding activity may occur (Table 1.5)

Table 1.5 Sources not estimated in 2015 (NE)

NFR14 code	Substance(s)	Reason for not estimated
1A1a Public electricity and heat production	NH ₃	no methodology available, NE according to EMEP/EEA 2016
1A1c Manufacture of solid fuels and other energy industries	NH ₃	no methodology available, NE according to EMEP/EEA 2016
1A2a Stationary combustion in manufacturing industries and construction: Iron and steel	NH ₃ , HCB, PCBs	no methodology available, NE according to EMEP/EEA 2016
1A2b Stationary combustion in manufacturing industries and construction: Non-ferrous metals	NH ₃	no methodology available, NE according to EMEP/EEA 2016
1A2gvii Mobile Combustion in manufacturing industries and construction	Hg, As, PCDD/PCDF, benzo(k) fluoranthene, Indeno (1,2,3-cd) pyrene, HCB, PCBs	no methodology available, NE according to EMEP/EEA 2016
1A3ai(i) International aviation LTO (civil)	NH ₃ , Pb, Cd, Hg, As, Cr, Cu, Ni, Se, Zn	no methodology available, NE according to EMEP/EEA 2013
1A3aii(i) Domestic aviation LTO (civil)	NH ₃ , Pb, Cd, Hg, As, Cr, Cu, Ni, Se, Zn, PCDD/F, benzo(a) pyrene, benzo(b) fluoranthene, benzo(k) fluoranthene, Indeno (1,2,3-cd) pyrene, PAHs, HCB, PCBs	no methodology available, NE according to EMEP/EEA 2013
1A3c Railways	Pb, Hg, As	no methodology available, NE according to EMEP/EEA 2013
1A3di(ii) International inland waterways	NO _x , NMVOC, SO ₂ , NH ₃	no methodology available, NE according to EMEP/EEA 2013
1A3dii National navigation (shipping)	Pb, Hg, As	no methodology available, NE according to EMEP/EEA 2013
1A4aii Commercial/institutional: Mobile	Hg, As, PCDD/F, benzo(k) fluoranthene, Indeno (1,2,3-cd) pyrene, HCB, PCBs	no methodology available, NE according to EMEP/EEA 2016
1A4bii Residential: Household and gardening (mobile)	Hg, As, PCDD/F, benzo(k) fluoranthene, Indeno (1,2,3-cd) pyrene, HCB, PCBs	no methodology available, NE according to EMEP/EEA 2016
1Aci Agriculture/Forestry/Fishing: Off-road vehicles and other machinery	Hg, As, PCDD/PCDF, benzo(k) fluoranthene, Indeno (1,2,3-cd) pyrene, HCB, PCBs	no methodology available, NE according to EMEP/EEA 2016
1A4ciii Agriculture/Forestry/Fishing: National fishing	NH ₃ , benzo(a) pyrene, benzo(b) fluoranthene, benzo(k) fluoranthene, Indeno (1,2,3-cd) pyrene, PAHs	no methodology available, NE according to EMEP/EEA 2016

NFR14 code	Substance(s)	Reason for not estimated
1A5b Other, Mobile (including military, land based and recreational boats)	NH ₃ , benzo(a) pyrene, benzo(b) fluoranthene, benzo(k) fluoranthene, Indeno (1,2,3-cd) pyrene, PAHs	no methodology available, NE according to EMEP/EEA 2016
1B1a Fugitive emission from solid fuels: Coal mining and handling	NMVOC, CO, Pb, Cd, Hg, As, Cr, Cu, Ni, Se, Zn	no methodology available, NE according to EMEP/EEA 2016
1B2av Distribution of oil products	SO ₂ , PCDD/PCDF	no methodology available, NE according to EMEP/EEA 2016
2A1 Cement production	Pb, Cd, As, Cr, Cu, Ni, Se, Zn, benzo(a)pyrene, benzo (b)fluoranthene, benzo(k)fluoranthene, indeno(1,2,3-cd)pyrene, PAHs	no methodology available, NE according to EMEP/EEA 2016
2A2 Lime production	NO _x , NMVOC, SO ₂ , CO, Pb, Cd, Hg,	no methodology available, NE according to EMEP/EEA 2016
2A3 Glass production	NH ₃ , PM _{2.5} , PM ₁₀ , BC, CO, Pb, Cd, Hg, As, Cr, Cu, Ni, Se, Zn, PCDD/F, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, indeno(1,2,3-cd)pyrene, PAHs, HCB	no data available
2A5a Quarrying and mining of minerals other than coal	PM _{2.5} , PM ₁₀ , TSP	no methodology available, NE according to EMEP/EEA 2016
2A5b Construction and demolition	PM _{2.5} , PM ₁₀ , TSP	no methodology available, NE according to EMEP/EEA 2016
2A5c Storage, handling and transport of mineral products	PM _{2.5} , PM ₁₀ , TSP	no methodology available, NE according to EMEP/EEA 2016
2B7 Soda ash production	PM _{2.5} , PM ₁₀ , TSP, BC	no methodology available, NE according to EMEP/EEA 2016
2C1 Iron and steel production	NH ₃ , Se, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, indeno(1,2,3-cd)pyrene, HCB	no methodology available, NE according to EMEP/EEA 2016
2D3b Road paving with asphalt	NO _x , SO ₂ , CO, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, indeno(1,2,3-cd)pyrene, PAHs, HCB	no methodology available, NE according to EMEP/EEA 2016
2D3c Asphalt roofing	Pb, Cd, Hg, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, indeno(1,2,3-cd)pyrene, PAHs, HCB	no methodology available, NE according to EMEP/EEA 2016
2G Other product use	BC	no methodology available, NE according to EMEP/EEA 2016
2H2 Food and beverages industry	PM _{2.5} , PM ₁₀ , TSP, BC	no methodology available, NE according to EMEP/EEA 2016
2I Wood processing	TSP	no methodology available, NE according to EMEP/EEA 2016
3Da2b Sewage sludge applied to soils	NO _x , NH ₃	no methodology available, NE according to EMEP/EEA 2016
3Df Use of pesticides	HCB	no methodology available, NE according to EMEP/EEA 2016
5A Biological treatment of waste - Solid waste disposal on land	NH ₃ , CO, Hg	no methodology available, NE according to EMEP/EEA 2016
5B1 Biological treatment of waste - Composting	NO _x , NMVOC, SO ₂ , PM _{2.5} , PM ₁₀ , TSP, BC, CO	no methodology available, NE according to EMEP/EEA 2016
5B2 Biological treatment of waste – Anaerobic digestion at biogas facilities	NO _x , NMVOC, SO ₂ , NH ₃ , PM _{2.5} , PM ₁₀ , TSP, BC, CO, Pb, Cd, Hg, Cr, Zn, PCDD/F, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, indeno(1,2,3-cd)pyrene, PAHs, HCB, PCBs	no methodology available, NE according to EMEP/EEA 2016
5C1biii Clinical waste incineration	NH ₃ , PM _{2.5} , PM ₁₀ , Se, Zn, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, indeno(1,2,3-cd)pyrene	no methodology available, NE according to EMEP/EEA 2016
5C1bv Cremation	BC	no methodology available, NE according to EMEP/EEA 2016

IE (included elsewhere):

“IE” is used for emissions by sources of pollutants estimated but included elsewhere in the inventory instead of under the expected source category (Table 1.6)

Table 1.6 Sources included elsewhere in 2015 (IE)

NFR14 code	Substance(s)	Included in NFR category
1A3bii Road transport: Light duty vehicles	PCDD/F, PAHs	1A3bi Road transport: Passenger cars

NFR14 code	Substance(s)	Included in NFR category
1A3biii Road transport: Heavy duty vehicles and buses	PCDD/F, PAHs	1A3bi Road transport: Passenger cars
1A3biv Road transport: Mopeds & motorcycles	PCDD/F, PAHs	1A3bi Road transport: Passenger cars
1A3ei Pipeline transport	All pollutants	1A4ai Commercial/institutional: Stationary
2D3e Degreasing	NMVOC	2D3g Chemical products
2D3f Dry cleaning	NMVOC	2D3g Chemical products
3Da2a Animal manure applied to soils	NMVOC	3B Manure management
3Da3 Urine and dung deposited by grazing animals	NMVOC	3B Manure management
5D1 Domestic wastewater handling	NMVOC	5D3 Other wastewater handling
5D2 Industrial wastewater handling	NMVOC	5D3 Other wastewater handling
5D2 Industrial wastewater handling	NH ₃	5D1 Domestic wastewater handling
5D3 Other wastewater handling	NH ₃	5D1 Domestic wastewater handling

NA (not applicable) is used for activities under a given source category that do occur within the Party but do not result in emissions of a specific pollutant.

C (confidential) is used for emissions by sources of pollutants of which the reporting could lead to the disclosure of confidential information. In case of Latvia, particular notation key is used only for glass production (2A3) due to only one glass fibre production company operating in country.

NO (not occurring) is used for categories or processes within a particular source category that do not occur within a Party.

The completeness is estimated taking into account the usage of notation key NE relation this number to total amount of the subcategories. Completeness is checked for all emissions.

2 Air pollutant emission trends

2.1 Overview

The emission estimates of air pollutants in Latvia include emissions from following gases: sulphur dioxide, nitrogen oxides, carbon monoxide, non-methane volatile organic compounds, ammonia, particulate matter (TSP, PM₁₀, PM_{2.5}), heavy metals (lead, cadmium, mercury, arsenic, chromium, copper, nickel, vanadium, zinc), PAHs, PCBs and PCDD/F.

2.2 Main pollutants (NO_x, NMVOC, SO₂, NH₃, CO)

Sulphur dioxide, nitrogen oxides, carbon monoxide, non-methane volatile organic compounds and ammonia emission trend and the main emission sources are shown in Figure 2.1-Figure 2.5. However, detailed information about emission trends in each sector can be found in relevant chapters.

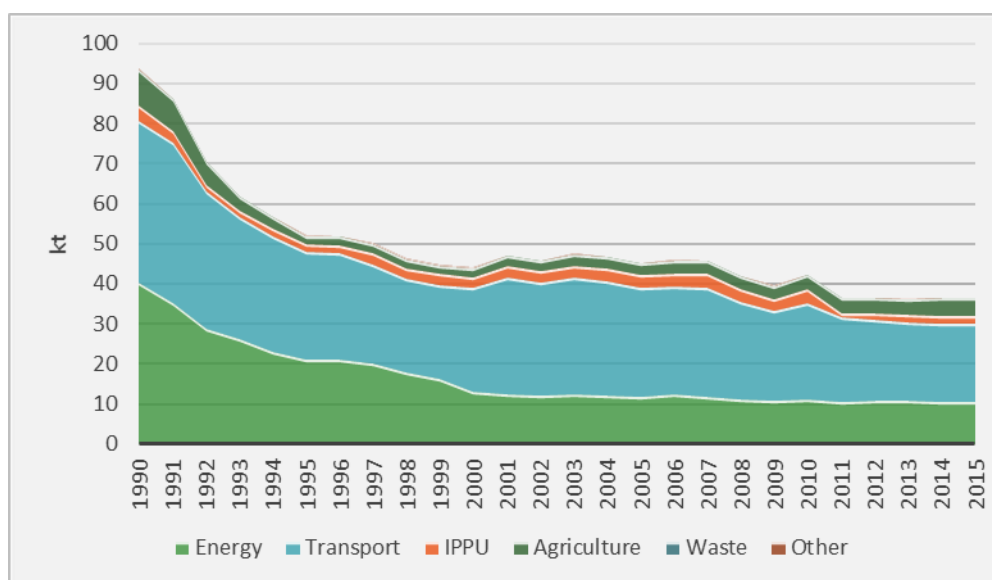


Figure 2.1 Total NO_x emissions (kt)

The total NO_x emissions have decreased by 61.0% from 1990 to 2015. Generally, the reduction is due to decrease of total fuel consumption that was caused by transformation of national economy as well as energy efficiency and control measures, especially for Transport sector, and also with replacement of solid fuels and heavy liquid fuels with natural gas and biomass fuels. In 2015, the total NO_x emissions were 36.53 kt, generated mainly in the Energy sector, including Transport (82.7% of total emissions).

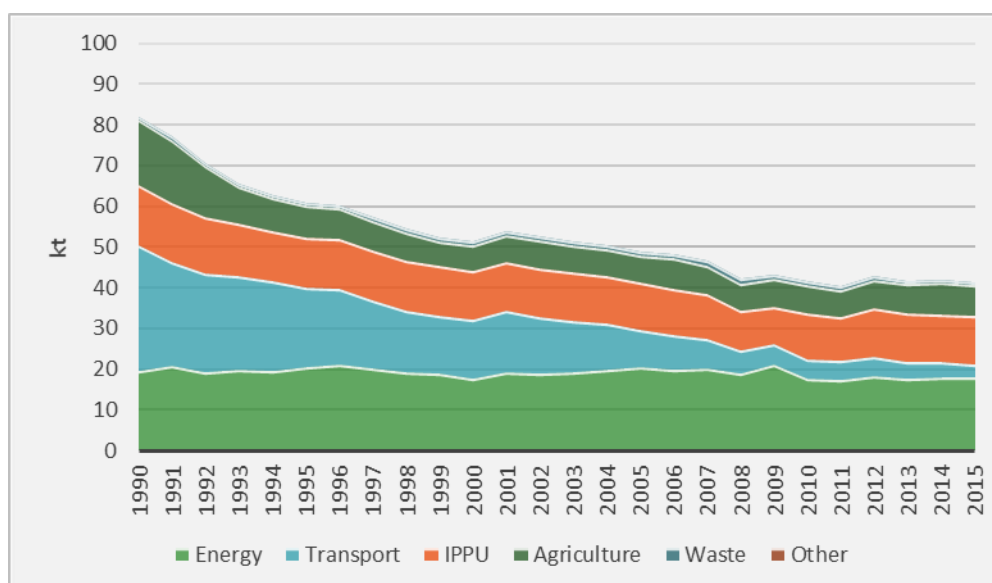


Figure 2.2 Total NMVOC emissions (kt)

The total NMVOC emissions were 41.37 kt in 2015, and have decreased by 49.6% from 1990 to 2015. The decrease in total NMVOC emissions mainly is because of decreased emissions in Transport sector and can be mainly explained with better technologies used in cars and gas stations which prevent gasoline from evaporation. NMVOC emissions in Transport sector have been reduced by 89.1% since 1990. In recent years, largest NMVOC emission producer are Energy sector (43.1% of total emissions) and IPPU sector (28.4%). Approximately 18.5% of all NMVOCs are generated in Agriculture sector from manure management.

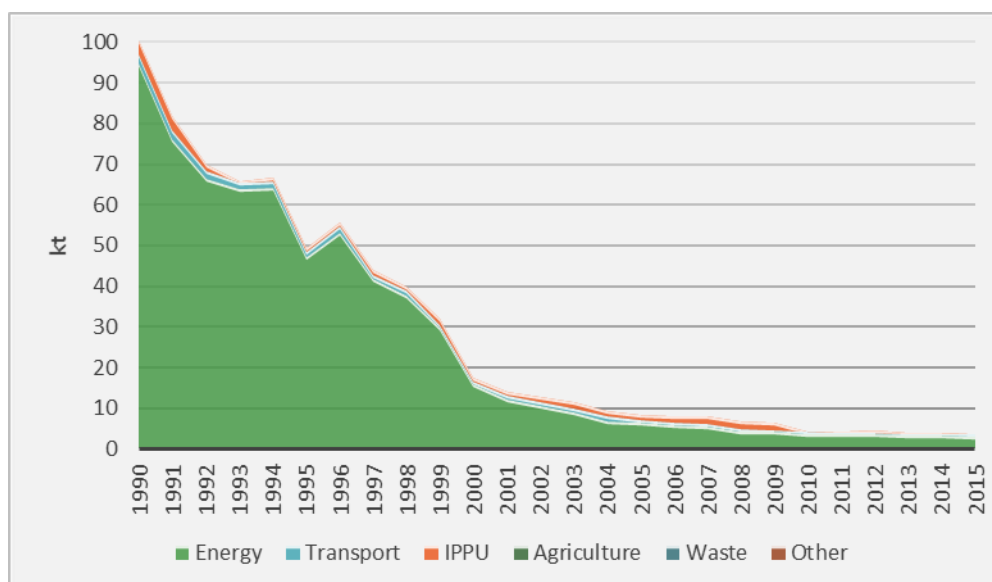


Figure 2.3 Total SO₂ emissions (kt)

Since 1990, total SO₂ emissions have decreased from approximately 100.46 kt to 3.65 kt (-96.4%). The reduction is mainly due to use of fuels with lower sulphur content as well as fuel switching from solid and

liquid types of fuel to natural gas and biomass. In 2015, SO₂ emissions are mainly produced in the Energy sector, including Transport, with 3.5 kt (94.4% of total emissions).

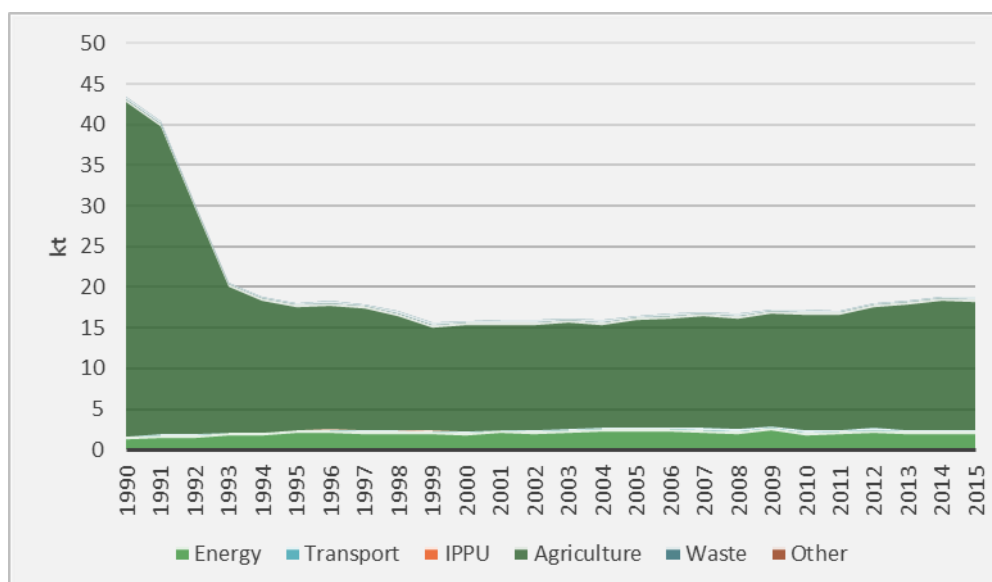


Figure 2.4 Total NH₃ emissions (kt)

The total ammonia emissions have decreased approximately by 56.8% from 1990 to 2015. In 2015, the amount of total NH₃ emissions produced was 18.76 kt. The large decrease can be explained with the collapse of USSR, when many farms were closed and agricultural activities stopped. The largest part – 86.0% of NH₃ emissions are produced from agricultural activities in 2015, and the remaining producers of ammonia are Energy (NFR 1) and Waste (NFR 5) sectors. Negligible NH₃ amounts are produced also in IPPU (NFR 2) and Other (NFR 6) sector.

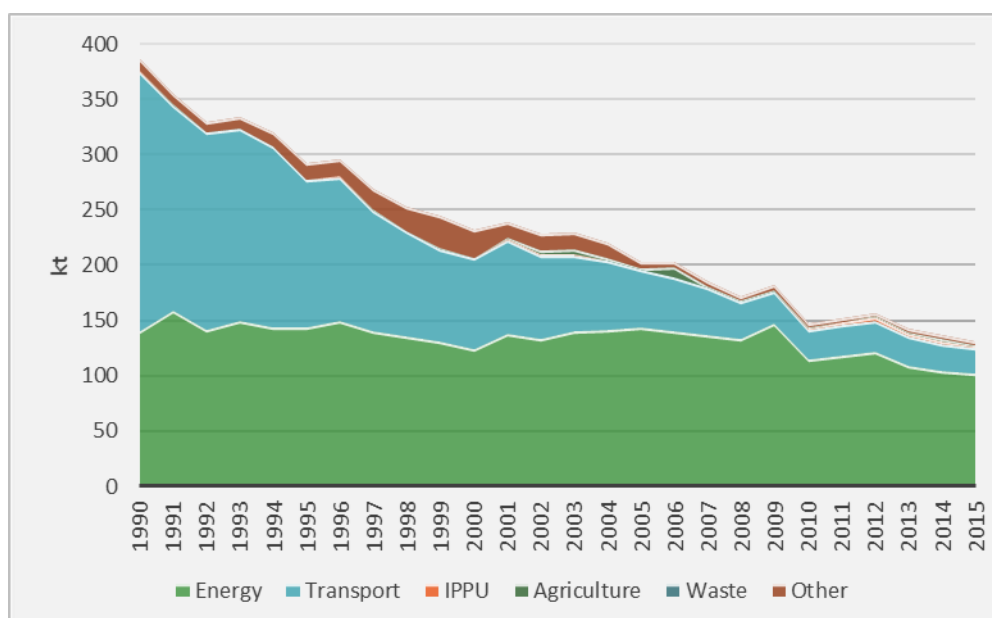


Figure 2.5 Total CO emissions (kt)

Carbon monoxide emission trend shows a decrease in emissions for period 1990 – 2015 by 66.0%. CO emissions, total 131.19 kt (2015), originates generally from the Energy (78.2%) and Transport (16.9% of total emissions). The decrease in CO emissions can be mainly explained with better technologies used in cars which prevent gasoline from incomplete combustion.

2.3 Particulate matter (PM_{2.5}, PM₁₀, TSP, BC)

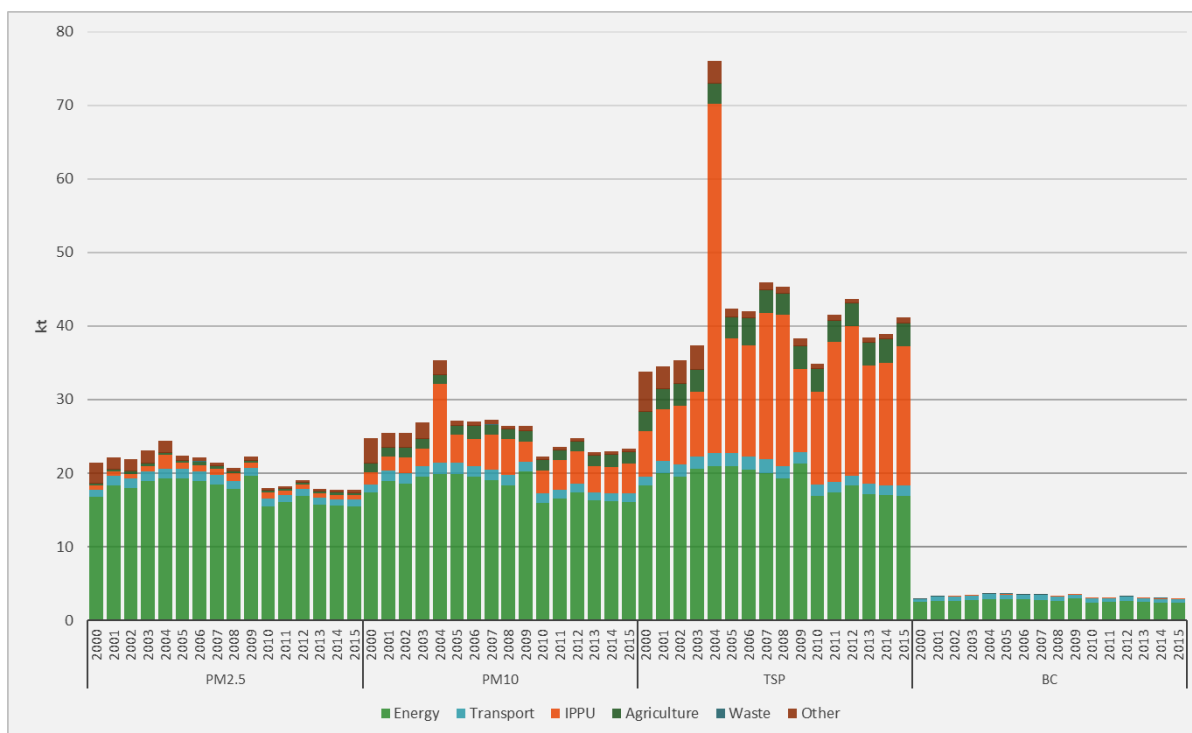


Figure 2.6 Total PM emissions (kt)

PM_{2.5} emissions have decreased in 2000-2015 by 17.4%, and PM₁₀ emissions have decreased by 5.7%, TSP emissions have had significant increase by 21.9% due to increased activity in Industrial Processes and Product Use sector (NFR 2). The largest part of PM emissions are produced in Energy sector (including Transport) – PM_{2.5} is 92.5%, PM₁₀ – 73.6% with exception of TSP emissions where 45.9% was produced in IPPU from total emissions in 2015 and 44.6% in Energy sector (including Transport). It is connected with intensive combustion of wood, especially in Residential sector (NFR 1A4b). Peak in PM emissions in 2004 can be explained with increased activities in Road paving (NFR 2D3b) in Via Baltic that connects the capitals of all Baltic States was built in particular year. PM emissions have increased in 2014-2015: PM₁₀ by 1.8% and TSP by 5.7% but PM_{2.5} have decreased by 0.4%. Increase in 2015 can be explained with increased activity in Road paving (NFR 2D3b) as in year 2004 when PM₁₀ and TSP emissions increased due to excessive road paving activity.

2.4 Heavy metals (Pb, Cd, Hg, As, Cr, Cu, Ni, Se, Zn)

Emissions of heavy metals are shown in the Figure 2.7-Figure 2.9. In IIR, only priority HMs are described, but emissions for additional heavy metals can be found in NFR tables.

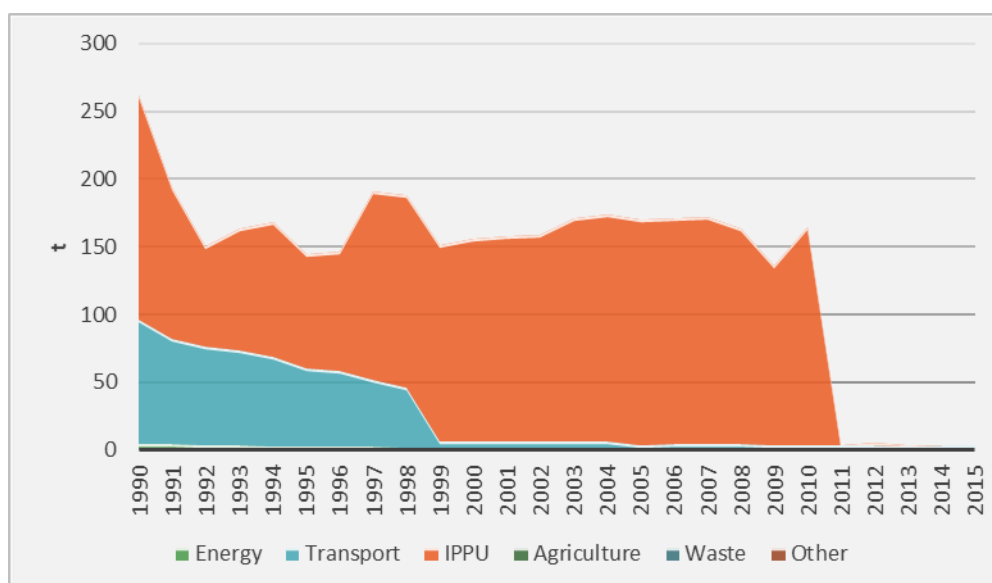


Figure 2.7 Total Pb emissions (t)

The most relevant changes can be seen in lead emissions (Figure 2.7). In comparison with the year 1990, Pb emissions have decreased by 98.8% in 2015, and the amount of Pb emitted in 2015 is 3.23 kt. Largest emitter in 2015 is Energy sector including Transport (95.7%). Significant decrease of lead emissions in Transport (NFR 1A3) sector by 19.3%, can be seen in 1999. That can be explained with the changes in international legislation that prohibited the use of liquid fuels with high lead content. The most significant emission decrease 97.6% happened in 2011 due to change of furnace type in metal production (NFR 2C1), other fluctuation in lead trend from IPPU sector can be explained with amount of metal produced.

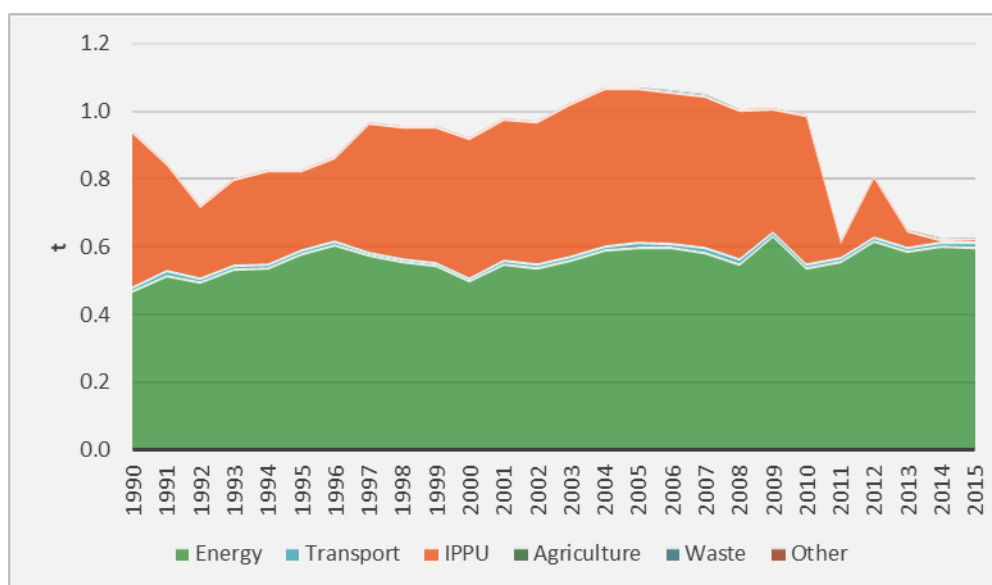


Figure 2.8 Total Cd emissions (t)

In 1990-2015, Cd emissions have decreased by 33.5%, and in 2015 total amounts of Cd emitted are 0.63 tonnes. Energy (including Transport) contributes to 98.1% of total Cd emissions in 2015. The increase of Cd emissions in Energy sector can be explained with increased use of biomass, especially in Residential sector (NFR 1A4b), where biomass products are widely used. Significant decrease of emissions can be seen in IPPU (97.5%) 1990-2015 due to bankruptcy of metal production company.

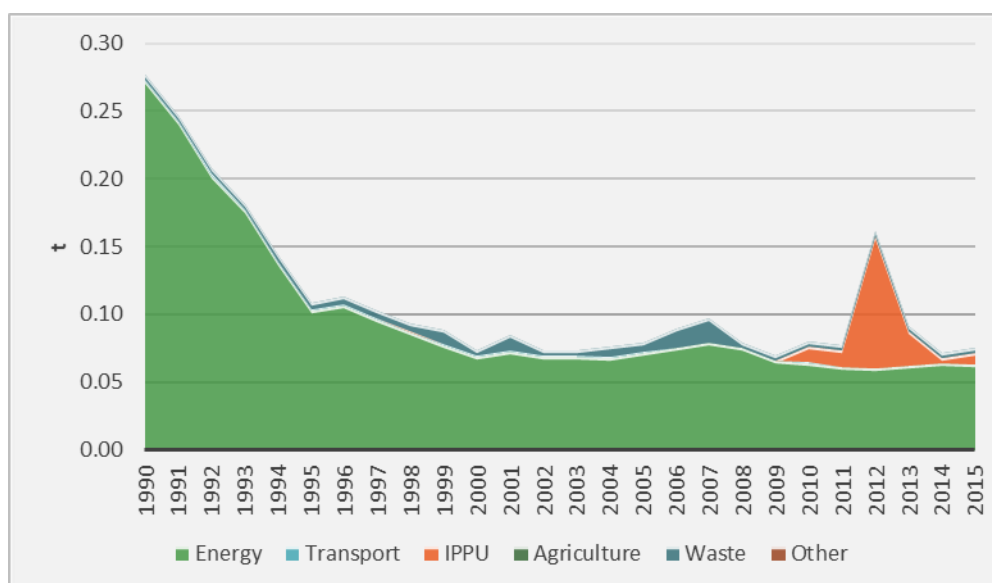


Figure 2.9 Total Hg emissions (t)

Mercury emission trend shows a decrease in emissions for period 1990 – 2015 by 72.7%. Hg emissions, total 0.08 t (2015), originates generally from the Energy sector (83.0%). The decrease in Hg emissions can be mainly explained with less amounts of fossil fuels used in combustion. Spike of Hg emission in 2012 IPPU sector can be explained with increased activity in Cement production (NFR 2A1).

2.5 Persistent organic pollutants (PCDD/F, PAHs, PCB, HCB)

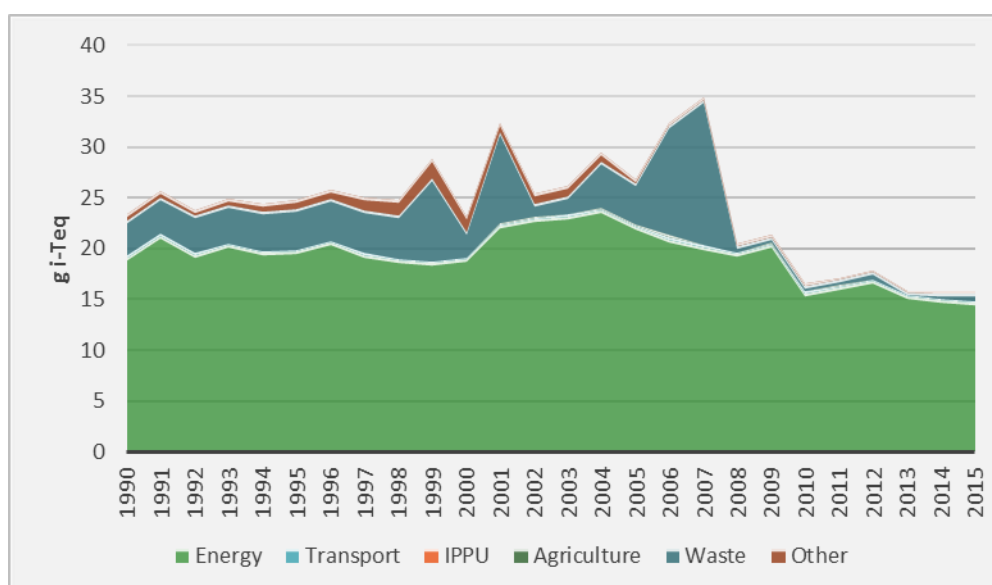


Figure 2.10 Total PCDD/F emissions (g i-Teq)

PCDD/F emissions have decreased by 32.7% in 1990-2015 and have a fluctuating trend in between. It is connected with waste incineration processes, as well as with biomass combustion. In 2015, approximately 93.7% emissions from all PCDD/F emissions are generated in the Energy sector (including Transport), but the remaining part of emissions are generated by the Waste incineration (NFR 5C), combustion of wood harvesting residues (NFR 6A) and grassland burning (NFR 3I). In Waste incineration PCDD/F emissions are fluctuating very remarkably due increased amounts of incinerated clinical waste in 2006-2007, but from year 2008 the facility is closed. In Energy sector the emissions have increased due to larger amounts of biomass combusted. In Latvia's case the wooden products are local fuel, therefore widely used, and also

the seasonal changes in temperature can be seen and are analysed in comparison with fuel consumption in relevant subchapters of stationary combustion.

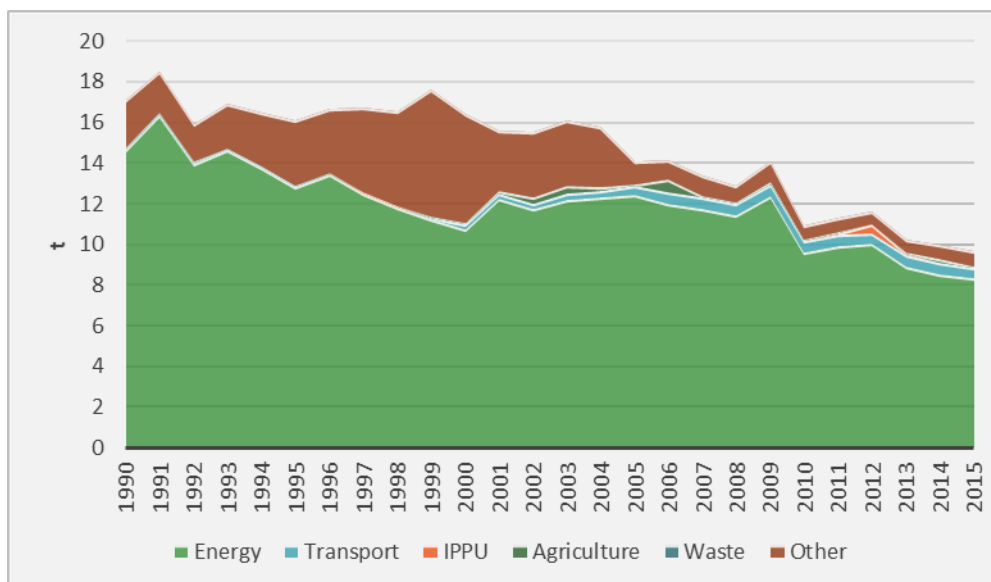


Figure 2.11 Total PAH emissions (t)

PAH emissions have decreased in 1990–2015 by 43.5%, reaching 9.66 tonnes in 2015. The fluctuations through the time series can be explained with changes in national economy and also weather conditions which influenced the consumption of particular fuels. In 2015 91.3% from PAHs were generated in Energy (including Transport) and mainly in solid biomass combustion processes.

It has to be noted that since 1999 total PAH emissions slightly differ from summarized benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene and indeno(1,2,3-cd)pyrene emissions (can be seen in NFR tables, columns X to AA). It is because of unavailability of segregated emission factors for each pollutant for industrial waste incineration (combusted in NFR 1A2 Manufacturing and Construction Industries for energy purposes), where emission factor only for total PAH emissions can be found.

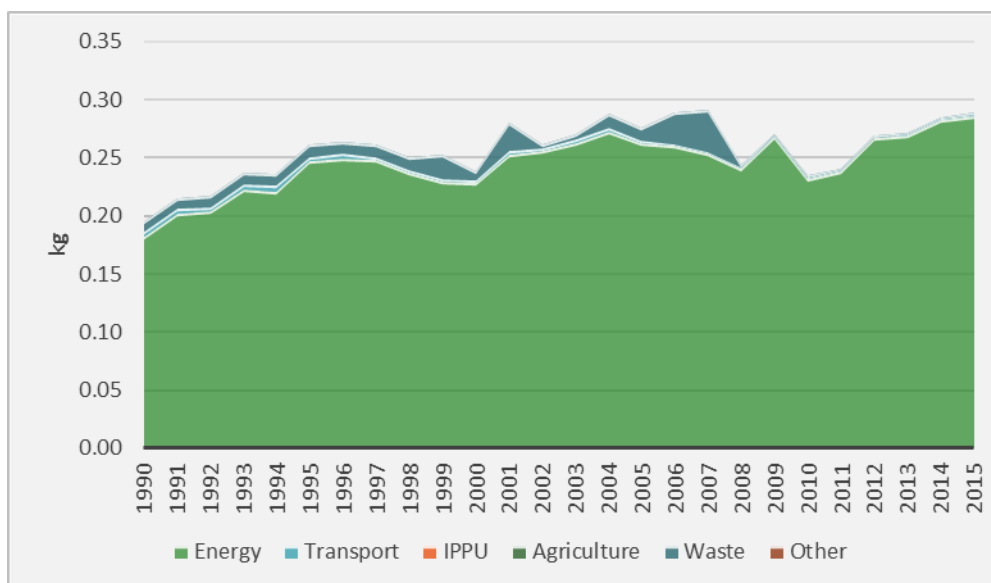


Figure 2.12 Total HCB emissions (kg)

HCB emissions have increased by 47.7% from 1990-2015, reaching 0.29 kg in 2015. Emissions have increased because of increasing use of wood and wood waste consumption in stationary fuel combustion sector. HCB emissions from stationary fuel combustion are estimated only from solid fuels – coal and coke,

and solid biomass combustion activities. 99.2% from HCB emissions in 2015 are generated in Energy (including Transport) and mainly in solid biomass combustion processes.

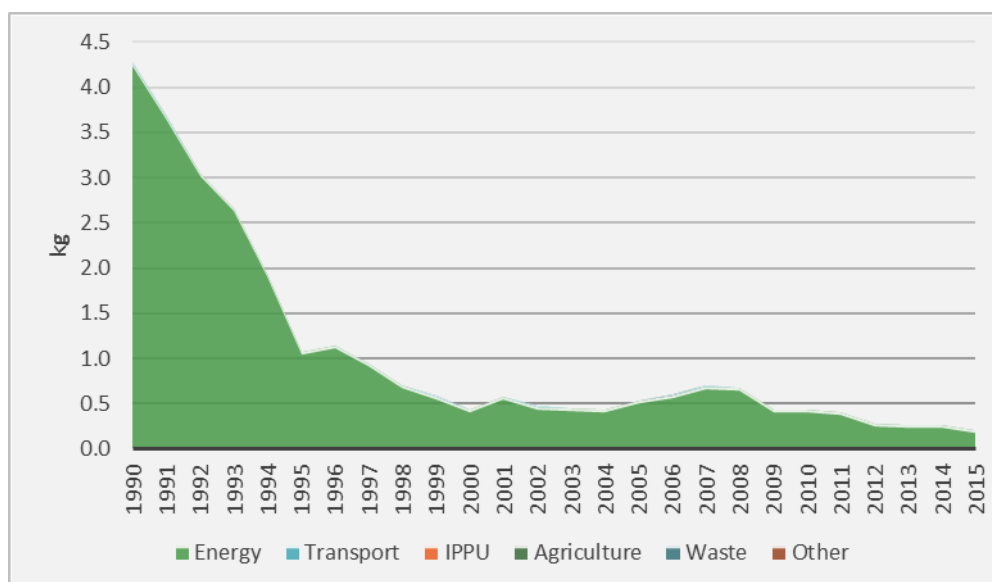


Figure 2.13 Total PCB emissions (kg)

PCB emission trend shows a decrease in emissions for period 1990 – 2015 by 95.1%. PCB emissions, total 0.21 kg (2015), originates generally from the Energy sector (including Transport), contributing 99.5% from all emissions. The decrease in PCB emissions can be mainly explained with less amounts of fossil fuels used in combustion.

3 Energy sector (NFR 1)

3.1 Sector overview

3.1.1 Quantitative overview

Both the imported (natural gas, liquid gas, oil and oil products, coal) and local fuels (wood, peat, hydro resources) are used in the Energy sector in Latvia (Table 3.1). Mainly the imported fuels (natural gas, coal) are used in heat generation in large combustion plants. Smaller boiler houses burn local fuel.

Table 3.1 Consumption of energy resources in Latvia (TJ) ²

	1990	1995	2000	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Energy consumption	318571	176159	143524	178707	183588	186027	179327	178015	185740	173188	175847	176162	175156	176028
Liquid fuels, total³	161209	81674	53518	68093	71073	75890	72799	70659	72127	64486	64456	64721	65592	68681
Residue Fuel Oil	76326	41290	9462	10231	7634	6581	7795	10272	8661	6541	6942	6852	6821	5467
Gasoline	26771	18130	14837	15138	16769	18307	16680	13945	12667	11926	10146	9286	9023	8918
Jet Kerosene	3068	1171	1142	2525	2875	3438	4126	4320	4946	4943	5033	5209	4646	4530
Other Kerosene	647	432	43	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Shale Oil	NO	78	2440	157	117	118	79	39	39	79	39	NO	NO	NO
Diesel Oil	48021	18274	20906	36791	39208	43862	41066	39141	42013	38520	38958	39433	40769	45594
Liquefied Petroleum Gases	3691	1548	2095	2552	2688	2414	2186	2003	2102	2414	3280	3840	4235	4103
Petroleum Coke	NO	NO	NO	429	627	132	NO	165	627	NO	NO	NO	NO	NO
Other Oil Products	2684	749	2593	269	1155	1038	866	774	1072	64	58	100	98	69
Solid fuels, total	26249	7225	2785	3199	3439	4248	4225	3409	4378	4509	3645	2905	2473	1950
Anthracite	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	82	27	NO	NO
Oil Shale	28	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Coke	237	53	26	54	32	NO	NO	NO	NO	NO	NO	NO	NO	NO
Coal	25984	7172	2759	3145	3407	4248	4225	3409	4378	4509	3563	2878	2473	1950
Peat products, total	3217	3836	2392	80	70	90	51	26	46	43	34	64	35	11
Peat briquettes	867	401	31	NO	NO	1	1	6	6	3	4	4	5	1
Peat	2350	3435	2361	80	70	89	50	20	40	40	30	60	30	10
Natural gas	99517	41304	44962	56685	58627	56588	55478	50742	61044	53528	50301	49994	44798	45758
Biomass, total	27501	42120	39774	49678	50032	48913	46372	53017	47647	49871	56535	57362	60979	58380
Wood	27501	42102	39695	49120	49518	48402	45749	52291	45376	46594	52169	52676	55531	52231
Straws	NO	NO	NO	NO	11	16	14	29	60	43	38	58	99	135
Charcoal	NO	NO	NO	60	30	45	60	60	60	60	59	90	90	60
Biofuel	NO	NO	NO	107	103	73	83	181	1158	1067	938	895	998	1047
Landfill Gas CH ₄	NO	NO	NO	251	259	271	290	323	331	349	347	371	369	624
Sludge Gas CH ₄	NO	18	41	90	76	80	79	100	114	100	105	97	91	99
Other Biogas CH ₄	NO	NO	NO	NO	NO	NO	NO	NO	37	465	1629	2140	2535	3053
Municipal wastes (biomass fraction)	NO	NO	37	49	34	26	98	33	510	1193	1250	1035	1266	1130
Other fuels, total	879	NO	94	972	348	299	401	162	499	752	877	1115	1279	1248
Municipal Waste (non-biomass fraction)	NO	NO	NO	NO	NO	NO	80	30	320	332	577	707	915	946
Industrial Waste	NO	NO	94	125	85	65	58	15	84	331	242	379	335	273
Waste Oil	879	NO	NO	847	263	234	263	117	95	88	58	29	29	29

Liquid fossil fuels have an important place in the Latvian energy resource market. Its market share is about 39.0% in 2015. The essential decrease of heavy oil share in CSB Energy Balance is explained with increase of costs due to increasing fuel costs because of implementation of the EU Directive 1999/32/EC prescribing that sulphur content of heavy oil shall not exceed 1%. The biggest part from liquid fuel consumption contributes diesel oil with approximately 66.4% from total liquid fuel consumption in 2015; diesel oil is mostly used in Transport sector. The total consumption of liquid fuels in 2015 has decreased by 57.4% since 1990.

² Excluding electricity.

³ Including fuel consumption for international aviation and international navigation.

Total share of *solid fuels* in national market is quite low – approximately 1.1% in 2015. The solid fuel consumption in recent years is stable although constantly decreasing 1990-2015 by 92.6%, with 21.1% decrease 2014-2015. A decrease in solid fuel consumption (-19.3%) can be seen in 2008-2009 due to global economic crisis. However, from 2009 to 2011 it increased by 32.3% that can mainly be explained with an increase of coal consumption, but in years 2011-2015 there can be seen a decrease in solid fuel consumption by 56.8% due to reduced use of coal.

Peat and *peat briquettes* are local fuels quite widely used in Latvia in 1990 with 1.1% of total energy consumption. However, nowadays amounts of peat products used have decreased and has 0.01% of total share in 2015. The reason is the same as for solid and liquid fuel - changes in technology. Peat was widely used in heat production, but now for heat and electricity production mostly biomass and gaseous fuels are used.

The largest consumers of *natural gas* are combined heat and power plants, and heat generation enterprises as well as industrial enterprises. Natural gas has a stable place in total fuel consumption where its share was 31.2% in 1990 and 26.0% in 2015. Natural gas consumption has decreased by 54.0% in 1990-2015. Recent years until 2011 the consumption of natural gas had an increasing trend – from 2009 to 2010 it increased by 20.3%, but in 2010-2015 there can be seen a decrease of natural gas consumption by 25.0%.

Biomass fuels are wood and wood products, straw, charcoal, liquid biofuels – bioethanol and biodiesel–, biogas – landfill gas, sludge gas, other biogas. In the total fuel consumption the share of firewood and other wood products is quite substantial with 29.7% of total energy consumption in 2015, comparing with 1990 when whole biomass usage was only 8.6% from total energy consumption. In 2010-2015 wood and wood products' use increased by 15.1%. In latest years liquid and gaseous biofuels are becoming more popular and their share from 0.25% in 2005 has reached 2.7% in 2015 from total fuel consumption. Recently fuels as straws are used more often, and it has an increasing trend with fluctuations, especially in 2010-2011 and 2013-2015, which can mainly be explained with significant temperature differences in winter.

There are also *industrial* and *municipal waste*⁴ consumed in the latest years, and the most significant increase can be observed in 2010 – comparing with 2009 the consumption of waste has almost 12-fold increase, and it reached 0.49% from total share. However, in the following years the increase of other fuels consumed was not as rapid as in previous 2009-2010, and the increase in particular fuels' use in 2013-2014 was by 15%. In 2015, however, consumption decreased by 2.4%. Also waste oils are reported as other fuels, however, this fuel type has a decreasing trend. During the pasts 3 years use of waste oil have been constant.

Hydroelectric power plants (HPP) and combined heat and power plants (CHP) produce part of the electrical power, while part is imported (Table 3.2, Table 3.3). Volume of electricity generation directly depends on the through-flow of the river Daugava. Also the import of electricity from Russia, Estonia and Lithuania has a quite substantial role in the electricity supply.

Table 3.2 Heat production and consumption in Latvia (TJ)

	Production	Own use and losses	Final consumption		
			NFR 1A2	NFR 1A4	TOTAL
1990	99439	15171	32929	51339	84268
1995	46112	7156	1969	36987	38956
2000	31867	6815	659	24393	25052
2001	33937	7038	641	26258	26899
2002	33048	6541	630	25877	26507
2003	33516	6409	626	26481	27107
2004	31093	6174	608	24311	24919
2005	31144	5886	684	24574	25258
2006	30056	5454	634	23968	24602
2007	28685	4911	554	23220	23774

⁴ For reporting purposes municipal waste has been divided into fossil and non-fossil fractions, but in the particular paragraph it is described as whole.

	Production	Own use and losses	Final consumption		
			NFR 1A2	NFR 1A4	TOTAL
2008	26402	4010	356	22036	22392
2009	26308	4099	298	21911	22209
2010	28662	4590	387	23685	24072
2011	25000	4104	268	20628	20896
2012	26857	4464	259	22134	22393
2013	26249	4551	479	21219	21698
2014	25747	4608	890	20249	21139
2015	25459	4358	1450	19651	21101

Table 3.3 Electricity production and consumption in Latvia (TJ)

	Production	Own use and losses	Import	Export	Final consumption			
					NFR 1A2	NFR 1A3	NFR 1A4	TOTAL
1990	23933	6883	25700	12798	11484	918	17550	29952
1991	20318	6682	15217	7	10807	785	17255	28847
1992	13803	5645	14688	7	8316	745	13777	22838
1993	14126	6102	9619	612	5440	688	10904	17032
1994	15984	6681	9533	2988	5076	670	10102	15848
1995	14324	6372	9529	1408	5130	677	10267	16074
1996	11254	7989	12377	760	4975	641	9266	14882
1997	16218	7694	6566	4	5519	634	8935	15088
1998	20869	6559	3290	1382	5296	612	10310	16218
1999	14796	5774	9349	2311	5130	554	10375	16059
2000	14890	5202	7589	1159	5159	547	10411	16117
2001	15408	5688	8424	1645	5562	623	10314	16499
2002	14310	5188	10217	1764	5494	518	11563	17575
2003	14310	5065	9616	137	5778	490	12456	18724
2004	16881	4975	9839	2290	5882	500	13072	19454
2005	17658	4767	10278	2545	6120	533	13972	20625
2006	17607	4522	10116	1087	6332	540	15242	22114
2007	17176	4194	17870	7070	6538	504	16740	23782
2008	18987	4198	16715	7643	6066	497	17298	23861
2009	20048	4032	15333	9378	5421	436	16114	21971
2010	23857	4626	14303	11160	5724	453	16197	22374
2011	21938	4133	14432	9950	6012	446	15829	22287
2012	22202	3636	17766	11678	7175	464	17015	24654
2013	22352	3556	18018	13140	6509	446	16719	23674
2014	18508	3146	19221	10883	6003	421	17276	23700
2015	19921	3215	18888	12330	6130	384	16750	23264

Types of fuels used for combustion in Latvia:

Liquid fuels are mainly imported from Latvia's neighbouring countries – Lithuania, Belarus, Russian Federation, Norway and others and consist of:

- shale oil;
- liquefied petroleum gas (LPG);
- motor gasoline and aviation gasoline;
- kerosene type jet fuel;
- other kerosene;
- gasoline type jet fuel;
- motor diesel oil and heating gas oil;
- residual fuel oil (RFO);
- other liquids;
- petroleum coke.

Solid fuels consist of coal and coke imported from Commonwealth of Independent States (countries of former Union of Soviet Socialist Republics), as well as local fuel – peat briquettes – that are mainly produced inside country but not imported;

Peat is 100% produced inside of the country;

Gaseous fuels (natural gas) are 100% imported from Russian Federation;

Biomass fuels:

- solid biomass – wood and other wood products, charcoal, straw, is mainly produced inside of the country,
- methane obtained from biogas that is 100% produced inside of the country – landfill gas is used since 2002 when first landfill started to collect and combust biogas with energy recovery, and sludge gas that is combusted with energy recovery since 1993 in one sewage purification plant, and also other biogases from anaerobic fermentation,
- liquid biofuels – biogasoline and biodiesel, are mainly imported from Latvia's neighbourhood countries.

Other fuels are municipal waste and industrial waste – used tires, different types of industrial ecofuel collected by and combusted in cement production plant in Latvia, as well as waste oils.

3.1.2 Description

Emissions from fuel combustion comprise all in-country fuel consumption for heat and electricity production purposes and to provide operation of transport vehicles. These emissions include point sources, transport and other fuel combustion. Emissions from fuel combustion in the Energy sector are divided into following subcategories:

- NFR 1A1 – Energy Industries;
- NFR 1A2 – Manufacturing Industries and Construction;
- NFR 1A3 – Transport – covers emissions from road transport, civil aviation, railways and domestic navigation, as well as emissions from off-road machinery (NFR 1A2g vii, 1A4a ii, 1A4b ii, 1A4c ii, 1A4c iii);
- NFR 1A4 – Other Sectors (Commercial/Institutional, Residential, Agriculture/Forestry/ Fisheries);
- NFR 1A5 – Other (Not elsewhere specified) – covers emissions from military machinery (offroad);
- NFR 1B – Fugitive emissions from solid fuels, natural gas and oil.

3.2 Stationary fuel combustion (NFR 1A1, 1A2, 1A4)

3.2.1 Sector overview

3.2.1.1 Source category description

This chapter includes stationary combustion plants and autoproducer plants (undertakings that generate electricity/heat wholly or partly for their own use, as an activity that supports their primary activity).

NFR 1A1 Energy industries sectors include emissions from fuel combustion in point sources in energy production. NFR 1A1 sector includes the emissions from on-site use of fuel in the energy production facilities and emissions from manufacturing of solid fuels (peat briquettes, charcoal plant) – these emissions are reported under 1A1c Manufacture of solid fuels and other energy industries sector. There is no petroleum refining in Latvia, therefore emissions in NFR 1A1b sector are not occurring.

NFR 1A2 and 1A4 sectors include emissions from autoproducers in the industrial production and commercial facilities – according to 2006 IPCC Guidelines, emissions from autoproducers are assigned to the sector where they were generated and not under NFR 1A1.

Under 1A2g viii Other sector emissions from following industrial sectors are reported:

- Transport Equipment;

- Machinery;
- Mining and Quarrying;
- Wood and Wood Products;
- Construction;
- Textiles and Leather;
- Non-specified (Industry).

Table 3.4 Source categories and methods for Stationary fuel combustion sectors

NFR code	Description	Method	AD	EF
1 A 1 a	Public electricity and heat production	Tier 1	NS ⁵	D ⁶
1 A 1 c	Manufacture of solid fuels and other energy industries	Tier 1	NS	D
1 A 2 a	Stationary combustion in manufacturing industries and construction: Iron and steel	Tier 1	NS	D
1 A 2 b	Stationary combustion in manufacturing industries and construction: Non-ferrous metals	Tier 1	NS	D
1 A 2 c	Stationary combustion in manufacturing industries and construction: Chemicals	Tier 1	NS	D
1 A 2 d	Stationary combustion in manufacturing industries and construction: Pulp, Paper and Print	Tier 1	NS	D
1 A 2 e	Stationary combustion in manufacturing industries and construction: Food processing, beverages and tobacco	Tier 1	NS	D
1 A 2 f	Stationary combustion in manufacturing industries and construction: Non-metallic minerals	Tier 1	NS, PS ⁷	D
1 A 2 g viii	Stationary combustion in manufacturing industries and construction: Other	Tier 1	NS	D
1 A 4 a i	Commercial/Institutional	Tier 1	NS	D
1 A 4 b i	Residential	Tier 2	NS	D
1 A 4 c i	Agriculture/Forestry/Fishing	Tier 1	NS	D

Table 3.5 Reported emissions in Stationary fuel combustion sectors in 2015

NFR code	Emissions
1 A 1 a	NO _x , NMVOC, SO ₂ , PM _{2.5} , PM ₁₀ , TSP, BC, CO, Pb, Cd, Hg, As, Cr, Cu, Ni, Se, Zn, PCDD/F, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, indeno(1,2,3-cd)pyrene, total PAHs, HCB, PCB
1 A 1 b	NO
1 A 1 c	NO _x , NMVOC, SO ₂ , PM _{2.5} , PM ₁₀ , TSP, BC, CO, Pb, Cd, Hg, As, Cr, Cu, Ni, Se, Zn, PCDD/F, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, indeno(1,2,3-cd)pyrene, total PAHs, HCB, PCB
1 A 2 a	NO _x , NMVOC, SO ₂ , PM _{2.5} , PM ₁₀ , TSP, BC, CO, Pb, Cd, Hg, As, Cr, Cu, Ni, Se, Zn, PCDD/F, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, indeno(1,2,3-cd)pyrene, total PAHs
1 A 2 b	NO _x , NMVOC, SO ₂ , PM _{2.5} , PM ₁₀ , TSP, BC, CO, Pb, Cd, Hg, As, Cr, Cu, Ni, Se, Zn, PCDD/F, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, indeno(1,2,3-cd)pyrene, total PAHs, HCB, PCB
1 A 2 c	NO _x , NMVOC, SO ₂ , NH ₃ , PM _{2.5} , PM ₁₀ , TSP, BC, CO, Pb, Cd, Hg, As, Cr, Cu, Ni, Se, Zn, PCDD/F, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, indeno(1,2,3-cd)pyrene, total PAHs, HCB, PCB
1 A 2 d	NO _x , NMVOC, SO ₂ , NH ₃ , PM _{2.5} , PM ₁₀ , TSP, BC, CO, Pb, Cd, Hg, As, Cr, Cu, Ni, Se, Zn, PCDD/F, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, indeno(1,2,3-cd)pyrene, total PAHs, HCB, PCB
1 A 2 e	NO _x , NMVOC, SO ₂ , NH ₃ , PM _{2.5} , PM ₁₀ , TSP, BC, CO, Pb, Cd, Hg, As, Cr, Cu, Ni, Se, Zn, PCDD/F, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, indeno(1,2,3-cd)pyrene, total PAHs, HCB, PCB
1 A 2 f	NO _x , NMVOC, SO ₂ , NH ₃ , PM _{2.5} , PM ₁₀ , TSP, BC, CO, Pb, Cd, Hg, As, Cr, Cu, Ni, Se, Zn, PCDD/F, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, indeno(1,2,3-cd)pyrene, total PAHs, HCB, PCB
1 A 2 g viii	NO _x , NMVOC, SO ₂ , NH ₃ , PM _{2.5} , PM ₁₀ , TSP, BC, CO, Pb, Cd, Hg, As, Cr, Cu, Ni, Se, Zn, PCDD/F, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, indeno(1,2,3-cd)pyrene, total PAHs, HCB, PCB
1 A 4 a i	NO _x , NMVOC, SO ₂ , NH ₃ , PM _{2.5} , PM ₁₀ , TSP, BC, CO, Pb, Cd, Hg, As, Cr, Cu, Ni, Se, Zn, PCDD/F, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, indeno(1,2,3-cd)pyrene, total PAHs, HCB, PCB
1 A 4 b i	NO _x , NMVOC, SO ₂ , NH ₃ , PM _{2.5} , PM ₁₀ , TSP, BC, CO, Pb, Cd, Hg, As, Cr, Cu, Ni, Se, Zn, PCDD/F, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, indeno(1,2,3-cd)pyrene, total PAHs, HCB, PCB
1 A 4 c i	NO _x , NMVOC, SO ₂ , NH ₃ , PM _{2.5} , PM ₁₀ , TSP, BC, CO, Pb, Cd, Hg, As, Cr, Cu, Ni, Se, Zn, PCDD/F, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, indeno(1,2,3-cd)pyrene, total PAHs, HCB, PCB

⁵ National statistics

⁶ Default EF from EMEP/EEA 2016

⁷ Plant specific (AD – data obtained from plant)

3.2.1.2 Key sources

In 2015, in stationary combustion the Energy industries (NFR 1A1) was important source for NO_x, As, Cu and Ni, Manufacturing industries (NFR 1A2) for SO₂ and PCBs, and Other sectors (commercial/institutional, households and agriculture/forestry/fishery; NFR 1A4) for NMVOCs, NH₃, CO, PMs, Pb, Cd, Hg, Cr, Se, Zn, PCDD/F, PAHs and HCB emissions Figure 3.1.

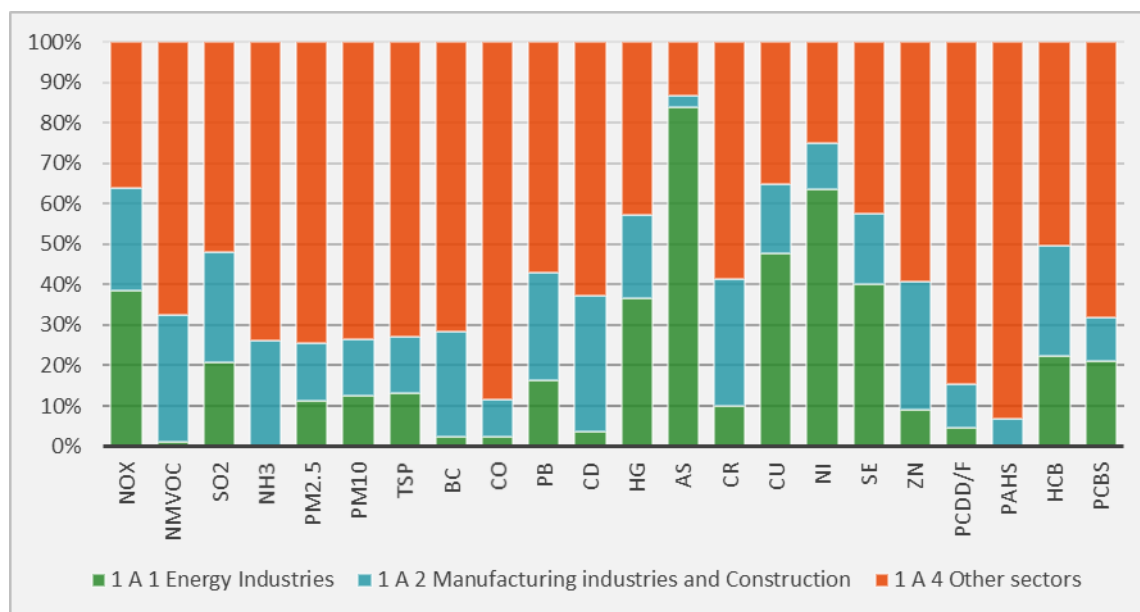


Figure 3.1 Distribution of emissions in Stationary combustion by subsectors in 2015 (%)

Main pollutants

NO_x emissions generated in stationary fuel combustion sectors are 32.9% from total emissions generated in energy sector or 28.9% from total emission generated in Latvia in 2015. The largest part in Stationary combustion were produced in 1A1 Energy Industries (38.5%). **SO₂** emissions from stationary fuel combustion were 83.8% from total SO₂ emissions in 2015, and 1A4 sector was the most important with 52.0% (within Stationary combustion). **NMVOC** emissions from Energy sector contribute to 37.3% of the total Latvia's NMVOC emissions in 2015. 1A4 sector contributed to the largest part with 67.4% from Stationary combustion emissions. The most important source for NMVOC emissions from stationary fuel combustion is solid biomass combustion in Residential sector. The largest part of **NH₃** emissions in stationary fuel combustion are produced in 1A4 sector – in 2015 8.6% of total NH₃ emissions are produced there and 73.7% from stationary fuel combustion. According to EMEP/EEA 2016, there are no emission factors for NH₃ emission estimation in 1A1 sector, therefore notation key NE in particular sector was used.

In 2015, stationary fuel combustion sectors accounted 78.2% of the total Latvia's **CO** emissions. 1A4 sector was the largest emission source accounting for 88.6% of stationary combustion emissions.

Particulate matter

Stationary fuel combustion generated 87.2% of **PM_{2.5}** emissions, 68.7% of **PM₁₀** emissions, 41.2% of **TSP** emissions and 82.6% of Latvia's total **black carbon** emissions in 2015. The largest part of PM emissions in stationary combustion are generated in 1A4 Other sectors (around 72-75%; for BC – 71.7%). Mainly particulate matter emissions are produced in biomass combustion process.

Heavy metals

Lead emissions from stationary fuel combustion were 50.2% from total Pb emissions in 2015, and 1A4 sector was the most important with 56.9% (within stationary combustion). **Cadmium** emissions from stationary fuel combustion account 96.1% from total emissions, and 1A4 sector is the biggest producer of cadmium emissions in stationary fuel combustion sector with 62.6% from total Cd emissions in energy

sector. In 2015 stationary fuel combustion accounted 83.0% of the Latvia's total mercury emissions. **Mercury** emissions from stationary fuel combustion are mainly emitted in solid fuels and biomass combustion, and the largest part of emissions are produced in 1A4 Other sectors (42.7% from stationary combustion).

POPs

Stationary fuel combustion is the main producer of POPs emissions – **PCDD/F** (92.9%), **PAHs** (86.4%), **HCB** (99.0%) and **PCB** (99.4%). 1A4 sector is the largest sector of HCB emissions with 50.4% of total stationary fuel combustion emissions. Solid biomass combustion is the main source of PAHs emissions in 2015, and 1A4 sector is the largest contributor to PAH emissions with 93.1% from stationary combustion respectively. In stationary fuel combustion, 1A4 Other sectors is 84.7% for the PCDD/F emissions where solid biomass and solid fuels are the main emitters for the particular emissions.

3.2.1.3 Trends in emissions

Table 3.6 Reported emissions in Stationary fuel combustion sectors in 1990-2015

	Unit	1990	1995	2000	2005	2010	2011	2012	2013	2014	2015	Change in 1990-2015, %
NO_x	kt	40.35	21.09	13.12	11.71	11.30	10.39	10.80	10.82	10.46	10.55	-73.9
NM VOC		15.50	17.45	15.16	18.10	15.46	15.93	17.00	15.81	15.59	15.44	-0.3
SO₂		94.78	47.13	15.77	6.33	3.75	3.47	3.55	3.30	3.29	3.07	-96.8
NH₃		1.55	2.35	2.13	2.54	2.14	2.24	2.42	2.23	2.21	2.19	40.7
PM_{2.5}		16.28	18.96	16.81	19.31	15.50	16.06	16.87	15.76	15.54	15.44	-5.1
PM₁₀		17.14	19.63	17.34	19.90	16.01	16.57	17.41	16.32	16.14	16.05	-6.3
TSP		18.45	20.81	18.27	20.93	16.85	17.43	18.30	17.20	17.03	16.94	-8.2
BC		2.38	2.86	2.47	2.86	2.39	2.49	2.66	2.47	2.44	2.42	1.7
CO	t	140.39	143.22	124.16	143.67	114.22	118.48	121.36	108.76	104.54	102.56	-26.9
Pb		4.81	2.26	1.50	1.79	1.60	1.61	1.62	1.59	1.65	1.62	-66.2
Cd		0.47	0.58	0.50	0.60	0.54	0.56	0.62	0.59	0.60	0.60	27.9
Hg		0.272	0.103	0.069	0.071	0.064	0.061	0.060	0.062	0.064	0.063	-76.9
Dioxins	g I-Teq	19.12	19.70	18.92	22.13	15.62	16.24	16.83	15.28	14.90	14.65	-23.4
PAHs	t	14.68	12.82	10.73	12.43	9.60	9.94	10.02	8.91	8.55	8.34	-43.2
HCB	kg	0.18	0.25	0.23	0.26	0.23	0.24	0.27	0.27	0.28	0.29	56.7
PCBs		4.27	1.07	0.43	0.53	0.44	0.40	0.27	0.26	0.26	0.21	-95.1

The majority of total emissions from stationary fuel combustion has decreased in 1990-2015, except for NH₃, BC, Cd and HCB emissions. An increase in particular emissions is directly related with the increased use of biomass in 1990-2015.

SO₂ has the biggest decrease in time period 1990–2015 by 96.8% (Table 3.6) and in 2010-2015 SO₂ emissions have decreased by 18%. The emission decrease is explained with fuel switch from heavy liquid fuels and solid fuels to natural gas and biomass use to cut the increased costs of these fuels and to meet the commitments of EU ETS.

There is also a large decrease in NO_x emissions by 73.9%, that can be explained with change in fuel types – solid fuels widely used previously were changed to biomass that has lower NO_x emission factor, therefore the emissions decreased.

NH₃ emissions, however, have increased by 40.7% in 1990-2015, which is mainly because of increased use of biomass. NH₃ emissions are calculated only from biomass burning processes in sectors 1A2 and 1A4.

Particulate matter emissions have decreased in 2000-2015 by 8.2%. Since 2005 particulate matter emissions have decreased due to the decrease of total fuel consumption as well as with increase of natural gas consumption in commercial and institutional buildings instead of wood and wood products consumption.

Heavy metal emissions have decreased by 66-77% in 1990-2015, except Cd, which has increased by 27.9%. Decrease of emissions is explained with a decrease of total fuel consumption in early 90-ties due to economic crisis in country. In recent years heavy metal emissions decreased due to fuel switch from heavy

liquid and solid fuels to natural gas and biomass consumption, except for Cd, which has relatively high emission factor for biomass.

PAH emissions have decreased by 43.2% in 1990-2015, HCB emissions increased by 56.7% and PCDD/F emissions decreased by 23.4% in 1990-2015 that is explained with sharp increase of solid biomass consumption and decrease of fossil fuel consumption. The decrease of PCB emissions by 95.1% is explained with decrease of solid fuel consumption – solid fuels have significantly higher emission factor than solid biomass therefore the decrease of first mentioned has a bigger effect.

3.2.2 Energy industries (NFR 1A1)

3.2.2.1 Overview

NFR 1A1 Energy industries sector includes emissions from fuel combustion in point sources in energy production. Fuel consumption in autoproducer combustion installations is excluded from this sector and included in particular sectors of NFR 1A2, 1A4a and 1A4c sectors according to 2006 IPCC Guidelines.

Emissions from combustion installations with NACE 2 codes 35.11 and 35.30 are reported in NFR 1A1a sector. There are no direct electricity-only production plants in Latvia. There are no petroleum refineries in Latvia. NFR 1A1 sector also includes the emissions from on-site use of fuel in the energy production facilities and emissions from manufacturing of solid fuels (peat briquettes and charcoal production plants) – these emissions are reported under NFR 1A1c Manufacture of solid fuels and other energy industries sector.

3.2.2.2 Trends in emissions

Table 3.7 Trends in emissions from 1A1 Energy Industries sector in 1990-2015

Year	Unit	1990	1995	2000	2005	2010	2011	2012	2013	2014	2015	Change in 1990-2015, %
NO_x	kt	10.543	6.249	4.404	3.698	4.097	3.806	3.618	4.075	3.818	4.058	-61.5
NM VOC		0.217	0.123	0.116	0.124	0.142	0.132	0.132	0.163	0.168	0.180	-17.1
SO₂		36.393	22.828	7.635	1.612	0.685	0.632	0.633	0.651	0.605	0.635	-98.3
PM_{2.5}		0.752	0.564	0.563	0.653	0.762	0.705	0.839	1.298	1.569	1.715	127.9
PM₁₀		0.993	0.728	0.683	0.764	0.886	0.820	0.977	1.511	1.825	1.994	100.8
TSP		1.375	0.970	0.810	0.861	0.987	0.913	1.086	1.676	2.024	2.211	60.8
BC	t	0.041	0.027	0.021	0.022	0.025	0.023	0.028	0.043	0.052	0.056	39.1
CO		2.612	1.387	1.558	1.735	2.016	1.872	1.850	2.254	2.286	2.456	-6.0
Pb		0.238	0.177	0.138	0.103	0.118	0.109	0.131	0.201	0.241	0.263	10.6
Cd		0.056	0.034	0.020	0.011	0.011	0.010	0.012	0.018	0.021	0.023	-59.6
Hg	g I-Teq	0.037	0.023	0.020	0.011	0.013	0.012	0.014	0.019	0.021	0.023	-37.0
Diox		0.176	0.163	0.216	0.243	0.293	0.272	0.324	0.498	0.597	0.651	270.4
PAHs	t	0.002	0.002	0.004	0.005	0.007	0.006	0.007	0.012	0.014	0.016	896.6
HCB	kg	0.032	0.038	0.034	0.023	0.030	0.028	0.034	0.051	0.059	0.064	102.4
PCB		0.002	0.004	0.011	0.015	0.019	0.017	0.021	0.033	0.041	0.044	2776.4

Large part of emissions from NFR 1A1 sector have decreased in 1990-2015 with an exception of PMs, Pb, PAHs and dioxins, as well as HCB and PCB emissions (Table 3.7) that can mainly be explained with decrease of liquid and solid fuels consumption and increased use of biomass consumption in 1A1 sector.

3.2.2.3 Methods

Tier 1 method was used to calculate emissions from the stationary fuel combustion. Calculation of all emissions from fuel combustion is done in Excel databases developed by experts from LEGMC.

The general method for preparing inventory data was used:

$$Em = EF \times B_q$$

where:

Em – total emissions (kt)

EF – emission factor (t/TJ)

B_q – amount of fuel in thermal units (TJ)

3.2.2.4 Emission factors

The main source for emission factors is EMEP/EEA 2016 (emission factors used for Energy sector are presented in Annex I, Table 1).

SO₂ emissions factors were calculated by formula taken from EMEP/EEA 2016 and were calculated by national expert considering physical characterization of types of fuels used in Latvia and taking into account national and international legislation. Percentage amount of sulphur content in used fuels is taken from national database "2-AIR" where polluters report the sulphur content data for certain types of fuels (Annex I, Table 2).

Emission factors for SO₂ are calculated by using following equation:

$$EF = 2 \times \left(\frac{s}{100} \right) \times \frac{1}{Q} \times 10^6 \times \left(\frac{100 - r}{100} \right) \times \left(\frac{100 - n}{100} \right)$$

where:

EF – emission factor (kg/TJ)

2 – SO₂ / S (kg/kg)

s – sulphur content in fuel (%)

r – retention of sulphur in ash (%)

Q – net calorific value (TJ/kt)

10⁶ – (unit) conversion factor

n – efficiency of abatement technology and/or reduction efficiency (%).

The default emission factors used in emission estimations were taken from EMEP/EEA 2016 (Annex I, Table 1). Emission factors for sludge gas and landfill gas were equalized to natural gas emission factors due to unavailability of particular emission factors for sludge gas. Emission factors for biodiesel were equalized to diesel emission factor.

3.2.2.5 Activity data

Mainly emissions from fuel combustion are calculated using fuel consumption data from the national Energy Balance, prepared by CSB. In previous submissions the Annual Questionnaires sent to EUROSTAT were used, but after internal third party review in 2014 the expert's conclusion was to use Energy Balance, if possible, to ensure more precise data. As in the EUROSTAT tables fuel consumption mainly is in natural units (kt, millions m³) therefore net calorific values provided by CSB were used to calculate fuel consumption into terajoules. However, there were differences between Annual Questionnaires' and Energy Balance data due to rounding and conversion of units, therefore it was decided to use Energy Balance data with accuracy up to 1 TJ (instead of Annual Questionnaire's accuracy up to 1 kt). Data on fuel consumption in NFR 1A1 sector are presented in Annex II, Table 2.

The CSB data collection system is based on detailed compulsory survey 2-EK (annual). About 6000 enterprises and organizations (with different types of economic activity) provide information on consumption of energy resources by filling form 2-EK "Survey on acquisition and consumption of energy resources" 2-EK represents the basic tool for creating energy balances at a country level.

It includes information about all enterprises of the local and public administration employing 10 or more persons, other enterprises employing 80 and more persons, as well as enterprises with turnovers equal or more than 4 mln euro, and other enterprises that CSB considers to be significant enough to include in the energy balance, for example, with large imports of wood briquettes, coal and oil products. Enterprises and organizations that are not included in the above mentioned selection were surveyed by the random sampling and afterwards the acquired results were extrapolated.

The amounts of methane from landfill gas combusted are taken from Waste expert, therefore are consistent with numbers of recovered amounts of landfill gas in Waste sector. The amounts of methane from sludge gas combusted are consistent with numbers of gas, recovered from Wastewater handling sector.

In Figure 3.2 there can be seen fuel consumption by fuel types in 1990-2015 in Energy Industries sector. The largest amounts of fuel types consumed through the time series are gaseous fuels. Liquid fuels were mostly used in the beginning of 1990-ties and starting 2000 use of them noticeably decreased. The amounts of biomass consumed are slightly increasing, while the consumption of solid fuels and peat has sharply decreased.

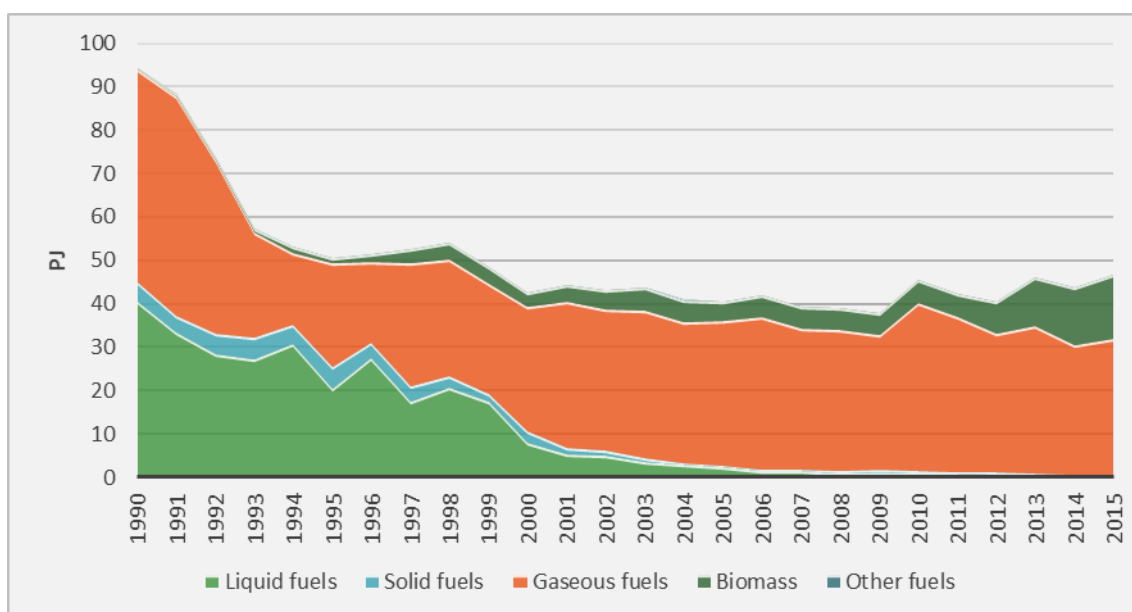


Figure 3.2 Fuel consumption in NFR 1A1 Energy Industries in 1990-2015 (PJ)

The biggest decrease in time period 1990–2015 for the two sub-sectors of NFR 1A1 Energy industries sector was for liquid fuel due to significant decrease of fuel consumption in 1A1a subsector by 99.3%. It is explained with fuel switching processes when liquid fuels were switched to cheaper fuels. Also, a stronger legislation contributed fuel switch to the type of fuels with lower level of emissions. It also explains why consumption of solid fuels decreased by 97.6%, gaseous fuels by 36.0% and consumption of biomass fuel has increased more than 30 times since 1990.

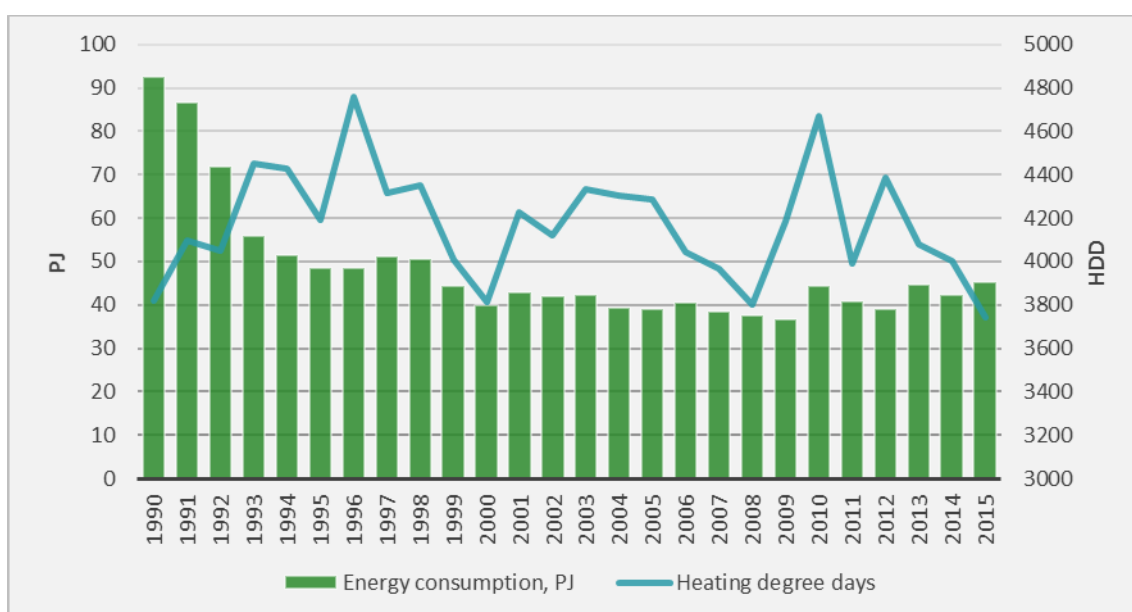


Figure 3.3 Fuel consumption in NFR 1A1a Main activity electricity and heat production and heating degree days in Latvia

As it can be seen in Figure 3.3 the fuel consumption in 1.A.1.a sector can be related with the heating degree days with an exception of 1990s when Soviet Union collapsed and reorganizations took place in Latvia. However, for time period from 1997 to 2002 there can be seen that in years where energy consumption reduced, the HDD were also reduced. In 2009-2010 the average temperature was lower and the use of fuel consumption increased. However, in year 2011 the fuel consumption decreased because of a relatively warm winter. In 2014 fuel consumption it decreased and the number of HDDs decreased. In 2015 HDDs decreased by 6.6% but fuel consumption increased, it could be explained with changes in technologies, when enterprises switched from heat plants to combined heat and power plants.

3.2.2.6 Uncertainties

Uncertainty in activity data of fuel combustion in NFR 1A1 sector is $\pm 2\%$ in 2015. CSB gives approximately 2% statistical sample error for statistical data. According to CSB, as data are obtained using information given by respondents, this number is a variation coefficient which characterizes selection of respondents. Total variation coefficient for energy balance is within 2-3%. In Latvia all fossil fuels (oil, natural gas and coal) are imported and import and export statistics are fairly accurate.

Uncertainty of activity data for solid biomass combustion was assigned as 5% because biomass activity data were collected by CSB with questionnaires sent to enterprises consuming biomass. Also, according to 2006 IPCC Guidelines, Volume 2, Chapter 1, pg. 1.19, biomass data are generally more uncertain than other data in national energy statistics, because a large fraction of the biomass may be part of the informal economy, and the trade in these type of fuels is frequently not registered in the national energy statistics and balances. That was a reason for higher uncertainty for biomass than for other fuel types. Uncertainty of sludge gas stationary combusted in enterprises covered by 1A1 Energy Industries sector was assumed rather low – 2% because the combusted fuel amount is obtained directly from wastewater treatment plant that has precise measurement equipment for accounting of combusted fuel. Still the methane percentage amount in combusted sludge gas is given approximately, therefore final uncertainty of combusted sludge gas is assumed as 5%. The same applies to landfill gas. Taking into account uncertainties of solid biomass and biogas consumption total biomass fuel consumption uncertainty is assumed as 5%.

Emission factor uncertainty is assumed as 50%, as these are default emission factors taken from EMEP/EEA 2016.

3.2.2.7 QA/QC and verification

Disaggregated data at the finest level possible are presented in the corresponding Annex. Data completeness has been explained in the previous subchapter.

Activity data have been checked at the data provider – CSB, which has its own internal QA/QC procedures based on mathematic model and analysis to avoid logic mistakes. When activity data have been received, the sectoral expert responsible for the emission estimation and reporting are comparing all data changes with the previous inventory, and all changes are explained in the corresponding subchapter. All fluctuations or changes in NCVs are double checked and agreed with CSB.

To verify the emissions, logical mistakes are checked by checking the time series of the activity data, emission factors and emissions consistency to display all significant and illogical changes in the activity data and emissions. The emissions for substances reported also under UNFCCC as indirect GHGs are cross-checked for verification purposes.

3.2.2.8 Recalculations

In Submission 2017, there were following recalculations done:

- Emission factor changed to EMEP/EEA 2016.
- Corrected activity data mistakes

3.2.2.9 Planned improvements

No improvements planned.

3.2.3 Manufacturing industries and construction (NFR 1A2)

3.2.3.1 Overview

NFR 1A2 Manufacturing industries and construction sector includes emissions from fuel combustion in combustion installations for industrial production including emissions from off-road. NFR 1A2 sector also includes the emissions from on-site use of fuel in the industrial production facilities (autoproducers) – these emissions are reported under particular sub-sectors of NFR 1A2 according to 2006 IPCC Guidelines.

Under NFR 1A2f Other sector emissions from following industrial sectors are reported:

- Non-Metallic Minerals;
- Transport Equipment;
- Machinery;
- Mining and Quarrying;
- Wood and Wood Products;
- Construction;
- Textiles and Leather;
- Other non-specified (Industry).

3.2.3.2 Trends in emissions

Table 3.8 Trends in emissions from NFR 1A2 Manufacturing Industries and Construction sector in 1990-2015

Year	Unit	1990	1995	2000	2005	2010	2011	2012	2013	2014	2015	Change in 1990-2015, %
NO _x	kt	17.46	9.60	4.87	3.48	3.20	2.73	3.05	2.87	2.81	2.68	-84.7
NMVOC		1.66	1.43	1.28	2.20	3.28	3.62	4.17	4.29	4.81	4.85	192.1
SO ₂		24.32	15.08	4.70	1.56	0.99	0.81	0.94	0.83	0.90	0.84	-96.6
NH ₃		0.02	0.09	0.10	0.20	0.36	0.41	0.48	0.50	0.57	0.58	2421.4
PM _{2.5}		0.87	0.75	0.56	0.96	1.47	1.65	1.91	1.97	2.22	2.23	157.1
PM ₁₀		0.88	0.76	0.57	0.99	1.51	1.69	1.95	2.01	2.27	2.28	157.9
BC		0.90	0.78	0.59	1.03	1.58	1.77	2.04	2.11	2.38	2.39	165.8
TSP		0.37	0.29	0.19	0.26	0.42	0.46	0.54	0.56	0.62	0.63	70.9
CO	t	4.50	3.38	2.55	4.69	6.39	7.08	8.16	8.27	9.31	9.26	105.7
Pb		0.23	0.16	0.11	0.29	0.31	0.35	0.41	0.40	0.45	0.44	93.2
Cd		0.011	0.033	0.036	0.074	0.128	0.146	0.169	0.176	0.200	0.202	1740.2
Hg	g I-Teq	0.030	0.014	0.010	0.019	0.014	0.014	0.015	0.013	0.014	0.013	-56.8
PCDD/F		0.43	0.40	2.09	3.09	1.06	1.20	1.39	1.41	1.60	1.59	268.7
PAHs	t	0.25	0.18	0.23	0.47	0.39	0.44	0.52	0.51	0.58	0.56	126.3
HCB	kg	0.004	0.012	0.024	0.042	0.049	0.056	0.065	0.068	0.077	0.078	1825.9
PCB		0.26	0.11	0.04	0.17	0.06	0.06	0.07	0.04	0.05	0.02	-91.4

As it can be seen in Table 3.8, the largest part of emissions with an exception of NO_x and SO₂, Hg and PCB have increased in 1990-2015, which can be explained with increased use of biomass and other fossil fuels comparing to 1990.

Emissions from NFR 1A2 have been increasing in the latest years with a fluctuating trend. The increase in 2000-ties were due to sharp development of nation economy and industry as well as increase of demand of industrial production and improvement of well-being of population. Increase of emissions are also caused by constant increase of solid fuels – coal, and other fuels (used tires) consumption that mostly is combusted in mineral and steel production industry. Decrease of emissions in 2007-2008 was influenced by the features of national economy development when in-country industrial production had started to decrease due to increase of costs of the production and dominance of imported products. Crisis in national economy in the second half of 2008 also caused a decrease of total emissions. In year 2012 there can be seen a decrease of fossil fuels, but increase in biomass usage, therefore NMVOC, NH₃, PM, Cd and POPs emissions have increased, because biomass has larger emission factors for particular pollutants, while other pollutant emissions have decreased due to less use of fossil fuels.

3.2.3.3 Methods

Tier 1 method was used to calculate emissions from the stationary fuel combustion. Calculation of all emissions from fuel combustion is done in Excel databases developed by experts from LEGMC.

The general method for preparing inventory data was used:

$$Em = EF \times B_q$$

where:

Em – total emissions (kt)

EF – emission factor (t/TJ)

B_q – amount of fuel in thermal units (TJ)

3.2.3.4 Emission factors

The main source of emission factors is EMEP/EEA 2016 (emission factors used for Energy sector are presented in Annex I, Table 1).

SO₂ emission factors are calculated using the same methodology as for NFR 1A1 sector, using Tier 2 (see chapter 3.2.2.4).

The default emission factors used in estimation of emissions were taken from EMEP/EEA 2016 (Annex I). Emission factors for biodiesel were equalized to diesel emission factor.

The municipal waste consumption is reported in NFR 1A2f, and the emission factors are taken from Waste sector after 3rd Stage in-depth review in 2013 where Energy expert suggested Latvia to use emission factors from particular sector.

3.2.3.5 Activity data

Mainly emissions from fuel combustion are calculated using fuel consumption data from the national Energy Balance, prepared by CSB. The data collection system for NFR 1A2 sector is the same as for NFR 1A1 sector. Data on fuel consumption in NFR 1A2 sector are presented in Annex II, Table 2.

Autoproducers data prepared by CSP are taken into account into the calculation of the emissions from NFR 1A2 sector according to 2006 IPCC Guidelines.

Only gasoline combustion is reported as off-roads in NFR 1A2g vii sector. All reported diesel oil is estimated as combusted stationary because it is not possible for CSB and LEGMC to divide the consumption between fuel combusted stationary and filled in technological vehicles (off-roads).

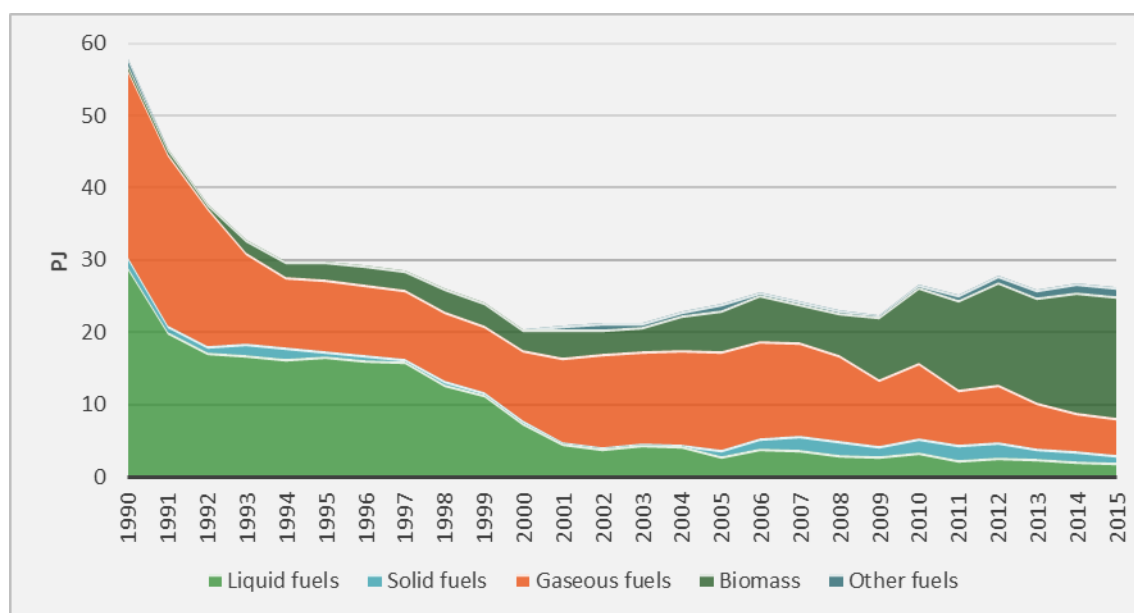


Figure 3.4 Fuel consumption in NFR 1A2 Manufacturing industries and construction in 1990-2015 (PJ)

The most of fuel types with an exception of biomass and natural gas fuels have decreased in 1990-2015 (Figure 3.4). Liquid fuels have the biggest decrease in time period by 93.2%. It is explained with fuel switching processes when liquid fuels were replaced with other cheaper fuels. Also stronger legislation contributed fuel replacement to the type of fuels with lower level of emissions.

The consumption of solid fuels (mainly coal) decreased in 1990-2004 with an exception of 1993-1994, mainly due to increased use of coal in Construction and Textiles and Leather sectors. Solid fuels consumption was growing rapidly by 7.1 times since 2004 until 2008 because of the growth in national economy, and decreased in 2009 by 31.7% due to global crisis. However, starting from 2009, the consumption of solid fuels increased by 57.8% until year 2012. The increase of solid fuel consumption was caused by the increase of oil price overall the world when coal combustion was cheaper than combustion of residual fuel oil and diesel oil. The increase in solid fuel consumption can also be explained with the development of mineral production sector – cement production – where coal is consumed. In 2012-2015 there can be seen a drop in solid fuel consumption – in Non-metallic minerals sector the consumption decreased by 45.5%, and in Iron and Steel sector by 100% because of bankruptcy of the largest steel producing company.

After the crisis in the beginning of 90-ties natural gas consumption steadily decreasing with some small exceptions due to fuel replacement processes and development of national economy. 1990-2015 natural gas consumption have decreased by 79.7%.

Consumption of biomass fuel had increased very significantly – by 26 times in 1990–2015 with some fluctuations in 2000-2008. Lower costs of solid and liquid biomass, large availability of the fuel in-country as well as development of EU ETS were the main reasons for liquid and solid fuels' replacement with biomass and natural gas.

Consumption of used tires and municipal wastes in Mineral production (information taken from „CEMEX”, the only company which combusts used tires and municipal waste for energy purposes) reported as other fossil fuels had a 49-fold increase in 1999-2015, and continue to increase year by year. Comparing with 2010, the consumption of wastes had increased by 1.7 times in 2015. The increase was influenced by intensified cement production that was caused by increased demand of construction materials and sharp development of construction sector. In the category of other fossil fuels also used oils are reported, and the amount of this fuel is fluctuating over years with a decreasing trend in recent years.

3.2.3.6 *Uncertainties*

Uncertainty in activity data of fuel combustion in NFR 1A2 sector is $\pm 2\%$ in 2015. CSB gives approximately 2% statistical sample error for statistical data. According to CSB, as data are obtained using information given by respondents, this number is a variation coefficient which characterizes selection of respondents. Total variation coefficient for energy balance is within 2-3%. In Latvia all fossil fuels (oil, natural gas and coal) are imported and import and export statistics are fairly accurate.

Uncertainty of activity data for solid biomass combustion was assigned as 5% because biomass activity data were collected by CSB with questionnaires sent to enterprises consuming biomass. Also, according to 2006 IPCC Guidelines, Volume 2, Chapter 1, pg. 1.19, biomass data are generally more uncertain than other data in national energy statistics, because a large fraction of the biomass may be part of the informal economy, and the trade in these type of fuels is frequently not registered in the national energy statistics and balances.

Uncertainty of other fuels consumption – municipal and industrial wastes used in mineral production is also assumed as low – 2% as the activity data is obtained from only one producer within EU ETS therefore the data is verified by accredited verifier and Regional Environmental Board.

Emission factor uncertainty is assumed as 50% as emission factors are taken from EMEP/EEA 2016.

3.2.3.7 QA/QC and verification

Disaggregated data at the finest level possible are presented in the corresponding Annex. Data completeness has been explained in the previous subchapter.

Activity data have been checked at the data provider – CSB, which has its own internal QA/QC procedures based on mathematic model and analysis to avoid logic mistakes. When activity data have been received, the sectoral expert responsible for the emission estimation and reporting are comparing all data changes with the previous inventory, and all changes are explained in the corresponding subchapter. All fluctuations or changes in NCVs are double checked and agreed with CSB.

To verify the emissions, logical mistakes are checked by checking the time series of the activity data, emission factors and emissions consistency to display all significant and illogical changes in the activity data and emissions. The emissions for substances reported also under UNFCCC as indirect GHGs are cross-checked with for verification purposes.

3.2.3.8 Recalculations

In Submission 2017, there were following recalculations done:

- Emission factor changed to EMEP/EEA 2016.
- Corrected activity data mistakes

3.2.3.9 Planned improvements

No improvements planned.

3.2.4 Other sectors (NFR 1A4)

3.2.4.1 Overview

NFR 1A4 Other Sectors include emissions from the small combustion plants used in Commercial/Institutional Residential sectors and Agriculture/Forestry/Fisheries. Also emissions from autoproducers are included in relevant sectors of NFR 1A4 as it is stated that emissions have to be reported in sector they are produced.

Emissions from mobile machinery used in Commercial (NFR 1A4a ii), Residential (NFR 1A4b ii) and Agriculture/Forestry (1A4c ii) and Fishery (1A4c iii) sectors are reported as off-road under Transport chapter.

3.2.4.2 Trends in emissions

Table 3.9 Trends in emissions from NFR 1A4 Other sectors in 1990-2015

	Unit	1990	1995	2000	2005	2010	2011	2012	2013	2014	2015	Change in 1990-2015, %
NO_x	kt	12.35	5.24	3.85	4.53	4.00	3.85	4.12	3.87	3.83	3.81	-69.1
NMVOC		13.62	15.90	13.76	15.78	12.04	12.18	12.70	11.36	10.61	10.41	-23.5
SO₂		34.06	9.23	3.43	3.16	2.07	2.02	1.98	1.82	1.78	1.59	-95.3
NH₃		1.53	2.26	2.03	2.33	1.78	1.83	1.94	1.73	1.64	1.61	5.2
PM_{2.5}		14.66	17.64	15.69	17.70	13.27	13.70	14.13	12.49	11.75	11.50	-21.6
PM₁₀		15.26	18.13	16.09	18.15	13.62	14.06	14.48	12.80	12.04	11.78	-22.8
BC		16.18	19.06	16.87	19.04	14.29	14.75	15.17	13.41	12.62	12.35	-23.7
TSP		1.97	2.55	2.25	2.57	1.95	2.00	2.10	1.87	1.77	1.73	-12.0
CO		133.28	138.44	120.05	137.24	105.82	109.53	111.35	98.24	92.94	90.85	-31.8
Pb	t	4.35	1.93	1.25	1.40	1.18	1.15	1.08	1.00	0.96	0.92	-78.7
Cd		0.40	0.52	0.45	0.52	0.40	0.40	0.44	0.40	0.38	0.38	-6.6
Hg		0.205	0.065	0.038	0.041	0.037	0.035	0.031	0.029	0.028	0.027	-87.0
PCDD/F	g I-Teq	18.52	19.13	16.62	18.80	14.27	14.77	15.12	13.38	12.71	12.41	-33.0
PAHs	t	14.43	12.64	10.49	11.96	9.21	9.49	9.50	8.39	7.96	7.76	-46.2
HCB	kg	0.15	0.20	0.17	0.20	0.15	0.15	0.17	0.15	0.15	0.14	-1.9
PCBs		4.00	0.95	0.38	0.35	0.36	0.32	0.17	0.18	0.17	0.14	-96.4

Almost all emissions have decreased in 1990-2015 NFR 1A4 Other Sectors, except for NH₃ (Table 3.9). It is explained with changes and redistribution of structure of national economy as well as with significant decrease of fuel consumption in the sector. Increase of emissions in 2008–2009 is explained with development of national economy and well-being of population. But in years 2009-2010 there can be seen a decrease in emissions, which can be explained with consequences caused by crisis. The emissions are also affected by weather conditions and recent increase of individual heating supply consumers in 1A4b Residential sector. The increase of gaseous fuels consumption, steady biomass fuel consumption and increase of peat consumption caused the increase of all emissions with the exception of SO₂ and PCBs emissions. Also high costs of liquid fuels and increase of natural gas prices in Latvia have caused the situation when previously used fuels had switched to biomass.

3.2.4.3 Methods

Tier 1 method was used to calculate emissions from the stationary fuel combustion. Calculation of all emissions from fuel combustion is done in Excel databases developed by experts from LEGMC.

The general method for estimation of emissions was used:

$$Em = EF \times B_q$$

where:

Em – total emissions (kt)

EF – emission factor (t/TJ)

B_q – amount of fuel in thermal units (TJ)

For residential sector Tier 2 method was used to calculate emissions, taking into account also the combustion installations. Data about installations are taken from CSB 5-yearly household questionnaires and calculations are made, using expert's judgement. The following method for estimation of emissions from EMEP/EEA 2016 was used:

$$E_i = \sum_{j,k} EF_{i,j,k} \times A_{j,k}$$

where:

E_i – annual emission of pollutant *i*,

EF_{i,j,k} – default emission factor of pollutant *i* for source type *j* and fuel *k*

A_{j,k} – annual consumption of fuel *k* in source type *j*

Calculations of all emissions are done in Excel databases developed by experts from LEGMC.

3.2.4.4 Emission factors

The main source for emission factors is EMEP/EEA 2016. Emission factors used for Energy sector are presented in Annex I, Table 1.

SO₂ emission factors are calculated using the same methodology as for NFR 1A1 and 1A2 sectors, using Tier 2 (see chapter 3.2.2.4), where sulphur content is country-specific for each fuel type.

The default emission factors used in estimation of emission were taken from EMEP/EEA 2016 (Annex I, Table 1). Emission factors for landfill gas were equalized to natural gas emission factors due to unavailability of particular emission factors for landfill gas. Emission factors for biodiesel were equalized to diesel emission factor.

3.2.4.5 Activity data

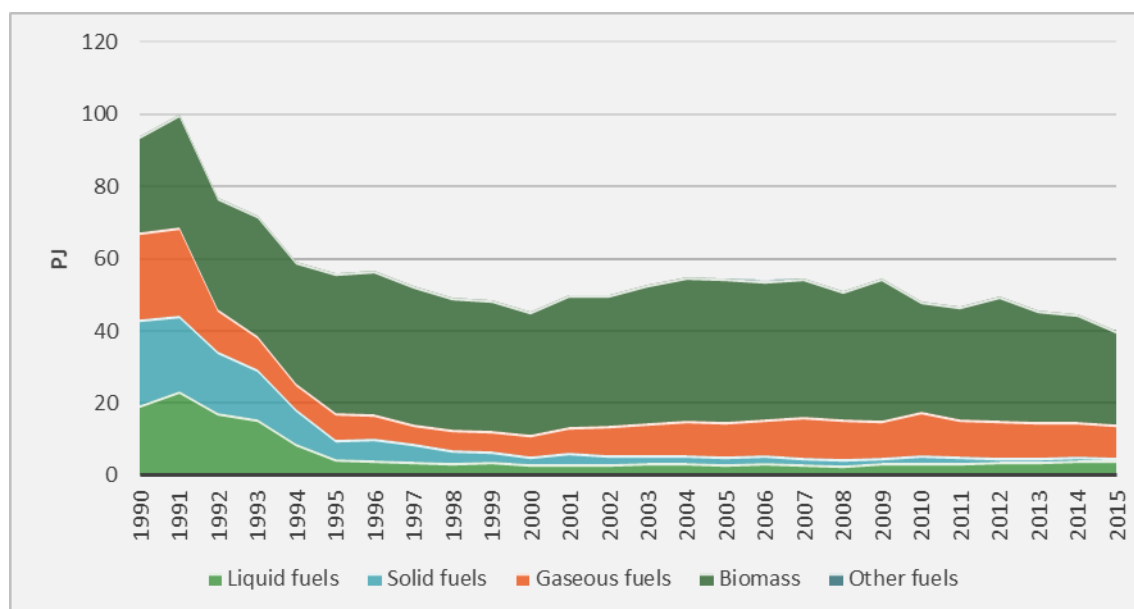


Figure 3.5 Fuel consumption in NFR 1A4 Other sectors in 1990–2015 (PJ)

The biggest decrease in 1990–2015 was for solid fuel consumption – 96.5% and liquid fuels consumption – 78.7% (Figure 3.5). It is explained with fuel switching processes when solid and liquid fuels were replaced with cheaper fuels. Also stronger legislation contributed fuel switching to the type of fuels with a lower level of emissions.

Since 1990 biomass dominates as a fuel in NFR 1A4 sector. The biggest part of solid biomass consumption goes to Residential sector where biomass is the main fuel in small capacity burning installations. Consumption of biomass fuel has decreased by 2.5% in 1990–2015 in NFR 1A4. However, it can be seen that the used amount of biomass has been fluctuating over recent years, which can mainly be explained with temperature fluctuations during winter.

Since 1997 natural gas consumption was constantly increasing until 2007, because it had lower costs therefore liquid and solid fuels were replaced with natural gas as a fuel. The increase in fuel consumption in NFR 1A4 Other sectors is strongly linked to decrease in fuel consumption in NFR 1A1 Energy industries when central heating supply consumers switched to individual heating supply. In the recent years decrease in consumption of natural gas can be observed, which was influenced by increase of natural gas price.

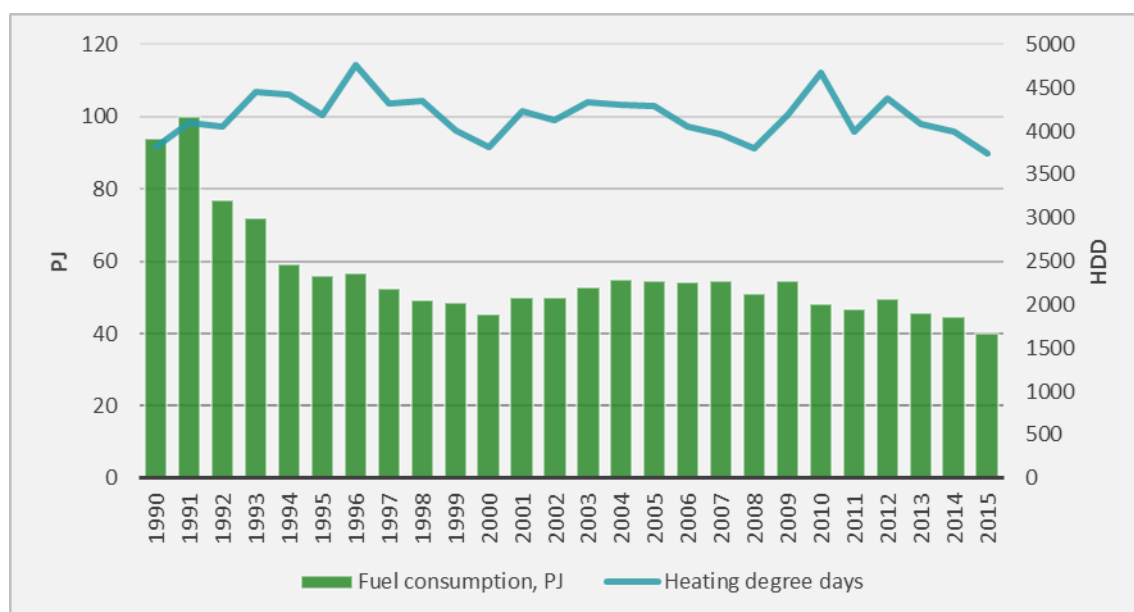


Figure 3.6 Fuel consumption in NFR 1A4 Other sectors and heating degree days in Latvia

As it can be seen in Figure 3.6, fuel consumption in NFR 1A4 sector is related with changes in temperature – in years where heating degree days are more, the amounts of consumed fuel are also larger, especially it can be seen in 1994-2003 and in the most recent years. In 2008 there was considerably low number of HDDs, and also the fuel consumed was less than in 2007. However, in 2009-2010 the correlation between HDDs and consumption is less visible because of impact of global crisis, which clearly affected the Residential sector. In 2011-2013 correlation can be seen in HDDs and fuel consumption – in 2012 the number of HDDs was by 9.9% higher than in 2011, and the amounts of fuel consumed were by 5% more. In 2013 the number of HDDs was by 7% less, and also fuel consumed was by 7% less than in 2012. In 2015 the number of HDDs was 6.4% less while the consumption of fuels consumption decrease by 10.6% compared with 2014.

3.2.4.6 Uncertainties

Uncertainty in activity data of fuel combustion in 1A4 sector is $\pm 2\%$ in 2015. CSB gives approximately 2% statistical sample error for statistical data. According to CSB, as data are obtained using information given by respondents, this number is a variation coefficient which characterizes selection of respondents. Total variation coefficient for energy balance is within 2-3%. In Latvia all fossil fuels (oil, natural gas and coal) are imported and import and export statistics are fairly accurate.

Uncertainty of activity data for solid biomass and peat combustion was assigned as 5% because biomass activity data were collected by CSB with questionnaires sent to enterprises consuming biomass. As fuel consumption in NFR 1A4b Residential sector is obtained only every 5 years using questionnaire and data are extrapolated until the next survey, therefore the uncertainty of all fuel consumption in residential sector is assumed 15%. According to 2006 IPCC Guidelines, Volume 2, Chapter 1, pg. 1.19, biomass data are generally more uncertain than other data in national energy statistics, because a large fraction of the biomass may be part of the informal economy, and the trade in these type of fuels is frequently not registered in the national energy statistics and balances. Uncertainty of landfill gas stationary combusted in enterprises covered by NFR 1A4 Other sectors was assumed rather low – 2% because the combusted fuel amount is obtained directly from landfill plant that has precise measurement equipment for accounting of combusted fuel.

Emission factor uncertainty is assumed as 50%.

3.2.4.7 QA/QC and verification

Disaggregated data at the finest level possible are presented in the corresponding Annex.

Activity data have been checked at the data provider – CSB, which has its own internal QA/QC procedures based on mathematic model and analysis to avoid logic mistakes. When activity data have been received, the sectoral expert responsible for the emission estimation and reporting are comparing all data changes with the previous inventory, and all changes are explained in the corresponding subchapter. All fluctuations or changes in NCVs are double checked and agreed with CSB.

To verify the emissions, logical mistakes are checked by checking the time series of the activity data, emission factors and emissions consistency to display all significant and illogical changes in the activity data and emissions. The emissions for substances reported also under UNFCCC as indirect GHGs are cross-checked with for verification purposes.

3.2.4.8 Recalculations

In Submission 2017, there were following recalculations done:

- Emission factor changed to EMEP/EEA 2016.
- Corrected activity data mistakes.
- 90% of diesel that was consumed in NFR 1A4ci Stationary combustion was moved to NFR 1A4cii after information received from CSB, that only 10% of diesel fuel reported in Agriculture/Forestry/Fishing is consumed stationary.

3.2.4.9 Planned improvements

No improvements planned.

3.3 Transport (NFR 1A3, NFR 1A5)

3.3.1 Sector overview

3.3.1.1 Source category description

Transport sector is a major contributor to national NO_x and Pb emissions in 2015. The sector includes civil aviation, road transport, railways, domestic navigation and off-road transport. Road Transport includes all transportation types of vehicles on roads: passenger cars, light duty vehicles, buses, heavy-duty vehicles and motorcycles and mopeds. It does not cover farm and forest tractors driving occasionally on the roads because these are included in “Other sectors” as off-roads (NFR 1A2g vii, 1A4a ii, 1A4b ii, 1A4c ii). Railway Transport includes railway transport operated by diesel locomotives. Civil Aviation includes helicopters, airplanes with turbojet engine and airplanes with piston engines. Military aircrafts are included in Other (NFR 1A5b). Domestic Navigation comprises for miscellaneous vessels (tugs, barges, towboats, icebreakers), recreational crafts and personal boats. Emissions from fishing boats are included in NFR 1A4c iii sector.

Table 3.10 shows the methods and source for activity data and emission factors used for emission calculating in Transport sector. Table 3.11 shows list of pollutants, which are produced in Transport sector.

Table 3.10 Source categories and methods for Transport sector

NFR code	Description	Method	AD	EF
1 A 3 a	Civil aviation	Tier 1, 2	NS ⁸	D ⁹
1 A 3 b	Road transport	Tier 2	NS	D
1 A 3 c	Railways	Tier 1	NS	D
1 A 3 d	Waterborne navigation	Tier 1	NS	D
1 A 3 e	Pipeline compressors	Tier 1	NS	D
1 A 2 g vii	Mobile Combustion in manufacturing industries and construction	Tier 1	NS	D
1 A 4 a ii	Commercial/industrial land based mobile machinery	Tier 1	NS	D
1 A 4 b ii	Residential: household and gardening land based machinery	Tier 1	NS	D
1 A 4 c ii	Agriculture/Forestry/Fishing: off-road vehicles and other machinery	Tier 1	NS	D

⁸ National Statistics

⁹ Default emission factor from guidelines

NFR code	Description	Method	AD	EF
1 A 4 c iii	National fishing	Tier 1	NS	D
1 A 5 b ii	Military aviation, navigation	Tier 1	NS	D

Table 3.11 Reported emissions in Transport sector in 2015

NFR code	Emissions
1 A 2 g vii	NO _x , NMVOC, SO ₂ , NH ₃ , PM _{2.5} , PM ₁₀ , TSP, BC, CO, Pb, Cd, Cr, Cu, Ni, Se, Zn, benzo(a)pyrene, benzo(b)fluoranthene, total PAHs
1 A 3 a i (i)	NO _x , NMVOC, SO ₂ , PM _{2.5} , PM ₁₀ , TSP, BC, CO
1 A 3 a ii (i)	NO _x , NMVOC, SO ₂ , PM _{2.5} , PM ₁₀ , TSP, BC, CO
1 A 3 b i	NO _x , NMVOC, SO ₂ , NH ₃ , PM _{2.5} , PM ₁₀ , TSP, BC, CO, Pb, Cd, Cr, Cu, Ni, Se, Zn, PCDD/F, benzo(a)pyrene, benzo(b)fluoranthene, indeno(1,2,3-cd)pyrene, total PAHs
1 A 3 b ii	NO _x , NMVOC, SO ₂ , NH ₃ , PM _{2.5} , PM ₁₀ , TSP, BC, CO, Pb, Cd, Cr, Cu, Ni, Se, Zn
1 A 3 b iii	NO _x , NMVOC, SO ₂ , NH ₃ , PM _{2.5} , PM ₁₀ , TSP, BC, CO, Pb, Cd, Cr, Cu, Ni, Se, Zn
1 A 3 b iv	NO _x , NMVOC, SO ₂ , NH ₃ , PM _{2.5} , PM ₁₀ , TSP, BC, CO, Pb, Cd, Cr, Cu, Ni, Se, Zn
1 A 3 b v	NMVOC
1 A 3 b vi	PM _{2.5} , PM ₁₀ , TSP, BC
1 A 3 b vii	PM _{2.5} , PM ₁₀ , TSP
1 A 3 c	NO _x , NMVOC, SO ₂ , NH ₃ , PM _{2.5} , PM ₁₀ , TSP, BC, CO, Cd, Cr, Cu, Ni, Se, Zn, benzo(a)pyrene, benzo(b)fluoranthene, total PAHs
1 A 3 d i (ii)	NA, NE
1 A 3 d ii	NO _x , NMVOC, SO ₂ , NH ₃ , PM _{2.5} , PM ₁₀ , TSP, BC, CO, Cd, Cr, Cu, Ni, Se, Zn, benzo(a)pyrene, benzo(b)fluoranthene, total PAHs
1 A 3 e i	IE
1 A 4 a ii	NO _x , NMVOC, SO ₂ , NH ₃ , PM _{2.5} , PM ₁₀ , TSP, BC, CO, Pb, Cd, Cr, Cu, Ni, Se, Zn, benzo(a)pyrene, benzo(b)fluoranthene, total PAHs
1 A 4 b ii	NO _x , NMVOC, SO ₂ , NH ₃ , PM _{2.5} , PM ₁₀ , TSP, BC, CO, Pb, Cd, Cr, Cu, Ni, Se, Zn, benzo(a)pyrene, benzo(b)fluoranthene, total PAHs
1 A 4 c ii	NO _x , NMVOC, SO ₂ , NH ₃ , PM _{2.5} , PM ₁₀ , TSP, BC, CO, Pb, Cd, Cr, Cu, Ni, Se, Zn, benzo(a)pyrene, benzo(b)fluoranthene, total PAHs
1 A 4 c iii	NO _x , NMVOC, SO ₂ , PM _{2.5} , PM ₁₀ , TSP, BC, CO, Pb, Cd, Hg, As, Cr, Cu, Ni, Se, Zn, PCDD/F, HCB, PCBs
1 A 5 b	NO _x , NMVOC, SO ₂ , PM _{2.5} , PM ₁₀ , TSP, BC, CO, Pb, Cd, Hg, As, Cr, Cu, Ni, Se, Zn, PCDD/F, HCB, PCBs

3.3.1.2 Key sources

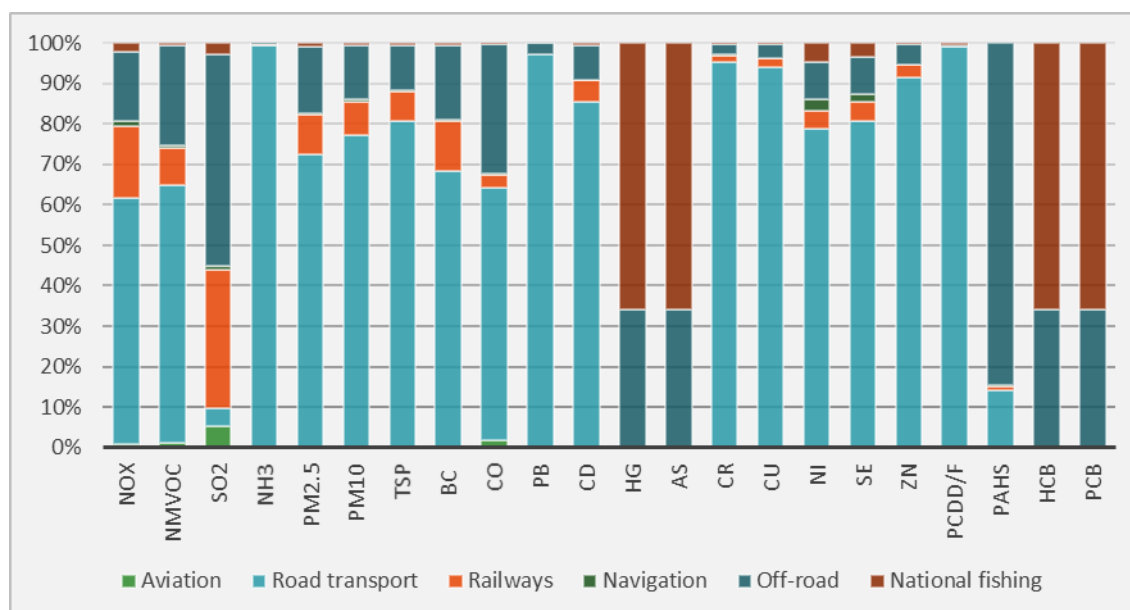


Figure 3.7 Distribution of emissions in Transport sector by subsectors in 2015 (%)

The biggest part of Transport emissions take up Road Transport then follows Railways, off-road and fishing emissions (Figure 3.7). Exception is SO₂ emissions where railway and off-road is the main sources of

emissions in transport sector. Civil aviation and domestic navigation contribute a very small part of transport emissions.

3.3.1.3 Trends in emissions

Table 3.12 Fuel consumption in Transport sector in 2014 and 2015 (TJ)

	Liquid fuel		Change in 2014-2015, %	Biofuels		Change in 2014-2015, %
	2014	2015		2014	2015	
Aviation	636	556	-12.6	NO	NO	NO
Road transport	36734	39286	6.9	840	880	4.8
Railways	2889	2765	-4.3	83	74	-10.8
Navigation	175	132	-24.6	NO	NO	NO
Off-road	4436	4682	5.5	NO	NO	NO
National fishing	297	214	-27.9	NO	NO	NO

In 2015, total fuel consumption in the transport sector (excluded off-road), compared to 2014 level, has increased by 5.4% (Table 3.12). In different subsectors various changes have taken place in 2015. The main impact to changes in total fuel consumption related to road transport where the fuel consumption has increased by around 6.9 %.

In total, road transport consumes around 82.7%, railway – about 5.8%, domestic civil aviation – around 1.1% (including international LTO) and off-roads – around 9.6%, national fishing and domestic navigation – the remaining share of fuel.

Diesel oil is the major fuel type in the transport sector and it constitutes around 71%, and is followed by gasoline – around 20%, but LPG constitutes around 6% and biofuels (biodiesel and bioethanol) around 2% of the total fuel consumption in the transport sector (excluding off-road).

Table 3.13 Trends in emissions from Transport sector in 1990 and 2015

Pollutant	Unit	1990	1995	2000	2005	2010	2011	2012	2013	2014	2015	Change in 1990-2015, %
NOx	kt	40.45	27.04	25.81	27.35	23.97	21.21	20.10	19.66	19.56	19.65	-51.41
NM VOC		30.78	19.33	14.54	9.34	4.73	4.59	4.52	4.09	3.68	3.35	-89.10
SO₂		2.11	1.32	0.86	0.67	0.39	0.42	0.40	0.39	0.38	0.39	-81.57
NH₃		0.02	0.04	0.08	0.25	0.25	0.24	0.23	0.23	0.24	0.24	1361.50
PM_{2.5}		1.23	0.80	0.93	1.29	1.09	0.96	0.94	0.92	0.92	0.93	-24.56
PM₁₀		1.42	0.94	1.06	1.47	1.29	1.14	1.11	1.11	1.13	1.15	-18.92
TSP		1.62	1.08	1.26	1.76	1.58	1.39	1.35	1.31	1.35	1.39	-14.02
BC		0.53	0.34	0.43	0.65	0.58	0.51	0.51	0.48	0.48	0.48	-9.19
CO	t	234.55	133.40	81.70	52.67	27.40	27.74	27.92	26.85	23.91	22.14	-90.56
Pb		91.66	58.18	4.58	2.08	1.91	1.76	1.53	1.45	1.44	1.47	-98.40
Cd		0.013	0.009	0.009	0.012	0.013	0.012	0.011	0.011	0.012	0.013	-1.58
Hg		1.1E-3	1.2E-3	7.8E-4	7.6E-4	3.6E-4	3.8E-4	2.7E-4	2.5E-4	2.8E-4	2.3E-4	-79.84
As		9.4E-3	7.4E-3	5.0E-3	3.6E-3	4.8E-4	5.2E-4	3.5E-4	3.4E-4	3.8E-4	3.1E-4	-96.72
Cr		0.18	0.13	0.14	0.19	0.21	0.18	0.17	0.17	0.18	0.20	12.88
Cu		4.38	3.10	3.34	4.67	5.21	4.51	4.27	4.40	4.64	5.05	15.19
Ni		0.51	0.38	0.28	0.24	0.11	0.10	0.09	0.10	0.10	0.11	-78.63
Se		0.02	0.01	0.01	0.02	0.02	0.01	0.01	0.01	0.01	0.01	-20.44
Zn		1.96	1.38	1.46	2.07	2.30	2.03	1.92	1.96	2.07	2.25	14.59
PCDD/F	g I-Teq	0.19	0.16	0.15	0.17	0.16	0.15	0.12	0.12	0.12	0.12	-36.50
PAHs	t	0.06	0.03	0.28	0.46	0.55	0.54	0.54	0.54	0.55	0.47	736.32
HCB	kg	4.1E-3	3.9E-3	2.6E-3	2.4E-3	9.6E-4	1.0E-3	7.1E-4	6.8E-4	7.6E-4	6.1E-4	-84.97
PCBs		0.03	0.02	0.14	0.23	0.27	0.27	0.27	0.27	0.27	0.23	590.15

Generally, the largest part of emissions have decreased in 1990-2015 (Table 3.13) with an exception of NH₃, Cr, Cu and PAHs. NH₃ emissions are likely to increase due to the increasing number of vehicles equipped with catalytic systems for combustion gas treatment. However, the amounts of ammonia produced in Transport sector are very small, that the significant increase in Transport sector has no impact on national total NH₃ emissions. Development and introduction of technologies for emission abatement especially in

road transport have ensured decreasing of NO_x, CO and PM emissions. Whereas implementation of stronger requirement for fuel quality have decreased SO₂ and Pb emissions.

3.3.2 Civil aviation (NFR 1A3a)

3.3.2.1 Overview

Civil aviation includes emissions both from national and international aviation LTO cycles. This category does not include military aviation, which is reported under 1A5b sector. In Latvia, civil aviation constitutes a small part of total emissions therefore it is not considered as a key source. The aviation gasoline is mainly used by small-sized propeller planes but jet kerosene is used by airplanes with turbo jets and turbo props engines.

3.3.2.2 Trends in emissions

Table 3.14 Trends and emissions in Civil aviation in 1990-2015

	Unit	1990	1995	2000	2005	2010	2011	2012	2013	2014	2015	Change in 1990-2015, %
NO_x	kt	0.12	0.041	0.043	0.07	0.14	0.15	0.14	0.14	0.13	0.14	18.38
NM_{VOC}		0.07	0.026	0.028	0.02	0.04	0.05	0.04	0.04	0.04	0.04	-42.11
SO₂		0.013	0.005	0.005	0.01	0.02	0.02	0.02	0.02	0.02	0.02	59.17
PM_{2.5}		0.0016	0.0006	0.0006	0.0012	0.0024	0.0025	0.0024	0.0024	0.0023	0.0024	48.08
PM₁₀		0.0016	0.0006	0.0006	0.0012	0.0024	0.0025	0.0024	0.0024	0.0023	0.0024	48.08
TSP		0.0016	0.0006	0.0006	0.0012	0.0024	0.0025	0.0024	0.0024	0.0023	0.0024	48.08
BC		0.0008	0.0003	0.0003	0.0006	0.0011	0.0012	0.0012	0.0012	0.00115	0.0011	48.08
CO		0.24	0.09	0.09	0.19	0.38	0.41	0.38	0.39	0.37	0.38	56.29

Different trend tendencies during the time span 1990 - 2015 have to be noted for emissions in civil aviation (Table 3.14). Up to year 2005 mostly all emissions have declined due to decreasing of activities in civil aviation (number of flights and fuel consumption). After year 2005 there is an increase of emissions mainly due to rather rapid increase of international flights to Riga airport (international landing and take-off emissions are included in emissions' calculation). Number of international flights has increased about 2 times in the last 10 years.

3.3.2.3 Methods

EMEP/EEA 2013 Tier 1 and Tier 2 approaches have been applied. Tier 2 approach with split in LTO and cruise cycles has been applied for jet kerosene emission calculation for time period 2004-2015. Tier 1 approach has been applied for aviation gasoline emission calculation.

3.3.2.4 Emission factors

Default emission factors for Civil aviation are taken from EMEP/EEA 2013 methodology and are presented in Table 3.15.

Table 3.15 Emission factors used in the calculation of emissions from Civil aviation (kt/PJ)

	NO _x	CO	NM _{VOC}	SO ₂	PM
Aviation petrol	0.25	0.1	0.05	0.005	0.21

Using Tier 2 approach for jet kerosene, emissions for LTO (landing/take off) and cruise are calculated individually. Prior to the emission calculation, representative aircraft type was chosen, for which the fuel consumption and emission data exist in the EMEP/EEA 2013.

3.3.2.5 Activity data

The data about fuel consumption in aviation is derived from the CSB. CSB has started to collect data as of year 2004 (Figure 3.8). For the time period 1990 – 2003 and for aviation gasoline consumption the data is

used from the study (IPE, 2004¹⁰). For 2004 onwards, the air flight statistics is provided by the Riga International Airport.

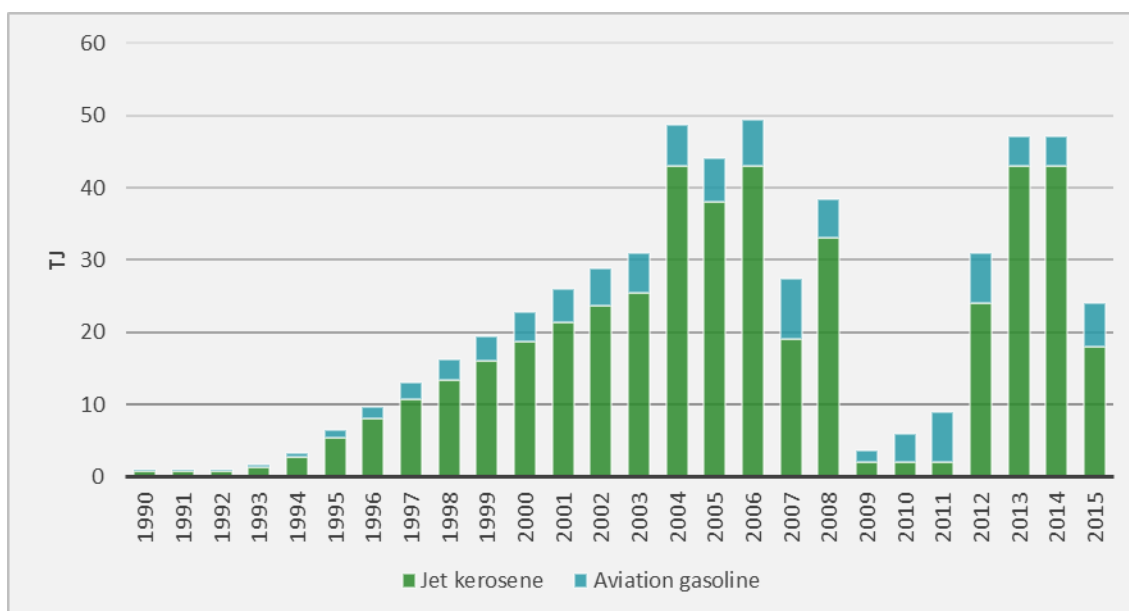


Figure 3.8 Fuel consumption in Civil aviation (TJ)

3.3.2.6 Uncertainties

CSB gives approximately 2% statistical sample error for statistical data. Considering this uncertainty in total fuel consumption for time period 2004 – 2015 is $\pm 2\%$. As fuel consumption for LTO and cruise cycle have been calculated based on assumptions concerning representative aircraft model, assumed uncertainty for fuel consumption in LTO and cruise cycle is $\pm 10\%$. For the rest of time period uncertainty in activity data of fuel consumption is $\pm 20\%$. Taking into account that it is used representative emission factors for LTO and cruise activities the uncertainty of EF lies between 20-45%.

3.3.2.7 QA/QC and verification

Assessment of trends have been performed.

3.3.2.8 Recalculations

Recalculations have been carried out (year 2010 - 2014) for domestic civil aviation due to corrected jet fuel consumption of representative aircraft type. To ensure consistent time series (split of emissions in LTO and cruise mode) for time period 1990 – 2003 it is recalculated all emissions for civil domestic and international aviation. The overlap technique was used for this task.

3.3.2.9 Planned improvements

No improvements are planned for the next submission.

3.3.3 Road transport (NFR 1A3b)

3.3.3.1 Overview

Road transport is producing the greatest part of emissions in Transport sector (Table 3.16). In the source category there are passenger cars, light and heavy duty vehicles as well as mopeds and motorcycles. In the source category emissions also from gasoline evaporation, Automobile road abrasion and Automobile tyre and brake wear are calculated.

¹⁰ "Research on fuel consumption by domestic aviation and private boats in domestic navigation"

3.3.3.2 Trends in emissions

Table 3.16 Trends and emissions in Road transport in 1990-2015

	Unit	1990	1995	2000	2005	2010	2011	2012	2013	2014	2015	Change in 1990-2015, %
NO_x	kt	24.219	17.819	18.267	18.407	15.981	12.577	11.865	11.549	11.747	12.005	-50
NMVOG		22.185	16.005	11.469	7.098	3.297	2.883	3.093	2.606	2.349	2.131	-92
SO₂		0.361	0.285	0.288	0.086	0.019	0.017	0.015	0.016	0.016	0.018	-95
NH₃		0.014	0.036	0.079	0.251	0.246	0.237	0.233	0.228	0.239	0.235	1596
PM_{2.5}		0.666	0.511	0.682	1.003	0.834	0.680	0.674	0.651	0.663	0.671	1
PM₁₀		0.756	0.636	0.803	1.177	1.022	0.845	0.832	0.835	0.861	0.889	7
TSP		1.018	0.771	1.003	1.456	1.309	1.096	1.072	1.033	1.075	1.123	10
BC		0.250	0.198	0.307	0.499	0.433	0.353	0.355	0.325	0.328	0.325	30
CO	t	188.552	129.383	74.921	43.278	18.665	16.691	17.656	15.789	14.312	13.854	-93
Pb		82.862	57.719	4.542	2.031	1.867	1.700	1.479	1.389	1.389	1.431	-98
Cd		0.009	0.007	0.007	0.010	0.011	0.010	0.009	0.009	0.010	0.011	22
PCDD/F		g I-Teq	0.182	0.148	0.140	0.167	0.159	0.144	0.123	0.116	0.117	-34
PAHs		t	0.038	0.028	0.033	0.053	0.064	0.054	0.052	0.054	0.059	74

In the road transport all main emissions have decreased in time period 1990 – 2015 with an exception of NH₃ and PM (Table 3.16). NH₃ emissions increase is likely to due to the increasing number of vehicles equipped with catalytic systems for combustion gas treatment. The main reason for decrease of emissions is steady improvement of cars' technologies and introduction of stronger requirements for fuel quality.

When analysing the development of emissions in road transport in 2015 following trends could be mentioned:

- NO_x and SO₂ emissions have increased in 2015 comparing with 2014 by 2.2% and 7.4% corresponding. The main reason for such trend is increase in diesel fuel consumption and vehicle kilometres travelled (VKT), however increase in NO_x and PM_{2.5} emission is partly compensated by the increased share of EURO 4, EURO 5 and EURO 6 cars;
- In 2015, PM emissions in road transport, compared to 2014 level have increased by 1.3%. The main reason for such trend is increase in diesel fuel consumption and VKT by passenger cars, LDV and HDV.
- NMVOG emissions in 2015 have decreased by 9.3% in comparison with 2014 mainly due to decrease in gasoline consumption;
- The main sources of NO_x emissions are heavy duty vehicles (HDV) 57.7% followed by passenger cars 32% and LDV 10%;
- The main sources of NMVOG emissions are passenger cars - around 75%;
- The main sources of SO₂ emissions are passenger cars around 55% and HDV around 34%.

3.3.3.3 Methods

Emission calculation from Road transport is performed using the "Computer Programme to calculate Emissions from Road Transportation" (COPERT IV), which is proposed to be used by EEA member countries for the compilation of CORINAIR emission inventories. COPERT IV methodologies can be applied for the calculation of traffic emission estimates at a relatively high aggregation level. Calculation of emissions is based on fuel consumption of road vehicles and of average mileage of vehicles and the fixed emission factors. Road traffic vehicles use five different fuels – gasoline, diesel oil, liquid petroleum gases (LPG), natural gas and biofuel. Before emission calculation COPERT IV model was calibrated to be consistent with actual sold fuel (energy statistics). Deviation between fuel consumption in COPERT model and statistics is less than 0.1%. Thus we can say that all emission calculation is based on actual sold fuel.

Corresponding to the COPERT IV fleet classification, all vehicles in the Latvia fleet are grouped into vehicle classes, subclasses and layers. The layer classification is a further division of vehicle sub-classes into groups of vehicles with the same average fuel consumption and emission factors, according to EU emission legislation levels.

In COPERT IV, fuel consumption and emission simulation can be made for operationally hot engines, taking into account gradually tighten emission standards and emission degradation due to catalyst wear. Furthermore, the emission effects of cold-start and evaporation are simulated. Estimation of evaporative emissions of hydrocarbons and the inclusion of cold start emission effects are dealt with in the Latvian inventory by using LEGMC meteorological input data for ambient temperature variations during months; the distribution of evaporate emissions in the driving modes are used default by COPERT IV model. Trip-speed dependent basis factors for fuel consumption and emissions are implemented. The fuel consumption and emission factors used in the Latvia inventory come from the COPERT IV model.

3.3.3.4 Activity data

As a basis for model input information, CSB data have been used considering the actual fuel consumption calibration with statistical fuel consumption, Road Traffic Safety Directorate (RTSD) collected and published data have been used considering stock of road transport in Latvia. Total mileage data for passenger cars, light duty trucks, heavy duty trucks and buses produced by the RTSD is used for the years 1996-2015 and can be seen on Annex I, Table 4.

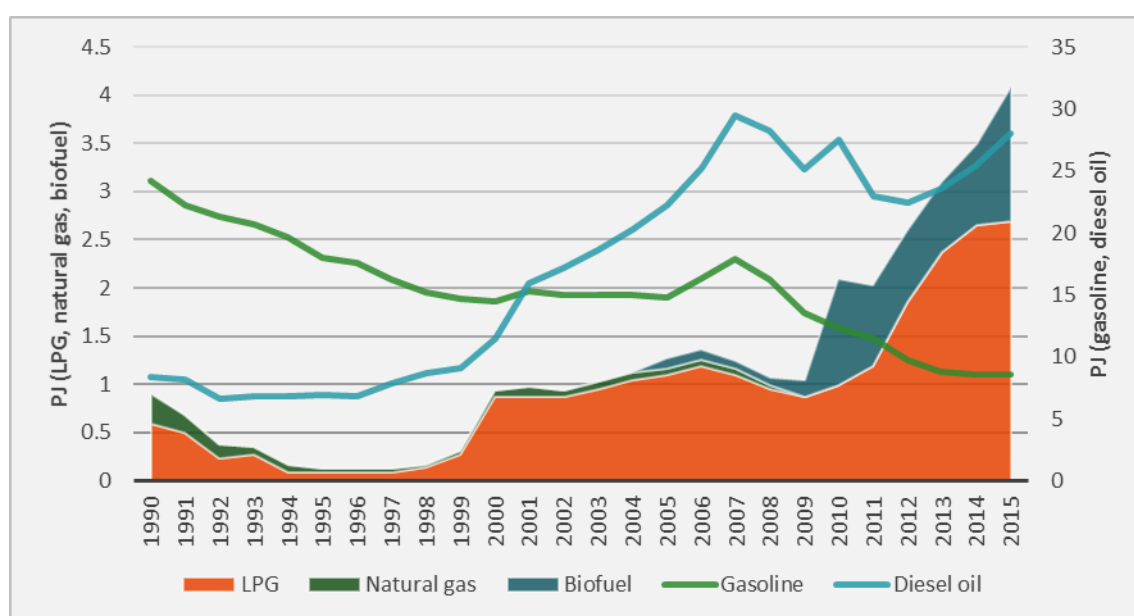


Figure 3.9 Development of fuel consumption in Road transport (TJ)

As seen in Figure 3.9 the fuel consumption has essentially changed in the time period 1990 – 2015. The gasoline consumption from the highest consumption in 1990 has decreased till 1999, reaching the lowest consumption and after six-year stabilization the increase was seen in 2006 and 2007. Consumption of gasoline had decreased in 2015 by 0.5% compared to 2014. Whereas diesel fuel consumption starting from 1997 has increased gradually till 2007. While it decreased in 2008 and 2009 mainly due to economic recession. Diesel fuel consumption has increased in 2015 by 10.2% compared to 2014. Substantial LPG consumption increase in road transport was observed starting from 2011.

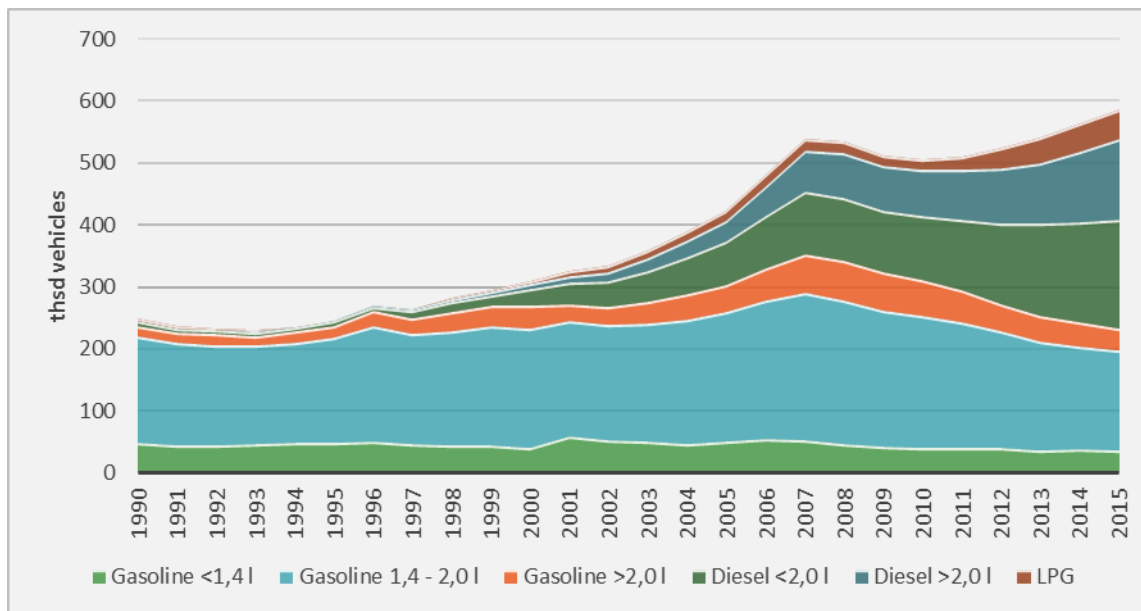


Figure 3.10 Distribution of passenger cars fleet by sub-classes

Analysing the development of the passenger car fleet in the time period 1990 – 2015, following features can be noted (Figure 3.10, Figure 3.11, Figure 3.12):

- Cars with a diesel engine of a capacity <2.0l constitute the major part but the second leading group is cars with a gasoline engine of a capacity 1.4l - 2.0l;
- Cars with a gasoline engine of a capacity < 1.4l during the whole period have small changes and it's constitute approximately 6.2% in year 2015 from total passenger cars;
- Cars with a gasoline engine of a capacity >2.0l starting from year 2010 have a small decreasing in their share of total passenger cars;
- As of 2000, the number of cars with diesel engines, both, < 2.0l and > 2.0l, grow rapidly and its share is 52.2% from the total number of passenger cars in 2015;
- As of 2005, in the car fleet with a gasoline engine, the number of EURO 3 and EURO 4 cars grows rapidly. In 2015 a share of EURO4 and EURO5 and EURO6 cars constitutes 30.5%;
- As of 2005, in the car fleet with a diesel engine, the number of EURO 4 and EURO 5 cars grows rapidly. In 2015 a share of EURO4, EURO5 and EURO6 cars constitute 32.7%.

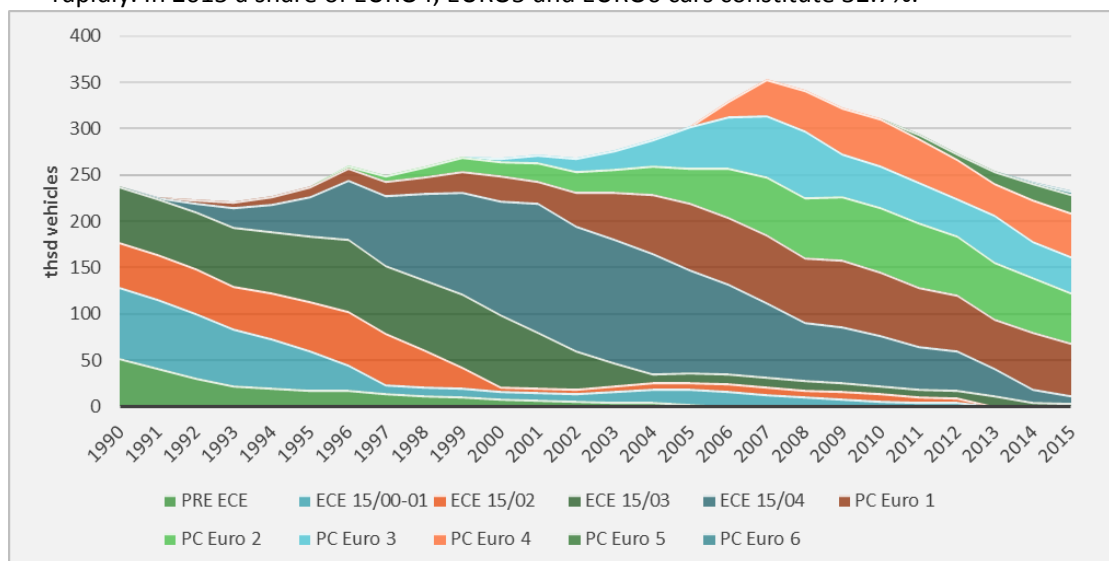


Figure 3.11 Distribution of gasoline passenger cars fleet by layers

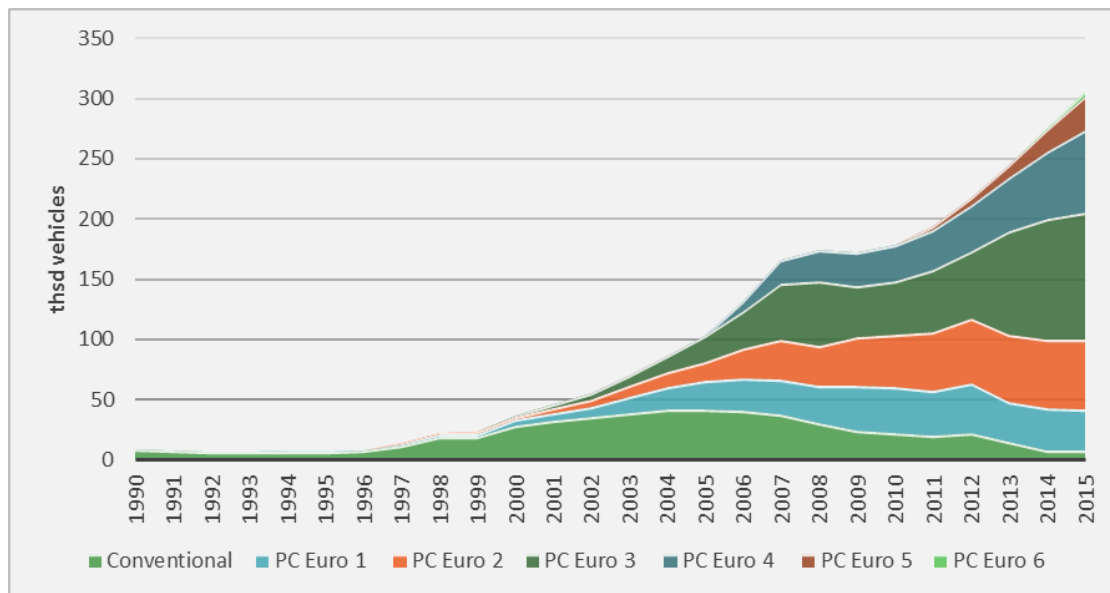


Figure 3.12 Distribution of diesel oil passenger cars fleet by layers

Analysing the development of LDV fleet (Figure 3.13, Figure 3.14) in the following time period, major features can be noted as follows:

- As of 1996, the number of cars with a gasoline engines have decreased;
- As of 2000, the number of cars with a diesel engine rapidly increases. In 2015 the share of diesel cars is 93.2%;
- As of 2005, the number of EURO4 and EURO5 and EURO6 cars have increased. In 2015 the share of EURO4, EURO5 and EURO6 cars constitute 50.0%;

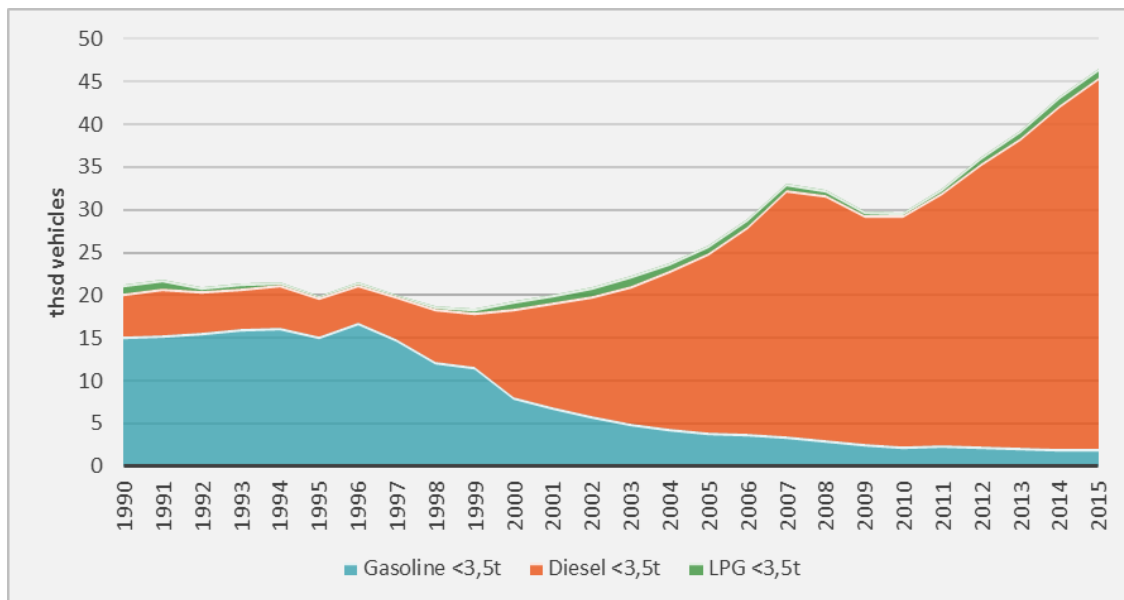


Figure 3.13 Distribution of light duty vehicles fleet by sub-classes

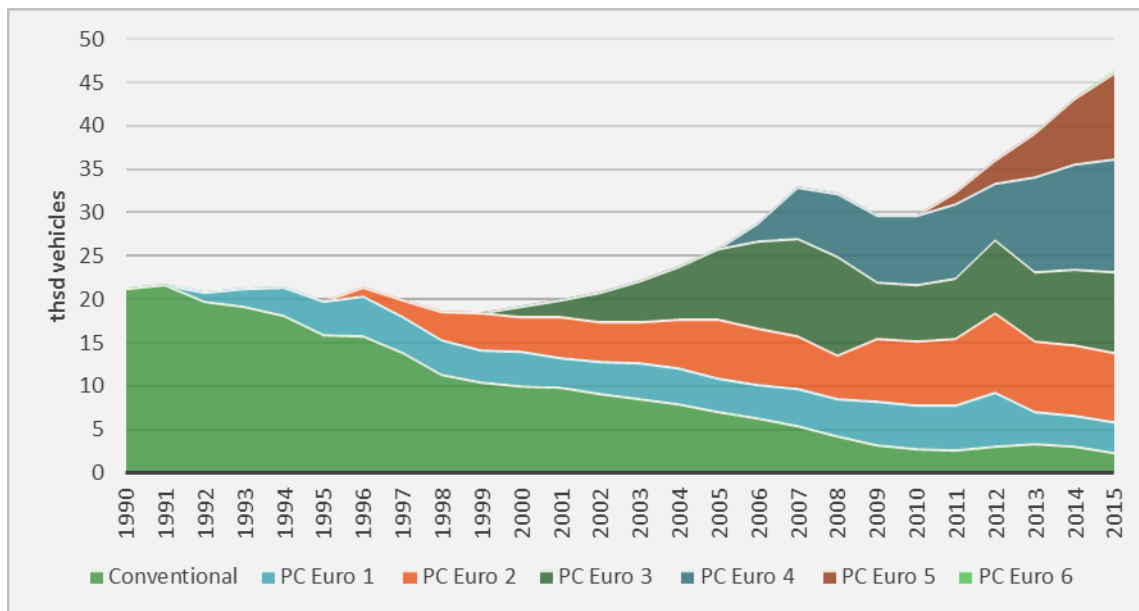


Figure 3.14 Distribution of light duty vehicles fleet by layers

The vehicle numbers per HDV sub-classes and layers are presented in the following figures.

Analysing the development of HDV fleet in the following time period, major features can be noted as follows:

- Since 2000, the number of cars with a gasoline engines have rapidly decreased. The share of gasoline cars has decreased from 33% to 3.8 % corresponding years 2000 and 2015;
- Since 2000, the number HDV cars with tonnage 14-34 t and a diesel engine starts to increase;
- As of 2000, average age reduction of cars takes place gradually. In 2015 the share of EURO IV, EURO V and EURO VI cars constituted 44.7%.

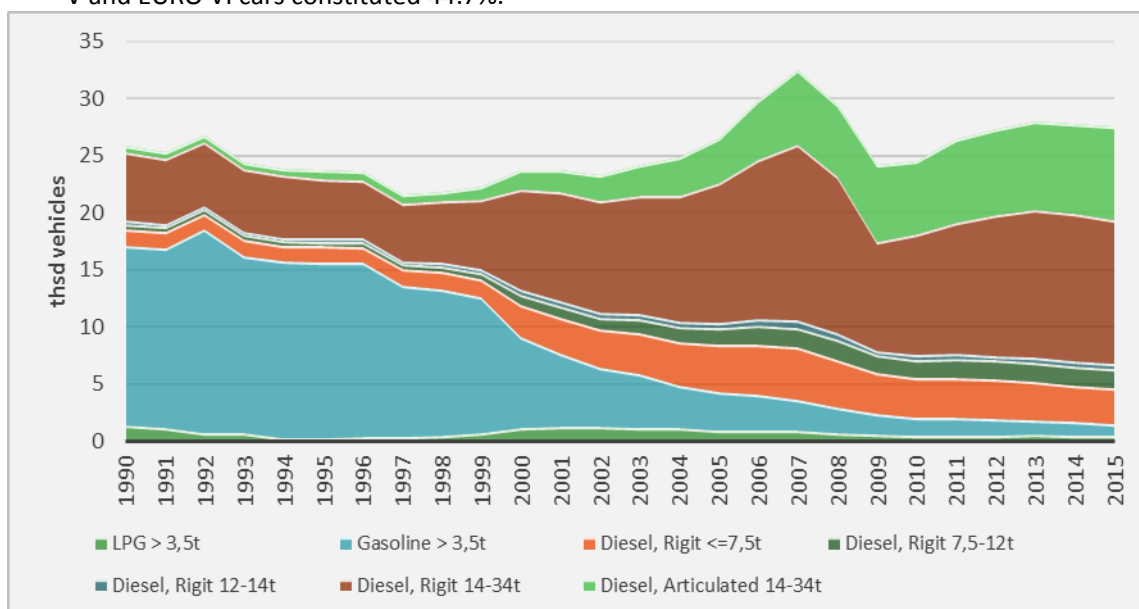


Figure 3.15 Distribution of heavy duty vehicles fleet by sub-classes

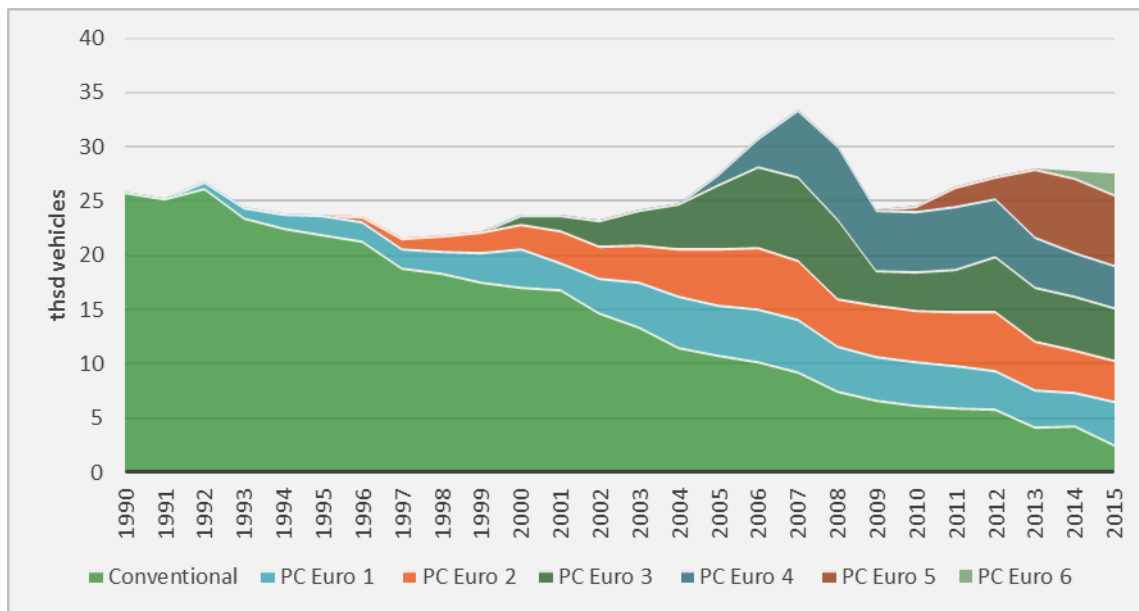


Figure 3.16 Distribution of heavy duty vehicles fleet by layers

Starting from the year 1990 emission for gasoline evaporation has been calculated according to the COPERT IV model method. Calculation of PM emissions has been performed taking into account emissions from road abrasion, tyres and brakes.

3.3.3.5 Uncertainties

Taking into account that CSB gives approximately 2% statistical sample error for statistical data, uncertainty in activity data of fuel consumption is $\pm 2\%$. To ensure time series consistency any recalculation related with model version updating is realized for all time period. Linear interpolation has been implemented only for cases when activity data fluctuation does not take place.

3.3.3.6 QA/QC and verification

Assessment of trends has been performed.

3.3.3.7 Recalculations

No recalculations have been carried out for this submission.

3.3.3.8 Planned improvements

No improvements are planned for the next submission.

3.3.4 Railway (NFR 1A3c)

3.3.4.1 Overview

The source category 1A3c Railways includes emissions from all diesel-powered rail transport in Latvia. Freight transport has a dominant role in railway. The railway transport accomplishes around 56.3% (2015) of the total freight transport in Latvia (traffic of goods in ton-km) and the transit transport traffic is dominant. In 2009 and 2010, transported freight along the railway and therefore the diesel consumption has a slightly decreased, compared to 2008 level. Due to dependence on transit transport of goods from Russia and other neighbouring countries fuel consumption has decreased by approximately 4.5% in 2015 compared to 2014.

3.3.4.2 Trends in emissions

Table 3.17 Trends and emissions in Railway in 1990-2015

Pollutant	Unit	1990	1995	2000	2005	2010	2011	2012	2013	2014	2015	Change in 1990-2015, %
NO_x	kt	8.86	3.98	3.41	4.30	3.50	3.99	4.22	3.78	3.67	3.50	-60
NM VOC		0.79	0.35	0.30	0.38	0.31	0.36	0.37	0.34	0.33	0.31	-60
SO₂		0.68	0.30	0.06	0.06	0.13	0.16	0.16	0.14	0.14	0.13	-80
NH₃		0.00118	0.00053	0.00045	0.00057	0.00047	0.00053	0.00056	0.00050	0.00049	0.00047	-60
PM_{2.5}		0.232	0.104	0.089	0.112	0.090	0.106	0.108	0.099	0.096	0.092	-60
PM₁₀		0.243	0.109	0.094	0.118	0.095	0.112	0.114	0.104	0.101	0.096	-60
TSP		0.257	0.116	0.099	0.125	0.100	0.118	0.120	0.110	0.106	0.102	-60
BC		0.150	0.068	0.058	0.073	0.059	0.069	0.070	0.064	0.062	0.059	-60
CO	t	1.808	0.813	0.696	0.877	0.706	0.830	0.845	0.772	0.748	0.715	-60
Cd		0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	-60
PAHs		0.014	0.006	0.005	0.007	0.005	0.006	0.005	0.006	0.006	0.005	-60

When analysing the development of emissions trends in railway (Table 3.17), following features could be noted:

- Due to the decreasing of diesel oil consumption by around 61% in railway in time period 1990 – 2015 all emissions have been decreased by 60 – 80 %;
- In time span 2000 – 2015 it is in place diesel fuel consumption increasing in railway by around 3%. It is a reason for PM and TSP emission increasing by around 3%. However, SO₂ emissions have decreased by about 48% at the same time due to implementation of stronger fuel quality requirement;
- Due to the decreasing of fuel consumption in railway all emissions have decreased by approximately 4.5 % in year 2015 comparing with year 2014.

3.3.4.3 Methods

When calculating emissions from railway, Tier 1 method has been applied.

3.3.4.4 Emission factors

Default emission factors for Railway (Table 3.18, Table 3.19) are taken from EMEP/EEA 2013. The emission factors for Particulate Matters are taken from CEPMEIP/TNO database (Table 3.10). The SO₂ emissions factors are used consistent with sulphur content in diesel oil by years (Table 3.20).

Table 3.18 Emission factors used for emissions calculation from Railway

Pollutant	Unit	Diesel oil
NO_x	kt/PJ	1.233
CO		0.252
NM VOC		0.109
NH₃	t/PJ	0.000165
Cd		0.00024
Cr		0.00118
Cu		0.04001
Ni		0.00165
Se		0.00024
Zn		0.02353
benzo(a)pyrene		0.000706
benzo(b)fluoranthene		0.0011767

Table 3.19 Emission factors used in the calculation of Particulate Matters emissions from Railway

	PM _{2.5}	PM ₁₀	TSP
	kt/PJ		
Diesel oil	0.03224	0.03389	0.03577

Table 3.20 SO₂ emission factors for Diesel oil used in the calculation of SO₂ emissions from Railway

	Sulphur content	NCV	EF (kt/PJ)
1990-2002; 2005-2007	0.2	42.49	0.0941
2003-2004	0.05	42.49	0.0235
2008-2015	0.1	42.49	0.0471

3.3.4.5 Activity data

Information about fuel consumption from CSB as a basis for emission calculation have been used. In 2009 and 2010, transported freight along the railway and therefore the diesel consumption has a slightly decreased, compared to 2008 level (Figure 3.17). Fuel consumption has decreased by around 4.5% in 2015 compared with year 2014.

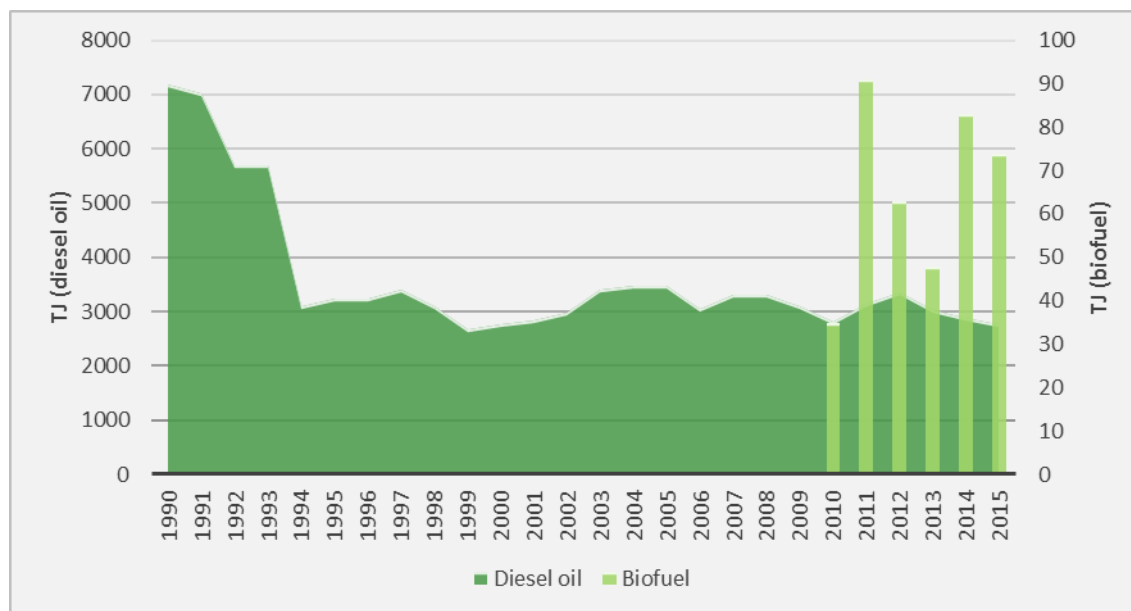


Figure 3.17 Fuel consumption in Railway transport (TJ)

3.3.4.6 Uncertainties

Uncertainty in activity data of fuel consumption is $\pm 2\%$ in 2015. CSB gives approximately 2% statistical sample error for statistical data. The uncertainty of EF lies between 20-45%.

3.3.4.7 QA/QC and verification

Assessment of trends has been performed.

3.3.4.8 Recalculations

No recalculations have been carried out for this submission.

3.3.4.9 Planned improvements

No improvements are planned for the next submission.

3.3.5 Navigation (NFR 1A3d)

3.3.5.1 Overview

Although Latvia has several ports, domestic navigation that providing transport of freight or passengers among local ports is not developed. Major activities in ports deal with international freight transport. In domestic navigation, the emissions are calculated for miscellaneous vessels (tugs, barges, towboats, icebreakers), recreational crafts and personal boats.

In 2014, the diesel oil consumption has decreased approximately 2 times compared to 2013 level. Number of services for international freight in harbours mostly affects the changes in the fuel consumption, however

dramatic fuel consumption decreasing in year 2014 is due to completed of a project (carried out during year 2013) concerning harbour deepening. Diesel oil consumption has decreased by approximately 24% in 2015 compared to 2014.

3.3.5.2 Trends in emissions

Table 3.21 Trends and emissions in Navigation in 1990-2015

	Unit	1990	1995	2000	2005	2010	2011	2012	2013	2014	2015	Change in 1990-2015, %
NO_x	kt	0.021	0.011	0.012	0.011	0.392	0.392	0.315	0.629	0.315	0.2390	1020
NM VOC		0.011	0.012	0.014	0.017	0.026	0.026	0.030	0.039	0.032	0.0209	89
SO₂		0.00028	0.00016	0.00017	0.00015	0.0051	0.0051	0.0041	0.0082	0.0041	0.0031	1000
NH₃		1.8E-06	9.41E-07	9.95E-07	8.5E-07	3.39E-05	3.39E-05	2.72E-05	5.44E-05	2.72E-05	2.06E-05	1046
PM_{2.5}		0.00091	0.00082	0.00093	0.00102	0.00763	0.00785	0.00657	0.01207	0.00668	0.0049	438
PM₁₀		0.00094	0.00083	0.00095	0.00104	0.00813	0.00835	0.00697	0.01287	0.00708	0.0052	456
TSP		0.00094	0.00083	0.00095	0.00104	0.00813	0.00835	0.00697	0.01287	0.00708	0.0052	456
BC		0.00014	0.00009	0.00010	0.00010	0.00220	0.00220	0.00177	0.00352	0.00179	0.0014	851
CO	t	0.035	0.039	0.045	0.052	0.076	0.076	0.088	0.111	0.095	0.0616	79
Cd		3.22E-09	2.04E-09	2.23E-09	2.14E-09	7.06E-08	5.06E-08	4E-08	9.9E-07	1.18E-06	0.71E-06	22052
PAHs		2.57E-05	1.64E-05	1.79E-05	1.72E-05	0.0006	0.0004	0.0003	0.0006	0.0003	0.0002	865

Analysing the development of the emission trends in domestic navigation (Table 3.21), following features can be noted:

- Due to remarkable increasing in fuel consumption in time period 1990 – 2015 (more than 10 times) all emissions have increased by several times;
- In year 2015 NO_x and SO₂ emissions have decreased by around 24% comparing with year 2014 due to fuel consumption decreasing. NMVOC emissions have decreased by around 34% but PM_{2.5} and PM₁₀ emissions by 26.7% and 26.5% corresponding.

3.3.5.3 Methods

When calculating emissions from navigation, Tier 1 method has been applied.

3.3.5.4 Emission factors

Default EFs (Table 3.22) for navigation is used (EMEP/EEA 2013):

Table 3.22 Emission factors used in the calculation of emissions from navigation

	NO _x	CO	NM VOC	NH ₃	PM _{2.5}	PM ₁₀	TSP
	kt/PJ						
Diesel oil	1.84749	0.17416	0.06589	0.00016	0.03295	0.0353	0.0353
Gasoline (from 2003)	0.214	13.05505	4.12875	0.00016	0.21611	0.21611	0.21611
Gasoline (1990-2002)	0.2138	13.0549	4.12702	0.00016	0.21611	0.21611	0.21611

EFs for gasoline are different due to varying NCV. The SO₂ emissions factors are used consistent with sulphur content in diesel oil and gasoline.

3.3.5.5 Activity data

The data about diesel oil and gasoline consumption in domestic navigation are derived from the CSB. CSB have started to collect data about diesel oil consumption and gasoline consumption in domestic navigation from year 2006. For the time period 1990 – 2005 the data for fuel consumption is used from the study “Evaluation of fuel consumption for domestic aviation and navigation” (IPE, 2004). Development of the fuel consumption in navigation is presented in Figure 3.18 below.

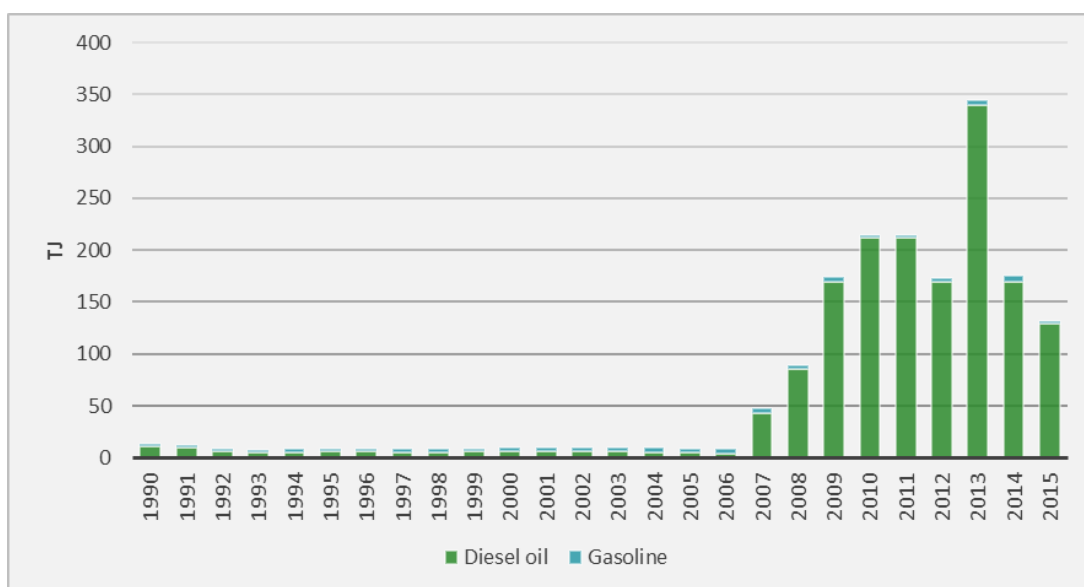


Figure 3.18 Development of gasoline and diesel oil fuel consumption in Navigation

3.3.5.6 Uncertainties

Uncertainty in activity data of fuel consumption for time period 2006 – 2015 is $\pm 2\%$. CSB gives approximately 2% statistical sample error for statistical data. For the rest of time period uncertainty in activity data of fuel consumption is $\pm 20\%$. The uncertainty of EF lies between 20-40%.

3.3.5.7 QA/QC and verification

Assessment of trends have been performed.

3.3.5.8 Recalculations

No recalculations have been carried out.

3.3.5.9 Planned improvements

No improvements are planned for the next submission.

3.3.6 Off-road mobile machinery (NFR 1A2gvii, 1A4aii, 1A4bii, 1A4cii, 1A4ciii, 1A5b)

3.3.6.1 Overview

Under the NFR 1A2g vii, 1A4a ii, 1A4b ii, 1A4c ii there are reported emissions from gasoline use. It is assumed that all gasoline is consumed for off-road purposes in Manufacturing industries and Construction, Commercial, Residential and Agriculture and Forestry sectors. It is assumed that 90% of diesel that is reported under Agriculture/Forestry/Fishing (1A4c) is consumed in off-road vehicles and machinery (1A4cii).

Under the NFR 1A4c iii Fishing sector it is assumed that all diesel and residual fuel oil is consumed for fishing boats.

Under the NFR 1A5b Other Mobile sources emissions from liquid fuels – aviation gasoline, diesel oil and jet kerosene, used in military aircrafts and ships are reported. These emissions appear since 1996.

3.3.6.2 Trends in emissions

Table 3.23 Trends and emissions in off-roads in 1990-2015

	Unit	1990	1995	2000	2005	2010	2011	2012	2013	2014	2015	Changes in 1990-2015, %
NO_x	kt	7.24	5.19	4.08	4.56	3.95	4.10	3.56	3.57	3.70	3.77	-47.9
NM VOC		4.55	0.49	0.74	0.94	0.87	1.09	0.99	1.07	0.93	0.85	-81.4

	Unit	1990	1995	2000	2005	2010	2011	2012	2013	2014	2015	Changes in 1990-2015, %
SO ₂		1.06	0.72	0.50	0.52	0.21	0.22	0.20	0.20	0.20	0.21	-79.8
NH ₃		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-27.1
PM _{2.5}		0.33	0.18	0.16	0.17	0.16	0.17	0.15	0.15	0.15	0.16	-51.8
PM ₁₀		0.34	0.19	0.16	0.18	0.16	0.17	0.15	0.15	0.16	0.16	-53.0
TSP		0.34	0.19	0.16	0.18	0.16	0.17	0.15	0.15	0.16	0.16	-53.0
BC		0.12	0.07	0.07	0.08	0.09	0.09	0.08	0.08	0.08	0.09	-27.4
CO		43.91	3.08	5.95	8.27	7.42	9.58	8.82	9.67	8.20	7.13	-83.8
Pb		8.80	0.46	0.04	0.05	0.04	0.06	0.05	0.06	0.05	0.04	-99.5
Cd	t	0.00226	0.00113	0.00099	0.00116	0.00114	0.00120	0.00108	0.00110	0.00111	0.00115	-49.3
Hg		0.00114	0.00117	0.00078	0.00076	0.00036	0.00039	0.00027	0.00025	0.00028	0.00023	-79.8
PCDD/PCDF	g l-Teq	0.0095	0.0085	0.0057	0.0048	0.0016	0.0017	0.0011	0.0011	0.0012	0.0010	-89.6
PAHs	t	0.00464	0.00024	0.24032	0.40059	0.48049	0.48073	0.47883	0.48073	0.48057	0.40049	8531.2
HCB		0.00408	0.00390	0.00260	0.00238	0.00096	0.00103	0.00071	0.00068	0.00076	0.00061	-85.0
PCBs	kg	0.00798	0.00638	0.00426	0.00314	0.00046	0.00049	0.00034	0.00032	0.00036	0.00029	-96.3

As it can be seen from Table 3.23 above, most of the emissions have decreased in 1990-2015 because of decreased amounts of fuel consumed.

3.3.6.3 Methods

When calculating emissions from off-roads, Tier 1 method has been applied.

3.3.6.4 Emission factors

Emission factors are taken from EMEP/EEA 2016. A complete table with all emission factors and references is presented in Annex I.

3.3.6.5 Activity data

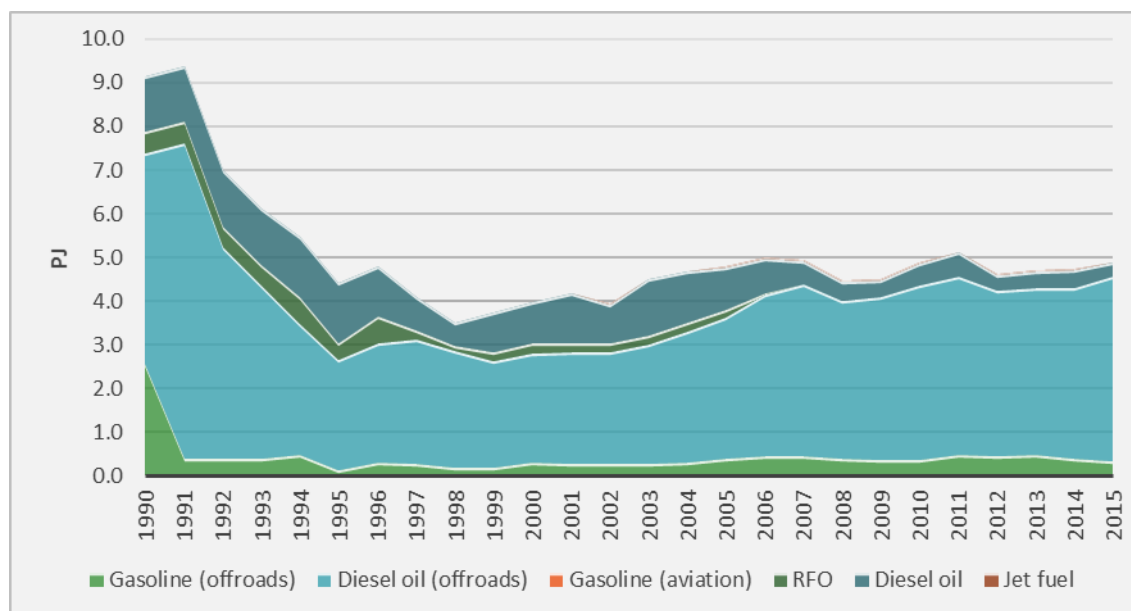


Figure 3.19 Fuel consumption in off-roads (PJ)

The data about diesel oil consumption and gasoline consumption in off-roads are derived from the CSB (Figure 3.19).

3.3.6.6 Uncertainties

Uncertainty in activity data of fuel combustion is assumed $\pm 2\%$ in 2015. CSB gives approximately 2% statistical sample error for statistical data. According to CSB, as data are obtained using information given by respondents, this number is a variation coefficient which characterizes selection of respondents. Total

variation coefficient for energy balance is within 2-3%. In Latvia all fossil fuels are imported and import and export statistics are fairly accurate.

Emission factor uncertainty is assumed as 50%.

3.3.6.7 QA/QC and verification

Disaggregated data at the finest level possible are presented in the corresponding Annex.

Activity data have been checked at the data provider – CSB, which has its own internal QA/QC procedures based on mathematic model and analysis to avoid logic mistakes. When activity data have been received, the sectoral expert responsible for the emission estimation and reporting are comparing all data changes with the previous inventory, and all changes are explained in the corresponding subchapter. All fluctuations or changes in NCVs are double checked and agreed with CSB.

To verify the emissions, logical mistakes are checked by checking the time series of the activity data, emission factors and emissions consistency to display all significant and illogical changes in the activity data and emissions. The emissions for substances reported also under UNFCCC as indirect GHGs are cross-checked with for verification purposes.

3.3.6.8 Recalculations

In Submission 2017, there were following recalculations done:

- 90% of diesel that was consumed in NFR 1A4ci Stationary combustion was moved to NFR 1A4cii after information received from CSB, that only 10% of diesel fuel reported in Agriculture/Forestry/Fishing is consumed stationary.
- Emission factor changed to EMEP/EEA 2016.
- Corrected activity data mistakes.

3.3.6.9 Planned improvements

No improvements planned.

3.4 Fugitive emissions (NFR 1B)

3.4.1 Overview

Under fugitive emissions from fuels Latvia reports following categories:

- NFR 1B1a Fugitive emission from solid fuels: Coal mining and handling includes fugitive particulate matters emissions from coal transportation and storage;
- NFR 1B2a v Distribution of oil products includes NMVOC emissions from oil storage;
- NFR 1B2b Fugitive emissions from natural gas (exploration, production, processing, transmission, storage, distribution and other) includes NMVOC emissions from natural gas transmission, storage and distribution systems in Latvia;
- NFR 1B2c Venting and flaring (oil, gas, combined oil and gas) includes NMVOC emissions from natural gas venting in Latvia.

There are no oil refineries in Latvia, therefore NMVOC emissions from gasoline distribution were calculated for the time period 1990–2015.

Fugitive particulate matters emissions in 1990-2015 from the operations of solid fuels – coal and coke, transportation via railways and storage and handling, are estimated.

3.4.2 Trends in emissions

Table 3.24 Fugitive emissions in 1990-2015

	1990	1995	2000	2005	2010	2011	2012	2013	2014	2015	Change in 1990-2015, %
NMVOC	4.18	3.19	2.48	2.28	2.35	1.40	1.44	1.71	2.34	2.40	-42.6
PM_{2.5}	0.000278	0.000078	0.000032	0.000038	0.000051	0.000053	0.000044	0.000037	0.000031	0.000024	-91.3

	1990	1995	2000	2005	2010	2011	2012	2013	2014	2015	Change in 1990-2015, %
PM₁₀	0.002784	0.000780	0.000324	0.000381	0.000510	0.000525	0.000435	0.000369	0.000306	0.000243	-91.3
TSP	0.006960	0.001950	0.000810	0.000953	0.001275	0.001313	0.001088	0.000923	0.000765	0.000608	-91.3

NMVOC emissions are decreasing due to less use of gasoline (Table 3.24). Also particulate matter emissions have decreased if compared to 1990.

3.4.3 Methods

LEGMC are receiving data about emissions from gas leakage directly from the natural gas holding company “Latvijas Gāze” for the time period 1990–2015. Consequently company “Latvijas Gāze” calculates emissions by itself, using data of natural gas density and other physical parameters, and measures the content of methane and other chemical compounds in natural gas, therefore it is assumed as Tier 2 method, using country-specific data and calculations.

EMEP/EEA 2016 Tier 1 methodology is used to estimate fugitive NMVOC emissions from operations with gasoline in 1990–2015. It uses the general equation, where emissions are obtained by multiplying the total amount of gasoline sold with the emission factor.

Particulate matters emissions are estimated by using Tier 2 methodology from EMEP/EEA 2016.

3.4.4 Emission factors

NMVOC emission factor – 2 kg/t oil – for emission from gasoline distribution was taken from EMEP/EEA 2016, Chapter 1.B.2.a.v Distribution of oil products, Table 3-1.

Emission factors for particulate matters emission estimation are taken from EMEP/EEA 2016, Chapter 1.B.1.a Fugitive emissions from solid fuels: Coal mining and handling, Table 3-6 (Table 3.25).

Table 3.25 PM emission factors (g/t)

	Coal
TSP	7.5
PM₁₀	3
PM_{2.5}	0.3

3.4.5 Activity data

In Figure 3.20 and Figure 3.21 and Table 3.26 activity data used for calculation can be seen.

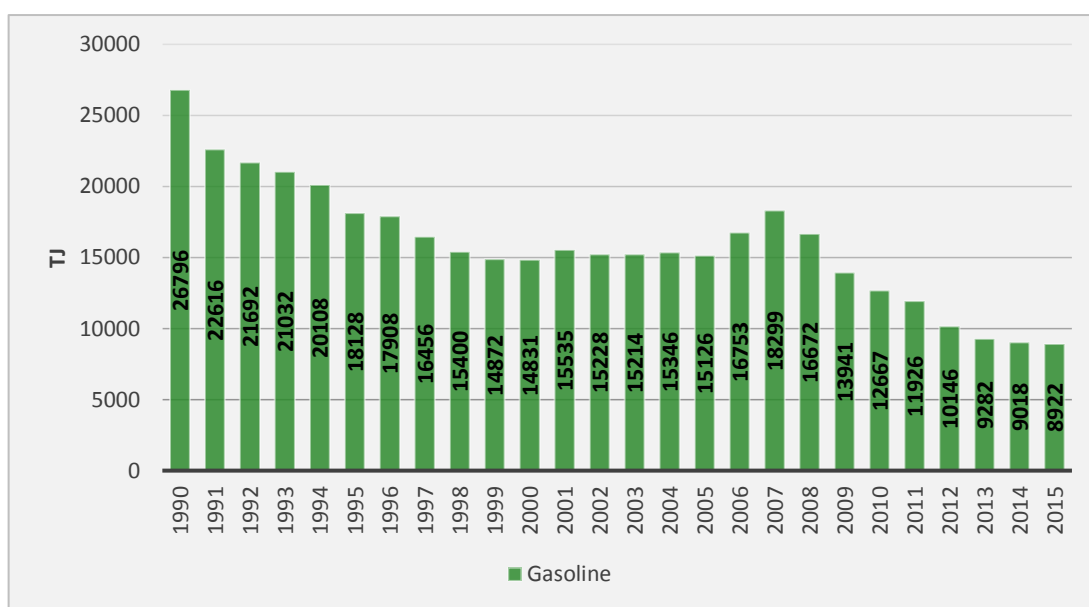


Figure 3.20 Gasoline consumption in Latvia in 1990-2015 (TJ)

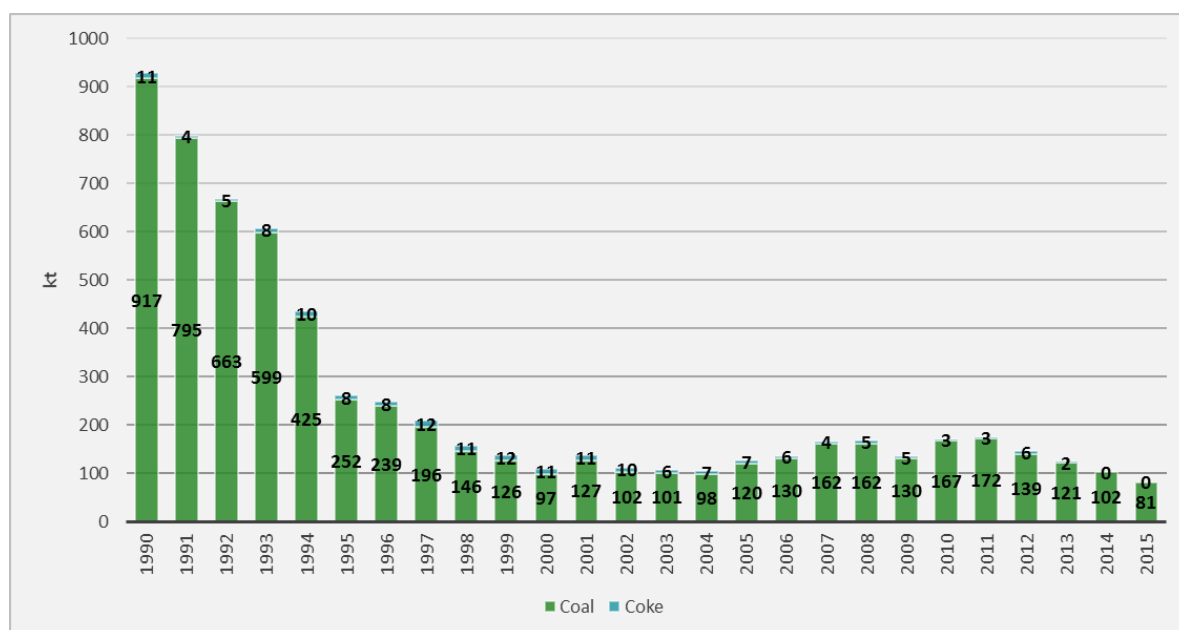


Figure 3.21 Activity data used for particulate matters emissions calculation in 2000–2015 (kt)

Table 3.26 Amounts of natural gas leaked in 1990-2015 (106 m3)

	Venting	Transmission and storage	Distribution	Other	Total
1990	5.61	0.13	0.69	12.44	18.87
1991	5.38	0.13	0.69	11.98	18.17
1992	4.83	0.13	0.59	10.92	16.47
1993	4.58	0.13	0.69	10.44	15.85
1994	4.46	0.13	0.69	10.21	15.48
1995	4.32	0.13	0.69	9.94	15.08
1996	4.13	0.13	0.69	9.58	14.53
1997	3.80	0.13	0.69	8.94	13.56
1998	3.63	0.11	0.69	8.58	13.01
1999	3.42	0.11	0.69	8.18	12.40
2000	3.11	0.11	0.69	7.57	11.48
2001	0.30	0.10	0.69	10.03	11.14
2002	0.98	0.10	0.69	9.86	11.63
2003	1.09	0.10	0.69	7.20	9.07
2004	1.56	0.09	0.69	6.63	8.98
2005	3.25	0.09	0.69	6.12	10.15
2006	1.80	0.08	0.69	4.71	7.28
2007	1.76	0.07	0.69	4.95	7.47
2008	2.44	0.07	0.69	4.48	7.67
2009	1.78	0.06	0.69	4.71	7.25
2010	1.64	0.06	0.69	4.59	6.98
2011	1.77	0.05	0.69	1.70	4.21
2012	1.34	0.05	0.69	3.35	5.43
2013	1.09	0.04	0.69	4.06	5.89
2014	1.53	0.04	0.66	5.69	7.93
2015	0.95	0.04	0.71	4.35	6.03

3.4.6 Uncertainties

Activity data for fugitive emissions from operations with gasoline and coal handling were taken from CSB and uncertainty was assumed as very low for about 2% as statistical frame mistake. Uncertainty for emission factor is assumed as 50%.

The representative of only natural gas distributing company „Latvijas Gāze” determined the level of uncertainty. The total uncertainty of NMVOC emissions from natural gas leakages in gas distribution and

transmission systems, as well as in gas storage facility is assigned as quite low – 20%, as emissions were measured and estimated by only enterprise operated with natural gas in Latvia – “Latvijas Gāze” by methodology developed for enterprise.

3.4.7 QA/QC and verification

Activity data have been checked at the data provider – Central Statistical Bureau, which has its own internal QA/QC procedures based on mathematic model and analysis to avoid logic mistakes. When activity data have been received, the sectoral expert responsible for the emission estimation and reporting are comparing all data changes with the previous inventory, and all changes are explained in the corresponding subchapter. All fluctuations or changes in NCVs are double checked and agreed with CSB.

As all emission factors are taken from EMEP/EEA 2016, no additional verification procedures have been performed.

To verify the NMVOC emissions, logical mistakes are checked by checking the time series of the activity data, emission factors and emissions consistency to display all significant and illogical changes in the activity data and emissions. The emissions are also cross-checked with emissions reported within UNFCCC for verification purposes.

3.4.8 Recalculations

No recalculations were performed in Submission 2017.

3.4.9 Planned improvements

No improvements have been planned for the next submission.

3.5 International bunkers

3.5.1 Overview

International bunkers cover International Aviation (only cruise mode) and International Navigation according to the IPCC GPG 2000. Emissions from International Aviation and Navigation are not included into national total emissions.

3.5.2 Trends in emissions

International maritime navigation contributed around 96%, 98% and 98% in total international emissions corresponding for NO_x and SO₂ and PM emissions in year 2015.

3.5.3 Emission factors

Default emission factors for International Aviation and Navigation are taken from EMEP/EEA 2016 methodology and are presented in Table 3.27 and Table 3.28. The emission factors for Particulate Matters for International Navigation are taken from CEPMEIP/TNO database (

Table 3.29).

Table 3.27 Emission factors to calculate emissions from International Aviation

Fuel type	Emissions factors, kt/PJ			
	NO _x	CO	NMVOC	SO ₂
Jet fuel	0.25	0.1	0.05	0.023

Table 3.28 Emission factors to calculate emissions from International Navigation

Fuel type	NO _x	CO	NMVOC	NH ₃	Pb	Cd	Hg	As	Cr	Cu	Ni	Se	Zn
	kt/PJ				t/PJ								
Diesel oil	1	0.25	0.11	0.0038	0.0024	0.00024	0.0012	0.0012	0.0009	0.0012	0.0016	0.0047	0.0118
RFO	1.6	0.5	0.11	0.0062	0.0049	0.00074	0.0005	0.0123	0.0049	0.0123	0.7389	0.0099	0.0222

Table 3.29 Emission factors for Particulate Matters for International Navigation

Fuel type	Emissions factors, kt/PJ		
	PM ₁₀	PM _{2.5}	TSP
Diesel oil	0.035	0.033	0.035
RFO	0.1527	0.1379	0.1527

The SO₂ emissions factors are used consistent with sulphur content in diesel oil (Table 3.30, Table 3.31).

Table 3.30 SO₂ emission factors used for Diesel oil in the SO₂ calculation of emissions for International Bunkers

	Fuel content	NCV	EF (kt/PJ)
1990-2007	0.2	42.49	0.094
2008-2015	0.1	42.49	0.0471

Table 3.31 SO₂ Emission factors used for RFO in the SO₂ calculation of emissions for International Bunkers

RFO	Fuel content	NCV	EF (kt/PJ)
1990-2006	2.8	40.6	1.352
2007-2015	1.5	40.6	0.7241

3.5.4 Activity data

Fuel consumption for emission calculation is obtained from CSB (Figure 3.22). To provide the consistent allocation of fuel consumption between domestic and international mode in the navigation and aviation, CSB each month collects and summarises the information which is submitted by enterprises which perform fuel bunkering. For this purpose the particular statistical report format is elaborated in which the enterprises have to fill in the data regarding amount of fuel sold respectively in domestic and international navigation and aviation.

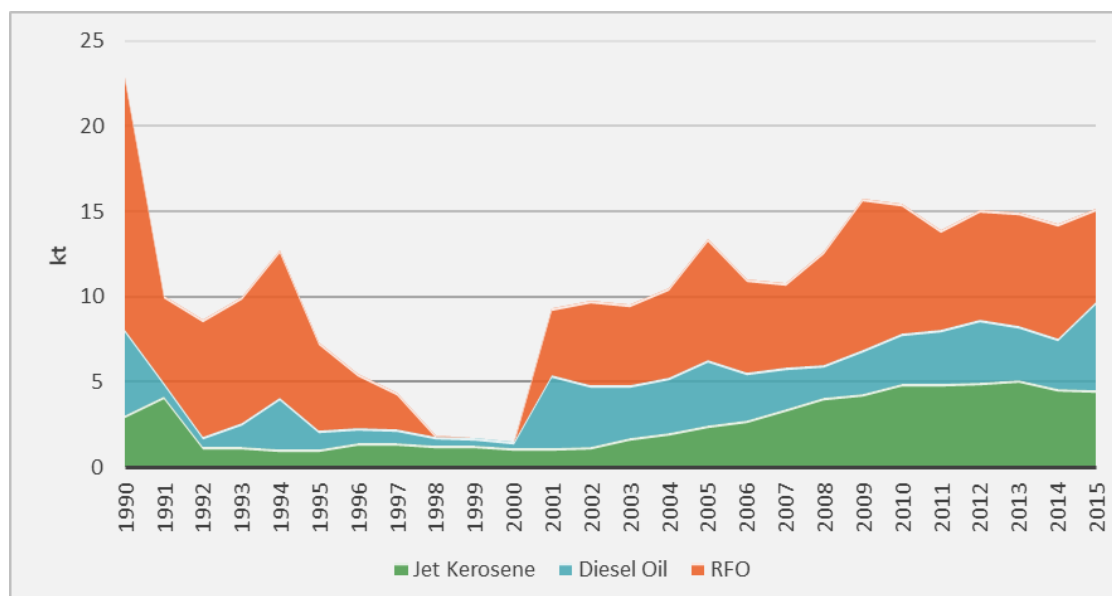


Figure 3.22 Fuel consumption in International Transport (PJ)

Taking into consideration the fact that ports in Latvia are focused on transit cargo transport, navigation activities have big fluctuations and depend on neighbouring countries' economical and international trading activities and competitiveness of Latvian ports' with other neighbouring ports in Baltic Sea. At the same

time fuel consumption and emissions from aviation are more stable, and recent trend depicts a persistent increase from year 2003. After the sulphur regulation for marine fuels was entered into force 1st of January 2015 in the North Sea and the Baltic Sea sulphur emission control area, SECA, a change in the kinds of fuels used has occurred. The allowed sulphur content in marine fuels was decreased from 1 per cent to 0.1 per cent by mass. To fulfill requirement concerning sulphur content limit ships have used diesel oil more in 2015 (Figure 3.22).

4 Industrial processes and Product use (NFR 2)

4.1 Sector overview

4.1.1 Overview of sector

Sources of emissions from Industrial processes and Product use are:

- Mineral products (NFR 2 A);
- Metal production (NFR 2 C);
- Other solvent and product use (NFR 2 D – 2 L)

There are no emissions reported from Wood processing (2 I), POPs production (2 J) as well as POPs and heavy metal consumption (2 K) and other sectors (2 L) in Latvia.

Table 4.1 Source categories and methods for Industrial processes and Product use sector

NFR code	Description	Method	AD	EF
2 A 1	Cement production	Tier 3	PS	PS
2 A 2	Lime production	Tier 1, Tier 2	PS, NS	D, PS
2 A 3	Glass production	Tier 1, Tier 3	PS, NS	D, PS
2 A 5 a	Quarrying and mining of minerals other than coal	NO	NO	NO
2 A 5 b	Construction and demolition	NO	NO	NO
2 A 5 c	Storage, handling and transport of mineral products	NO	NO	NO
2 A 6	Other mineral products	NO	NO	NO
2 B 1	Ammonia production	NO	NO	NO
2 B 2	Nitric acid production	NO	NO	NO
2 B 3	Adipic acid production	NO	NO	NO
2 B 5	Carbide production	NO	NO	NO
2 B 6	Titanium dioxide production	NO	NO	NO
2 B 7	Soda ash production	NO	NO	NO
2 B 10 a	Chemical industry: Other (please specify in the IIR)	NO	NO	NO
2 B 10 b	Storage, handling and transport of chemical products (please specify in the IIR)	NO	NO	NO
2 C 1	Iron and steel production	Tier 2	NS, PS	D
2 C 2	Ferroalloys production	NO	NO	NO
2 C 3	Aluminium production	NO	NO	NO
2 C 4	Magnesium production	NO	NO	NO
2 C 5	Lead production	NO	NO	NO
2 C 6	Zinc production	NO	NO	NO
2 C 7 a	Copper production	NO	NO	NO
2 C 7 b	Nickel production	NO	NO	NO
2 C 7 c	Other metal production (please specify in the IIR)	NO	NO	NO
2 C 7 d	Storage, handling and transport of metal products (please specify in the IIR)	NO	NO	NO
2 D 3 a	Domestic solvent use including fungicides	Tier 2	NS	Tier 2
2 D 3 b	Road paving with asphalt	Tier1	NS	D
2 D 3 c	Asphalt roofing	Tier1	NS	D
2 D 3 d	Coating applications	Tier 1	NS	Tier 1
2 D 3 e	Degreasing	Tier 1	NS	Tier 1
2 D 3 f	Dry cleaning	CS	NS	CS
2 D 3 g	Chemical products	Tier 1, Tier 2	NS	Tier 1, Tier 2
2 D 3 h	Printing	Tier 1	NS	Tier 1
2 D 3 i	Other solvent use (please specify in the IIR)	Tier 1, Tier 2	NS	Tier 1, Tier 2
2 G	Other product use (please specify in the IIR)	Tier 2	NS	Tier 2
2 H 1	Pulp and paper industry	NO	NO	NO
2 H 2	Food and beverages industry	Tier 1	NS	D
2 H 3	Other industrial processes (please specify in the IIR)	NO	NO	NO
2 I	Wood processing	NE	NE	NE
2 J	Production of POPs	NO	NO	NO
2 K	Consumption of POPs and heavy metals	NO	NO	NO

NFR code	Description	Method	AD	EF
	(e.g. electrical and scientific equipment)			
2 L	Other production, consumption, storage, transportation or handling of bulk products (please specify in the IIR)	NO	NO	NO

Table 4.2 Reported emissions in Industrial Processes sector in 2015

NFR code	Emissions
2A1	NO _x , NMVOC, SO ₂ , PM _{2.5} , PM ₁₀ , TSP, BC, CO, Hg
2A2	PM _{2.5} , PM ₁₀ , TSP, BC
2A3	NO _x , NMVOC, SO ₂ , TSP, CO
2C1	NO _x , NMVOC, SO ₂ , PM _{2.5} , PM ₁₀ , TSP, BC, CO, Pb, Cd, Hg, As, Cr, Cu, Ni, Zn, PCDD/PCDF, total PAHs, PCBs
2D3a	NMVOC
2D3b	NMVOC, PM _{2.5} , PM ₁₀ , TSP, BC
2D3c	NMVOC, PM _{2.5} , PM ₁₀ , TSP, BC, CO
2D3d	NMVOC
2D3e	NMVOC
2D3f	NMVOC
2D3g	NMVOC
2D3h	NMVOC
2D3i	NMVOC
2G	NO _x , NMVOC, SO ₂ , NH ₃ , PM _{2.5} , PM ₁₀ , TSP, CO, Pb, Cd, Hg, As, Cr, Cu, Ni, Zn, PCDD/PCDF, benzo(a) pyrene, benzo(b) fluoranthene, benzo(k) fluoranthene, Indeno (1,2,3-cd) pyrene, total PAHs
2H2	NMVOC

4.1.2 Key sources

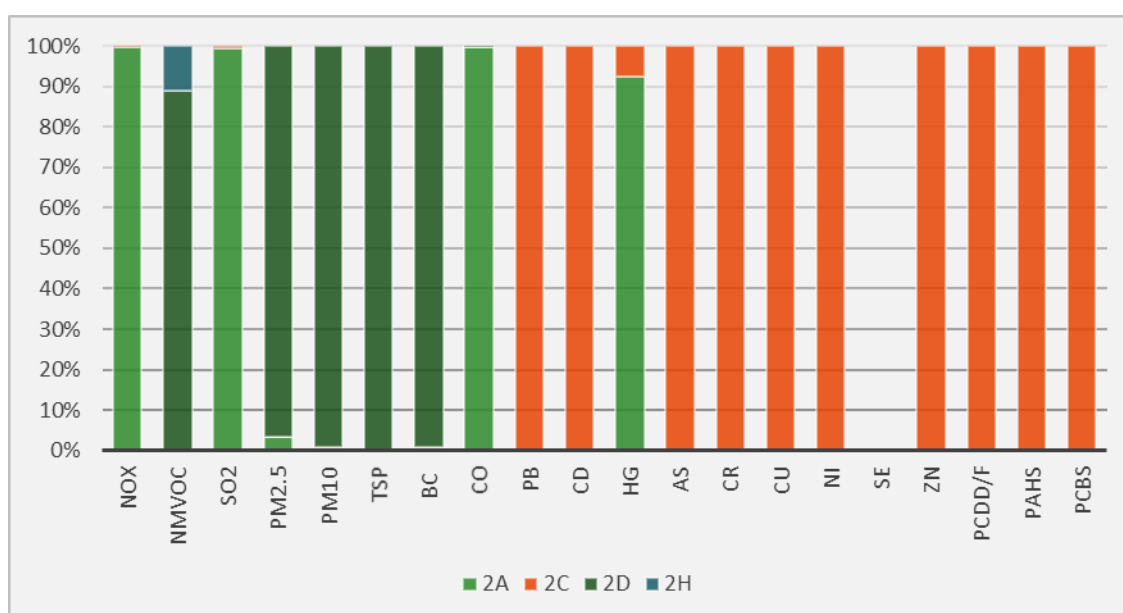


Figure 4.1 Emissions from Industrial Processes and Product Use sector by subsectors in 2015

There are three main categories in IPPU sector – mineral production dominates in NO_x, SO₂, CO and in heavy metal emissions, but metal production dominates in PCDD/PCDDF, PAHs and PCBs. Coating application sector (NFR 2D3d) dominates in NMVOC, particulate matter and BC emissions (Figure 4.1). Division of emission most likely could be different because several emissions are not estimated due to lack of official methodology and default or country specific emission factors.

Cement production sector is a key source category for NO_x and SO₂ emissions with 5.1% and 5.2% from total NO_x and SO₂ emissions in 2015.

The main share of total NMVOC emissions was contributed by Coating (2D3d) –10.3% or 4.27 kt and Domestic solvent use (2D3a) – 2.5% or 1.04 kt. Road paving with asphalt is a key source category for TSP

emissions with 45.2% from total TSP emissions, 17.0% from total PM₁₀ emissions and 3.0% from total PM_{2.5} emissions in 2015.

4.1.3 Trends in emissions

Table 4.3 Change in emissions from Industrial Processes sector in 1990-2015

	Unit	1990	1995	2000	2005	2010	2011	2012	2013	2014	2015	Change from 1990-2015, %
NO_x	kt	3.712	1.666	2.781	3.189	3.310	1.122	1.704	1.666	1.894	1.872	-50
NM VOC		14.675	12.371	11.976	11.686	11.161	10.775	11.955	11.975	11.769	11.740	-20
SO₂		3.571	0.944	0.933	1.443	0.204	0.425	0.495	0.240	0.215	0.194	-95
PM_{2.5}		0.688	0.315	0.551	0.861	0.734	0.594	0.652	0.532	0.546	0.607	-12
PM₁₀		1.704	0.733	1.733	3.824	3.074	4.109	4.416	3.522	3.619	4.115	142
TSP		3.406	1.969	6.137	15.634	12.655	18.982	20.339	16.144	16.577	18.894	455
BC		0.013	0.007	0.017	0.033	0.027	0.031	0.033	0.026	0.027	0.102	691
CO		0.13	0.12	0.12	0.10	0.95	1.86	3.66	2.71	2.35	1.74	1221
Pb	t	165.08	83.82	150.26	166.60	160.70	0.56	2.35	0.66	0.16	0.14	-99.9
Cd		0.46	0.24	0.41	0.46	0.44	0.04	0.18	0.05	0.01	0.01	-97.5
Hg		0.00	0.00	0.00	0.00	0.01	0.01	0.10	0.03	0.00	0.01	6207
As		16.51	8.38	15.01	16.64	16.06	0.00	0.01	0.00	0.00	0.00	-100
Cr		1.28	0.64	1.16	1.29	1.23	0.02	0.09	0.02	0.00	0.00	-99.7
Cu		0.18	0.10	0.25	0.32	0.23	0.08	0.12	0.10	0.10	0.07	-61.7
Ni		5.53	2.80	5.02	5.57	5.36	0.13	0.60	0.15	0.01	0.02	-99.7
Se		0.03	0.01	0.01	0.02	0.00	0.00	0.00	0.00	0.00	0.00	-100
Zn		4.48	2.27	4.12	4.59	4.38	0.65	3.07	0.75	0.06	0.08	-98
PCDD/F	g I-teq	0.00028	0.00024	0.00025	0.00021	0.00022	0.00066	0.0027	0.00074	0.00017	0.00020	-26
PAHs	kg	0.01	0.00	0.01	0.01	0.01	0.08	0.40	0.09	0.00	0.01	8.9
PCB	kg	NA	NA	NA	NA	NA	0.00	0.00	0.00	0.00	0.00	-100

Emissions in the Industrial Processes sector are linked with the economic situation in the country as well as availability of statistical data. The largest decrease in emissions occurred between 1990 and 1993, when industry was affected by a crisis (Table 4.3).

At the beginning of 1990s during the countrywide change in government system and national economy, statistics was not well kept, therefore there is a lack of statistical data regarding industry during this time period or they are vague. The data extrapolation was carried out for the sectors where possible although the extrapolation is almost impossible to do due to different circumstances – changes and total restructuring of national economy when industrial development wasn't predictable and explainable.

From 2000-2008 the emissions from IPPU increased because of growing demand of industrial products in neighbouring countries. It led to rapid development of Latvian industry due to increased activity in construction and production of building materials.

Industrial production faced significant decrease at the end of 2008 and 2009, caused by financial crisis in Latvia's economy. It led to reduced purchase capacity which can be explained with decrease of population welfare. As a result, the activity in building and construction sector decreased as well as companies were taxed with higher taxes.

In 2010 all industrial processes and product use emissions increased with exception of SO₂ emissions that decreased by 88.9% and NO_x by 92.9% compared to previous year. Decrease were related to switching from wet to dry cement production technology in the first half of 2010. The data of SO₂ and NO_x are not representative because the new dry process cement production technology began to work with full capacity only in July 2010. To reduce NO_x emissions from cement production SNCR (Selective Non-Catalytic Reduction System) method is used. Using SNCR system the NO_x emission reduction in flue gas of 40-60% is achievable, depending on the cement kiln type, fuel and NO_x content. Reducing agents such as urea and ammonia are injected into the hot flue gases. They react with nitrogen monoxide and form nitrogen and water. In addition, SNCR are used together with more than 50% ecofuel which functions as blaze

extinguisher in that way to reduce NO_x emissions. After switching from wet to dry process cement production SO₂ and NO_x emissions are measured automatically in new technological plant and are considered as plant-specific data that are available and taken from national statistical database “2-AIR”.

Heavy metal emissions from metal industry are remarkably decreased comparing 1990 to 2015 due to technological changes in metal production plant that occurred in 2011. Since then all crude steel are produced only in Electric arc furnace (EAF) whose EFs are lower than Open hearth furnace (OHF) technology which was used in years 1990-2010. Since 2016 submission PCDD/PCDF, PAHs and PCBs emissions from metal industry are also calculated. PCBs emissions are applicable only for EAF technology. These emissions are reported for 2011-2015.

In 2010-2015 CO emissions are remarkably increased due to new cement plant’s dry technology. New cement plant’s emissions are automatically measured at plant site and available from national database “2-AIR”.

4.2 Mineral products (NFR 2A)

4.2.1 Source category description

4.2.1.1 Overview

This chapter includes industrial production emissions from production processes:

- NFR 2A1 Cement production – NO_x, NMVOC, SO₂, CO, particulate matter, BC and Hg emissions;
- NFR 2A2 Lime production – particulate matter emissions, BC;
- NFR 2A3 Glass and glass fibre production – NO_x, NMVOC, SO₂, CO and particulate matter emissions.

4.2.1.2 Trends in emissions

Table 4.4 Change in emissions from Mineral Products in 1990-2015

	Unit	1990	1995	2000	2005	2010	2011	2012	2013	2014	2015	Change from 1990 to 2015, %
NO_x	kt	0.902	0.237	0.226	0.358	0.577	1.097	1.592	1.638	1.891	1.867	106.9
NMVOC		0.155	0.042	0.041	0.072	0.022	0.026	0.014	0.013	0.019	0.010	-93.9
SO₂		3.409	0.896	0.853	1.354	0.118	0.414	0.444	0.227	0.214	0.193	-94.4
PM_{2.5}		0.281	0.048	0.037	0.053	0.019	0.001	0.003	0.023	0.025	0.019	-93.1
PM₁₀		1.102	0.160	0.115	0.142	0.030	0.002	0.004	0.034	0.038	0.029	-97.3
TSP		2.342	0.281	0.174	0.167	0.113	0.030	0.040	0.079	0.071	0.032	-98.7
BC		0.004	0.001	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	-94.0
CO	t	NA/NE	NA/NE	NA/NE	NA/NE	0.846	3.558	3.558	2.615	2.259	1.646	94.6
Pb		0.074	0.017	0.012	0.038	NA/NE	NA/NE	NA/NE	NA/NE	NA/NE	NA/NE	–
Cd		0.006	0.001	0.001	0.003	NA/NE	NA/NE	NA/NE	NA/NE	NA/NE	NA/NE	–
Hg		0.000	0.000	0.000	0.000	0.012	0.003	0.056	0.016	0.004	0.008	5745.3
As		0.008	0.002	0.001	0.004	NA/NE	NA/NE	NA/NE	NA/NE	NA/NE	NA/NE	–
Cr		0.010	0.002	0.002	0.005	NA/NE	NA/NE	NA/NE	NA/NE	NA/NE	NA/NE	–
Cu		0.000	0.000	0.000	0.000	NA/NE	NA/NE	NA/NE	NA/NE	NA/NE	NA/NE	–
Ni		0.021	0.005	0.004	0.011	NA/NE	NA/NE	NA/NE	NA/NE	NA/NE	NA/NE	–
Se		0.035	0.008	0.006	0.018	NA/NE	NA/NE	NA/NE	NA/NE	NA/NE	NA/NE	–
Zn		0.016	0.004	0.003	0.008	NA/NE	NA/NE	NA/NE	NA/NE	NA/NE	NA/NE	–

Most of emissions have increased in 1990-2015 mainly due to increase of industrial production in Cement production. CO emissions have increased due to the new cement production plant that started to work in 2010 using dry process technology (Table 4.4).

In 2015 NO_x and CO emissions have increased by 106.9% and 94.6% comparing with 1990 and 2010 accordingly due to the changes in technology of cement production. In cement plant NO_x, SO₂ and CO emissions, as well as particulates and Hg are measured automatically at plant site. Compared to 1990

emissions of particulate matter PM_{2.5}, PM₁₀ and TSP decrease by accordingly 93.1%, 97.3% and 98.7%. To reduce particulates, all mineral producers are equipped with filters.

NMVOC emissions have decreased for 93.9% in 2015 comparing to 1990. It is mainly due to the closure of glass production plant in 2005 and change of technology in cement plant.

4.2.2 Cement clinker production (NFR 2A1)

4.2.2.1 Overview

Under this sector NO_x, NMVOC, SO₂, PM_{2.5}, PM₁₀, TSP, BC and HG emissions are reported from Cement production sector including emissions from cement and clinker production processes.

4.2.2.2 Trends in emissions

Table 4.5 Change in emissions from Cement clinker production in 1990-2015

	Unit	1990	1995	2000	2005	2010	2011	2012	2013	2014	2015	Change in 1990-2015, %
NO_x	kt	0.902	0.237	0.226	0.358	0.492	1.017	1.517	1.539	1.795	1.864	106.51
NMVOC		0.154	0.040	0.038	0.061	0.008	0.011	0.011	0.011	0.011	0.009	-94.03
SO₂		3.409	0.896	0.853	1.354	0.075	0.374	0.388	0.171	0.153	0.191	-94.41
PM_{2.5}		0.120	0.032	0.030	0.048	0.019	0.001	0.002	0.023	0.025	0.019	-83.97
PM₁₀		0.341	0.090	0.085	0.135	0.029	0.002	0.004	0.034	0.038	0.029	-91.43
TSP		0.401	0.105	0.100	0.159	0.030	0.005	0.004	0.035	0.039	0.030	-92.49
BC		0.004	0.001	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	-92.83
CO	t	NE	NE	NE	NE	0.812	1.738	3.532	2.584	2.230	1.644	102.63
Hg		NE	NE	NE	NE	0.012	0.003	0.056	0.016	0.004	0.008	-36.07

In 1990-2010 wet technology for cement production was used, that caused emission increase due to different EFs.

In 2015 NMVOC, SO₂ and particulate matter emissions have decreased (Table 4.5) compared to 1990 because all emissions are automatically measured in plant site as well as total suspended particulates are weighted and returned in further production for different types of cement.

Starting from 2010 fully dry process kiln was started to use whereas previously (1990 – 2009 partly) only wet process kiln was used in cement production. In 2009 both kiln processes - dry and wet - were used in cement production. As a result, from 2009 to 2010 SO₂ emissions have decreased about 93.4% due to the change of cement clinker production technology from wet to dry process kiln.

Tyres and lube oil which contains sulphur compounds are used as a resources for clinker production. NO_x decreased by 6.4% but these data are not representative due to the new technology that started to work with full capacity only in July 2010.

In 2011 and 2012 emissions from NFR 2A1 sector increased due to growing activity in cement production comparing with previous year. In 2013 cement production decreased by 6.6% but in 2014 increased by 3.6%. In 2015 produced amount of clinker have decreased by 16.0% compared to 2014 due to decrease of exported amounts and decrease of building activities in Latvia. Cement products are mainly exported thereby cement production directly depends on demand in external and internal market.

4.2.2.3 Methods

Tier 2 approach was used to calculate NO_x, NMVOC, SO₂ (from EMEP/CORINAIR 2007) and particulate matter emissions (from EMEP/EEA 2009 and EMEP/EEA 2016) from cement production taking into account produced amount of clinker in wet process kilns and technology based EFs.

In the middle of 2009 previously operating cement production plant was closed and the new one was opened in different area. In the new plant dry process kiln is used instead of wet process kiln that was used previously. Therefore, all emissions are automatically measured and reported by plant site. Since 2010 all emissions are reported as plant-specific (Tier 3 method).

According to A category pollution permit there are 36 dedusting filters installed in the cement production plant with total efficiency approximately 99%.¹¹ These filters mainly are designed to collect large coarse particles. Therefore, total TSP emissions decreased by 99% due to installation of filters. TSP emissions are measured automatically in plant.

Plant's emission data were taken from statistical data base „2-AIR“. For 2010-2015 additionally Hg emissions are reported which also were taken from previously mentioned data source.

4.2.2.4 Emission factors

As the EFs for NO_x, NMVOC and SO₂ are not available in EMEP/EEA 2013¹² (marked as “Not Estimated”) the EFs from EMEP/CORINAIR 2007¹³ were used as these emissions are emitted in the production process according to cement production plant (Table 4.6). EFs were divided for wet process kiln used till the first half of 2009 and for dry process kiln used starting with second half of 2009 and afterwards.

Table 4.6 EFs for cement clinker production (kt/kt)

	NO _x	NMVOC	SO ₂	PM _{2.5}	PM ₁₀	TSP
Wet Process Kiln	0.00135	0.00023	0.0051	0.00018	0.00051	0.0006

Since 2010 the plant-specific emission data is reported by plant therefore EFs for new dry process technology are not applied.

4.2.2.5 Activity data

The produced clinker is not weighed in cement production plant, but estimated from final cement type by multiplying it with cement/clinker ration according to data taken from cement producer's annual GHG report under EU ETS (Figure 4.2).

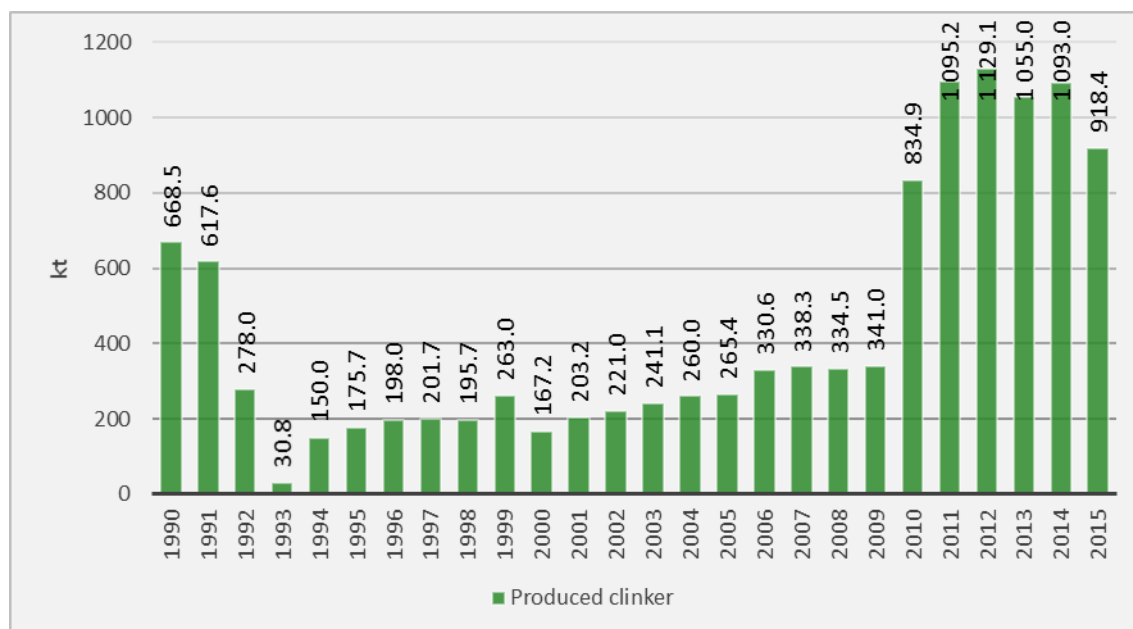


Figure 4.2 Cement production activity data in 1990–2015 (kt)

4.2.2.6 Uncertainties

Uncertainty of cement production data is taken from Cement production plant's GHG report under EU ETS (2.5% uncertainty for activity data of clinker production and 7.5% uncertainty for activity data of CKD).

¹¹ http://old.vpzb.gov.lv/ippc/atlauja/Aat/Cemex_meiri.pdf (page 15)

¹² <http://www.eea.europa.eu/publications/emep-eea-guidebook-2013/part-b-sectoral-guidance-chapters/2-industrial-processes/2-a-mineral-products/2-a-1-cement-production/view> (pages 12-13)

¹³ <http://www.eea.europa.eu/publications/EMEPCORINAIR5/B3311vs2.4.pdf/view> (pages 12-13)

The total uncertainty U_{total} is being calculated, using following formula of combined uncertainty:

$$U_{total} = \sqrt{U_1^2 + U_2^2 + \dots + U_n^2}$$

where:

U_{total} = the percentage uncertainty in the product of the quantities

U_i = the percentage uncertainties associated with each of the quantities

Combined activity data uncertainty is calculated as 8%.

Emission factor for NFR 2A1 sector is used only for NMVOC emissions and for all other emissions in 1990-2009 and partially in 2010 so uncertainty 10% is assumed. For CO, NO_x, SO₂, particulates and Hg emission factor is not applicable as these emissions are measured automatically at plant site starting from middle of 2010.

Up to 50% of uncertainty may be assigned to the emission estimates of most of the trace elements emitted from major point sources in Europe (Pacyna, 1994). Similar uncertainty can be assigned for emission estimates of these compounds from cement production.

4.2.2.7 QA/QC and verification

Assessment of trends have been performed. All data are checked on input mistakes to comparing calculation data base with input data in NFR tables in all time series. All figures and tables represented in IIR 2017 are made based on final completed NFR data table.

4.2.2.8 Recalculations

No recalculations have been carried out.

4.2.2.9 Planned improvements

No improvements are planned for the next submission.

4.2.3 Lime production (NFR 2A2)

4.2.3.1 Overview

Under NFR 2A2 sector PM_{2.5}, PM₁₀, TSP and BC emissions from lime production are reported as these emissions are estimated based on total produced lime data.

4.2.3.2 Trends in emissions

Table 4.7 Emissions from Lime production in 1990-2015

	Unit	1990	1995	2000	2005	2010	2011	2012	2013	2014	2015	Change in 1990-2015, %
PM _{2.5}	kt	0.15	0.013	0.0055	0.00010	0.0000269	0.0000059	0.000017	0.000015	0.000025	0.000027	-99.982
PM ₁₀		0.75	0.067	0.028	0.00067	0.00018	0.000039	0.00011	0.00010	0.00017	0.00018	-99.976
TSP		1.93	0.17	0.071	0.0013	0.00036	0.000078	0.00023	0.00020	0.00033	0.00037	-99.981
BC		0.00069	0.000062	0.000025	4.61E-07	1.24E-07	2.70E-08	7.83E-08	6.84E-08	1.15E-07	1.26E-07	-99.982

In 2008-2009 emissions have decreased significantly due to the economic crisis. Afterwards emissions from lime production are fluctuating due to economic situation and changes in industrial activities in the country. Emissions from lime production sector decreased by about 99% since 1990. In 2014-2015 emissions from Lime production sector increased by approximately 10%.

4.2.3.3 Methods

Tier 2 approach was used to estimate particulate matter and BC emissions from lime production. There are two lime production plants in Latvia. One of the plants used limestone in lime production 2007-2012. Since 2013 limestone is not used anymore. Second plant still uses dolomite in lime production.

4.2.3.4 Emission factors

Both lime production plants have A category pollution permits. Since 2005 the facilities must have best available technologies (BAT) and the emissions from the production processes have to be controlled. Therefore controlled EFs from EMEP/EEA 2016 for particulate matters and BC are used for 2005-2015. For 1990-2004 the uncontrolled EFs from EMEP/EEA 2016 were used to estimate particulate matter and BC emissions (Table 4.8).

Table 4.8 Emission factors for lime production in 1990–2015 (kt/kt)

	PM_{2.5}	PM₁₀	TSP
Lime (total production) 1990-2004	0.0007	0.0035	0.009
Lime (total production) 2005-2015	0.00003	0.0002	0.0004

4.2.3.5 Activity data

The data of produced lime in lime production plants is not available due to confidentiality. These data are re-estimated backwards taking into account the approximate percentage of the lime that is produced by using of raw materials (Table 4.9, Figure 4.3).

Table 4.9 Used raw materials in lime production

	Used limestone, kt	Used dolomite (dry), kt
1990	NO	383.25
1995	NO	33.67
2000	NO	13.84
2005	NO	5.97
2010	0.35	1.25
2011	0.35	NO
2012	0.32	0.69
2013	NO	0.89
2014	NO	1.49
2015	NO	1.63

The information of technology used in lime production is available:

- in the first facility lime is produced only from limestone and there are 3 shaft-type kilns installed in facility;
- in the second facility lime is produced only from dolomite using shaft-type kilns;

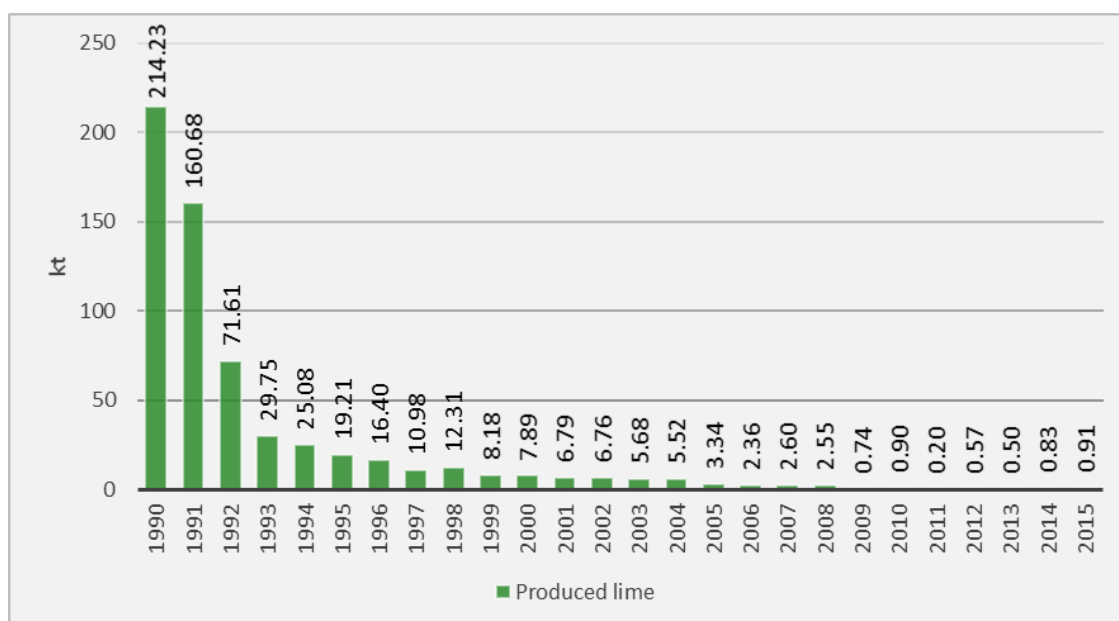


Figure 4.3 Lime production activity data in 1990–2015 (kt)

In 2011 production was stopped in one of the largest lime production plants due to preparation of implementing the highest BAT. Currently only one lime production plant produces lime from dolomite. Emissions from dolomite use in lime production are continuously decreasing since the beginning of 1990s due to recession of overall national economy. In latest years, there is an overall decrease of activity in lime production due to reduced industrial activity.

4.2.3.6 *Uncertainties*

Uncertainty of lime production activity data is taken from Lime production plant's GHG report under EU ETS (8 % uncertainty for activity data of lime production).

As default emission factors for lime production from 2006 IPCC Guidelines as well as Monitoring reporting Guidelines (MRR¹⁴) are used uncertainty is assumed 50% due to unavailable plant specific data of produced lime.

4.2.3.7 *QA/QC and verification*

Assessment of trends has been performed. All data are checked on input mistakes comparing calculation database with input data in NFR tables in all time series. All figures and tables represented in IIR 2017 are made based on final completed NFR data table.

4.2.3.8 *Recalculations*

No recalculations have been carried out.

4.2.3.9 *Planned improvements*

No improvements are planned for the next submission.

4.2.4 Glass production (NFR 2A3)

4.2.4.1 *Overview*

In this sector NMVOC emissions are estimated from use of raw materials (fluorspar, potash, butylacetate, soda and witherite (barium carbonate)) in glass production plants as well as NMVOC emissions from glass production and glass fibre production reported by glass production facilities.

¹⁴ Commission Regulation (EU) No 601/2012 of 21 June 2012 on the monitoring and reporting of greenhouse gas emissions pursuant to Directive 2003/87/EC of the European Parliament and of the Council

Till 2006 the total produced glass amount was known from the Central Statistical Bureau. 1990-2006 particulate matter and heavy metal emissions were calculated by using known total produced glass amount and applying EFs from EMEP/EEA 2016. Since 2007 only one glass production plant remained therefore activity data became confidential “C”. Due to that since 2007 only CO, NO_x, SO₂ and TSP emissions are reported as they are available from national database “2-AIR”. Heavy metal emissions are reported 1990-2006 when the total produced glass amount was available. Since 2007 heavy metal emissions reported as NE due to lack of activity data for those emission calculations.

4.2.4.2 Trends in emissions

Table 4.10 Emissions from Glass production in 1990-2015

	1990	1995	2000	2005	2010	2011	2012	2013	2014	2015	Change from 1990 to 2015, %
NMVOC	0.0013	0.0016	0.0027	0.011	0.014	0.015	0.0022	0.0026	0.0076	0.00035	-72.91
CO	NE	NE	NE	NE	0.034	0.027	0.026	0.031	0.029	0.001	-96.40
NO_x	NE	NE	NE	NE	0.085	0.080	0.075	0.099	0.095	0.003	-96.19
SO₂	NE	NE	NE	NE	0.043	0.040	0.056	0.057	0.062	0.002	-95.39
PM_{2.5}	0.0105	0.0024	0.0018	0.0054	NE	NE	NE	NE	NE	NE	-
PM₁₀	0.0118	0.0028	0.0020	0.0061	NE	NE	NE	NE	NE	NE	-
TSP	0.0131	0.0031	0.0022	0.0068	0.082	0.025	0.036	0.044	0.031	0.0010	-92.02
BC	0.0000065	0.0000015	0.0000011	0.0000034	NE	NE	NE	NE	NE	NE	-
Pb	0.074	0.017	0.012	0.038	NE	NE	NE	NE	NE	NE	-
Cd	0.0057	0.0013	0.0010	0.0029	NE	NE	NE	NE	NE	NE	-
Hg	0.00013	0.000031	0.000022	0.000068	NE	NE	NE	NE	NE	NE	-
As	0.0083	0.0019	0.0014	0.0043	NE	NE	NE	NE	NE	NE	-
Cr	0.0100	0.0023	0.0017	0.0052	NE	NE	NE	NE	NE	NE	-
Cu	0.00030	0.000071	0.000051	0.00016	NE	NE	NE	NE	NE	NE	-
Ni	0.0213	0.0050	0.0036	0.0111	NE	NE	NE	NE	NE	NE	-
Se	0.0349	0.0082	0.0059	0.0181	NE	NE	NE	NE	NE	NE	-
Zn	0.0161	0.0038	0.0027	0.0084	NE	NE	NE	NE	NE	NE	-

Activity data for NMVOC emission calculation from 1997 to 2015 were taken from national database “2-AIR” where glass fibre production plant reported its emissions divided by NMVOC sub-type (Table 4.10). For 1990-1996 only butylacetate data are available from glass fibre production company’s application for GHG permit within EU ETS. Only for 2005 also glass production company reported its NMVOC emissions but since then glass is no longer produced in Latvia, thereby NMVOC emissions from glass production are reported only for 2005. NMVOCs from glass fibre production are still occurring and reported.

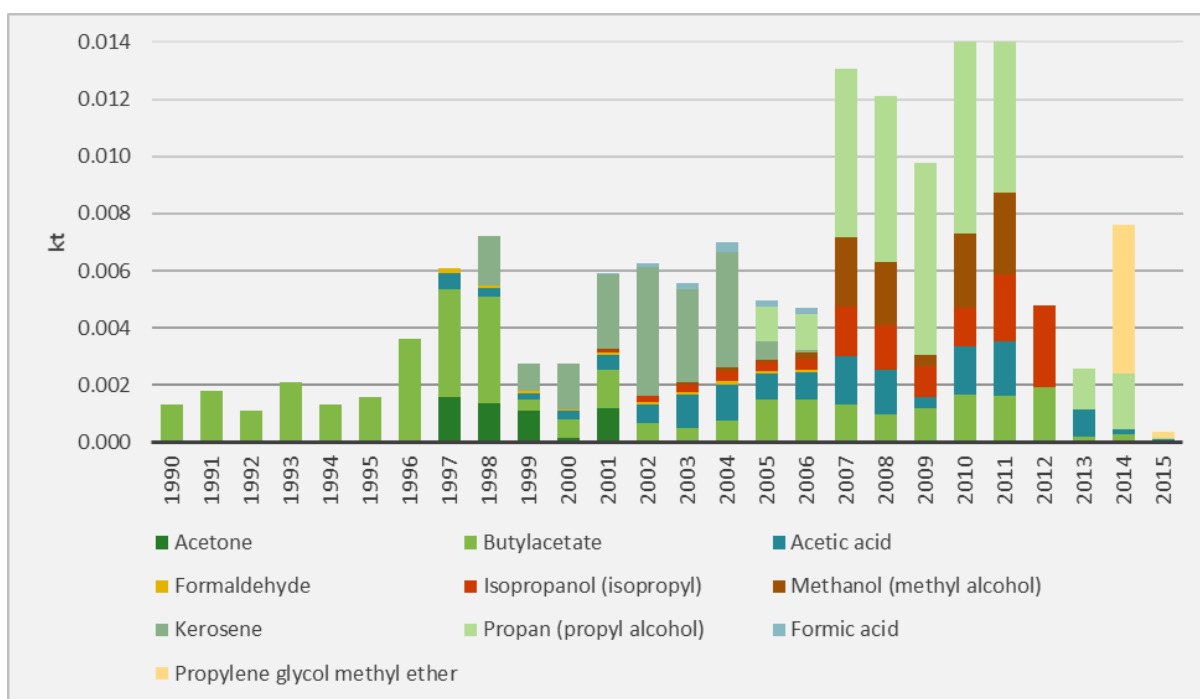


Figure 4.4 NMVOC emissions from glass fibre production in 1990–2015 (kt)

Use of potash as well as NMVOC emissions from glass production stopped in 2005 when one of the glass production plant's suspended its activity but in the other glass production plant raw materials are used (Figure 4.4). Use of witherite occurred only in 2005-2007 in glass production manufacturing plant but in 2008 and 2009 the plant suspended its activity. Since 2005 NMVOC emissions are emitted only from glass fibre production but in smaller amounts.

In 2015 only butylacetate, acetic acid, propan (propyl alcohol) and propylene glycol methyl ether was used in glass fibre production in small amounts. It resulted in NMVOC emission decrease by 95.4% compared to 2014.

4.2.4.3 Methods

EFs of particulate matters and heavy metals were taken from EMEP/EEA 2016 for Tier 1 approach.

NMVOC emissions were taken from national database "2-AIR" where glass fibre production plant has reported its NMVOC emissions therefore no EF was used.

4.2.4.4 Emission factors

To estimate particulate matter emissions, EF from EMEP/EEA 2016 are used (Table 4.11).

Table 4.11 Emission factors for glass production

	PM _{2.5}	PM ₁₀	TSP	BC	Pb	Cd	Hg	As	Cr	Cu	Ni	Se	Zn
	kt/kt				t/t								
Glass production	0.00024	0.00027	0.0003	0.062% of PM _{2.5}	0.0017	0.00013	0.000003	0.00019	0.00023	0.000007	0.00049	0.0008	0.00037

4.2.4.5 Activity data

Emissions from additional raw materials used in glass production plants – fluorspar, potash, soda, butylacetate and witherite (barium carbonate) are used as activity data to estimate heavy metals and particulate matter from glass and glass fibre production plants (Figure 4.5).

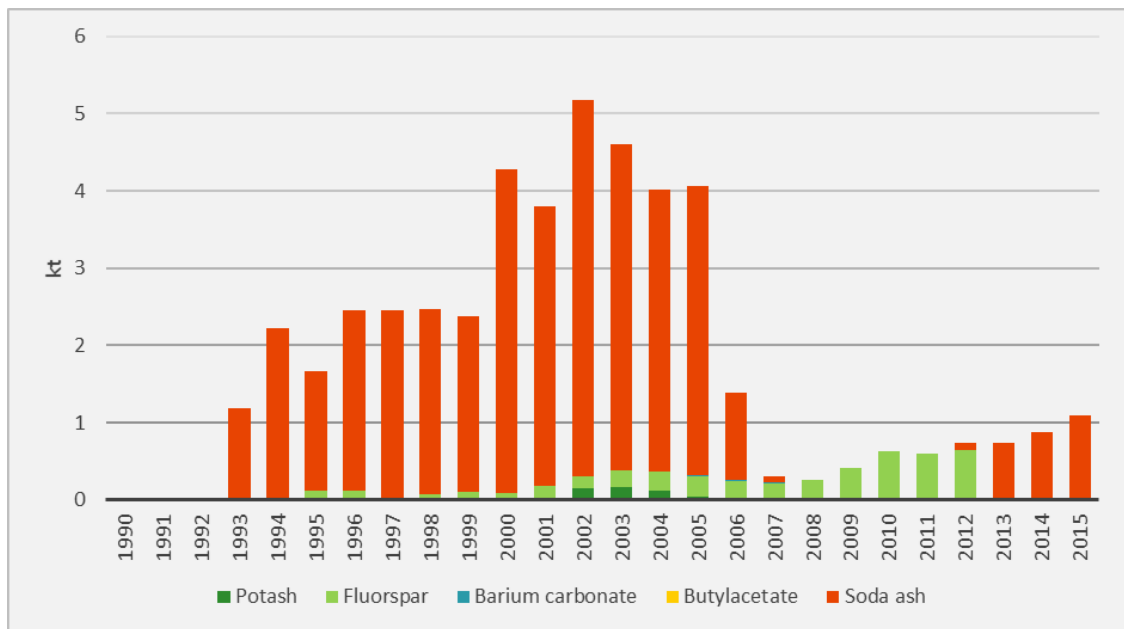


Figure 4.5 Activity data for raw materials use in glass production in 1990-2015 (kt)

4.2.4.6 Uncertainties

Uncertainty of glass production activity data is taken from Glass production plant's GHG report under EU ETS (2.5 % uncertainty for activity data of glass production). The uncertainty is quite low as plant specific reported data is used. Accredited verifiers and Latvia's Regional Environmental Boards verify the activity data reported in production plant's annual GHG reports within EU ETS so the activity data is adequately verified.

EFs for this sector are taken from glass production plant so the uncertainty could be assumed as quite low. Still the estimation of the emission factors can't be adequately verified so the uncertainty is assumed as quite high – 60%, according to 2006 IPCC Guidelines.

4.2.4.7 QA/QC and verification

Assessment of trends have been performed. All data are checked on input mistakes by comparing calculation data base with input data in NFR tables in all time series. All figures and tables represented in IIR 2017 are made based on final completed NFR data table.

4.2.4.8 Recalculations

Before 2017 IIR particulate matter and heavy metal emissions were calculated for entire time series by using known total produced glass amount from 1990 till 2006 and assuming that since 2007 the total produced glass amount is constant as it was in 2006 (because only one glass company remained hence their data became confidential). In 2017 this approach was considered wrong because more likely total produced glass amount couldn't be the same since 2006. As this is the only glass production company in the country, the glass production data can't be obtained and used in emission calculations due to confidentiality.

Taking into account above mentioned particulate matter and heavy metal emissions were calculated only during the period when total produced glass amount was known (1990-2006). Since 2007 total produced glass amount is confidential thus heavy metal and PM_{2.5}, PM₁₀ emissions are reported as NE because there are no activity data for emission calculation. Since 2007 only CO, NO_x, SO₂ and TSP emissions are reported as they are reported by glass production company and available from national database "2-AIR". Since 2007 glass fibre production plant have reported only TSP emissions not specifying particle size. Hence PM_{2.5}, PM₁₀ emissions are NE since 2007.

4.2.4.9 Planned improvements

No improvements are planned for the next submission.

4.3 Metal production (NFR 2C)

4.3.1 Overview

Emissions from crude iron as input material in iron and steel production in open-hearth furnaces as well as crude iron used in electric arc furnaces are included in the inventory according to 2006 IPCC Guidelines unlike scrap metal, used in crude steel production, which is excluded from inventory report. The indirect GHG emission sources are included under iron and steel production too.

4.3.2 Trends in emissions

Emissions of NMVOC, CO, NO_x and SO₂ gases as well as emissions of particulate matters, heavy metals and dioxins are reported under 2C1 Iron and Steel production sector (Table 4.12).

Table 4.12 Emissions from Metal production in 1990-2015

	Unit	1990	1995	2000	2005	2010	2011	2012	2013	2014	2015	Trend in 1990-2015, %
NO_x	kt	2.805	1.425	2.551	2.827	2.730	0.022	0.109	0.025	1.20E-05	0.0016	-99.94
NMVOC		0.011	0.006	0.010	0.011	0.011	0.008	0.038	0.009	4.26E-06	0.00057	-94.78
SO₂		0.088	0.045	0.080	0.089	0.086	0.010	0.050	0.012	5.55E-06	0.00075	-99.15
PM_{2.5}		0.330	0.168	0.300	0.333	0.321	0.004	0.018	0.004	1.94E-06	0.00026	-99.92
PM₁₀		0.440	0.223	0.400	0.443	0.428	0.004	0.020	0.005	2.22E-06	0.00030	-99.93
TSP		0.550	0.279	0.500	0.554	0.535	0.005	0.025	0.006	2.78E-06	0.00037	-99.93
BC		0.00792	0.00402	0.007204	0.00798	0.00771	1.27E-05	6.32E-05	1.46E-05	7.0E-09	9.43E-07	-99.99
CO	t	0.00055	0.00028	0.0005	0.00055	0.00054	0.00029	0.00142	0.00033	1.57E-07	2.12E-05	-96.14
Pb		165.00	83.80	150.09	166.30	160.59	0.44	2.17	0.50	2.41E-04	0.0324	-99.98
Cd		0.00044	0.2235	0.40023	0.44348	0.42824	0.03353	0.16729	0.03864	1.85E-05	0.0025	467.09
As		16.5	8.37978	15.00876	16.630	16.059	0.0025	0.0125	0.0029	1.39E-06	0.00019	-100.00
Cr		0.00127	0.64245	1.150672	1.275	1.2312	0.01676	0.08364	0.0193	9.25E-06	0.0012	-1.38
Cu		0.00017	0.0838	0.150088	0.1663	0.1606	0.0034	0.0167	0.00386	1.85E-06	0.00025	51.22
Ni		5.50	2.79	5.00	5.54	5.35	0.12	0.59	0.14	6.48E-05	0.0087	-99.84
Zn		4.46	2.26	4.05	4.49	4.34	0.60	3.01	0.70	3.33E-04	0.0449	-98.99
PCDD/PCDF	g i-Teq	3.69E-05	1.87E-05	3.35E-05	3.71E-05	3.59E-05	5.03E-04	2.51E-03	5.80E-04	2.78E-07	3.74E-05	1.57
PAHs	t	0.0055	0.00279	0.005003	0.00554	0.00535	0.08046	0.40149	0.09273	4.44E-05	0.00599	8.88
PCBs	kg	NA	NA	NA	NA	NA	0.00042	0.00209	0.00048	2.31E-07	3.12E-05	-92.56

One of the biggest decrease in emissions occurred in time period 1990–1991 due to crisis in Latvia's national economy. Crisis in late 1990s was caused by economic crisis in Russia and it reflected in decrease of demand of products from Metal Production sector. Also, final amount of steel products produced in the only metal industry facility decreased in latest years.

Main decrease of emission trend occurred in early 1990s can be explained with economic situation in industry during this period. Since 1995 emissions were increasing due to increase in metal production. Emissions slightly decreased from 2004 to 2005 by 0.5% that is explained with decrease in production of steel, because production was affected by economic situation and decrease in demand of product in national and international market.

In 1990-2007 emissions have increased by 1.5% and decreased by 5% in 2007-2008 that can be explained with economic crisis that begun in the second part of 2008. The emissions continued to decrease by 16.97% in 2008-2009.

Emissions in 2010 have increased by 21.55% compared to 2009. In 2011 can observed remarkable decrease (about 68.60%) of all emissions from Metal production sector due to changes in technology used in Metal production plant when steel production process was stopped after a semester. The plant switched their

technology from Open hearth furnace (OHF) to Electric arc furnace (EAF). In 2011 Metal production plant went under reconstruction as a result amount of steel produced in EAF and OHF decreased for 75.11% and 68.67%.

In 2012 all emissions from Metal production sector increased after plant reconstruction. Comparing year 2012 with base year particulate matter emissions have increased by 67.18%. NO_x, NMVOC, SO₂ and heavy metals increased about 52.07%. In 2013 production plant operated for 5-7 months that is why there is noticeable decrease of produced steel amount and produced emissions. Comparing emission trend with base year all emissions were remarkably decreased, except PCDD/PCDF, PAHs and PCBs which were additionally calculated since 2016 submission. PCBs emissions are applicable only from 2011 as all crude steel is produced in EAF. PCDD/ PCDF and PAHs emissions have increased significantly because these emissions are calculated with quite higher EFs that are applicable for EAF technology.

In 2014 only 0.09 kt crude steel were produced from scrap metal because production was almost stopped. In 2015 the metal production company begun to produce steel again therefore emissions appeared again.

4.3.3 Methods

Tier 2 method from EMEP/EEA 2013 was used to calculate emissions from steel production.

4.3.4 Emission factors

Emission factors for NO_x, CO and SO₂ emissions are taken from EMEP/CORINAIR 2007 for 1990-2010 because EFs are not available in EMEP/EEA 2016 for OHF technology. Particulate matter and heavy metal EFs are taken from EMEP/EEA 2016. According to methodology for estimations of emissions from processes in OHF, where 95% of total steel production is produced, EFs for 1990-2010 taken from EMEP/EEA 2016 are applicable. After 2011 all crude steel was produced in EAF and EFs applicable to this production technology are taken from EMEP/EEA 2016.

Table 4.13 Emission factors for Iron and Steel production

	Unit	EF for 1990-2010	EF for 2011-2015
NO_x	kt/kt	0.0051	0.00013
NMVOC		0.00002	0.000046
SO₂		0.00016	0.00006
PM_{2.5}		0.0006	0.000021
PM₁₀		0.0008	0.000024
TSP		0.001	0.00003
BC	% of PM _{2.5}	2.4	0.36
CO	kt/kt	0.000001	1.7E-09
Pb	t/t	0.0003	0.0000026
Cd		0.0000008	0.0000002
Hg		0.00000005	0.00000005
As		0.00003	0.00000015
Cr		0.0000023	0.0000001
Cu		0.0000003	0.00000002
Ni		0.00001	0.0000007
Zn		0.00001	0.0000036
PCDD/F		6.7E-08	0.000003
Total 4 PAHs		0.01	0.00000048
PCB		NA	0.00000025

4.3.5 Activity data

Activity data were taken from the CSB and enterprises. Activity data on production and output by manufacturing companies are freely available until 1999. CSB gives only restricted information on production and output of goods since 1999, the information is classified as confidential. LEGMC has signed an agreement with CSB to receive data about total production of products from sectors whose data are

confidential. Still as industrial producers are participants in the EU ETS the GHG reports of these enterprises have to be freely available.

The GHG reports of EU ETS operators are published on LEGMC home page. The data source of the activity data is industrial producers and the confidentiality rules no longer apply.

Latvia has simpler situation in activity data from 2C1 Metal Production because there is only one steel producer and it participates in EU ETS. It is possible to obtain more accurate and complete activity data and emission factors from enterprise that is involved in the emission trading system (Figure 4.6).

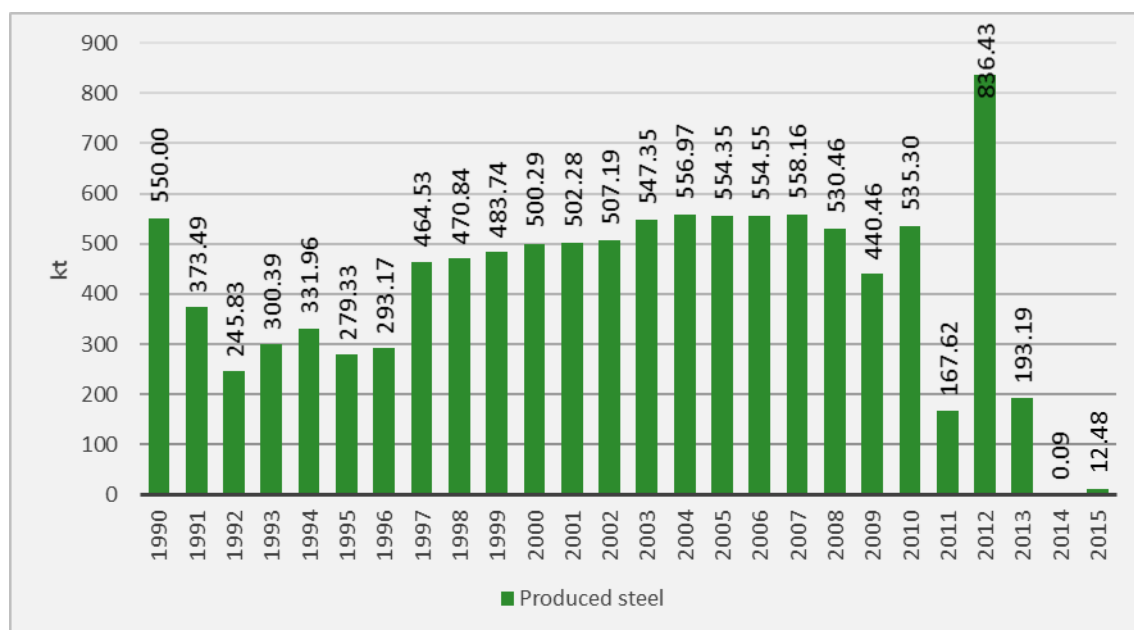


Figure 4.6 Steel production activity data in 1990–2015 (kt)

After going through a crisis in 2008-2009, there was an increase in all emissions from Metal production in 2010. Sharp decrease of emissions in 2011 can be observed due to change in technology of metal production, and decrease in amount of steel produced in EAF (about 75.11%) and steel produced in OHF (about 68.67 %). Since mid-2011 the OHF is not used anymore in this company. At the end of 2010 installation was dismantled and new one was set up. In 2011 plant was working for 4 months. All crude steel was produced from crude iron and scrap metal in EAF. In 2011-2013 all crude steel was produced in EAF and plant was not operating a full year but only for 4-7 month in these years. In 2012 sharp increase of produced crude steel can be observed as new technology was implemented, but production plant operated for 7 month with full capacity. In 2014 steel production plant works only one day for experimental reason and produced only 0.093 kt steel. In 2015 the metal production company begun to produce steel again therefore emissions appeared and increased again.

4.3.6 Uncertainties

The uncertainty of activity data for this sector is assumed as 5%. The activity data reported in iron and steel production plant's annual GHG report within EU ETS is verified by accredited verifiers and Latvia's Regional Environmental Boards so the activity data is adequately verified.

Uncertainty of emission factors taken from EMEP/EEA 2016 methodologies is assigned as 20 % so it is appropriate for OHF and EAF in iron and steel industry in Latvia.

4.3.7 QA/QC and verification

Assessments of trends have been performed. Data is checked on input mistakes by comparing calculation data base with input data from NFR tables in all time series. All figures and tables represented in Submission 2017 are made based on final completed NFR data table.

4.3.8 Recalculations

Recalculations were done for all heavy metal emissions in all time series due to mistake in use of units. Previously heavy metals were reported in kilotons although it is required to report tons in NFR tables. All heavy metal emissions were converted to tons and reported correctly in NFR and IIR.

4.3.9 Planned improvements

No improvements are planned for the next submission.

4.4 Other solvent and product use (NFR 2D-2L)

4.4.1 Source category description

4.4.1.1 Overview

Other solvent and product use sector includes indirect emissions from:

- 2D3a Domestic solvent use including fungicides;
- 2D3b Road paving with asphalt;
- 2D3c Asphalt roofing;
- 2D3d Coating applications;
- 2D3e Degreasing;
- 2D3f Dry cleaning;
- 2D3g Chemical products;
- 2D3h Printing;
- 2D3i Other solvent and product use;
- 2 G Other product use (tobacco, fireworks);
- 2H1 Pulp and paper industry;
- 2H2 Food and beverages industry.

4.4.1.2 Trends in emissions

Table 4.14 Emissions from Other solvent and product use in 1990-2015

	Unit	1990	1995	2000	2005	2010	2011	2012	2013	2014	2015	Change in 1990-2015, %
NM VOC	kt	14.51	12.32	11.93	11.60	11.13	10.74	11.90	11.95	11.75	11.75	-19
SO₂		0.0732	0.0031	0.0006	0.0010	0.0004	0.0005	0.0007	0.0006	0.0006	0.0004	-99
PM_{2.5}		0.077	0.100	0.213	0.475	0.394	0.589	0.632	0.505	0.520	1.875	2321
PM₁₀		0.161	0.350	1.218	3.239	2.617	4.103	4.392	3.483	3.580	13.669	8388
TSP		0.514	1.408	5.463	14.912	12.007	18.947	20.273	16.059	16.506	63.493	12262
BC		0.001	0.002	0.009	0.024	0.019	0.030	0.033	0.026	0.026	0.102	14243
CO		0.131	0.123	0.119	0.099	0.101	0.092	0.103	0.091	0.096	0.097	-26

Solvent Use sector was the largest pollution source of NMVOC emissions in Latvia in 2015 and it covered over 25.1% (10.39 kt) from the total Latvia's NMVOC emissions. In general the NMVOC emissions from Solvent Use sector have been constantly decreasing since the beginning of 1990s till 2015 mostly due to the the economic situation in the country. The slightly decrease in emissions occurred between 1991 and 1997, when industry was affected by a crisis. In subsequent years there has been observed NMVOC emission increase till 2006 which resulted in import growth of NMVOC containing products. At the end of 2008 the world was struck by the economic crisis which also affected the Solvent Use sector in Latvia till 2009. As shown there is slight increase of NMVOC emissions of Solvent Use sector during the later period of 2010 till 2015. For instance, emissions of NMVOC have increased by 6.78 % from 9.73 kt NMVOC in 2010 to 10.39 kt NMVOC in 2015 (Table 4.14).

The emissions from Asphalt roofing and Road paving with asphalt sectors are increasing since the beginning of 1990s. Slight emission decrease in 1999-2000 can be explained with used bitumen percentage division changes between for road paving with asphalt and asphalt roofing.

Since Latvia is EU member state from 2004, financial resources from EU projects are available for national infrastructure projects which very strongly influences the activities in road paving and building sector.

In 2004 the now highway “Via Baltica” which connects the capitals of all Baltic States was constructed. Sharp emission increase in 2003-2004 can be explained with availability of funding from EU which was the main reason why the road paving activity increased before and afterwards. In the next years road paving activities decreased but not to the level before 2004.

4.4.2 Road paving with asphalt and Asphalt roofing (NFR 2D3b, 2D3c)

4.4.2.1 Overview

In this sector NMVOC, particulate matter, BC and CO emissions from construction materials production as well as road paving activities are reported.

According to CSB information, the biggest part of NMVOC and other emissions occurs during road paving with asphalt. Just a small part of all bitumen mixtures are used in asphalt roofing sector.

4.4.2.2 Trends in emissions

Table 4.15 Emissions from Asphalt roofing and Road paving in 1990-2015

	Unit	1990	1995	2000	2005	2010	2011	2012	2013	2014	2015	Trend in 1990-2015, %
NMVOC	kt	0.0015	0.0045	0.0116	0.0319	0.0257	0.0406	0.0434	0.0344	0.0353	0.0404	2570
PM_{2.5}		0.0393	0.0131	0.1559	0.4287	0.3449	0.5452	0.5833	0.4619	0.4747	0.5427	1218
PM₁₀		0.0967	0.2901	1.1608	3.1921	2.5679	4.0593	4.3428	3.4391	3.5345	4.0406	4078
TSP		0.4493	1.3477	5.4057	14.8656	11.9584	18.9037	20.2243	16.0156	16.4600	18.8170	4088
BC		0.0007	0.0021	0.0087	0.0239	0.0192	0.0304	0.0325	0.0258	0.0265	0.0303	4154
CO		0.0001	0.0002	0.0004	0.0011	0.0009	0.0014	0.0015	0.0012	0.0012	0.0014	1791

The emissions from these two particular sectors are constantly increasing since the beginning of 1990s.

The main factor, which influences the road paving activities, is availability of funding for road construction. This caused sharp emission increase after Latvia's joining to EU in 2004 when EU funding became available and the new highway “Via Baltica” was built. After 2004 emissions from road paving and asphalt roofing are fluctuating reaching the peak in 2015 when significant emission increase has been observed because according to Latvia's State Road Network Statistics the length of renewed and constructed bituminous pavements (km) increased compared to 2014 due to increased funding for state road programmes from state consolidated budget and EU.

4.4.2.3 Methods

EMEP/EEA 2016 Tier 1 approach was used to estimate NMVOC emissions from the 2D3c. Asphalt roofing and 2D3b Road Paving with Asphalt. According to CSB the biggest part of bitumen mixtures amount is used for road paving. Only a small part is used for roofing activities.

NMVOC emissions are estimated using simpler default methodology:

$$E_{NMVOC} = AD_{bitumen} \times EF_{NMVOC}$$

where:

E_{NMVOC} – NMVOC emissions (kt)

$AD_{bitumen}$ – bitumen and bitumen mixtures used in 2D3b and 2D3c activities (kt)

EF_{NMVOC} – NMVOC emission factor (kt/kt)

4.4.2.4 Emission factors

Default CO and NMVOC, as well as particulate matter and BC emission factors are taken from EMEP/EEA 2016. Due to lack of information about the technology used Tier 1 EFs was implemented (Table 4.16).

Table 4.16 Emission factors for asphalt roofing and road paving

	CO	NMVOC	PM _{2.5}	PM ₁₀	TSP	BC
Unit	kt/kt	kt/kt	kt/kt	kt/kt	kt/kt	% of PM _{2.5}
Asphalt Roofing	0.0000095	0.00013	0.00008	0.0004	0.0016	5.7
Road Paving with Asphalt	NE	0.000016	0.0004	0.003	0.014	0.013

4.4.2.5 Activity data

The activity data to calculate NMVOC emissions from road paving and asphalt roofing are taken from the CSB (Table 4.17). The amount of bitumen mixtures was used as activity data. According to CSB the bitumen mixtures includes:

- Asphalt bitumen that usually consists of 60% or more of bitumen and solvent. Used for highway paving;
- Emulsion – or a solid asphalt, bitumen, pitch, tar suspensions in water that are used especially in highway paving;
- Asphalt mastic and other bitumen resins, and similar bituminous mixtures that include minerals such as sand or asbestos;
- Products that are sintered in blocks and that are repeatedly melted before use.

According to information provided by CSB the biggest part of bitumen mixtures is used for road paving. According to 2006 IPCC Guidelines typically 80-90% of bitumen is used for road paving materials.¹⁵ Latvia before the beginning of 1990s was part of former USSR and was going through the economic transition phase, it was assumed that 80% is used for road paving and remaining is used for asphalt roofing till 2000. After 2000 it is assumed that 90% was used for road paving.

Table 4.17 Activity data for road paving with asphalt and asphalt roofing production

	Amount of bitumen mixtures used (kt)	% of asphalt used for road paving	% of asphalt used for roofing	Road Paving With asphalt (kt)	Asphalt roofing (kt)
1990	39.00	80%	20%	31.20	7.80
1991	12.60	80%	20%	10.08	2.52
1992	2.10	80%	20%	1.68	0.42
1993	58.93	80%	20%	47.14	11.79
1994	125.63	80%	20%	100.50	25.13
1995	116.99	80%	20%	93.59	23.40
1996	214.81	80%	20%	171.85	42.96
1997	225.00	80%	20%	180.00	45.00
1998	225.53	80%	20%	180.43	45.11
1999	334.81	80%	20%	267.85	66.96
2000	423.64	90%	10%	381.28	42.36
2001	495.70	90%	10%	446.13	49.57
2002	558.42	90%	10%	502.58	55.84
2003	625.67	90%	10%	563.11	62.57
2004	3651.96	90%	10%	3286.76	365.20
2005	1165.02	90%	10%	1048.51	116.50
2006	1116.70	90%	10%	1005.03	111.67
2007	1492.52	90%	10%	1343.27	149.25
2008	1536.66	90%	10%	1382.99	153.67
2009	838.45	90%	10%	754.60	83.84
2010	937.18	90%	10%	843.46	93.72
2011	1481.48	90%	10%	1333.33	148.15
2012	1584.97	90%	10%	1426.48	158.50
2013	1255.14	90%	10%	1129.62	125.51

¹⁵ http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/3_Volume3/V3_5_Ch5_Non_Energy_Products.pdf (page 5.14)

	Amount of bitumen mixtures used (kt)	% of asphalt used for road paving	% of asphalt used for roofing	Road Paving With asphalt (kt)	Asphalt roofing (kt)
2014	1289.97	90%	10%	1160.97	129.00
2015	1474.68	90%	10%	1327.21	147.47

Amount of materials used and emissions produced in this sector are strictly depending on funding and activity in road construction and building.

4.4.2.6 *Uncertainties*

Uncertainty of activity data for estimations of emissions from 2D3c Asphalt roofing sector and 2D3b Road Paving with Asphalt sector is assumed rather low as CSB data of used bitumen mixtures is used and the percentage of IPCC 2006 Guidelines is used to divide bitumen use for roofing and paving activities. As it is not clear how much of the total bitumen is used for asphalt paving and for asphalt roofing (bitumen use in construction sector) the uncertainty is assumed at least 20%.

The emission factors for 2D3c and 2D3b sectors are assumed 70% because default emission factors are used. The uncertainty EFs are taken from EMEP/EEA 2016 and Tier 1 EFs is assumed 50% because default EFs are used.

4.4.2.7 *QA/QC and verification*

Assessment of trends have been performed. All data are checked on input mistakes by comparing calculation data base with input data from NFR tables in all time series. All figures and tables represented in IIR 2017 are made based of final completed NFR data table.

4.4.2.8 *Recalculations*

No recalculations have been carried out.

4.4.2.9 *Planned improvements*

No improvements are planned for the next submission.

4.4.3 Solvent use (NFR 2D3a, 2D3d, 2D3e, 2D3f, 2D3g, 2D3h, 2D3i)

4.4.3.1 *Overview*

Solvent Use sector was the largest pollution source of NMVOC emissions in Latvia in 2015 and it covered over 25.1% (10.38 kt) from the total Latvia's NMVOC emissions. The main share of total NMVOC emissions contributed Coating applications – 41.17% or 4.27 kt and Chemical products – 27.03% or 2.81 kt (Figure 4.7).

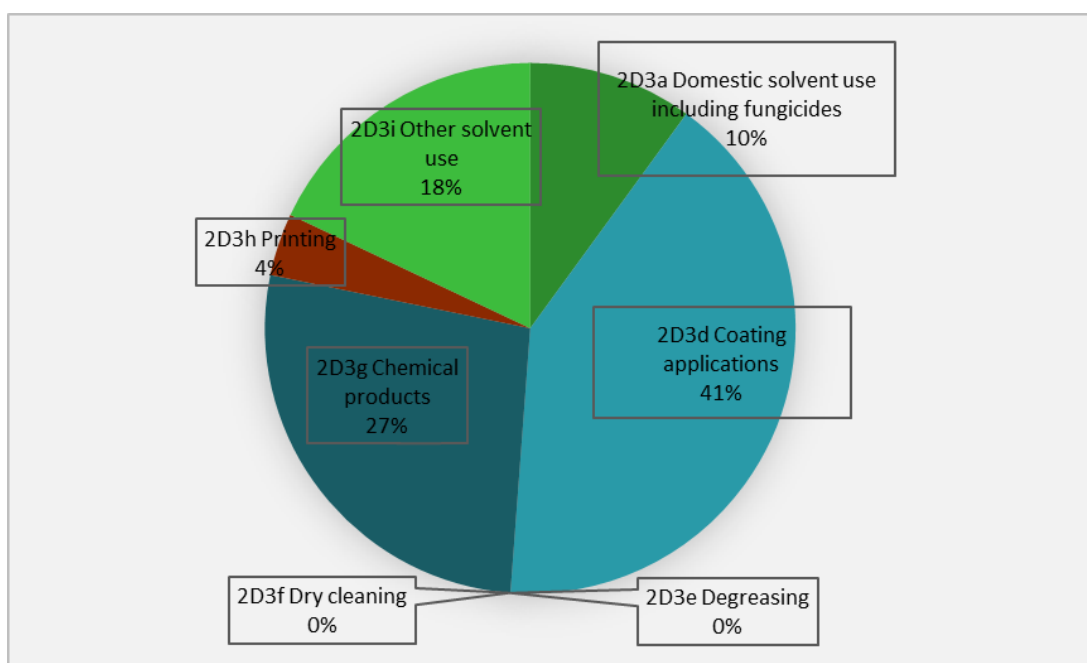


Figure 4.7 Distribution of NMVOC emissions in Solvent use sector in 2015 (kt)

Domestic solvent use including fungicides (NRF 2D3a) comprises NMVOC emissions from a number of product categories, for instance, cosmetics & toiletries, household products, construction and car care products. *Coating applications* (NRF 2D3d) includes paints and varnishes from *Decorative coating application* (paints for architectural application by construction enterprises and professional painters as well as by private consumers), *Industrial coating application* (paint application for manufacture automobiles, car repairing, coil coating, boat building, wood as well as other industrial paint applications) and *Other coating applications*. *Degreasing* (NRF 2D3e) includes cleaning products from water-insoluble substances such as grease, fats, oils waxes and tars. *Dry Cleaning* (NRF 2D3f) constitutes a small amount which is included in NRF 2D3e due to the lack of statistics. *Chemical products* (NRF 2D3g) sector covers NMVOC emissions from the use of chemical products taking into account many activities such as polyurethane and polystyrene foam processing, organic chemical industry, manufacture of paints, inks and glues, fat edible and non-edible oil extraction and industrial application of adhesives. *Printing* (NRF 2D3h) involved the use of inks, cleaning solvents and organic dampeners. *Other product use* (NRF 2D3i) includes emissions from application of underseal treatment and conservation of vehicles, glues and adhesives, preservation of wood and other solvent use.

To divide the NMVOC containing products by NFR subsectors EMEP/EEA 2016 was used.

4.4.3.2 Trends in emissions

Solvent Use sector was the largest pollution source of NMVOC emissions in Latvia in 2015 and it covered over 25.1% (10.39 kt) from the total Latvia's NMVOC emissions. The slightly decrease in emissions occurred between years 1991 and 1997, when industry was affected by a crisis. In subsequent years there has been observed NMVOC emission increase till 2006 which resulted in import growth of NMVOC containing products. At the end of 2008 the world was struck by the economic crisis which also affected the Solvent Use sector in Latvia till 2009. As shown there is slight increase of NMVOC emissions during the later period of 2010 till 2015. For instance, emissions of NMVOC of Solvent sector have increased by 6.78 % from 9.73 kt NMVOC in 2010 to 10.39 kt NMVOC in 2015 (Table 4.18).

Table 4.18 NMVOC emissions from Solvent use in 1990-2015

	1990	1995	2000	2005	2010	2011	2012	2013	2014	2015	Change in 1990-2015, %
Domestic solvent use including fungicides	2.05	1.92	1.83	1.73	1.88	2.10	2.04	1.79	1.97	1.04	-49.22
Coating applications	4.74	4.44	4.22	4.00	4.68	4.00	3.95	5.11	4.35	4.27	-9.89
Degreasing, Dry cleaning	0.05	0.05	0.05	0.04	0.02	0.03	0.03	0.02	0.03	IE	-
Chemical products	2.84	2.66	2.53	2.39	2.16	1.99	3.06	2.79	2.87	2.81	-1.11
Printing	0.26	0.25	0.23	0.22	0.29	0.37	0.35	0.32	0.35	0.39	50.68
Other solvent use	1.17	1.10	1.05	0.99	0.68	0.89	1.09	0.53	0.84	1.86	58.85

In Latvia Regulation of the Cabinet of Ministers of 3 April 2007 No.231 "Regulations Regarding the Limitation of Emissions of Volatile Organic Compounds From Certain Products" contains legal norms arising from Directive 2004/42/EC. According to this Regulation, I stage of the Directive came into force in 2007 and II stage – in 2010. Related to the Directive 1999/13/EC. Meanwhile Regulation of the Cabinet of Ministers of 30 November 2010 No.1082 "Procedure by Which Polluting Activities of Category A, B and C Shall Be Declared and Permits for the Performance of Category A and B Polluting Activities Shall Be Issued" contains legal norms arising from Directive 2010/75/EU.

Unfortunately, given that there was found out data gaps in the activity data obtained from the Register of Chemical Substances and Chemical Mixtures for all time series it is not possible to correctly analyze the impact of legal requirements on the NMVOC emission for all time series. It is planned to analyse activity data more detailed by the next reporting.

4.4.3.3 Methods

NMVOC emissions from Solvent Use sector (except 2D3f and partly 2D3g) were estimated according to EMEP/EEA 2016 methodology based on Tier 1 or Tier 2 approach.

NMVOC emissions (kt) from Solvent Use sector were calculated for the time series 2005-2015 using the equation below:

$$E_{NMVOC} = EF_{NMVOC} \times AD$$

where:

E_{NMVOC} – non-methane volatile organic compounds emissions from solvents and other production use (kt);

EF_{NMVOC} – emission factor from EMEP/EEA 2016;

AD – activity data from the Register of Chemical Substances and Chemical Mixtures (kt).

To obtain a comparable data in time series for years where statistics was not well kept NMVOC emissions were extrapolated taking into account number of inhabitants taken from CSB database provided by the Central Statistical Bureau (Table 4.19).

Table 4.19 The number of population used as activity data under Other solvent and product use for years 1990-2005

	Number of inhabitants
1990	2668140
1991	2658161
1992	2643000
1993	2585675
1994	2540904
1995	2500580
1996	2469531
1997	2444912
1998	2420789
1999	2399248
2000	2377383
2001	2353384

	Number of inhabitants
2002	2320956
2003	2299390
2004	2276520
2005	2249724

NMVOC emissions data from Dry cleaning and Chemical products subsectors was obtained directly from database “2-Air” at Ltd. Latvian Environment, Geology and Meteorology Centre for 2006-2015. From the 1990ties till 2005 statistics for NMVOC emissions data also was not well kept. “2-Air” is database where enterprises (that do any pollution activity and have category A, B, or C polluting activity) report their emissions data; it is approximately 3000 enterprises in total every year. From these approximately 3000 enterprises data is used only from the enterprises that produced NMVOC emissions according to the *EMEP/EEA 2016*. The enterprises have been reporting their produced NMVOC emissions dividing in a particular NMVOC.

4.4.3.4 Emission factors

The NMVOC emission factors (Table 4.20) are taken from the *EMEP/EEA 2016*.

Table 4.20 Approaches and emission factors for Solvent Use sector

Subcategories	NRF	EF	Tier	Unit
Cosmetics and toiletries (all)	2D3a	0.83	2	t/t solvent
Household products (all)	2D3a	0.65	2	t/t solvent
DIY/buildings (all), Adhesives, Paint/varnish removers and solvents	2D3a	0.95	2	t/t solvent
Car care products (all)	2D3a	0.94	2	t/t solvent
Pesticides	2D3a	0.865	2	t/t solvent
Domestic use of pharmaceutical products	2D3a	0.606	2	t/t product
Paint application: construction and buildings	2D3d	0.23	2	t/t paint applied
Paint application: domestic use	2D3d	0.23	2	t/t paint applied
Coating applications: manufacture of automobiles	2D3d	0.4	1	t/t paint applied
Paint application: car repairing	2D3d	0.72	2	t/t paint applied
Paint application: coil coating	2D3d	0.8	2	t/t paint applied
Coating applications: Boat building	2D3d	0.4	1	t/t paint applied
Paint application: wood	2D3d	0.8	2	t/t paint applied
Coating applications: Other industrial paint application	2D3d	0.2	1	t/t paint applied
Other non industrial paint application	2D3d	0.74	2	t/t paint applied
Degreasing	2D3e	0.46	1	t/t cleaning products
Chemical products, manufacture and processing	2D3g	0.01	1	t/t product
Polystyrene foam processing	2D3g	0.06	2	t/t polystyrene
Rubber processing	2D3g	0.008	2	t/t rubber produced
Tyre production	2D3g	0.01	2	t/t tyres
Paints manufacturing	2D3g	0.011	2	t/t product
Polyurethane processing	2D3g	0.12	2	g/kg foam processed
Printing	2D3h	0.5	1	t/t ink
Glass Wool Enduction	2D3i	0.25	2	t/t solvent
Fat, edible and non-edible oil extraction	2D3i	0.002	1	t/t product used
Application of glues and adhesives	2D3i	0.002	1	t/t product used
Preservation of wood	2D3i	0.945	2	t/t preservative (organic solvent-borne preservative)
Preservation of wood	2D3i	0.005	2	t/t preservative (waterborne preservative)
Other solvent and product use	2D3i	0.002	2	t/t product

4.4.3.5 Activity data

From the 1990ties till 2005 statistics for Solvent Use was not well kept due to the country-wide changes in the governmental system and national economy. For 2006-2015 activity data for Coating application,

Degreasing, Chemical Products (part of the activity data), Printing industry, Domestic solvent use and Other solvent use was obtained from the Register of Chemical Substances and Chemical Mixtures (CR) at Ltd. Latvian Environment, Geology and Meteorology Centre. In the CR data of imported and produced amount of chemical products containing NMVOCs is collected together with the percentage of a particular NMVOC in imported or produced products. It is assumed that the NMVOC containing products imported in the country in a particular year are utilized in the same year as the data of the actual use is not available or is confidential. In the CR information on a particular year, amount of produced and imported chemicals (ton), NACE code, trade name, chemical name, CAS number and concentration (from ... till ... %) is provided.

To obtain a comparable data in time series for years where statistics was not well kept NMVOC emissions were extrapolated taking into account number of inhabitants taken from CSB database provided by the Central Statistical Bureau (Table 4.19).

Activity data from Dry cleaning and part of the activity data from Chemical products subsectors reported by enterprises is not available as these data is not required to be reported and could be assumed as confidential.

4.4.3.6 Uncertainties

Latvia has developed a detailed inventory for the Solvent Use sector thereby the uncertainty of activity data is estimated to be the default value of 25 percent according to the IPCC 2006 Guidelines. Emission factor uncertainty is assumed to be $\pm 20\%$ accordance with EMEP/EEA 2016, 2.D Other solvent and product use. Time series consistency was ensured by using one method for all time series.

4.4.3.7 QA/QC and verification

QA/QC check is performed with Tier1 method from EMEP/EEA 2016, 2.D Other solvent and product use.

All estimations of the emissions done in the LEGMC also are checked on the logical mistakes by checking the time series of the activity data, emission factors and emissions consistency to display all significant and illogic changes in the activity data and emissions.

Quality control check list is filled for each category taking into account criteria given in QA/QC plan approved in national legislation. All findings were documented and introduced in GHG inventory. All corrections are archived in centralized archiving system (common FTP folder).

4.4.3.8 Recalculations

Recalculations have been done for the all time series taking into account that previous reporting system for Register of Chemical Substances and Chemical Mixtures has improved. For instance, from this year electronic reporting system has implemented for the chemicals importers and producers (previous the annual reports by enterprises were submitted in paper form). In particular, now it is necessary to specify product group (request for allocation of subcategories under Solvent Use sector) for produced or imported chemical mixtures placed in territory of Latvia (previously this was done by expert judgment). The implementation of this electronic reporting system has led to an increase in the availability of information on the solvent sector as well as an improvement on data quality, in particular more accurate division by subcategories. Based on the submitted information by enterprises for the previous calendar year all historical data were reviewed and recalculated.

4.4.3.9 Planned improvements

It is planned to more detailed analyse activity data obtained from the Chemical Register and database "2-Air" for all time series, as well as to improve NMVOC emission calculation for historical years where statistics was not well kept.

4.4.4 Other product use (NFR 2G)

4.4.4.1 Overview

Other Product Use sub-sector includes emissions from Use of fireworks and Tobacco combustion. This sub-sector contains NO_x, NMVOC, SO₂, NH₃, PM_{2.5}, PM₁₀, TSP, CO, Pb, Cd, Hg, As, Cr, Cu, Ni, Zn, PCDD/PCDF, benzo(a) pyrene, benzo(b) fluoranthene, benzo(k) fluoranthene, Indeno (1,2,3-cd) pyrene emissions.

4.4.4.2 Trends in emissions

The emissions from Other product use subsector have constantly decreased overall since the beginning of 90ties although emissions from Use of fireworks have increased. Emissions of heavy metals mostly occur from Use of fireworks and their increase in the latest years is linked with the economic situation of the country (Table 4.21).

Table 4.21 Emissions from Other product use sector in 1990-2015

	1990	1995	2000	2005	2010	2011	2012	2013	2014	2015	Change from 1990 to 2015, %
NO_x	0.0043	0.0040	0.0039	0.0032	0.0033	0.0030	0.0033	0.0029	0.0031	0.0030	-29.30
NMVOC	0.0115	0.0108	0.0103	0.0083	0.0087	0.0078	0.0087	0.0078	0.0082	0.0081	-30.09
SO₂	0.0000	0.0000	0.0006	0.0010	0.0004	0.0005	0.0007	0.0006	0.0006	0.0004	1629.31
NH₃	0.0099	0.0093	0.0088	0.0072	0.0075	0.0067	0.0075	0.0067	0.0070	0.0069	-30.09
PM_{2.5}	0.0643	0.0603	0.0573	0.0466	0.0487	0.0437	0.0487	0.0434	0.0456	0.0450	-30.08
PM₁₀	0.0643	0.0603	0.0573	0.0466	0.0487	0.0437	0.0488	0.0434	0.0456	0.0450	-30.07
TSP	0.0643	0.0603	0.0573	0.0466	0.0487	0.0437	0.0488	0.0434	0.0456	0.0450	-30.07
CO	0.1313	0.1231	0.1185	0.0974	0.1003	0.0902	0.1010	0.0900	0.0944	0.0927	-29.39
Pb	0.0062	0.0058	0.1646	0.2595	0.1102	0.1270	0.1721	0.1537	0.1583	0.1065	1629.31
Cd	0.0129	0.0121	0.0118	0.0098	0.0099	0.0090	0.0101	0.0090	0.0094	0.0092	-28.60
Hg	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1629.31
As	0.0000	0.0000	0.0003	0.0004	0.0002	0.0002	0.0003	0.0003	0.0003	0.0002	1629.31
Cr	0.0001	0.0001	0.0033	0.0052	0.0022	0.0025	0.0034	0.0031	0.0032	0.0021	1629.31
Cu	0.0164	0.0153	0.1047	0.1563	0.0722	0.0806	0.1072	0.0957	0.0988	0.0693	323.73
Ni	0.0067	0.0062	0.0120	0.0146	0.0091	0.0092	0.0115	0.0102	0.0106	0.0086	28.53
Zn	0.0085	0.0079	0.0603	0.0907	0.0414	0.0465	0.0619	0.0553	0.0571	0.0398	369.70
PCDD/F	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	-30.09
PAH	0.0006	0.0005	0.0005	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	-120.38

4.4.4.3 Methods

Emissions from Use of fireworks and Tobacco combustion were calculated according to EMEP/EEA 2016 methodology and based on Tier 2 approach.

Emissions (kt) from Use of fireworks and Tobacco combustion sector were calculated for the time series 2003-2015 using the equation below:

$$E = EF \times AD$$

where:

E – emissions from Use of fireworks and Tobacco combustion (kt);

EF – emission factor from EMEP/EEA 2016;

AD – activity data from the Central Statistical Bureau, (kt).

To obtain a comparable data in time series for years where statistics was not in sufficient quality emissions were calculated using the same methodology as for years 2003-2015. Assuming that base year for NMVOC emissions is year 2002, emissions for years where statistics was not well kept were calculated proportionally, taking into account the number of inhabitants provided by the Central Statistical Bureau (Table 4.19).

4.4.4.4 Emission factors

All emission factors for Use of fireworks and Tobacco combustion are taken from the EMEP/EEA 2016.

4.4.4.5 Activity data

From the 1990ties till 2002 statistics for Use of fireworks and Tobacco combustion was not well kept due to the country-wide changes in the governmental system and national economy. For 2003-2015 the quantity of used fireworks (CN code 3604) and tobacco combusted (CN code 2402) in Latvia is estimated by the import and export data available from Central Statistical Bureau of Latvia. Data regarding production of fireworks and tobacco are not available.

To obtain a comparable data in time series for years where statistics was not in sufficient quality activity data was obtained using the same methodology as for emission calculation. Assuming that base year for activity data is year 2002, activity data for years where statistics was not well kept were calculated proportionally, taking into account the number of inhabitants provided by the Central Statistical Bureau (Table 4.19).

4.4.4.6 Uncertainties

Emission factor uncertainty is assumed to be $\pm 20\%$ accordance with EMEP/EEA guidebook 2016, 2.D Other solvent and product use. Time series consistency was ensured by using one method for all time series.

4.4.4.7 QA/QC and verification

All estimations of the emissions done in the LEGMC are checked on the logical mistakes by checking the time series of the activity data, emission factors and emissions consistency to display all significant and illogic changes in the activity data and emissions.

Quality control check list is filled for each category taking into account criteria given in QA/QC plan approved in national legislation. All findings were documented and introduced in GHG inventory. All corrections are archived in centralized archiving system (common FTP folder).

4.4.4.8 Recalculations

No recalculations have been carried out.

4.4.4.9 Planned improvements

No improvements are planned.

4.4.5 Pulp and paper industry and Food and beverages industry (NFR 2H1, 2H2)

4.4.5.1 Overview

Other Production sub-sector includes indirect emissions from:

- Pulp and Paper industry;
- Food and drink industry.

Under this sector a research on pulp and paper sector was made as there are two producers that are reporting activity data with the PRODCOM code 17.11.14.00.00 - manufacture of pulp. According to available information these two manufactures have changed their activity and there are no information about raw materials that could be produced or imported.

4.4.5.2 Trends in emissions

Table 4.22 Emissions from Pulp and Paper (NFR 2H1) and Food and Drink (NFR 2H2) production sectors in 1990-2015

	Unit	1990	1995	2000	2005	2010	2011	2012	2013	2014	2015	Trend in 1990-2015, %
NMVOC	kt	3.38	1.89	2.00	2.19	1.37	1.32	1.33	1.35	1.30	1.30	-62
SO ₂		0.07318	0.00308	NO	NO	NO	NO	NO	NO	NO	NO	-100

The biggest fluctuations in emissions observed in 1991–1993 due to the changing of economic situation in the country (Table 4.22). Decrease of NMVOC emissions in 1999–2001 can be explained with economic

crisis. In 2002–2004 NMVOC emissions were stable. NMVOC emissions have decreased by 29.3% in 2006–2007 that could be explained with decrease of produced spirits by 35.5%. Emissions in 2008–2009 have decreased by 5.99% that is explained with the crisis in national economy that affected food and drink production industry because of decrease in purchasing capacity due to lower salaries, increased taxes etc. After going through a crisis in 2010 increased about 5.08%. In 2015 the NMVOC emissions constitute 1.30 kt which is approximately the same level as 2014.

SO₂ emissions are reported in 1990 – 1996 when there was a pulp and paper industry in the country. In 1996, pulp and paper facility was closed. In latest years wood pulp and paper industry is developing again, but wood pulp is imported and not produced in the country so SO₂ emissions that occurred in pulp production processes are not emitted.

4.4.5.3 Methods

Tier 1 method from EMEP/EEA 2016 was used to calculate emissions from Pulp and paper production and Food and drink production sectors. NMVOC emissions from the food and drink industry as well as SO₂ emissions from pulp and paper industry are calculated.

4.4.5.4 Emission factors

The NMVOC emission factors (Table 4.23) are taken from the EMEP/EEA 2016. NMVOC emission factor for spirits production corresponds to other spirits. CSB provided aggregated statistical data where it can be seen that 95.5% of all spirits produced in Latvia are produced from grains (sheer alcohol or spirits) and no brandy and whiskey is produced in Latvia. Hence EF for Other Spirits 0.4 kg/hl (alcohol) is used.

Table 4.23 Emission factors for food and drink industries

Production	Emission factors
Food and drink industries (NMVOC)	
Wine	0.08 kg/hl
Beer	0.035 kg/hl
Spirits	0.4 kg/hl
Meet, fish, poultry	0.3 kg/t
Sugar	10 kg/t
Cakes, biscuits, breakfast cereals	1 kg/t
Bread	8 kg/t
Animal feed	1 kg/t
Pulp and paper industry (SO₂)	
Pulp and paper	0.002 kt/kt

4.4.5.5 Activity data

Activity data for calculation of the NMVOC emissions from the food and drink industry is obtained from the CSB. Activity data of pulp and paper sub-sector were taken from CSB (Table 4.24). Since 2007 data for the category – wine production, was classified as confidential and not publicly available. That's why for this category 2006 year's data was used also for years 2007–2015.

Table 4.24 Activity data for 2.H sector

	Pulp and Paper	Wine	Beer	Spirits	Meat, fish, poultry	Sugar	Cakes, biscuits, breakfast cereals	Bread	Animal feed
	kt	1000 hl	1000 hl	1000 hl	kt	kt	kt	kt	kt
1990	36.6	19.9	87.4	324.5	569.3	31	54.8	314	200
1991	44.7	197.5	1295.3	330	490.4	35	39.2	293	200
1992	30.8	179.8	858.9	259.3	281.6	39	22.1	240	200
1993	4.7	87.7	545.9	217.4	154	26	15.8	177.4	245.4
1994	0.2	134.2	637.9	314.8	95.6	15.8	22.7	161.5	174
1995	1.5	159.2	652.8	341.5	82.8	29.3	24.4	145.4	214.4
1996	1.5	154.7	644.9	379.6	100.5	31.2	13.1	137.1	206.2
1997	NO	114.7	714.8	456.4	129.1	41.2	16.9	132.1	205
1998	NO	99.6	721	417.4	110.9	64.9	18.1	124.8	203.3

	Pulp and Paper	Wine	Beer	Spirits	Meat, fish, poultry	Sugar	Cakes, biscuits, breakfast cereals	Bread	Animal feed
	kt	1000 hl	1000 hl	1000 hl	kt	kt	kt	kt	kt
1999	NO	65.9	953.2	416.0	166.9	66.5	20.8	121.5	144.5
2000	NO	68.9	945.1	269.5	197.3	62.8	24.3	121.1	173.8
2001	NO	52.5	996.6	168.5	244.6	56.0	24.4	123.1	184.9
2002	NO	56.8	1199.2	237.9	262.9	76.8	29	122.6	201.3
2003	NO	45.9	1336.6	226.6	264.4	74.9	37.3	124	201.4
2004	NO	59.7	1313.1	238.8	262.5	67.0	43.6	119.3	211.8
2005	NO	73.4	1293.3	308.2	243.8	71.1	53.6	116.3	248.6
2006	NO	77.1	1383	360.6	288.4	59.9	45	107.3	244.2
2007	NO	C	1414.3	232.5	286	NO	46.5	102.3	336.8
2008	NO	C	1333.8	220.7	297.7	NO	38.5	100.7	307.3
2009	NO	C	1292.4	180.1	253.5	NO	33.3	95.9	299.3
2010	NO	C	1484.9	177.7	242.2	NO	37.5	89.9	405.8
2011	NO	C	1626.6	166.5	261.5	NO	39.7	88.6	360.9
2012	NO	C	1488.5	C	264.3	NO	44.5	91.4	348.2
2013	NO	C	1513.7	C	286.2	NO	56.4	88.1	380.1
2014	NO	C	967.5	C	270.7	NO	50.4	84.9	379.5
2015	NO	C	887.8	C	260.4	NO	31.76	86.9	393.9

4.4.5.6 Uncertainties

Uncertainty of activity data was assumed as $\pm 2\%$ for 1990-2006 because statistical data from CSB were used. For 2007-2015 the uncertainty is assumed higher – 10%, as no precise information is available for wine production. NMVOC emission factors were assigned as 50% because default emission factors taken from EMEP/EEA 2016 were used.

4.4.5.7 QA/QC and verification

Assessment of trends have been performed. All data are checked on input mistakes to comparing calculation data base with input data in NFR tables in all time series. All figures and tables represented in IIR 2017 are made on basis of final completed NFR data table.

4.4.5.8 Recalculations

No recalculations have been carried out.

4.4.5.9 Planned improvements

No improvements are planned.

5 Agriculture (NFR 3)

5.1 Sector overview

5.1.1 Overview

In agriculture sector emissions from following subsectors are calculated for:

- Manure management (NFR 3B), which includes cattle, sheep, goats, horses, swine, poultry and fur animals;
- Agricultural soils (NFR 3D);
- PM emissions (NFR 3B, 3D);
- Other (3I), which include emissions from last year's grass burning (Table 5.1).

Table 5.1 Source categories and methods for agriculture sector

NFR code	Longname	Method	EF	AD
3 B 1 a	Manure management - Dairy cattle	Tier 1, 2	D ¹⁶ , CS ¹⁷	NS ¹⁸
3 B 1 b	Manure management - Non-dairy cattle	Tier 1, 2	D, CS	NS
3 B 2	Manure management - Sheep	Tier 1, 2	D, CS	NS
3 B 3	Manure management - Swine	Tier 1, 2	D, CS	NS
3 B 4 a	Manure management - Buffalo	NO		
3 B 4 d	Manure management - Goats	Tier 1, 2	D, CS	NS
3 B 4 e	Manure management - Horses	Tier 1, 2	D, CS	NS
3 B 4 f	Manure management - Mules and asses	NO		
3 B 4 g i	Manure management - Laying hens	Tier 1, 2	D, CS	NS
3 B 4 g ii	Manure management - Broilers	Tier 1, 2	D, CS	NS
3 B 4 g iii	Manure management - Turkeys	Tier 1, 2	D, CS	NS
3 B 4 g iv	Manure management - Other poultry (Ducks, Geese)	Tier 1, 2	D, CS	NS
3 B 4 h	Manure management - Other animals (Fur animals)	Tier 1, 2	D, CS	NS
3 D a 1	Inorganic N-fertilizers (includes also urea application)	Tier 2	D	NS
3 D a 2 a	Animal manure applied to soils	Tier 1, 2	D, CS	NS
3 D a 2 b	Sewage sludge applied to soils	NE		
3 D a 2 c	Other organic fertilizers applied to soils (including compost, digestate and other)	Tier 1	D	NS
3 D a 3	Urine and dung deposited by grazing animals	Tier 1, 2	D, CS	NS
3 D a 4	Crop residues applied to soils	NA		
3 D b	Indirect emissions from managed soils	NA		
3 D c	Farm-level agricultural operations including storage, handling and transport of agricultural products	Tier 1, 2	D	NS
3 D d	Off-farm storage, handling and transport of bulk agricultural products	NA		
3 D e	Cultivated crops	Tier 1	D	NS
3 D f	Use of pesticides	NE		
3 F	Field burning of agricultural residues	NO		
3 I	Agriculture other	Tier 1	D	NS

NO_x (nitrous oxides), NMVOC (volatile organic compounds), NH₃ (ammonia), PM (particulate matter), TSP (total suspended particulate matter), BC (black carbon), CO (carbon monoxide), DIOX (dioxins) and PAH (polycyclic aromatic hydrocarbons) emissions from agriculture sector are included in the submission 2017 report (Table 5.2).

Table 5.2 Reported emissions in agriculture sector in 2015

NFR code	Emissions
3 B 1 a	NO _x , NMVOC, NH ₃ , PM _{2.5} , PM ₁₀ , TSP

16 Default value from EMEP/EEA 2016 or 2006 IPCC Guidelines

17 Country specific value

18 National statistics

NFR code	Emissions
3 B 1 b	NO _x , NMVOC, NH ₃ , PM _{2.5} , PM ₁₀ , TSP
3 B 2	NO _x , NMVOC, NH ₃ , PM _{2.5} , PM ₁₀ , TSP
3 B 3	NO _x , NMVOC, NH ₃ , PM _{2.5} , PM ₁₀ , TSP
3 B 4 d	NO _x , NMVOC, NH ₃ , PM _{2.5} , PM ₁₀ , TSP
3 B 4 e	NO _x , NMVOC, NH ₃ , PM _{2.5} , PM ₁₀ , TSP
3 B 4 gi	NO _x , NMVOC, NH ₃ , PM _{2.5} , PM ₁₀ , TSP
3 B 4 gii	NO _x , NMVOC, NH ₃ , PM _{2.5} , PM ₁₀ , TSP
3 B 4 giii	NO _x , NMVOC, NH ₃ , PM _{2.5} , PM ₁₀ , TSP
3 B 4 giv	NO _x , NMVOC, NH ₃ , PM _{2.5} , PM ₁₀ , TSP
3 B 4 h	NO _x , NMVOC, NH ₃ , PM _{2.5} , PM ₁₀ , TSP
3 D a 1	NO _x , NH ₃
3 D a 2 a	NO _x , NH ₃
3 D a 2 c	NO _x , NH ₃
3 D a 3	NO _x , NH ₃
3 D c	PM _{2.5} , PM ₁₀ , TSP
3 D e	NMVOC
3 I	NO _x , NMVOC, SO ₂ , NH ₃ , PM _{2.5} , PM ₁₀ , TSP, CO, PCDD/PCDF, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, total PAHs

5.1.2 Key sources

The agriculture sector was responsible for the largest part of total NH₃ emissions (86.04%) in 2015. The remaining part originated from transport, combustion in power plants and from households, as well as from wastewater treatment.

NH₃ emissions in agriculture sector are divided into emissions from crop production, agricultural soils, as well as emissions from manure management and other sources. In 2015, emissions from crop production and agricultural soils constituted 54.31% (8.76 kt), including emissions from inorganic N-fertilizers, animal manure and other organic fertilizers which were applied to soils, urine and dung from grazing animals. The share of emissions from manure management reached 45.63% (7.36 kt). However, 94.34% (4.16 kt) of NO_x emissions were reported from crop production and agricultural soils and 4.70% of emissions were linked to manure management.

In 2015, the largest part of NMVOC emissions was related to manure management – 85.40% (6.53 kt). Crop production and agricultural soils accounted for 1.01 kt (13.15%) of NMVOC. 46.57% (0.15 kt) of PM_{2.5} and 73.70% (1.15 kt) of PM₁₀ emissions originated from crop production and agricultural soils, while 38.80% (0.12 kt) and 22.72% (0.35 kt) were related to manure management, respectively. 58.20% (1.82 kt) of TSP emissions were reported from crop production and agricultural soils, while 39.05% (1.22 kt) belonged to manure management (Figure 5.1).

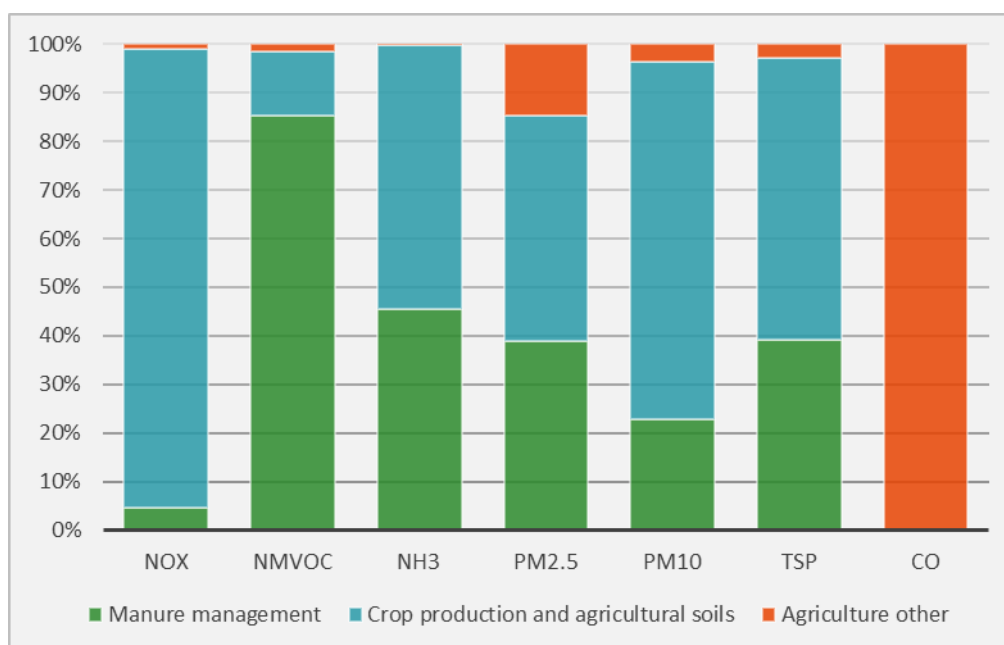


Figure 5.1 Distribution of emissions in agriculture sector by subsectors in 2015 (%)

5.1.3 Trends in emissions

The NH₃ emissions from agriculture have decreased by 61% over the period of 1990 – 2015 (Table 5.3). The general reason for this is transition to a market economy during 1991-1995, when the number of livestock in farms significantly decreased as well as the use of nitrogen fertilizers. In the recent years, it is possible to observe positive trends of mineral N fertilizer consumption due to increase of agriculture land use and expansion of crop production and number of livestock.

Table 5.3 Emissions from agriculture sector in 1990-2015

	Unit	1990	1995	2000	2005	2010	2011	2012	2013	2014	2015	Changes in 1990-2015, %
NO_x	kt	9.10	2.21	2.23	2.88	3.62	3.62	3.91	4.17	3.31	4.47	-51
NMVOC		16.23	8.04	6.52	6.94	7.07	7.01	7.32	7.50	9.11	7.72	-52
NH₃		41.57	15.43	13.42	13.44	14.58	14.51	15.19	15.64	16.15	16.14	-61
PM_{2.5}		0.55	0.27	0.24	0.25	0.27	0.25	0.27	0.27	0.36	0.31	-43
PM₁₀		2.44	1.21	1.12	1.23	1.37	1.33	1.40	1.43	1.59	1.56	-36
TSP		6.75	2.98	2.60	2.86	3.06	2.95	3.03	3.10	3.23	3.13	-54
BC		NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
CO	g i-Teq	0.21	0.20	0.84	0.76	0.93	0.60	0.70	0.70	2.54	1.21	487
PCDD/PCDF		0.00	0.00	0.02	0.02	0.02	0.01	0.01	0.01	0.05	0.03	488
PAHs		0.01	0.01	0.06	0.05	0.06	0.04	0.05	0.05	0.18	0.08	486

The amount of PM, NMVOC and NO_x emissions depend on the number of produced animals and crops. In the time period 1990-2015, PM emissions have decreased by 36-43%. Similarly, emissions of NO_x and NMVOC have decreased by 51% and 52%, respectively (Table 5.3).

Emissions from grassland burning were determined according to EMEP/EEA 2016 and 2006 IPCC Guidelines. In Latvia it occurs seasonally and emission amount depends on the burned area. Prohibition to burn grass and crop residues on fields has been included into good agricultural and environmental condition practice under cross-compliance framework and has been respectively penalized in respect to beneficiaries of direct payment schemes and RD area-related payments of the programming periods 2007-2014 and 2014-2020.

The area of grassland burning was taken from the State Fire and Rescue Service – SFRS. Under this system, SFRS sends reports on the recorded cases to the Rural Support Service who applies sanctions to the

beneficiaries, such requirement under standards of good agricultural and environmental condition and respective sanctions will be continued onwards.

5.2 Manure management (NFR 3B)

5.2.1 Overview

In the NFR category 3B NO_x, NMVOC and NH₃ emissions from manure management are included. In 2015, majority of NH₃ emissions from manure management in different livestock categories were related to production of the dairy cattle (45.40%), swine (21.08%), non-dairy cattle (10.07%), fur animals (depicted as *other animals*; 7.54%) and laying hens (6.66%) production (Figure 5.2).

PM emissions in the inventory are given in TSP, PM₁₀ and PM_{2.5}. PM emissions include primary particles in the form of dust from stables. The main sources of PM emissions are livestock feeding and buildings of housing livestock. These emissions originate mainly from animal feed, bedding materials, feathers and manure. Emissions of PM occur also from free-range animals, but EMEP/EEA 2016 methodology has focused on housed animals.

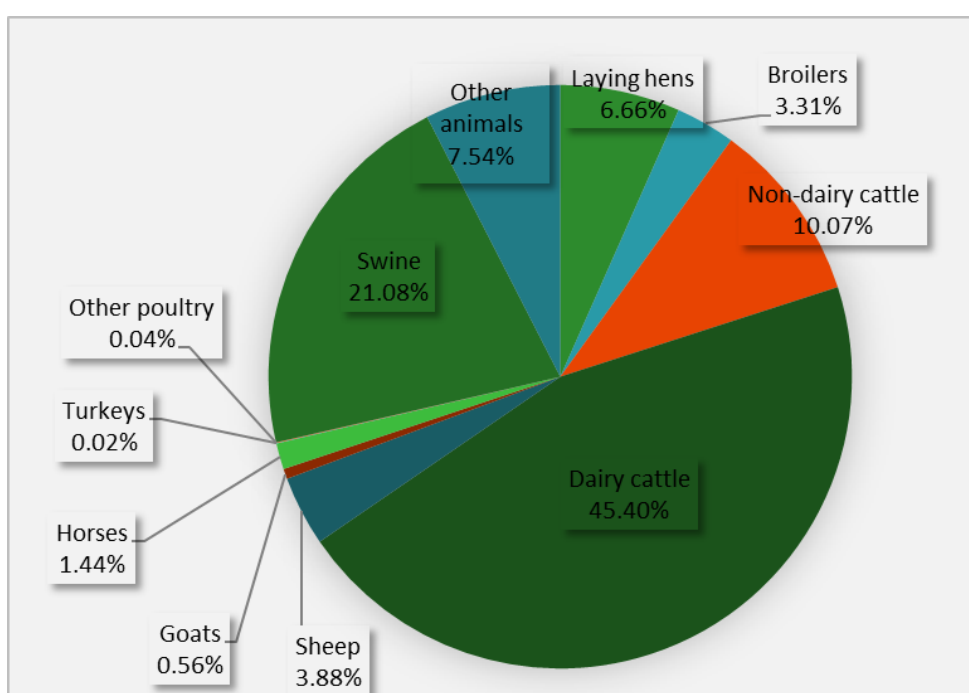


Figure 5.2 NH₃ emissions from manure management in 2015

5.2.2 Trends in emissions

Latvian livestock industry has been influenced by historical events and the changing economic situation¹⁹. As seen in Table 5.4, emissions from manure management has noticeably decreased since the beginning of the 90's after the collapse of the Soviet Union and the restoration of independence of the Republic of Latvia. Particularly significant changes in the livestock industry began in 1992 when most of big farms went into liquidation. However, after Latvia joined the EU in 2004 it was possible to observe a slight increase of livestock numbers and related emissions. The NH₃ as well as PM_{2.5} and PM₁₀ emissions from manure management have decreased by 69% over the period of 1990 – 2015. 71% decrease can be observed in NO_x and TSP emission trend over the period 1990-1995. NMVOC emissions have decreased by 55% over the period of 1990 – 2015.

¹⁹ Aina Dobeļe, Irina Pilvere, Edgars Ozols, Lasma Dobeļe Land Resources For Agricultural Production In Latvia.

http://www.westeastinstitute.com/journals/wp-content/uploads/2013/02/ZG12-261-Aina-and-Lasma-Full-Paper_formatted-Land-Resources-For-Agricultural-Production-In-Latvia.pdf

Table 5.4 Trends in emissions from Manure management in 1990-2015

	Unit	1990	1995	2000	2005	2010	2011	2012	2013	2014	2015	Change in 1990-2015, %
NO_x	kt	0.71	0.32	0.24	0.23	0.21	0.21	0.22	0.22	0.23	0.21	-71
NM VOC	kt	14.81	7.22	5.68	6.01	6.03	6.02	6.29	6.45	6.74	6.61	-55
NH₃	kt	23.43	10.47	8.16	7.91	7.47	7.35	7.46	7.57	7.69	7.36	-69
PM_{2.5}	kt	0.39	0.17	0.12	0.12	0.12	0.11	0.12	0.12	0.12	0.12	-69
PM₁₀	kt	1.13	0.44	0.33	0.35	0.35	0.34	0.35	0.36	0.36	0.35	-69
TSP	kt	4.20	1.51	1.17	1.25	1.28	1.21	1.23	1.26	1.25	1.22	-71

Predominant part of PM emissions is related to cattle, swine and poultry. The amount of emissions in the trend of PM emissions from 1990, depends on changes in the number of livestock due to significant changes in livestock industry (Figure 5.3).

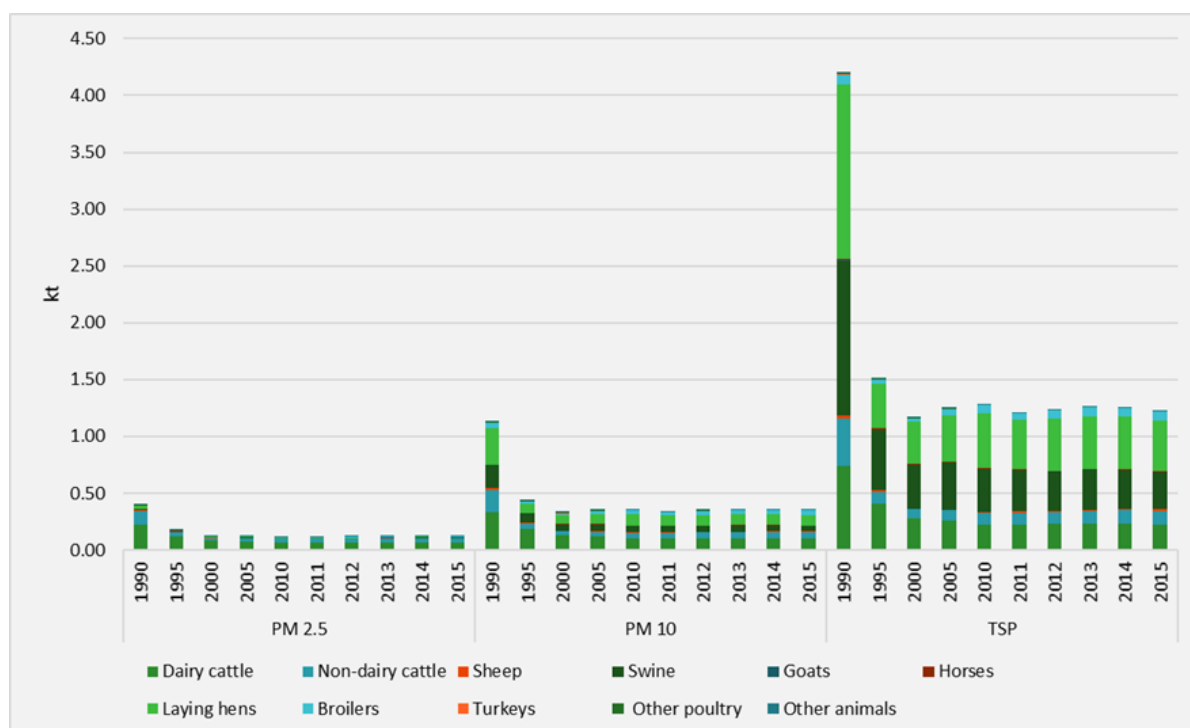


Figure 5.3 PM emissions from stables 1990-2015

In 2015, majority of PM emissions from manure management in different livestock categories were related to cattle, laying hens and swine. The biggest contributors for PM_{2.5} emissions were dairy cattle - 55% (0.07 kt), non-dairy cattle - 30% (0.04 kt) and laying hens 6% (0.01 kt)). The biggest contributors for PM₁₀ emissions were dairy cattle - 29% (0.10 kt), laying hens – 26% (0.09 kt), non-dairy cattle – 16% (0.06 kt) and swine – 14% (0.05 kt), as regards TSP emissions, these were laying hens – 36% (0.44 kt), swine – 27% (0.33 kt) and dairy cattle – 18% (0.22 kt).

The majority of NO_x emissions were related to dairy cattle – 42% (0.09 kt) as well as 61% (3.99 kt) of NMVOC emissions related to dairy cattle.

All emissions related to manure management were strongly related to the livestock numbers. At the end of 2015, agricultural holdings were breeding 419.1 thousand cattle, which was by 2.9 thousand less than the year before, according to the information from Central Statistical Bureau of Latvia (CSB)²⁰. The number of dairy cows fell by 3.5 thousand or 2.1 %, however, the number of suckling cows rose by 4.6 thousand or 13.6 %. Partially because of further spread of the African swine fever, the number of swine decreased by 15.3 thousand or 4.4 % over the year. In 2015, the number of sheep and goats continued to grow – by 9.7

²⁰ Agriculture in Latvia. Collection of Statistical Data. Rīga: 2014. 64 pp

thousand or 10.5 % and 0.4 thousand or 3.2 %, respectively, while the number of horses reduced by 0.5 thousand or 4.7 %.

Trends in manure management of cattle time series show that solid manure system still account for the biggest part of the total manure management systems distribution, whereas slurry-based system increase significantly. Small farms use predominantly solid manure management system, while large farms mostly use liquid/slurry management system. The share of pasture tends to decrease for dairy cattle, however, for other all cattle categories the share of pasture show small changes in the time series. Trends in manure management of swine show significant increase of the manure share for slurry-based system and manure use for biogas production.

5.2.3 Methods

Emission calculations are based on EMEP/EEA 2016. Estimation Tier 2 (mass flow approach) is used for NH₃ and NO_x emissions, which is described in the EMEP/EEA methodology. Calculations were done with the Excel spreadsheets. Due to the N-flow calculation process, NH₃ emission estimates were obtained from manure management systems from housing, storage and on field application (reported in 3D Agricultural soils), and grazing (reported in 3D Agricultural soils). In the same process, NO_x emissions from manure storage were calculated. Emission estimates are done separately for each animal category (NFR 3.B.1.a, b; 3.B.2; 3.B.4.d, e, f, h and 3.B.gi,ii,iii,iv). Emissions from manure spreading are not calculated for fur animals (3.B.4.h Other animals) due to not available emission factor. Calculated NO emissions were converted to NO₂ due to the reporting requirements.

NMVOC emission estimations for sheep, swine, goats, horses, poultry and other animal livestock categories are based on Tier 1 methodology described in the EMEP/EEA 2016. Also PM and TSP emissions are estimated using Tier 1 methodology for all animal categories:

$$E_{\text{pollutant}_{\text{animal}}} = AAP_{\text{animal}} \times EF_{\text{pollutant}_{\text{animal}}}$$

where:

EF_{pollutant_animal} - pollutant emissions for each livestock category;

AAP_{animal} - number of animals of a particular category that are present on average within the year;

EF_{pollutant_animal} - EF of pollutant (kg a⁻¹).

For dairy and non-dairy cattle NMVOC emission estimations were done by using Tier 2 methodology described in the EMEP/EEA 2016.

5.2.4 Emission factors

The emission factors used to estimate NH₃ emissions from manure management are default Tier 2 from EMEP/EEA 2016, 3B Manure management (Table 5.5). To estimate emissions from poultry deposited by grazing, emission factors are assumed as solid storage because they are not available in EMEP/EEA 2016 guidebook.

Table 5.5 Emission factors (EF) used for calculation of the NH₃-N emissions from manure management

Animal type	Manure type	EF housing	EF storage	EF spreading	EF grazing
Dairy cattle	slurry	0.20	0.20	0.55	0.10
	solid	0.19	0.27	0.79	0.10
Other cattle	slurry	0.20	0.20	0.55	0.06
	solid	0.19	0.27	0.79	0.06
Fattening pigs	slurry	0.28	0.14	0.40	-
	solid	0.27	0.45	0.81	-
Sows	slurry	0.22	0.14	0.29	-
	solid	0.25	0.45	0.81	-
Sheep, goats	solid	0.22	0.28	0.90	0.09
Horses	solid	0.22	0.35	0.90	0.35
Laying hens	solid	0.41	0.14	0.69	0.41

Animal type	Manure type	EF housing	EF storage	EF spreading	EF grazing
Broilers	solid	0.28	0.17	0.66	0.28
Turkeys	solid	0.35	0.24	0.54	0.35
Ducks	solid	0.24	0.24	0.54	0.24
Geese	solid	0.57	0.16	0.45	0.57
Fur animals	solid	0.27	0.09	NA	-

Emission factors used to estimate NO_x emissions from manure management are the default values from EMEP/EEA 2016 (Table 5.6).

Table 5.6 Emission factors (EF) used for calculation of the NO-N emissions from manure management

EF Storage	
Slurry	Solid
0.0001	0.0100

Emission factors which are used to estimate NMVOC from manure management are represented in Table 5.7.

Table 5.7 Emission factors (EF) used for calculation of the NMVOC emissions from manure management

Tier 1 emission factors, kg AAP ⁻¹ a ⁻¹			
Livestock	EF, with silage feeding	EF, without silage feeding	EF
Fattening pigs (8-110 kg)	-	0.6	0.6
Sows (and piglets to 8kg, boars)	-	1.7	1.7
Sheep	0.3	0.2	0.2
Goats	0.6	0.5	0.6
Horses	7.8	4.3	6.0
Layers	-	0.2	0.2
Broilers	-	0.1	0.1
Turkeys	-	-	0.5
Ducks	-	0.5	0.5
Geese	-	0.5	0.5
Fur animals		1.9	1.9
Tier 2 emission factors, kg NMVOC kg/MJ feed intake			
Livestock	EF _{NMVOC, silage feeding}	EF _{NMVOC, building}	EF _{NMVOC, graz}
Dairy cattle	0.0	0.0	0.0
Non-dairy cattle	0.0	0.0	0.0

The NH₃ emission calculations also include evaluation of emission reduction measures influence. The estimation of emission reduction is based on ammonia emission abatement measures for cattle and swine manure storage. According to Regulations No 834 of the Cabinet of Ministers of Latvia²¹, all animal housings with more than 10 animal units and, in the vulnerable zone, with more than five animal units must have manure storages. Therefore, NH₃ emission reduction potential is included in the emission calculation and based on the Guidance Document on Control Techniques for Preventing and Abating Emissions of Ammonia recommendations it is set as 50% for storage. It is stated that application of slurry has to be done within 12 h by national regulations, therefore, in this category reduction of emissions is set to be 30% for cattle and swine and to 70% for poultry. Solid manure has to be incorporated within 24 h, and reduction rate by this activity is set to be 35%²².

The calculation of PM and TSP emissions is based on EMEP/EEA 2016 methodology. Emission factors by type are shown in the Table 5.8.

²¹National regulations No. 834 *Regarding Protection of Water and Soil from Pollution with Nitrates Caused by Agricultural Activity*
<http://likumi.lv/ta/id/271376-noteikumi-par-udens-un-augsnes-aizsardzibu-no-lauksaimnieciskas-darbibas-izraisita-piesarnojuma-ar-nitratiem>

²² Economic Commission for Europe Guidance Document on Control Techniques for preventing and Abating Emissions of Ammonia, 17-20 September 2007, Geneva

Table 5.8 PM and TSP emission factors (EF)

	EF TSP	EF PM ₁₀	EF PM _{2.5}
Dairy cows	1.38	0.63	0.41
Other cattle	0.465	0.215	0.14
Fattening pigs	1.05	0.14	0.006
Sows	0.62	0.17	0.01
Sheep	0.14	0.06	0.02
Goats	0.14	0.06	0.02
Horses	0.48	0.22	0.14
Layers	0.19	0.04	0.003
Broilers	0.04	0.02	0.002
Turkeys	0.11	0.11	0.02
Ducks	0.14	0.14	0.02
Geese	0.24	0.24	0.03
Fur animals	0.018	0.008	0.004

5.2.5 Activity data

The number of cattle, sheep, swine, goats, horses, poultry and fur-bearing animals population, as well as data on milk production and fat content in milk are obtained from the CSB Database²³ and statistical yearbooks²⁴. The distribution of different manure management systems (MMS) is adopted from national studies. Calculations of the distribution are made based on research results and developed methodology provided by Latvia University of Agriculture²⁵.

Statistical information about the livestock number in Latvia is included in Table 5.9. The number of fur-bearing animals is not available for 1990-1992 and 1995 therefore interpolation and extrapolation are used to fill in the gaps of time series. The same activities have been done for turkeys, ducks and geese, because statistical data are not available for the period 1990 – 1998.

Table 5.9 Number of livestock (thousand heads), 1990–2015

Year	1990	1995	2000	2005	2010	2011	2012	2013	2014	2015
Dairy cows	535.1	291.9	204.5	185.2	164.1	164.1	164.6	165.0	165.9	162.4
Beef cattle under 1 year	257.7	47.2	22.2	26.3	23.6	21.9	26.1	26.8	35.5	36.4
Dairy cattle under 1 year	267.6	87.6	75.7	92.6	82.1	82.1	82.3	82.5	83.0	77.2
Beef cattle 1-2 years old	88.6	17.8	10.7	17.0	13.4	12.5	15.7	20.9	20.2	21.4
Dairy cattle 1-2 years old	214.0	64.2	40.9	42.6	54.2	54.2	54.3	54.5	54.7	54.8
Cattle after 2 years old	76.4	20.7	12.7	21.5	42.2	46.0	50.1	56.9	62.9	66.9
Fattening pigs	1155.5	439.1	324.9	347.3	314.2	301.5	289.6	298.8	287.6	278.5
Sows	245.6	113.7	68.6	80.6	75.5	73.5	65.6	68.8	61.7	55.8
Sheep	164.6	72.2	28.6	41.6	76.8	79.7	83.6	84.8	92.5	102.3
Goats	5.4	8.9	10.4	14.9	13.5	13.4	13.3	12.6	12.3	12.7
Horses	30.9	27.2	19.9	13.9	12.0	11.5	10.9	10.7	10.1	9.6
Layers	8050.5	2071.2	1980.5	2121.8	2549.5	2315.9	2395.0	2430.5	2443.8	2335.3
Broilers	2270.6	923.6	570.2	1365.0	1638.3	1417.7	1898.3	1906.4	1796.6	2035.9
Turkeys	10.1	10.1	12.5	15.1	1.0	1.1	1.4	1.7	2.0	3.1
Ducks	48.6	48.6	51.0	38.4	2.9	2.9	3.1	3.8	5.5	6.6
Geese	12.6	12.6	14.4	16.2	1.6	1.8	1.9	2.1	2.7	3.3
Fur animals	260.2	213.5	97.2	141.7	167.0	183.7	231.6	231.6	313.9	272.2

²³ Agriculture, Forestry and Fishery. <http://data.csb.gov.lv/pxweb/en/lauks/?rxid=a79839fe-11ba-4ecd-8cc3-4035692c5fc8>

²⁴ Agriculture in Latvia. Collection of Statistical Data. Riga: 2014. 64 pp

²⁵ Priekulis J., Ābolīņš A. (2015) Calculation Methodology for Cattle Manure Management Systems Based on the 2006 IPCC Guidelines. Proceedings of the 25th NJF Congress Nordic View to Sustainable Rural Development. Riga, pp.274-280

The data of N excretion during the year per each livestock category used for the inventory are mainly country specific and are obtained from national studies. The research of country specific N excretion values is done according to outcomes of pre-defined project "Development of the National System for Greenhouse Gas Inventory and Reporting on Policies, Measures and Projections" under 2009 – 2014 EEA Grants Programme National Climate Policy. All N excretion values used in the inventory are represented in Table 5.10 and Table 5.11.

Table 5.10 Average N excretions (N, kg year⁻¹) per head of animal

	Livestock category		N, kg year ⁻¹	Source
Non-dairy cattle sub-groups	Young cattle under 1 year	dairy cattle calves	15.7	National studies
		beef cattle calves	18.5	National studies
	Young cattle aged from 1 to 2 years	dairy cattle	24.7	National studies
		beef cattle	26.4	National studies
	Cattle after 2 years old	bulls	93.9	National studies
		heifers	49.4	National studies
		other cows	65.9	National studies
	Fattening pigs		14.00	National studies
	Sheep		15.30	National studies
	Goats		15.80	National studies
	Horses		44.00	National studies
	Layers		0.55	National studies
	Broilers		0.35	National studies
	Turkeys		1.64	EMEP/EEA 2016
	Ducks		0.58	National studies
	Geese		1.12	National studies
	Fur animals		8.34	IPCC 2006 default

Average N excretion data during the year for dairy cattle vary in all emission reporting period depending on productivity indicators. As regards sows, piglets to 8 kg and boars, N excretion differs through years depending on age-based distribution (Table 5.11).

Table 5.11 Average N excretions for cattle (N, kg year⁻¹) per head of cattle

Year	Dairy cows	Sows (and piglets to 8kg, boars)
1990	85.77	22.46
1995	84.74	21.16
2000	99.62	23.66
2005	104.00	24.24
2010	106.56	24.13
2011	107.11	24.25
2012	108.17	24.59
2013	109.64	24.62
2014	110.52	24.45
2015	108.84	24.46

Calculations of MMS are done according to pre-defined project "Development of the National System for Greenhouse Gas Inventory and Reporting on Policies, Measures and Projections" under the most important outcomes of 2009 - 2014 EEA Grants Programme National Climate Policy. Main differences caused by implementation of the new methodology to determine MMS should be tended to liquid manure system, which was found as not typical for non-dairy cattle in Latvia. Significantly, the share of pasture, range and paddock were reduced for all livestock groups, except beef cattle. Most of the large livestock farms refuse from grazing to keep high productivity of animals and arrange resources in economically feasible way. Table 5.12 represents the share of each manure management system in 2015.

Table 5.12 Share of each manure management system per animal type (%), 2015

	Pasture	Solid storage	Slurry	Anaerobic digester
Dairy cows	6.6	47.7	33.1	12.6
Beef cattle under 1 year old	78.7	21.3	0.0	0.0
Dairy cattle under 1 year old	7.3	83.0	0.0	9.7
Beef cattle 1- 2 years old	78.7	21.3	0.0	0.0
Dairy cattle 1 - 2 years old	7.3	83.0	0.0	9.7
Cattle after 2 years old	78.7	21.3	0.0	0.0
Fattening pigs	0.0	8.8	60.1	31.1
Sows	0.0	9.6	59.5	30.9
Sheep	23.5	76.5	0.0	0.0
Goats	10.5	89.5	0.0	0.0
Horses	14.3	85.7	0.0	0.0
Layers	3.0	13.4	0.0	36.0
Broilers	0.0	100.0	0.0	0.0
Turkeys	16.7	83.3	0.0	0.0
Ducks	19.0	81.0	0.0	0.0
Geese	17.5	82.5	0.0	0.0
Fur animals	0.0	100.0	0.0	0.0

NMVOC emission calculation for dairy and non-dairy cattle is based on Tier 2 approach of EMEP/EEA 2016. Feed intake values in MJ used for NMVOC emission calculation are calculated using IPPC 2006 methodology (Table 5.13).

Table 5.13 Feed intake values in MJ per year

	1990	1995	2000	2005	2010	2011	2012	2013	2014	2015
Dairy cattle	88168	86267	96435	102604	107976	108541	110134	112335	113824	113407
Young cattle	29330	28699	27745	27789	28277	28171	28436	28883	28741	29050
Adult cattle	55803	55825	53880	61061	63445	64328	65486	65743	66569	67679

5.2.6 Uncertainties

The uncertainty associated with activity data was received from CSB of Latvia. Generally, the uncertainty of activity data provided by CSB of Latvia is set as 2%. Uncertainty of emission factors for NH₃ ranges is from ±14% to 136%, for NO_x is from -50% to +100% according to EMEP/EEA 2016.

5.2.7 QA/QC and verification

Assessment of trends has been performed by a sectoral expert. Statistical data were verified by CSB.

5.2.8 Recalculations

Changes between last year's submission and this year submission result from:

- implementation of fully adopted the EMEP/EEA 2016 Tier 2 methodology to estimate NH₃, NO and NMVOC emissions from manure management and Tier 1 for PM, TSP and NMVOC;
- an implementing country specific N excretion values.

5.2.9 Planned improvements

It is necessary to provide consistent reporting on NH₃ emissions from biogas facilities with the sector 5B.

5.3 Agricultural soils (NFR 3D)

5.3.1 Overview

Latvia reports under category 3D ammonia (NH₃) and nitrous oxides (NO_x) emissions from inorganic N-fertilizer application, NH₃ and NO_x emissions from animal manure, other organic fertilizers applied to soils

and urine and dung deposits from grazing animals, as well as volatile organic compounds (NMVOC) and particulate matter (PM_{2.5}, PM₁₀, TSP) emissions from crop production.

5.3.2 Trends in emissions

Emissions from agricultural soils have noticeably decreased since the beginning of 90's when agricultural production was reduced (Table 5.14).

In 2015, the sector of agricultural soils contributed 8.76 kt NH₃. The main source of the emission was application of inorganic N-fertilizers, contributing 58.2 % or 5.10 kt of NH₃ emissions from agricultural soils. These emissions were reported in category 3.D.a.1. NH₃ emission on pastures (3.D.a.3) has a share of 4.0 % (0.35 kt). Application of manure (3.D.a.2) and other organic fertilizers to soils (3.D.a.2.c) emitted 3.17 kt of NH₃ or 36.1% of total NH₃ emission from agricultural soils. The remaining share of NH₃ emission referred to other sources. Agricultural soils made up 4.16 kt of NO_x emissions in the agricultural sector. The NO_x emissions from agricultural soils mostly rose due to application of inorganic-N fertilizer.

In 2015, the sector of agricultural soils contributed 1.01 kt of NMVOC emission in Latvia. The only source for NMVOC is emission from cultivated crops (3.D.e). In 2015, agricultural soils contributed 1.82 kt, 1.15 kt and 0.15 kt of the total agricultural TSP, PM₁₀ and PM_{2.5} emissions, respectively. These emissions were reported in category 3.D.c (Farm-level agricultural operations including storage, handling and transport of agricultural products).

Table 5.14 Emissions from fertilizers, urine and dung deposited by grazing animals and crop production, 1990-2015 (kt)

	Unit	1990	1995	2000	2005	2010	2011	2012	2013	2014	2015	Changes in 1990-2015, %
NO _x	kt	8.28	1.80	1.89	2.63	3.39	3.39	3.65	3.90	4.08	4.16	-50%
NMVOC		1.40	0.80	0.76	0.86	0.95	0.93	0.97	0.99	0.99	1.01	-28%
NH ₃		18.13	4.96	5.25	5.53	7.11	7.16	7.72	8.07	8.43	8.76	-52%
PM _{2.5}		0.15	0.09	0.09	0.10	0.12	0.12	0.13	0.13	0.14	0.15	0%
PM ₁₀		1.3	0.76	0.75	0.84	0.97	0.96	1.02	1.04	1.11	1.15	-12%
TSP		2.54	1.45	1.37	1.56	1.72	1.7	1.75	1.79	1.79	1.82	-28%

However, emissions from agricultural soils have been increasing since 2000. This could be explained by an increase of area covered by crops and fertilizer use. During the time period of 2010-2015, the total area of utilized agricultural land in the country has grown by 79.3 thousand hectares or 4.4 %, reaching 1 884.8 thousand hectares in 2015. In 2015, NH₃ emissions rapidly increased in relation to inorganic N-fertilizer use. Use of mineral fertilizers per one hectare of sown area has increased from 106 kg in 2014 to 110 kg in 2015 or by 3.8 % and use of nitrogen per one ha of sown area also increased from 63 kg in 2014 to 65 kg in 2015. In 2015, harvested yield of grain reached 3.0 million tons – 794.3 thousand tons or 35.7 % more than in 2014. The significant growth in the harvested production of grain was affected not only by increase in the cereal cropland (17.2 thousand hectares or 2.6 % more than in 2014), but also by a notable rise in average yield per hectare. In 2015, the total sown area of pulses increased 2.7 times. The increase was encouraged by the introduction of a new support payment for climate-and environment-friendly farming practices or agricultural greening. Emissions from animal manure applied to soils and urine and dung deposited by grazing animals are related to the total number of livestock in the country described in the Chapter 3.B. All statistical information is adopted from the collection of statistics “Agriculture in Latvia” (2016)²⁶ developed by the Agricultural Statistics Section, Agricultural and Environment Statistics Department of CSB of Latvia.

5.3.3 Methods

Emission calculation of NH₃ from inorganic N-fertilizer is based on the consumption of fertilizer of different types and related emission factors. Emission calculation of NO_x is based on the total consumption of N in inorganic N-fertilizer, manure or excreta and related emission factor. NMVOC and PM, including TSP

²⁶ The collection of statistics “Agriculture in Latvia” (2016). Available at <http://www.csb.gov.lv/dati/e-publikacijas/latvijas-lauksaimnieciba-2016-44224.html>

emissions were calculated using the data of the total sown area and emission factors. NH₃ emissions from animal manure applied to soils and urine and dung deposited by grazing animals are calculated under the category 3.B.

NH₃, NO_x, NMVOC, PM and TSP emissions are calculated by methodology explained in EMEP/EEA 2016. NH₃ and NO_x emissions from crop production and agricultural soils are calculated using the following equation:

$$E_{pollutant} = AR_{nitrogen\ applied} \times EF_{pollutant}$$

where:

$E_{pollutant}$ = amount of pollutant emitted (kg a⁻¹),
 $AR_{nitrogen\ applied}$ = amount of N applied in fertilizer or organic waste (kg a⁻¹),
 $EF_{pollutant}$ = EF of pollutant (kg kg⁻¹).

For calculation of NH₃ emission from inorganic N-fertilizers in the country, the number of each type of fertilizer consumption (expressed as mass of fertilizer-N used per year) is multiplied by the appropriate emission factor. The emissions from the different fertilizer types are summed for period 1990-2015.

NMVOC and PM emissions from crop production and agricultural soils are calculated by using the following equation:

$$E_{pollutant} = AR_{area} \times EF_{pollutant}$$

where:

$E_{pollutant}$ = amount of pollutant emitted (kg a⁻¹),
 AR_{area} = area covered by crop (ha),
 $EF_{pollutant}$ = EF of pollutant (kg ha⁻¹).

5.3.4 Emission factors

The default (Tier 1) emission factors for NMVOC, TSP and NO_x were used for calculations as given in EMEP/EEA 2016 guidelines and the same emission factors are used for all years 1990-2015:

- 0.86 kg ha⁻¹ for NMVOC;
- 1.56 kg ha⁻¹ for TSP;
- 0.04 kg kg⁻¹ fertilizer, manure or waste applied for NO₂.

NH₃ emissions are calculated on the basis of on consumption data of inorganic fertilizer types and suggested EF's according to EMEP/EEA 2016 methodology. Two emission factors are implemented to calculate NH₃ emissions for the period of 1990-2015, because detailed data on fertilizer types for the period are not available. EF 0.05 (kg NH₃ kg⁻¹ fertilizer N applied) is used for all fertilizer types except urea, and EF 155 (g NH₃ kg⁻¹ fertilizer N applied) is used for urea. For 1990-2015, emissions of PM are estimated based on suggested Tier 2 EF's for agricultural crop operations in wet climate conditions. The implemented emission factors for PM emissions are represented in Table 5.15.

Table 5.15 PM emission factors (EF) for agricultural crop operations

Crop	EF, kg ha ⁻¹ for PM ₁₀				EF, kg ha ⁻¹ PM _{2.5}			
	Soil cultivation	Harvesting	Cleaning	Drying	Soil cultivation	Harvesting	Cleaning	Drying
Wheat	0.25	0.49	0.19	0.56	0.015	0.02	0.009	0.168
Ray	0.25	0.37	0.16	0.37	0.015	0.015	0.008	0.111
Barley	0.25	0.41	0.16	0.43	0.015	0.016	0.008	0.129
Oat	0.25	0.62	0.25	0.66	0.015	0.025	0.0125	0.198
Other arable	0.25	NC	NC	NC	0.015	NC	NC	NC
Grass	0.25	0.25	0	0	0.015	0.01	0	0

NH₃ emissions from pasture grazed by livestock and animal manure applied to soils are derived by Tier 2 methodology that is implemented for NH₃ emission calculation from manure management.

5.3.5 Activity data

Information regarding to inorganic N-fertilizer consumption and the area covered by crops is provided by CSB of Latvia for the period of 1990-2015. Data about the use of N with inorganic fertilizers are provided in Figure 5.4.

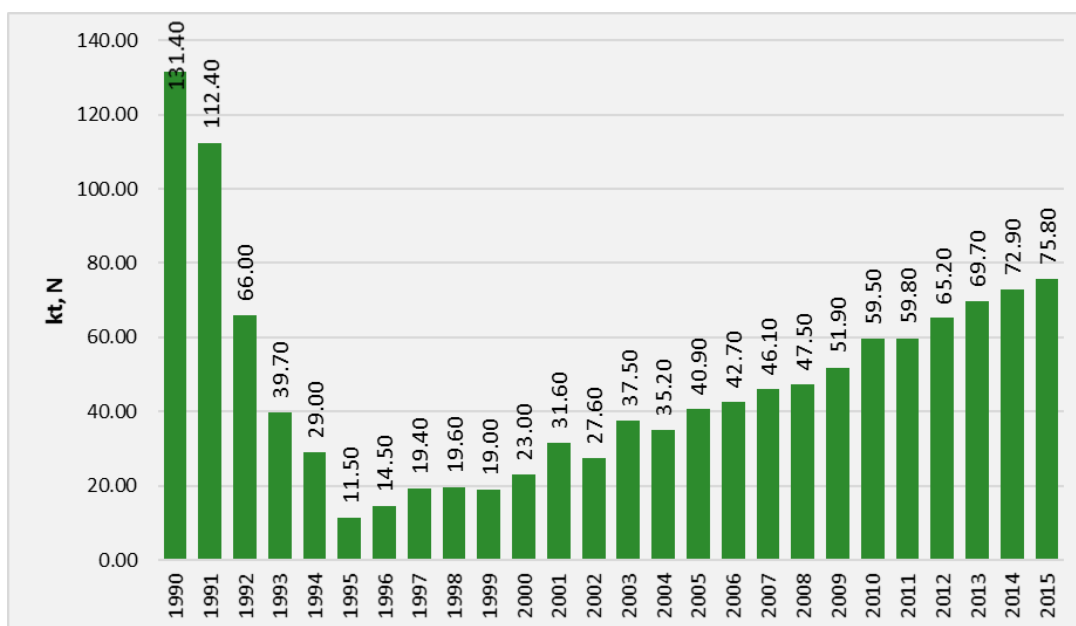


Figure 5.4 Used N with inorganic N-fertilizer (kt), 1990-2015

The data of detailed statistics of consumption of different types of N fertilizers are available for the period of 2007-2015. For years 1990-2006 data on consumption of urea were derived by interpolation or extrapolation of available statistical data. Same additional results of urea consumption were obtained from FAO statistics for 2002 and 2003. Consumption data of urea and other N fertilizer for that period were based on calculations including statistics of N consumption in inorganic fertilizers (Table 5.16).

Table 5.16 Consumption of fertilizer types (t), 2007-2015

Fertilizer type	2007	2008	2009	2010	2011	2012	2013	2014	2015
Ammonium nitrate	89155	84006	103333	107953	113185	109837	112238	127237	124443
Ammonium sulphate	4176	5728	11294	14931	17559	23524	32114	33135	36227
Calcium ammonium nitrate	NA	19399	9084	4699	4891	4748	8738	4669	4243
Urea	1946	4323	5930	5459	5798	7901	5558	6445	8468
Urea and ammonium nitrate solutions	2091	1025	3356	NA	NA	NA	NA	NA	NA
NPK complex	105896	92952	72195	107669	112652	131702	157503	147146	121114

Area covered by crops for period 1990-2015 is represented in Figure 5.5.

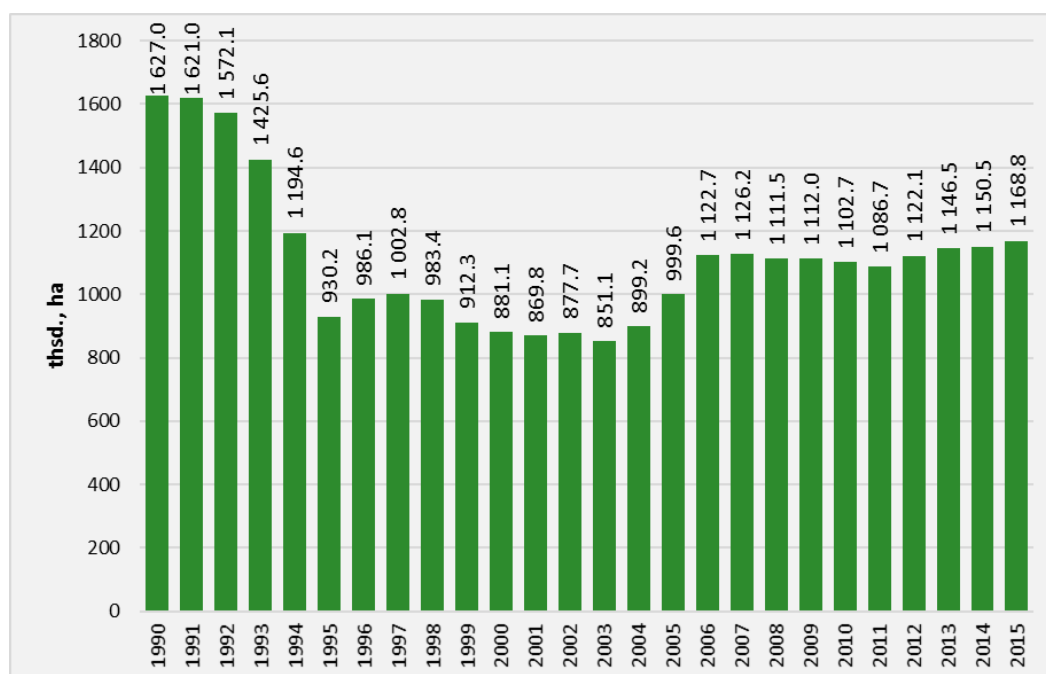


Figure 5.5 Area covered by crops (thsd. ha), 1990-2015

5.3.6 Uncertainties

The uncertainty associated with activity data is received from CSB of Latvia. Generally, the uncertainty of activity data provided by CSB of Latvia is set as 2%. Uncertainty of emission factors is no less than 50% for NH₃ emissions.

5.3.7 QA/QC and verification

A sectorial expert has performed assessment of trends. Statistical data are verified by CSB.

5.3.8 Recalculations

Recalculations have been done due to implementation of:

- 1) new EF for NH₃ emissions from inorganic N-fertilizer application according to EMEP/EEA 2016 guidelines;
- 2) Tier 2 approach for calculation of PM_{2.5}, PM₁₀ emissions;
- 3) reporting emissions from other organic fertilizers.

5.3.9 Planned improvements

Reporting of NH₃ emissions will be supplemented by NH₃ emission calculation from sewage sludge according to EMEP/EEA 2016 methodology. Reporting will include data of emission from use of pesticides

5.4 Other (NFR 3I)

5.4.1 Overview

Under category 3I Other NO_x, NMVOC, SO₂, NH₃, PM_{2.5}, PM₁₀, TSP, CO, PCDD/PCDF and PAHs emissions from grassland burning are included. Such activities in Latvia appeared seasonally.

5.4.2 Trends in emissions

Table 5.17 Emissions from grassland burning in 1990-2015

	Unit	1990	1995	2000	2005	2010	2011	2012	2013	2014	2015	Change in 1990-2015, %
NO_x	kt	0.007	0.007	0.029	0.026	0.032	0.021	0.024	0.025	0.089	0.042	487
NM VOC		0.019	0.018	0.077	0.069	0.085	0.055	0.064	0.064	0.232	0.11	487
SO₂		0.002	0.002	0.007	0.006	0.007	0.005	0.006	0.006	0.020	0.01	486
NH₃		0.002	0.002	0.007	0.006	0.007	0.005	0.006	0.006	0.020	0.01	486
PM_{2.5}		0.008	0.007	0.032	0.028	0.035	0.023	0.026	0.026	0.095	0.05	487
PM₁₀		0.009	0.009	0.039	0.035	0.043	0.028	0.032	0.032	0.117	0.06	487
TSP		0.015	0.014	0.060	0.054	0.066	0.043	0.049	0.050	0.180	0.09	487
CO	g i-Teq	0.207	0.196	0.844	0.756	0.931	0.604	0.698	0.703	2.543	1.21	487
PCDD/PCDF		0.004	0.004	0.018	0.016	0.019	0.013	0.015	0.015	0.053	0.03	488
PAHs		0.014	0.014	0.058	0.052	0.064	0.042	0.048	0.049	0.175	0.08	486

Emission amount depends on the burned area and is shown in the Table 5.17. It can be seen that emissions have increased due to the increase of areas burned.

5.4.3 Methods

Emissions from grassland burning were determined according to the EMEP/EEA 2016 and IPCC 2006. Emissions from wildfires in grassland were calculated using equation 2.27 of the IPCC 2006. Mass of available fuel in grassland's fires – 2.1 t DM ha⁻¹ (Table 2.4 of IPCC 2006), fraction of the biomass combusted 0.74 (Table 2.6 of IPCC 2006).

5.4.4 Emission factors

Emission factors for NO_x, CO, NMVOC, SO₂, NH₃, TSP, PM₁₀ and PM_{2.5} emission calculation regarding burning of grassland is shown in the Table 5.18 (EMEP/EEA 2016, 11.B Forest fires, Table 3-8).

Table 5.18 Emission factors (EF) for grassland burning according to EMEP/EEA 2016

Pollutant	Value	Unit
NO_x	13	kg/ha area burned
CO	373	kg/ha area burned
NM VOC	34	kg/ha area burned
SO₂	3	kg/ha area burned
NH₃	3	kg/ha area burned
TSP	17	g/kg wood burned
PM₁₀	11	g/kg wood burned
PM_{2.5}	9	g/kg wood burned

PAH emissions are calculated according to EMEP/CORINAIR Emission Inventory Guidebook, but DIOX emissions are calculated according to UNEP, Standardized Toolkit for Identification and Quantification of Dioxin and Furan Releases. Emission factor is chosen as for Grassland and moor fires – 5 µg TEQ/t.

5.4.5 Activity data

Area of grassland burning was taken from the SFRS and data are available starting from 1993 (Figure 5.6). For 1990-1992 no statistical information exists. However, an expert's assumption for years 1990-1992 was made, using extrapolation from burned areas of the following 5 years' period. The number of grassland fires and burnt area is directly dependent on anthropogenic activities. Over the past 15 years, most (in numbers and area burned) grassland fires occurred in 2006.

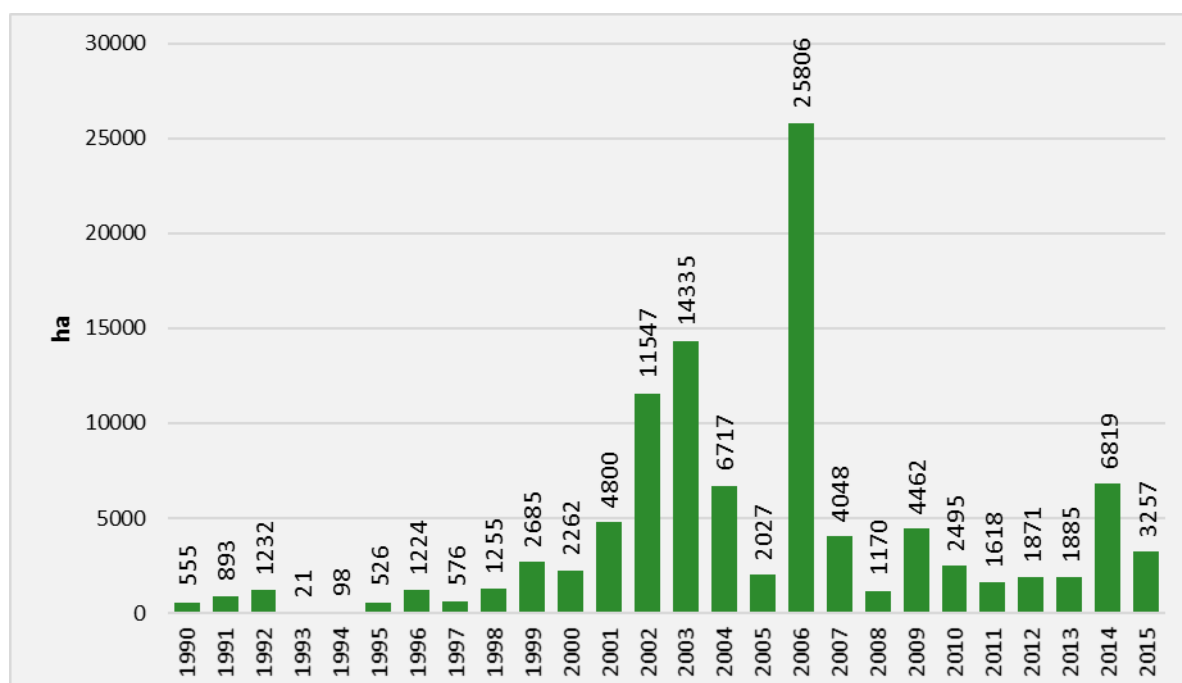


Figure 5.6 Area of last years grass burned (ha)

5.4.6 Uncertainties

Uncertainty of activity data (area) for biomass burning is estimated at $\pm 10\%$ based on expert judgement. Uncertainties in emission factors are based on the EMEP/EEA emission inventory guidebook 2016 (11.B Forest fires, Table 3-8) default values.

5.4.7 QA/QC and verification

Quality control procedures named in IPCC 2006 were done. Assessment of trends has been performed. Land areas of wildfires burning were reviewed with latest statistics.

5.4.8 Recalculations

No recalculations are done.

5.4.9 Planned improvements

No improvements are planned to be carried out.

6 Waste (NFR 5)

6.1 Sector overview

6.1.1 Overview

Waste management has acquired prior significance in the environmental protection policy as one of the instruments for sustainable use of natural resources. The main directions in the waste management are the development of the construction of polygons and collecting system for non-hazardous municipal waste and the development of system for the collection and treatment of hazardous waste. At the moment 11 non-hazardous waste polygons and one polygon for hazardous waste got A category permit according to IPPC directive. Biogas collection and use for energy production from biodegradable wastes and sludge is set as one of priorities in Latvia.

Main activity data sources for emissions calculations in waste sector is “3-Waste” data base, which is developed by LEGMC. According to the information from LEGMC the total generated volume of waste are shown in Table 6.1.

Table 6.1 Generated wastes in Latvia

Year	Municipal (all non-hazardous) wastes	Hazardous wastes	Total
2006	1420.46	54.372	1474.832
2007	1386.57	41.605	1428.175
2008	1368.79	46.4	1415.16
2009	1033.91	55.563	1089.473
2010	1131.404	55.089	1186.493
2011	1535.057	58.476	1593.533
2012	1799.440	85.121	1884.561
2013	1902.007	109.23	2011.237
2014	2013.695	80.978	2094.673
2015	2087.507	86.603	2174.110

Data of water abstraction and use, wastewater treatment and discharge have been collected since 1991 in the frame of state statistical survey “2 – Water”. State statistical survey “2-Water” must be reported by all enterprises which have issued permits on water use, water resources use or mineral deposits quarry use, or IPPC permit.

Table 6.2 shows the methods and source for activity data and emission factors used for emission calculating in Waste sector. Table 6.3 shows list of pollutants which are produced in Waste sector.

Table 6.2 Source categories and methods for Waste sector

NFR code	Long name	Method	AD	EF
5 A	Solid waste disposal on land	Tier 1	PS	D
5 B 1	Biological treatment of waste - Composting	Tier 1	PS	D
5 C 1 b ii	Hazardous waste incineration	Tier 1	PS	D
5 C 1 b iii	Clinical waste incineration	Tier 1	PS	D
5 C 1 b v	Cremation	Tier 1	PS	D
5 D	Waste-water handling	Tier 2	PS, CS	D

Table 6.3 Reported emissions in Waste sector in 2015

NFR code	Emissions
5A	NMVOC, PM _{2.5} , PM ₁₀ , TSP
5B1	NH ₃
5 C 1 b iii	NO _x , NMVOC, SO ₂ , TSP, BC, CO, Pb, Cd, Hg, As, Cr, Cu, Ni, PCDD/F, total PAHs, HCB
5 C 1 b v	NO _x , NMVOC, SO ₂ , PM _{2.5} , PM ₁₀ , TSP, CO, Pb, Cd, Hg, As, Cr, Cu, Ni, Se, Zn, PCDD/F, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, indeno(1,2,3-cd)pyrene, total PAHs, HCB, PCBs
5D1	NH ₃
5D3	NMVOC

6.1.2 Key sources

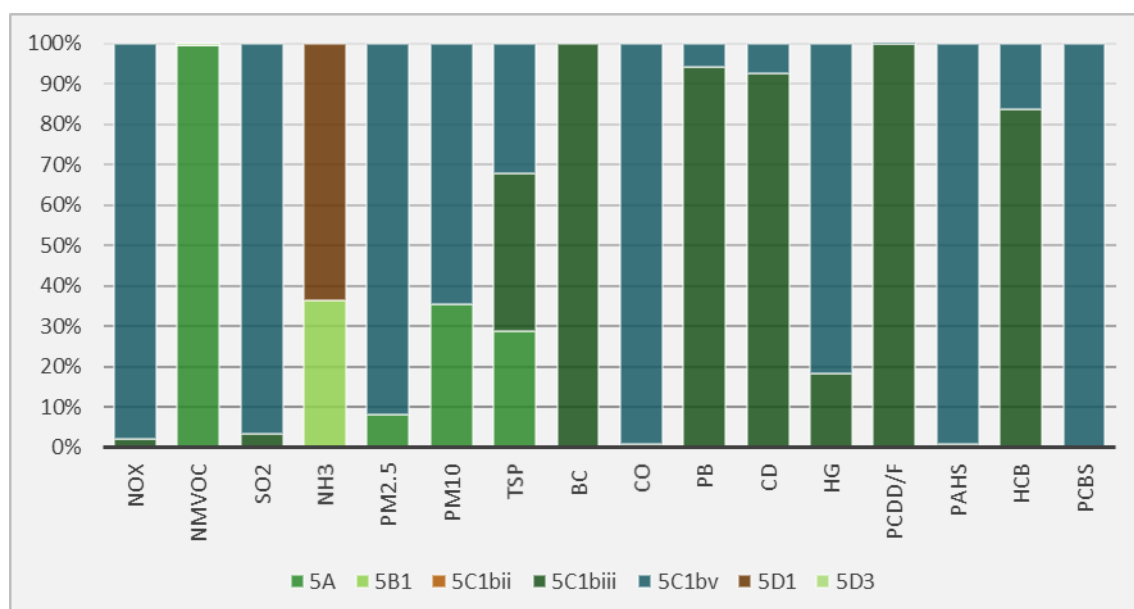


Figure 6.1 Distribution of emissions in Waste sector by subsectors in 2015 (%)

Emissions of NH₃ are key source in Waste water handling sector (5D; Figure 6.1). Emissions of heavy metals, PAHs, HCB, PCBs and PCDD/PCDF occurs only from waste incineration and cremation, relatively these are small amounts. NMVOC emissions mainly occurs from solid waste disposal.

6.1.3 Trends in emissions

Table 6.4 Change in emissions from Waste sector between 1990 and 2015 (%)

Pollutant	Unit	1990	1995	2000	2005	2010	2011	2012	2013	2014	2015	Change in 1990-2015, %
NO _x	kt	0.00045	0.00100	0.00166	0.00168	0.00194	0.00182	0.00167	0.00179	0.00182	0.00202	344
NMVOc		0.715	0.828	0.945	0.958	0.949	0.860	0.830	0.837	0.792	0.789	10
SO ₂		0.00006	0.00013	0.00019	0.00024	0.00025	0.00025	0.00023	0.00025	0.00024	0.00028	376
NH ₃		0.245	0.229	0.221	0.226	0.229	0.154	0.177	0.175	0.183	0.189	-23
PM _{2.5}		0.00002	0.00002	0.00006	0.00007	0.00009	0.00029	0.00027	0.00035	0.00026	0.00020	1140
PM ₁₀		0.00010	0.00012	0.00018	0.00019	0.00021	0.00042	0.00040	0.00049	0.00039	0.00031	207
TSP		0.00162	0.00189	0.00129	0.00208	0.00058	0.00088	0.00094	0.00086	0.00078	0.00081	-50
BC	t	0.00003	0.00004	0.00002	0.00004	0.00001	0.00000	0.00001	0.00000	0.00000	0.00001	-78
CO		0.000229	0.000345	0.000652	0.000384	0.000437	0.000309	0.000279	0.000302	0.000399	0.000339	48
Pb		0.0055	0.0065	0.0044	0.0067	0.0011	0.0009	0.0012	0.0004	0.0009	0.0012	-78
Cd		0.000692	0.000810	0.000526	0.000846	0.000133	0.000113	0.000154	0.000058	0.000111	0.000160	-77
Hg		0.0036	0.0050	0.0041	0.0067	0.0037	0.0038	0.0037	0.0035	0.0038	0.0044	22
PCDD/F	g I-Teq	3.416	3.981	2.498	4.160	0.584	0.512	0.722	0.236	0.472	0.740	-78
PAHs	t	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	771
HCB	kg	0.0089	0.0104	0.0072	0.0109	0.0020	0.0016	0.0021	0.0009	0.0017	0.0022	-75
PCB		NA	0.000231	0.000462	0.000627	0.000862	0.000885	0.000808	0.000882	0.000911	0.000982	100

Emission estimates from the waste sector include:

- NMVOC, PM_{2.5}, PM₁₀, TSP emissions from solid waste disposal;
- NH₃ emissions from composting;
- NMVOC, NH₃ emissions from waste water handling;
- Many pollutant emissions from incineration of hazardous and clinical wastes and cremation. Emissions from waste incineration with energy recovery are counted under Energy sector.

Data on hazardous waste in Latvia have been collected and compiled by LEGMC since 1997, but data on municipal waste since 2001. Since year 2002 data bases about hazardous and municipal waste are combined in one data base “3-Waste”. Data in this data base are taken from State Statistical survey about waste, which occurs every year. Statistical survey about waste must fill all enterprises, which have permits on pollutant activities (A and B category) and all enterprises, which have permits on waste management operations.

Data of wastewater treatment and discharge have been collected since 1991 in the frame of state statistical survey “2-Water”. State statistical survey “2-Water” must be filled by all enterprises which have permits on water use, water resources use or mineral deposits quarry use, or else A and B category polluting activity permit or C category acknowledgment. CSB data also are used as activity data for emission calculation.

6.2 Solid waste disposal (NFR 5A)

6.2.1 Overview

Solid waste disposal is a main waste treatment operation in Latvia. Significant amount of landfill gas is emitted annually from waste disposal sites. NMVOC are some part of landfill gas. NMVOC emissions relates to disposed waste amounts.

6.2.2 Trends in emissions

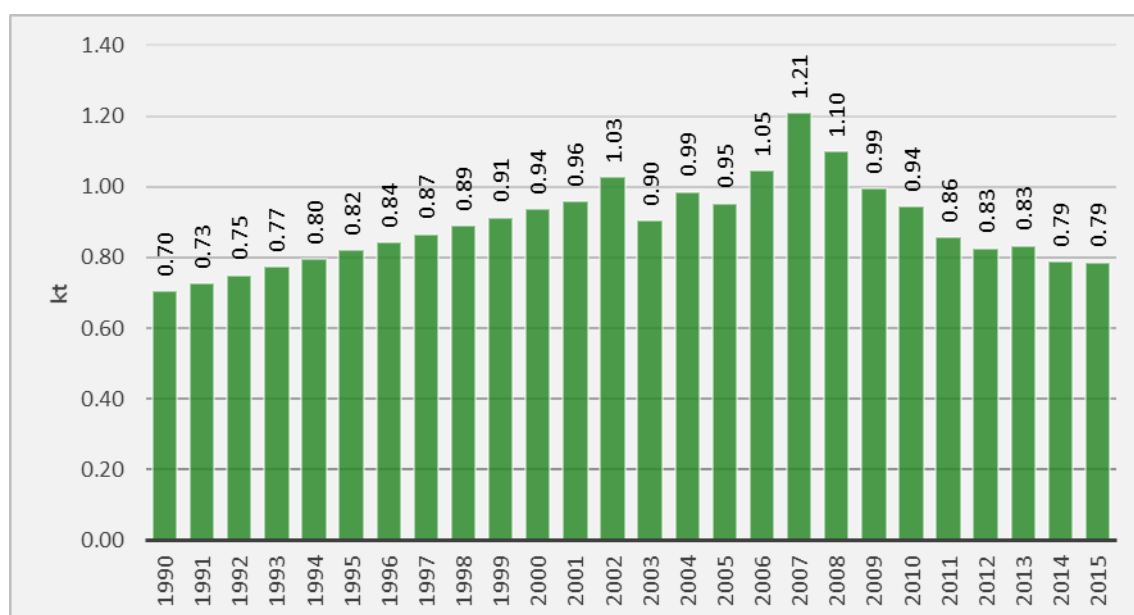


Figure 6.2 NMVOC emissions from Solid waste disposal (kt)

Emissions of NMVOC from solid waste disposal (Figure 6.2) correlate with CH₄ emissions, which are calculated according to UNFCCC requirements. These emissions mostly relates to disposed waste amounts in landfills.

6.2.3 Methods

NMVOC, PM_{2.5}, PM₁₀, TSP emissions from solid waste disposal are calculated. EMEP/EEA 2013 for emissions calculations is used. To estimate NMVOC, PM_{2.5}, PM₁₀, TSP emissions from solid waste disposal disposed amount are multiplied with emission factors from “Table 3-1 Tier 1 emission factors for source category 5.A Biological treatment of waste - Solid waste disposal on land”.

6.2.4 Emission factors

Table 6.5 Emission factors for disposed waste (EMEP/EEA 2016)

Pollutant	EF (unit/disposed waste)
NM VOC	1.56 kg/t
PM _{2.5}	0.033 g/t
PM ₁₀	0.219 g/t
TSP	0.463 g/t

6.2.5 Activity data

To calculate NM VOC, PM_{2.5}, PM₁₀, TSP emissions - amount of disposed waste must be known.

Data about disposed amounts are taken from waste statistical survey “3-Waste” (Figure 6.3).

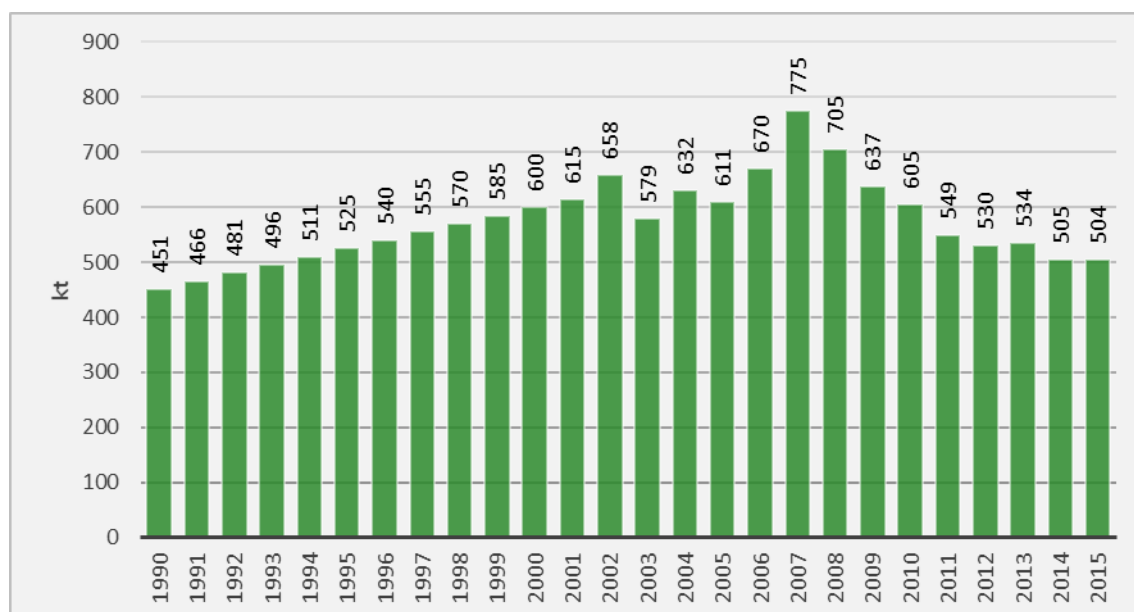


Figure 6.3 Disposed waste amounts in Latvia (kt)

Disposed amounts for years 1990-2001 are estimated according to equal growth between 1975 and 2002. The base year for disposed amount estimation is 1975. According to research **Error! Bookmark not defined.** disposed amount in 1975 was 227 152 tonnes. Data about waste disposal on land for 2002 - 2015 are taken from database “3-Waste”. Fluctuations in disposed waste amounts is due to economic growth in years 2007 and 2008. Last years disposed amount is decreased due to waste recovery development.

6.2.6 Uncertainties

Uncertainty for activity data is estimated as 7%. The same uncertainty is used also for emission calculations in UNFCCC.

6.2.7 QA/QC and verification

Disposed waste amounts are taken from waste data bases. Data in this data bases are checked and approved by Regional Environmental Boards. Check of emissions calculations are done. Assessments of trends have been performed.

6.2.8 Recalculations

Recalculations are done due to changes of activity data for disposed amount. New estimation for historical years is done.

6.2.9 Planned improvements

No planned improvements.

6.3 Composting and anaerobic digestion (NFR 5B)

6.3.1 Overview

NH₃ emissions from waste composting are calculated under this category. Composting is set as one of priorities in waste treatment in Latvia. For composting biological degradable wastes are useful. In Latvia these are mostly “park - garden” and “food production” wastes.

Data about industrial composting become available since 2003, when waste treatment companies start waste composting and get IPPC permits on this activity.

Composting in private households has been very popular for many years. Composted amount in households is estimated according to research done by Waste Management Association of Latvia in year 2015. In this research total amount of composted waste in households are estimated for years 2012 – 2014. Time series till 1990 is developed according to population changes.

6.3.2 Trends in emissions

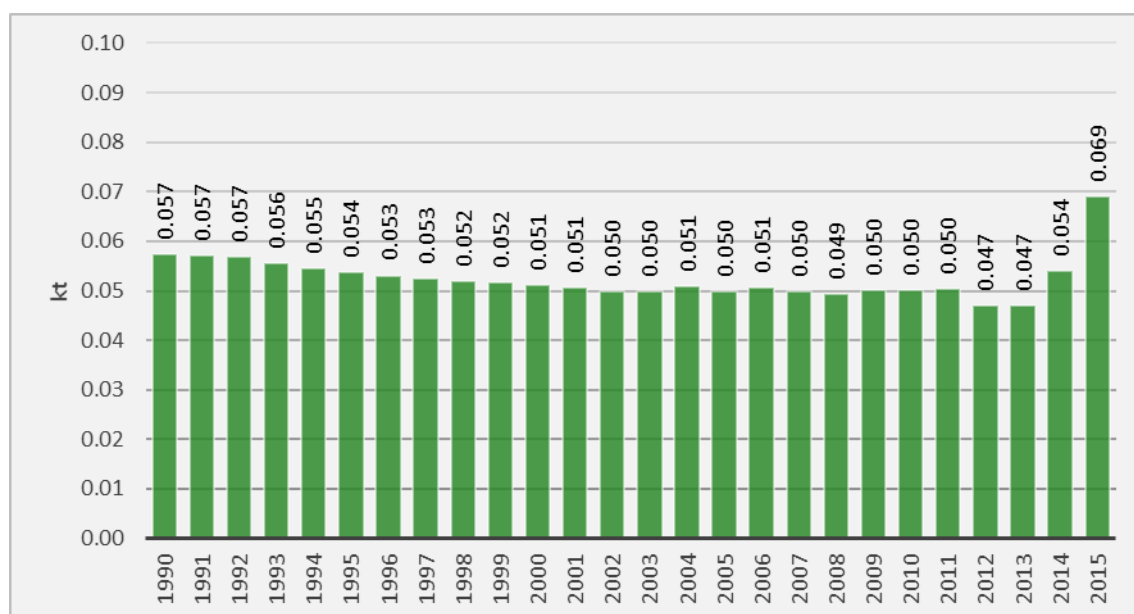


Figure 6.4 NH₃ emissions from composting (kt)

Composting NH₃ emissions increases in 2015 due to increase of industrial composting amounts.

6.3.3 Methods

Composted waste amount is multiplied by emission factor.

6.3.4 Emission factors

NH₃ emission factor 0.24 kg/t is taken from EMEP/EEA 2016.

6.3.5 Activity data

Composted waste amount is taken from “3-Waste” database, R3 - Recycling/reclamation of organic substances that are not used as solvents (including composting and other biological transformation processes), recovery operation for determination of composted amounts was used. Not all amounts, which classified under recovery as R3, are composted. To determine composted amount, each enterprise, which

reports with recovery operations R3, working profile must be taken in account. Starting from year 2013 separate R3A code for composting was implemented in Latvia legislation and reporting requirements.

Table 6.6 Composted waste amounts (kt)

	Industrial waste composted	Household waste composted	Total waste composted
1990	NO	239.09	239.09
1991	NO	238.20	238.20
1992	NO	236.84	236.84
1993	NO	231.70	231.70
1994	NO	227.69	227.69
1995	NO	224.08	224.08
1996	NO	221.29	221.29
1997	NO	219.09	219.09
1998	NO	216.93	216.93
1999	NO	215.00	215.00
2000	NO	213.43	213.43
2001	NO	210.89	210.89
2002	NO	207.98	207.98
2003	2.22	206.05	208.27
2004	7.91	204.00	211.90
2005	6.56	201.60	208.16
2006	11.70	199.64	211.34
2007	9.42	197.93	207.35
2008	9.28	196.41	205.69
2009	15.11	193.81	208.92
2010	18.55	190.02	208.57
2011	23.70	185.91	209.60
2012	17.62	178.16	195.78
2013	14.37	181.35	195.72
2014	40.04	184.61	224.65
2015	67.577	190.73	258.307

6.3.6 Uncertainties

Uncertainty for activity data is estimated as 37%. The same uncertainty is used also for calculations in UNFCCC.

6.3.7 QA/QC and verification

Industrial composted waste amounts are taken from waste data bases. Data in this data bases are checked and approved by Regional Environmental Boards. Assessments of trends have been performed.

6.3.8 Recalculations

No recalculations.

6.3.9 Planned improvements

No planned improvements.

6.4 Waste incineration (NFR 5C)

6.4.1 Overview

Currently there are no large amounts of waste being incinerated in Latvia without energy recovery. The main source of emissions is attributed to the hazardous and clinical waste incineration. The amounts of incinerated clinical waste are registered in the hazardous waste database (from 2002 in "3-Waste" data base) as Health service for humans and animals as well as related research waste. The rest of the incinerated waste from hazardous waste database is considered as hazardous (industrial) waste.

Incinerated amounts for years 1990 – 1998 is extrapolated according to average value of incinerated amount for years 2002 – 2013 what is attributed to disposed waste value.

In cremation sector 5C1bv emissions from human bodies and animal waste (carcasses) incineration are calculated.

Emissions from various types of fires such as landfill fires and open burning of garden waste are not estimated for Latvia.

6.4.2 Trends in emissions

In 2001 large increase of emissions are shown, because one enterprise reported huge amount of incinerated wastes, but another years' amount is much smaller. Emissions are increased compared with 1990. Increase is due to one more emission source occurred since 1994, when crematorium starts to operate in Latvia.

For clinical waste all 18 EWC group codes are counted. For clinical waste increase are shown in years 2006 and 2007, when clinical waste were incinerated in hazardous waste incineration facility. From year 2008 facility was closed.

PM_{2.5}, PM₁₀, TSP emissions are calculated from animal (carcasses) waste burning. Data in "3-Waste" data base is available from year 2011. Bird factory and cattle remains were burned in installation without energy recovery.

Table 6.7 Emissions in Waste incineration in 1990-2015

	1990	1995	2000	2005	2010	2011	2012	2013	2014	2015	Changes in 1990-2015, %
NO_x	0.00045	0.00100	0.00166	0.00168	0.00194	0.00182	0.00167	0.00179	0.00182	0.00202	344
NM VOC	0.00231	0.00270	0.00516	0.00168	0.00152	0.00008	0.00004	0.00003	0.00127	0.00004	-98
SO₂	0.00006	0.00013	0.00019	0.00024	0.00025	0.00025	0.00023	0.00025	0.00024	0.00028	376
PM_{2.5}	0.000001	0.000001	0.000042	0.000054	0.000074	0.000272	0.000256	0.000333	0.000248	0.000183	14933
PM₁₀	0.000002	0.000002	0.000044	0.000055	0.000074	0.000305	0.000287	0.000376	0.000277	0.000200	9274
TSP	0.001410	0.001643	0.001009	0.001797	0.000301	0.000628	0.000696	0.000613	0.000547	0.000573	-59
BC	0.000032	0.000038	0.000022	0.000040	0.000005	0.000005	0.000007	0.000002	0.000004	0.000007	-78
CO	0.00023	0.00035	0.00065	0.00038	0.00044	0.00031	0.00028	0.00030	0.00040	0.00034	48
Pb	0.00553	0.00646	0.00443	0.00666	0.00112	0.00086	0.00118	0.00043	0.00092	0.00122	-78
Cd	0.00069	0.00081	0.00053	0.00085	0.00013	0.00011	0.00015	0.00006	0.00011	0.00016	-77
Hg	0.00357	0.00501	0.00414	0.00668	0.00370	0.00376	0.00371	0.00346	0.00376	0.00436	22
PCDD/F	3.42	3.98	2.50	4.16	0.58	0.51	0.72	0.24	0.47	0.74	-78
PAHs	9.39E-09	3.00E-08	5.42E-08	6.01E-08	7.56E-08	7.37E-08	6.74E-08	7.30E-08	7.89E-08	8.18E-08	771
HCb	0.00888	0.01044	0.00719	0.01087	0.00200	0.00161	0.00210	0.00091	0.00170	0.00221	-75
PCB	NA	0.00023	0.00046	0.00063	0.00086	0.00088	0.00081	0.00088	0.00091	0.00098	100

6.4.3 Methods

For emissions calculation EMEP/EEA 2016 methodology are used. The amount of incinerated waste is multiplied with emission factors.

6.4.4 Emission factors

Table 6.8 Emission factors for waste incineration

Pollutant	Units EF	Industrial EF	Clinical EF	Animal EF
NO_x	kg/t	0.87	2.3	-
NM VOC	kg/t	7.4	0.7	-
SO₂	kg/t	0.047	0.54	-
CO	kg/t	0.07	0.19	-
PM_{2.5}	kg/t	0.004	NE	0.538
PM₁₀	kg/t	0.007	NE	0.628
TSP	kg/t	0.01	17	0.897
Pb	g/t	1.3	62	-
Cd	g/t	0.1	8	-

Pollutant	Units EF	Industrial EF	Clinical EF	Animal EF
Hg	g/t	0.056	43	-
As	g/t	0.016	0.2	-
Cr	g/t	NE	2	-
Cu	g/t	NE	98	-
Ni	g/t	0.14	2	-
Se	g/t	NE	NE	-
Zn	g/t	NE	NE	-
PCDD/PCDF	µg i-Teq/t	350	40	-
PAHs	g/t	0.02	0.04	-
HCB	g/t	0.002	0.1	-
PCBs	g/t	NE	NA	-

Emissions from cremation are calculated according to EMEP/EEA 2016. PM_{2.5}, PM₁₀, Se and Zn are not calculated, because emission factors are not available.

Table 6.9 Emission factors from cremation

Pollutant	EF	Units EF
NOx	0.825	kg/body
NMVOC	0.013	kg/body
SO ₂	0.113	kg/body
CO	0.14	kg/body
PM _{2.5}	34.70	g/body
PM ₁₀	34.70	g/body
TSP	38.56	g/body
CO	0.14	kg/body
Pb	30.03	mg/body
Cd	5.03	mg/body
Hg	1.49	g/body
As	13.61	mg/body
Cr	13.56	mg/body
Cu	12.43	mg/body
Ni	17.33	mg/body
Se	19.78	mg/body
Zn	160.12	mg/body
PCDD/ PCDF	0.027	µg/body
benzo(a) pyrene	13.2	µg/body
HCB	0.15	mg/body
PCBs	0.41	mg/body

6.4.5 Activity data

Table 6.10 Incinerated waste in Latvia

Year	Hazardous waste (kt)	Clinical waste (kt)	Animal waste (kt)	Total (kt)
1990	0.429082	0.116729	NO	0.545812
1991	0.404964	0.110168	NO	0.515131
1992	0.380845	0.103606	NO	0.484451
1993	0.356726	0.097045	NO	0.453771
1994	0.332607	0.090484	NO	0.423091
1995	0.308488	0.083922	NO	0.392410
1996	0.321434	0.087444	NO	0.408878
1997	0.341924	0.093018	NO	0.434942
1998	0.362414	0.098592	NO	0.461006
1999	0.347210	0.201420	NO	0.548630
2000	0.690280	0.056410	NO	0.746690
2001	1.319270	0.213310	NO	1.532580
2002	0.165643	0.032247	NO	0.197890

Year	Hazardous waste (kt)	Clinical waste (kt)	Animal waste (kt)	Total (kt)
2003	0.201813	0.040607	NO	0.242420
2004	0.210125	0.112325	NO	0.322450
2005	0.215127	0.102127	NO	0.317254
2006	0.786160	0.261890	NO	1.048050
2007	0.540500	0.350861	NO	0.891361
2008	0.299750	0.012361	NO	0.312111
2009	0.200000	0.011663	NO	0.211663
2010	0.200000	0.012843	NO	0.212843
2011	0.006300	0.012738	0.366092	0.385130
2012	NO	0.018049	0.348861	0.366910
2013	NO	0.005887	0.479833	0.485720
2014	0.166927	0.010341	0.3166033	0.493301
2015	NO	0.018498	0.18548	0.203978

Emissions from cremation are calculated according to EMEP/EEA 2016.

Data about burned bodies are provided by operator of crematorium. In Latvia operates only one crematorium.

Table 6.11 Burned bodies in Riga crematorium

Year	Burned bodies
1994	54
1995	564
1996	819
1997	817
1998	869
1999	982
2000	1127
2001	1297
2002	1293
2003	1389
2004	1391
2005	1529
2006	1630
2007	1959
2008	2227
2009	1977
2010	2102
2011	2158
2012	1970
2013	2150
2014	2222
2015	2395

6.4.6 Uncertainties

Uncertainty for cremation of bodies are not estimated, because it is correct figure from crematorium. Uncertainty of incinerated amount from “3-Waste” database is 44%. The same uncertainty is used also for calculations in UNFCCC.

6.4.7 QA/QC and verification

Incinerated waste amounts are taken from waste databases. Data in this databases are checked and approved by Regional Environmental Boards. Assessments of trends have been performed.

QA/QC and verification included:

- Quality check of activity data in the period of reporting;

- Quality check in calculation of emissions for UNFCCC NIR;

6.4.8 Recalculations

Emissions recalculated due to re estimation of disposed waste amount for years 1990 – 2001.

6.4.9 Planned improvements

No planned improvements.

6.5 Waste water handling (NFR 5D)

6.5.1 Overview

Data of LEGMC shows there were 192 million m³ of waste water discharged in Latvia (2015). Most of national population (77%, 2015) is served by urban waste water collecting and treatment.

Emissions of NH₃ from latrines and NMVOC from Waste Water Handling were calculated within this report.

6.5.2 Trends in emissions

Table 6.12 NMVOC and ammonia emissions from Waste water handling (kt)

	1990	1995	2000	2005	2010	2011	2012	2013	2014	2015	Change in 1990-2015, %
NMVOC	0.0090	0.0054	0.0039	0.0034	0.0033	0.0036	0.0035	0.0034	0.0027	0.0029	-68.00
NH₃	0.19	0.18	0.17	0.18	0.18	0.10	0.13	0.13	0.13	0.12	-35.99

Both NMVOC and NH₃ emissions are decreasing over entire period (Table 6.12) due to such factors as slow decrease of national population, increase of collection and treatment of waste water and measures to increase the efficiency of water use, thus decreasing amounts of waste water produced.

6.5.3 Methods

For emission calculation, EMEP/EEA 2016 was used as methodology source (Table 6.13). According to methodology, activity data are multiplied by according emission factors to calculate emissions, and for both substances emitted methodologies are considered to be Tier 2 methods.

6.5.4 Emission factors

Table 6.13 Activity data and emission factors for calculation of NH₃ and NMVOC emission from Waste Water Handling sector

Emission	Activity data	Emission factor value	Emission factor unit
NH₃	Population using latrines	1.6	kg/person/year
NMVOC	Amount of waste water produced	15	mg/m ³ waste water

Default EMEP emission factors for both NH₃ and NMVOC were used.

6.5.5 Activity data

Activity data were taken from water use, treatment and discharge national statistics (data base of state statistical survey “2-Water”).

Table 6.14 Activity data type and value example

Emission	Source of activity data	Activity data value (2015)
NH₃	Population using latrines	75 (thousands of people)
NMVOC	Amount of waste water produced and discharged	192 (millions of m ³)

Population using latrines was estimated through rate of urbanization (data of World Bank) and degree of treatment and discharge pathway or method for national population not connected to waste water collecting system (IPCC Guidelines 2006). Part of national population, not connected to waste water

collecting and treatment system, are served with septic tanks, which, according to EMEP/EEA 2016, is not source of NH₃ emissions.

Statistical data on number of national population served or not served by waste water collecting and treatment services is available from year 2000. Extrapolation was used to obtain part of population not served for period 1990-1999. Extrapolation and change in reporting procedure implemented in 2008 and again in 2011 can lead to some inconsistency of statistical data results.

Table 6.15 Activity data and result of emission (NH₃ and NMVOC) calculations from Waste Water Handling sector 1990-2015

Year	Population using latrines	Emission of NH ₃ , kt	Amount of waste water produced, mio m ³	Emission of NMVOC, kt
1990	117 164	0.187	600	0.00900
1991	116 726	0.187	571	0.00857
1992	116 060	0.186	526	0.00789
1993	113 543	0.182	427	0.00641
1994	111 577	0.179	402	0.00603
1995	109 806	0.176	357	0.00536
1996	108 443	0.174	331	0.00497
1997	107 362	0.172	327	0.00491
1998	108 052	0.173	320	0.00480
1999	107 091	0.171	283	0.00425
2000	106 115	0.170	257	0.00386
2001	123 179	0.197	244	0.00366
2002	114 880	0.184	243	0.00365
2003	95 313	0.153	229	0.00344
2004	112 302	0.180	211	0.00317
2005	110 157	0.176	226	0.00339
2006	106 107	0.170	196	0.00294
2007	104 127	0.167	210	0.00315
2008	123 157	0.197	191	0.00287
2009	107 003	0.171	226	0.00339
2010	112 129	0.179	222	0.00333
2011	64 780	0.104	241	0.00362
2012	81 441	0.130	234	0.00351
2013	80 245	0.128	229	0.00344
2014	80 677	0.129	182	0.00273
2015	74 997	0.120	192	0.00288

6.5.6 Uncertainties

The following uncertainties were used for Wastewater Handling sector for activity data and emission factors. Uncertainties were estimated, using similar methodology as in the UNFCCC NIR.

Table 6.16 Uncertainties for Waste Water handling sector

Emission	Activity data	Emission factor
NH ₃	9%	30%
NMVOC	10%	30%

6.5.7 QA/QC and verification

QA/QC and verification included:

- Quality check of activity data in the period of annual reporting, when water using enterprises are submitting their annual water data (including both number of national population served by waste water collection and/or certain type and level of treatment , and amount of total waste water discharged); data are submitted electronically in a water statistics data base “2-Water”, and only after a quality check, performed by an inspector of Regional Environment Board of State Environment Service, the particular report is included in a national statistics.

- Quality check in calculation of emissions for UNFCCC NIR;
- Trend analysis.

6.5.8 Recalculations

NH₃ emissions were recalculated for entire reporting period (1990 – 2014) due to harmonization of methodology to estimate number of population using latrines in accordance with IPCC Guidelines 2006 and UNFCCC NIR.

NMVOC emissions were recalculated for year 2013 due to update of activity data.

6.5.9 Planned improvements

No improvements are planned.

7 Other and Natural emissions (NFR 6A, 11B)

7.1 Biomass burning on - site in the forest (NFR 6A)

7.1.1 Sectoral overview

This category (NFR 6A) comprises NO_x, CO, PM_{2.5}, PM₁₀, TSP, PCDD/PCDF and PAHs emissions arising from burning on site in forest (Table 7.1)

Table 7.1 Emissions from on – site burning in the forest

	Unit	1990	1995	2000	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	Change in 1990-2015, %
NO _x	kt	0.15	0.21	0.35	0.08	0.06	0.07	0.06	0.07	0.05	0.05	0.04	0.04	0.05	0.05	-67.8
PM _{2.5}		1.27	1.74	2.89	0.62	0.51	0.53	0.46	0.55	0.39	0.39	0.35	0.35	0.40	0.41	-67.8
PM ₁₀		1.55	2.13	3.54	0.76	0.63	0.65	0.57	0.68	0.48	0.47	0.43	0.42	0.49	0.50	-67.8
TSP		2.39	3.29	5.47	1.17	0.97	1.00	0.88	1.04	0.74	0.73	0.66	0.66	0.75	0.77	-67.8
CO		10.97	15.11	25.09	5.37	4.45	4.61	4.03	4.79	3.38	3.37	3.02	3.01	3.44	3.53	-67.8
PCDD/F	g i-Teq	0.70	0.97	1.61	0.34	0.29	0.30	0.26	0.31	0.22	0.22	0.19	0.19	0.22	0.23	-67.8
PAHs	t	2.33	3.21	5.33	1.14	0.94	0.98	0.86	1.02	0.72	0.71	0.64	0.64	0.73	0.75	-67.8

Variation of the emissions depends from the annual felling stock and the approach used to utilize harvesting residues. Since 2005 it is becoming more common to use harvesting residues from final felling in forest biofuel production, therefore, incineration and other types of utilization of residues are not used widely anymore in final felling. In thinning harvesting residues are used to improve soils bearing capacity during forwarding. The study on the actual utilization practice was implemented by LSFRI Silava in 2012 and 2014. The study results demonstrated that no harvesting residues are incinerated in state forests and in 15 % of the clear-felling sites (by area) harvesting residues are incinerated in private forests²⁷. Due to lack of information about transition between previous practice and correct figures of incineration of harvesting residues, it is assumed that incineration of harvesting residues is reduced in 2011, but earlier studies²⁸ are used for previous years.

7.1.2 Methodological issues

Generally 2006 IPCC Guidelines, EMEP/EEA 2016 and EMEP/CORINAIR simpler methodology were used. Emissions are estimated as follows: emission factor multiplied by activity data provided by National forest inventory, State forest service and Fire and Rescue Service.

Dioxins (PCDD/ PCDF) are calculated according to the UNEP methodology, EF from 97. pp. 5 micrograms TEQ/t incinerated material.

7.1.3 Emission factors and other parameters

For CO and NO_x emission calculation from burning on - site in the forest were used default emission factors according to 2006 IPCC Guidelines, Volume 4, Chapter 2, Table 2.5. For PM_{2.5}, PM₁₀ and TSP emission calculation from burning on - site in the forest were used default emission factors according to EMEP/EEA 2016, 11.B Forest fires, Table 3-1 (Table 7.2).

Table 7.2 Emission factors for open burning of forests

Pollutant	Value	Unit
CO	78 ± 31	g kg ⁻¹ dry matter burnt
NO _x	1.1 ± 0.6	g kg ⁻¹ dry matter burnt
TSP	17	g kg ⁻¹ wood burned

²⁷ Lazdiņš, A., Zariņš, J., 2013. Meža ugunsgrēku un mežizstrādes atlieku dedzināšanas radītās siltumnīcefekta gāzu emisijas Latvijā (Greenhouse gas emissions due to forest fires and incineration of harvesting residues in Latvia), in: ReferātuTēzes. Presented at the Latvijas Universitātes 71. zinātniskā konference "Ģeogrāfija, ģeoloģija, vides zinātne", Latvijas Universitāte, Rīga, pp. 133–137.

²⁸ Lipiņš, L., 2004. Assessment of wood resources and efficiency of wood utilization (Koksnes izejvielu resersu un to izmantošanas efektivitātes novērtējums).

Pollutant	Value	Unit
PM ₁₀	11	g kg ⁻¹ wood burned
PM _{2.5}	9	g kg ⁻¹ wood burned

Emission factors for PAHs were estimated by multiplying the benz[a]pyrene emission factor by the appropriate ratios (Table 7.3).

Table 7.3 PAHs emission factors for open burning of forests

PAH	Default emission factor (best estimate), g t ⁻¹	Ratio	Emission factor, g t ⁻¹
Benzo [b] fluoranthene	7.2	0.6	4.32
Benzo [k] fluoranthene	7.2	0.3	2.16
Benz [a] pyrene	7.2	1.0	7.20
Indeno [123cd] pyrene	7.2	0.4	2.88

The following assumptions have been made for burnt harvesting residues calculation (Source: State Forest Service, private forest owners questionnaires):

- 1990 to 2000 – 50 % of harvesting residues left for incineration and 67 % incinerated, the rest left to decay;
- 2001 to 2004 – 30 % of harvesting residues left for incineration and 67 % incinerated and 70 % left to decay;
- 2005 to 2009 – 7 % of harvesting residues left for incineration and 100 % burned on-site, the rest left for decay or extracted for bioenergy production.
- starting from 2010 – 4 % of harvesting residues left for incineration and 100 % burned on-site, the rest left for decay or extracted for bioenergy production.

7.1.4 Activity data

Emissions from controlled fires were calculated considering average stock of harvesting residues (BEFs for conversion of stem biomass to above-ground biomass), which considerably increased due to increase of estimates of harvesting stock (Figure 7.1).

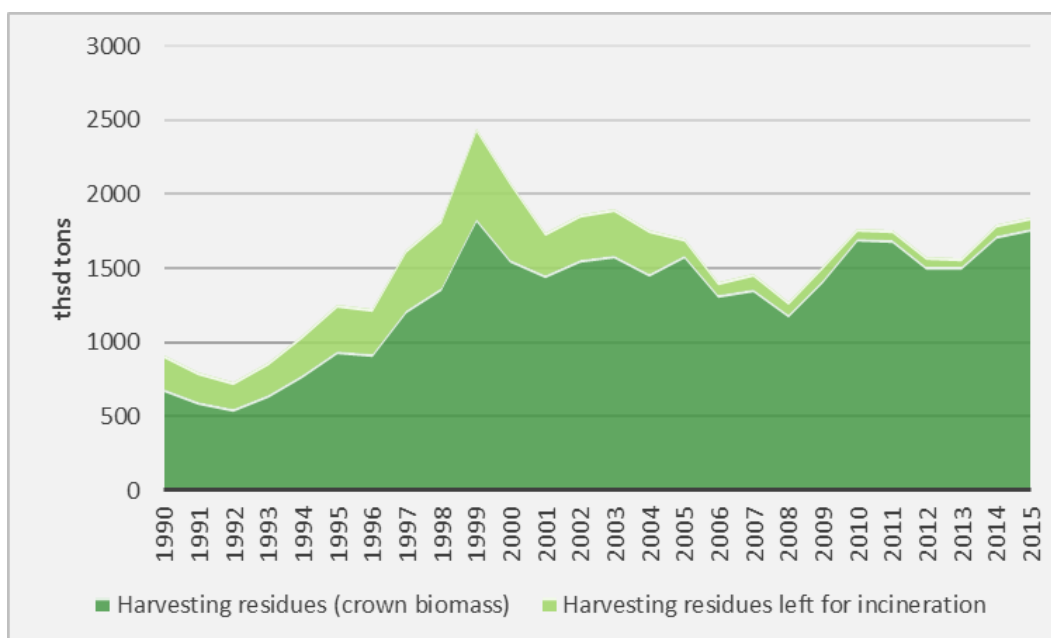


Figure 7.1 Harvesting residues and residues left for incineration (1000 tons)

7.1.5 Uncertainties

Combined activity data uncertainty is $\pm 92.6\%$. Uncertainties of emission factors are based on the 2006 IPCC Guidelines' and EMEP/EEA 2016 default values.

7.2 Forest wildfires (NFR 11B)

7.2.1 Sector overview

This source category (NFR 11B) includes NO_x, NMVOC, SO_x, NH₃, CO, PM_{2.5}, PM₁₀, TSP, PCDD/PCDF and PAHs emission from wildfires in forest land (Table 7.4).

Table 7.4 Emissions from forest wildfires

	Unit	1990	1995	2000	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	Change in 1990-2015, %
NO _x	kt	0.05	0.10	0.25	0.02	0.64	0.05	0.07	0.12	0.06	0.02	0.02	0.04	0.12	0.08	69.4
NMVOC		0.13	0.27	0.66	0.06	1.68	0.14	0.18	0.32	0.16	0.06	0.05	0.11	0.32	0.22	69.4
SO _x		0.01	0.02	0.05	0.00	0.13	0.01	0.01	0.02	0.01	0.00	0.00	0.01	0.02	0.02	69.4
NH ₃		0.01	0.02	0.06	0.01	0.14	0.01	0.02	0.03	0.01	0.01	0.00	0.01	0.03	0.02	69.4
PM _{2.5}		0.15	0.35	0.95	0.09	2.66	0.22	0.29	0.53	0.26	0.10	0.08	0.18	0.55	0.37	145.5
PM ₁₀		0.18	0.43	1.17	0.11	3.25	0.26	0.36	0.65	0.32	0.12	0.09	0.22	0.67	0.45	145.5
TSP		0.28	0.67	1.80	0.18	5.02	0.41	0.56	1.00	0.49	0.19	0.14	0.34	1.03	0.70	145.5
CO	g i-Teq	1.39	2.89	7.11	0.65	18.19	1.46	1.97	3.49	1.71	0.66	0.49	1.17	3.49	2.36	69.4
PCDD/F		0.08	0.20	0.53	0.05	1.48	0.12	0.16	0.29	0.15	0.06	0.04	0.10	0.30	0.20	145.5
PAHs		0.28	0.65	1.76	0.17	4.89	0.40	0.54	0.97	0.48	0.19	0.14	0.34	1.00	0.68	145.5

7.2.2 Methodological issues

Generally EMEP/EEA 2016, 2006 IPCC Guidelines and EMEP/CORINAIR simpler methodology were used. Emissions are estimated as follows: emission factor multiplied by activity data provided by National forest inventory, State forest service and Fire and Rescue Service. Dioxins (PCDD/ PCDF) are calculated according to the UNEP methodology, EF from 97. pp. 5 micrograms TEQ/t incinerated material.

Amount of burned biomass is considered according to average growing stock of living biomass, dead wood and litter in a particular year. Combustion efficiency or fraction of biomass combusted (dimension-less) is considered 0.45 according to Table 2.6 of 2006 IPCC Guidelines²⁹.

7.2.3 Emission factors and other parameters

For NO_x, NMVOC, SO_x, NH₃, CO, PM_{2.5}, PM₁₀ and TSP emission calculation from forest wildfires were used default emission factors according to EMEP/EEA 2016, 11.B Forest fires, Table 3-5 (Table 7.5).

Table 7.5 Emission factors for forests wildfires

Pollutant	Value	Unit
NO _x	190	kg ha ⁻¹ area burned
CO	5400	kg ha ⁻¹ area burned
NMVOC	500	kg ha ⁻¹ area burned
SO _x	38	kg ha ⁻¹ area burned
NH ₃	43	kg ha ⁻¹ area burned
TSP	17	g kg ⁻¹ wood burned
PM ₁₀	11	g kg ⁻¹ wood burned
PM _{2.5}	9	g kg ⁻¹ wood burned

Emission factors for PAHs were estimated by multiplying the benz[a]pyrene emission factor by the appropriate ratios (Table 7.3).

7.2.4 Activity data

The area statistics on forest wildfires are compiled by the State forest service and they are based on information given by the local units. Area of forest fires and biomass in burned area is shown in Figure 7.2.

²⁹ Combustion factor values (proportion of prefire biomass consumed) for fires in a range of vegetation types.

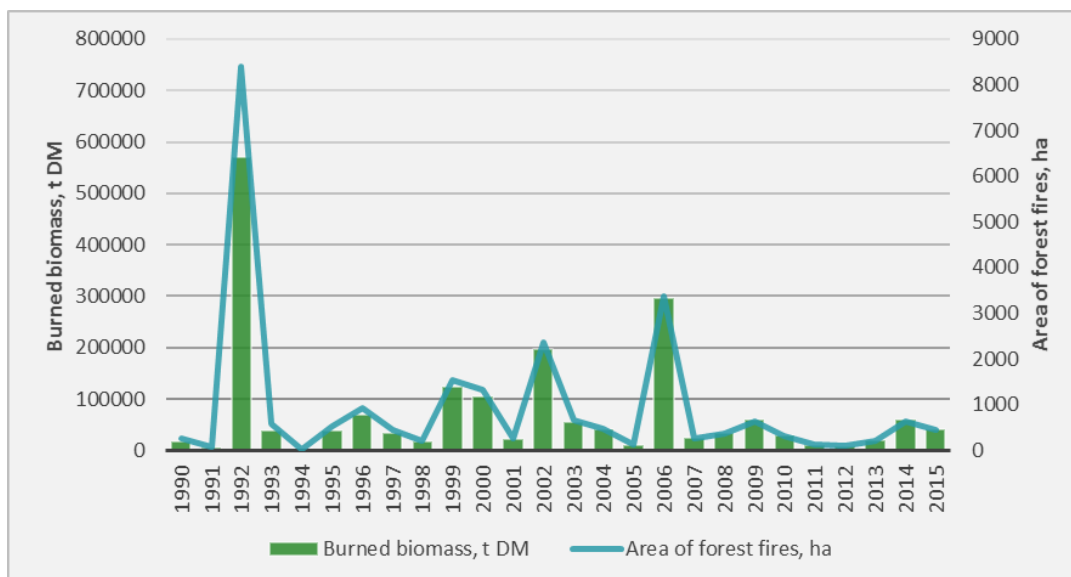


Figure 7.2 Area of forest fires and biomass in burned area

7.2.5 Uncertainties

Combined activity data uncertainty is $\pm 37.4\%$. Uncertainties of emission factors are based on the EMEP/EEA 2016 default values.

8 Recalculations and improvements

8.1 Recalculations

In Submission 2017, large recalculations have been made. That affected almost all main pollutant emissions, especially NMVOC (Figure 8.1).

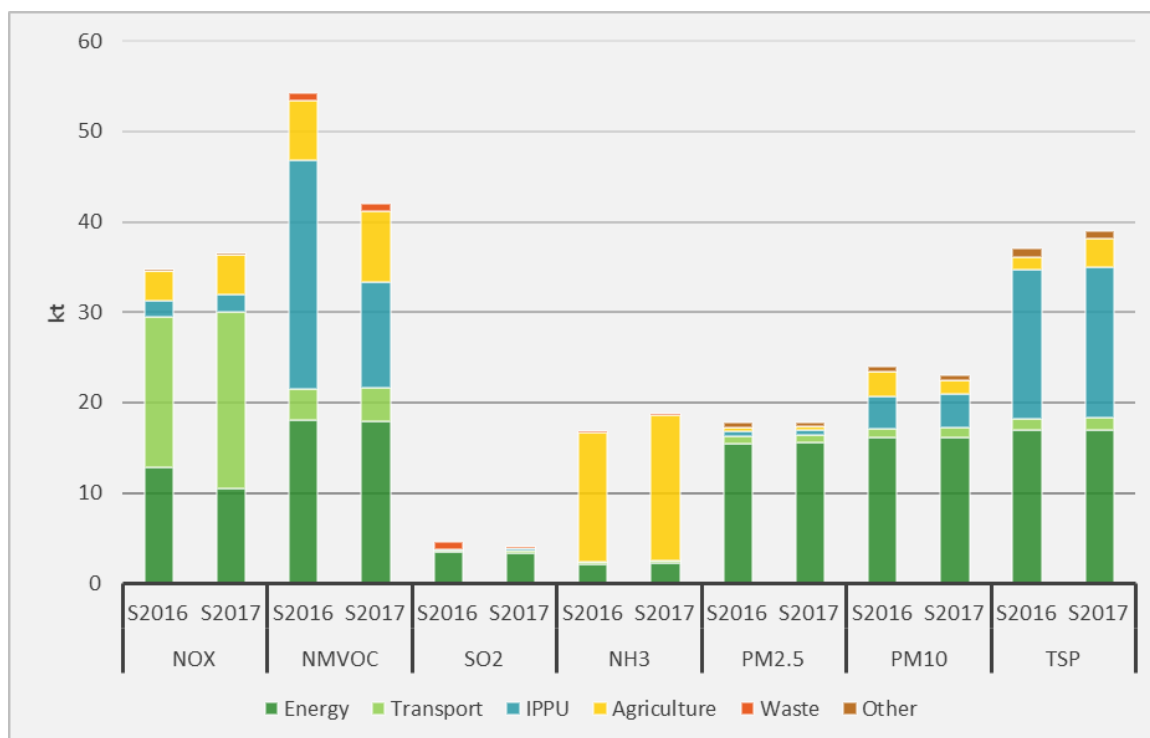


Figure 8.1 Emission comparison for 2014 between Submission 2016 and Submission 2017

Comparing reported emissions of 2014 in Submission 2016 and Submission 2017, NO_x emissions have increased by 4.96% mainly due to the changes in methodology in Energy and Agriculture subsectors. The remarkable changes in NMVOC emissions by -22.50% are because of changes in methodology in Solvent use (IPPU). NH₃ emissions have changed by 7.51%, which can be explained with methodology change in Agriculture. Changes in SO₂ emissions by 2.93% are because of changes in Energy and IPPU sector, as well as PM_{2.5} emissions by 0.17%. Total PM₁₀ emissions have decreased by 4.36% mainly due to recalculations in Agriculture and Other sector. TSP emissions have increased by 5.10% mainly due to Transport and Agriculture sector.

List of main recalculations by sectors are listed below:

Energy sector

- Emission factor changed to EMEP/EEA 2016;
- Corrected activity data mistakes;
- 90% of diesel that was consumed in 1A4ci Stationary combustion was moved to 1A4cii after information received from CSB, that only 10% of diesel fuel reported in Agriculture/Forestry/Fishing is consumed stationary.

IPPU sector

- Changes in activity data for glass production;
- Recalculations for all heavy metal emissions in Iron and Steel production;
- Updated methodology for Solvent use.

Agriculture sector

- Implementation of fully adopted the EMEP/EEA 2016 Tier 2 methodology to estimate NH₃, NO and NMVOC emissions from manure management and Tier 1 for PM, TSP and NMVOC;
- Implementation of country specific N excretion values;
- New EF for NH₃ emissions from inorganic N-fertiliser application according to EMEP/EEA 2016 guidelines;
- Tier 2 approach for calculation of PM_{2.5}, PM₁₀ emissions;
- Reporting emissions from other organic fertilizers.

Waste sector

- Recalculations are done due to changes of activity data for disposed amount;
- NH₃ emissions were recalculated for entire reporting period (1990 – 2014) due to harmonization of methodology to estimate number of population using latrines in accordance with IPCC Guidelines 2006 and UNFCCC NIR;
- NMVOC emissions were recalculated for year 2013 due to update of activity data.

8.2 Planned improvements

Planned improvements are as follow:

Energy sector

- No improvements planned.

IPPU sector

- It is planned to make more detailed analyse of activity data obtained from the Chemical Register and database “2-Air” for all time series, as well as to improve NMVOC emission calculation for historical years where statistics was not well kept.

Agriculture sector

- It is planned to improve consistent reporting of NH₃ emissions from biogas facilities with the sector 5B;
- Reporting of NH₃ emissions will be supplemented by NH₃ emission calculation from sewage sludge according to EMEP/EEA 2016 methodology. Reporting will include data of emission from use of pesticides.

Waste sector

- No improvements planned.

9 Projections

The latest data was reported on 30.04.2015. The next submission of projections is planned to be reported in 2017.

10 Submission of Latvia's gridded emissions data

The latest data were reported on 09.12.2013. The next submission of gridded emissions is planned to be reported in 2017.

11 References

- Report - Economic development of Latvia. Ministry of Economics of Latvia. 2011.
 - CSDD. Transportlīdzekļu statistikas kopsavilkums Latvijā. 2015.
 - Informācijas sagatavošana par gaistošo organisko savienojumu emisijām Latvijā atbilstoši ES Direktīvas 2001/81/EC prasībām, LPPC, Rīga:2002.
 - Agriculture and rural Area of Latvia. Ministry of Agriculture. 2011.
 - Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories. 1996.
 - Intergovernmental Panel on Climate Change (IPCC). Good Practice Guidance and Uncertainty management in National GHG. 2000.
 - UNEP Standardized Toolkit for Identification and Quantification of Dioxin and Furan Releases
 - The EMEP/EEA air pollutant emission inventory guidebook. Technical report No 9/2009.
 - Lipins L. Assessment of wood resources and electivity of wood utilization. 2004.
 - Research - Assessment, actualization and prediction of emission factors and coefficients of GHG and NH₃ from agriculture for projecting of GHG, based on "Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories - Module 4 Agriculture" and Guidelines of Project "Projecting the impact of agriculture on Greenhouse Gas Fluxes in Eastern Europe". Latvian State Institute of Agrarian Economics. 2005.
 - Melece.L. Pētījums par organisko augšņu (histosols) daudzumu Latvijā 1990-2004.
 - Sudārs R. Slāpekļa izdalīšanās no kūsmēsliem un kūsmēsļu apsaimniekošanas (savākšanas, uzglabāšanas un utilizācijas) sistēmas un to raksturojums.
 - LZA Fizikālās Enerģētikas institūts, "Pētījums par vietējās aviācijas un vietējo iekšzemes ūdensceļu degvielas patēriņu no 1990-2004". Rīga, 2006.
 - Informācijas sagatavošana par gaistošo organisko savienojumu emisijām Latvijā atbilstoši ES Direktīvas 2001/81/EC prasībām. LPPC, Rīga, 2002.
 - <http://www.csb.gov.lv:8080/dialog/statfile16.asp>
 - <http://www.lm.gov.lv/?sadala=255>
 - [Databases 2-Air, 2-Water, 3-Waste](#)
 - CSB Annual EUROSTAT Energy Questionnaire, 2015.
 - EMEP/EEA air pollutant emission inventory guidebook - 2016
 - EMEP/EEA air pollutant emission inventory guidebook - 2013
 - EMEP/EEA air pollutant emission inventory guidebook - 2009
 - Guidelines for Reporting data under the Convention on Long Range Transboundary Air pollution (ECE/EB.AIR/125).
 - Annual Energy data, CSB, 2015. Available on http://data.csb.gov.lv/Menu.aspx?selection=vide_lkgad%C4%93jie%20statistikas%20dati_Ener%C4%A3%C4%93tika&tablelist=true&px_tableid=EN0070.px&px_path=vide_lkgad%C4%93jie%20statistikas%20dati_Ener%C4%A3%C4%93tika&px_language=en&px_db=vide&rxid=cdbc978c-22b0-416a-aacc-aa650d3e2ce0
 - EU ETS data, available on LEGMC homepage ([2005-2007](#); [2008-2012](#)) and State Environmental Service ([2013-2020](#))
 - "Prodcom_2008.xls" CSB. Industrial production statistics, 2010.
 - <http://www.eea.europa.eu/publications/EMEPCORINAIR5>
- <http://www.eea.europa.eu/publications/emep-eea-guidebook-2013>

Annex I: Detailed methodological descriptions

Table 1 Emission factors and assumptions for Energy sector

	NOx	NM	VOC	NH ₃	PM _{2.5}	PM ₁₀	TSP	CO	Pb	Cd	Hg	As	Cr	Cu	Ni	Se	Zn	PCDD/F	B(a)p	B(b)f	B(k)f	I(1,2,3-cd)P	HCB	PCB	Reference
Unit	g/GJ							mg/GJ									ng I-TEQ/GJ	mg/GJ				μg/GJ	μg/WHO-TEG/GJ		
1.A.1																									
Diesel oil	65	0.8	NE	0.8	3.2	6.5	16.2	4.07	1.36	1.36	1.81	1.36	2.72	1.36	6.79	1.81	0.5	NE	NE	NE	0.007	NE	NE	EMEP/EEA 2016 - 1A1 - Table 3-6	
RFO	142	2.3	NE	19.3	25.2	35.6	15.1	4.56	1.2	0.341	3.98	2.55	5.31	255	2.06	87.8	2.5	NE	0.005	0.005	0.007	NE	NE	EMEP/EEA 2016 - 1A1 - Table 3-5	
LPG	89	2.6	NE	0.89	0.89	0.89	39	0.0015	0.00025	0.1	0.12	0.00076	0.000076	5E-04	0.011	0.002	0.5	6E-04	8E-04	8E-04	8E-04	NE	NE	EMEP/EEA 2016 - 1A1 - Table 3-4	
Jet fuel	65	0.8	NE	0.8	3.2	6.5	16.2	4.07	1.36	1.36	1.81	1.36	2.72	1.36	6.79	1.81	0.5	NE	NE	NE	0.007	NE	NE	EMEP/EEA 2016 - 1A1 - Table 3-6	
Other kerosene	65	0.8	NE	0.8	3.2	6.5	16.2	4.07	1.36	1.36	1.81	1.36	2.72	1.36	6.79	1.81	0.5	NE	NE	NE	0.007	NE	NE	EMEP/EEA 2016 - 1A1 - Table 3-6	
Other liquid	65	0.8	NE	0.8	3.2	6.5	16.2	4.07	1.36	1.36	1.81	1.36	2.72	1.36	6.79	1.81	0.5	NE	NE	NE	0.007	NE	NE	EMEP/EEA 2016 - 1A1 - Table 3-6	
Petroleum coke	65	0.8	NE	0.8	3.2	6.5	16.2	4.07	1.36	1.36	1.81	1.36	2.72	1.36	6.79	1.81	0.5	NE	NE	NE	0.007	NE	NE	EMEP/EEA 2016 - 1A1 - Table 3-6	
Waste oils	65	0.8	NE	0.8	3.2	6.5	16.2	4.07	1.36	1.36	1.81	1.36	2.72	1.36	6.79	1.81	0.5	NE	NE	NE	0.007	NE	NE	EMEP/EEA 2016 - 1A1 - Table 3-6	
Shale oil	65	0.8	NE	0.8	3.2	6.5	16.2	4.07	1.36	1.36	1.81	1.36	2.72	1.36	6.79	1.81	0.5	NE	NE	NE	0.007	NE	NE	EMEP/EEA 2016 - 1A1 - Table 3-6	
Coal	209	1	NE	3.4	7.7	11.4	8.7	7.3	0.9	1.4	7.1	4.5	7.8	4.9	23	19	10	7E-04	0.037	0.029	0.001	6.7	0.0033	EMEP/EEA 2016 - 1A1 - Table 3-2	
Coke	209	1	NE	3.4	7.7	11.4	8.7	7.3	0.9	1.4	7.1	4.5	7.8	4.9	23	19	10	7E-04	0.037	0.029	0.001	6.7	0.0033	EMEP/EEA 2016 - 1A1 - Table 3-2	
Peat briquettes	247	1.4	NE	3.2	7.9	11.7	8.7	15	1.8	2.9	14.3	9.1	1	9.7	45	8.8	10	0.001	0.037	0.029	0.002	6.7	0.0033	EMEP/EEA 2016 - 1A1 - Table 3-3	
Peat	247	1.4	NE	3.2	7.9	11.7	8.7	15	1.8	2.9	14.3	9.1	1	9.7	45	8.8	10	0.001	0.037	0.029	0.002	6.7	0.0033	EMEP/EEA 2016 - 1A1 - Table 3-3	
Natural gas	89	2.6	NE	0.89	0.89	0.89	39	0.0015	0.00025	0.1	0.12	0.00076	0.000076	5E-04	0.011	0.002	0.5	6E-04	8E-04	8E-04	8E-04			EMEP/EEA 2016 - 1A1 - Table 3-4	
Wood	81	7.31	NE	133	155	172	90	20.6	1.76	1.51	9.46	9.03	21.1	14.2	1.2	181	50	1.12	0.043	0.016	0.037	5	3.5	EMEP/EEA 2016 - 1A1 - table 3-7	
CH4 from Sludge Gas	89	2.6	NE	0.89	0.89	0.89	39	0.0015	0.00025	0.1	0.12	0.00076	0.000076	5E-04	0.011	0.002	0.5	6E-04	8E-04	8E-04	8E-04	NE	NE	EMEP/EEA 2016 - 1A1 - Table 3-4	
Landfill gas	89	2.6	NE	0.89	0.89	0.89	39	0.0015	0.00025	0.1	0.12	0.00076	0.000076	5E-04	0.011	0.002	0.5	6E-04	8E-04	8E-04	8E-04	NE	NE	EMEP/EEA 2016 - 1A1 - Table 3-4	

	NO _x	NM _{VOC}	NH ₃	PM _{2.5}	PM ₁₀	TSP	CO	Pb	Cd	Hg	As	Cr	Cu	Ni	Se	Zn	PCDD/F	B(a)p	B (b)f	B (k)f	I(1,2,3-cd)P	HCB	PCB	Reference	
Unit	g/GJ							mg/GJ									ng I-TEQ/GJ	mg/GJ				μg/GJ	μg/WHO-TEG/GJ		
Other Biogas	89	2.6	NE	0.89	0.89	0.89	39	0.0015	0.00025	0.1	0.12	0.00076	0.000076	5E-04	0.011	0.002	0.5	6E-04	8E-04	8E-04	8E-04	NE	NE	EMEP/EEA 2016 - 1A1 - Table 3-4	
Biodiesel	65	0.8	NE	0.8	3.2	6.5	16.2	4.07	1.36	1.36	1.81	1.36	2.72	1.36	6.79	1.81	0.5	NE	NE	NE	0.007	NE	NE	EMEP/EEA 2016 - 1A1 - Table 3-6	
1.A.2																									
Diesel oil	513	25	NE	20	20	20	66	0.08	0.006	0.12	0.03	0.2	0.22	0.008	0.11	29	1.4	0.002	0.015	0.002	0.002	NE	NE	EMEP/EEA 2016 - 1A2 - Table 3-4	
RFO	513	25	NE	20	20	20	66	0.08	0.006	0.12	0.03	0.2	0.22	0.008	0.11	29	1.4	0.002	0.015	0.002	0.002	NE	NE	EMEP/EEA 2016 - 1A2 - Table 3-4	
LPG	74	23	NE	0.78	0.78	0.78	29	0.011	0.0009	0.54	0.1	0.013	0.0026	0.013	0.058	0.73	0.52	7E-04	0.003	0.001	0.001	NE	NE	EMEP/EEA 2016 - 1A2 - Table 3-3	
Jet fuel	513	25	NE	20	20	20	66	0.08	0.006	0.12	0.03	0.2	0.22	0.008	0.11	29	1.4	0.002	0.015	0.002	0.002	NE	NE	EMEP/EEA 2016 - 1A2 - Table 3-4	
Other kerosene	513	25	NE	20	20	20	66	0.08	0.006	0.12	0.03	0.2	0.22	0.008	0.11	29	1.4	0.002	0.015	0.002	0.002	NE	NE	EMEP/EEA 2016 - 1A2 - Table 3-4	
Other liquid	513	25	NE	20	20	20	66	0.08	0.006	0.12	0.03	0.2	0.22	0.008	0.11	29	1.4	0.002	0.015	0.002	0.002	NE	NE	EMEP/EEA 2016 - 1A2 - Table 3-4	
Petroleum coke	513	25	NE	20	20	20	66	0.08	0.006	0.12	0.03	0.2	0.22	0.008	0.11	29	1.4	0.002	0.015	0.002	0.002	NE	NE	EMEP/EEA 2016 - 1A2 - Table 3-4	
Waste oils	513	25	NE	20	20	20	66	0.08	0.006	0.12	0.03	0.2	0.22	0.008	0.11	29	1.4	0.002	0.015	0.002	0.002	NE	NE	EMEP/EEA 2016 - 1A2 - Table 3-4	
Shale oil	513	25	NE	20	20	20	66	0.08	0.006	0.12	0.03	0.2	0.22	0.008	0.11	29	1.4	0.002	0.015	0.002	0.002	NE	NE	EMEP/EEA 2016 - 1A2 - Table 3-4	
Coal	173	88.8	NE	108	117	124	931	134	1.8	7.9	4	13.5	17.5	13	1.8	200	203	45.5	58.9	23.7	18.5	0.62	170	EMEP/EEA 2016 - 1A2 - Table 3-2	
Coke	173	88.8	NE	108	117	124	931	134	1.8	7.9	4	13.5	17.5	13	1.8	200	203	45.5	58.9	23.7	18.5	0.62	170	EMEP/EEA 2016 - 1A2 - Table 3-2	
Peat briquettes	173	88.8	NE	108	117	124	931	134	1.8	7.9	4	13.5	17.5	13	1.8	200	203	45.5	58.9	23.7	18.5	0.62	170	EMEP/EEA 2016 - 1A2 - Table 3-2	
Peat	173	88.8	NE	108	117	124	931	134	1.8	7.9	4	13.5	17.5	13	1.8	200	203	45.5	58.9	23.7	18.5	0.62	170	EMEP/EEA 2016 - 1A2 - Table 3-2	
Anthracite	173	88.8	NE	108	117	124	931	134	1.8	7.9	4	13.5	17.5	13	1.8	200	203	45.5	58.9	23.7	18.5	0.62	170	EMEP/EEA 2016 - 1A2 - Table 3-2	
Oil shale	173	88.8	NE	108	117	124	931	134	1.8	7.9	4	13.5	17.5	13	1.8	200	203	45.5	58.9	23.7	18.5	0.62	170	EMEP/EEA 2016 - 1A2 - Table 3-2	
Natural gas	74	23	NE	0.78	0.78	0.78	29	0.011	0.0009	0.54	0.1	0.013	0.0026	0.013	0.058	0.73	0.52	7E-04	0.003	0.001	0.001	NE	NE	EMEP/EEA 2016 - 1A2 - Table 3-3	
Wood	91	300	NE	140	143	150	570	27	13	0.56	0.19	23	6	2	0.5	512	100	10	16	5	4	5	0.06	EMEP/EEA 2016 - 1A2 - Table 3-5	

	NO _x	NM _{VOC}	NH ₃	PM _{2.5}	PM ₁₀	TSP	CO	Pb	Cd	Hg	As	Cr	Cu	Ni	Se	Zn	PCDD/F	B(a)p	B(b)f	B(k)f	I(1,2,3-cd)P	HCB	PCB	Reference
Unit	g/GJ							mg/GJ									ng I-TEQ/GJ	mg/GJ				μg/GJ	μg/WHO-TEQ/GJ	
Blodiesel	513	25	NE	20	20	20	66	0.08	0.006	0.12	0.03	0.2	0.22	0.008	0.11	29	1.4	0.002	0.015	0.002	0.002	NE	NE	EMEP/EEA 2016 - 1A2 - Table 3-4
Landfill gas	74	23	NE	0.78	0.78	0.78	29	0.011	0.0009	0.54	0.1	0.013	0.0026	0.013	0.058	0.73	0.52	7E-04	0.003	0.001	0.001	NE	NE	EMEP/EEA 2016 - 1A2 - Table 3-3
Unit	kg/Mg waste							g/Mg waste									μg I-TEQ/Mg waste				g/Mg waste			
Industrial wastes (used tires)	0.87	7.4	NE	0.004	0.007	0.01	0.07	1.3	0.1	0.056	0.016	NE	NE	0.14	NE	NE	350	NE	NE	NE	NE	0.002	NE	EMEP/EEA 2016 - 5.C.1.b - Table 3-1
Unit	g/Mg							mg/Mg									ng/Mg	μg/Mg				ng/Mg		
Municipal wastes	1071	5.9	3	3	3	3	41	58	4.6	18.8	6.2	16.4	13.7	21.6	11.7	24.7	52.5	8.4	17.9	9.5	11.6	45.2	3.4	EMEP/EEA 2016 - 5.C.1.a - Table 3-1
1.A.4.a i, 1.A.4.c i																								
Unit	g/GJ							mg/GJ									ng I-TEQ/GJ	mg/GJ				μg/GJ		
Diesel oil	513	25	NE	20	20	20	66	0.08	0.006	0.12	0.03	0.2	0.22	0.008	0.11	29	1.4	0.002	0.015	0.002	0.002	NE	NE	EMEP/EEA 2016 - 1A4 - Table 3-9
RFO	513	25	NE	20	20	20	66	0.08	0.006	0.12	0.03	0.2	0.22	0.008	0.11	29	1.4	0.002	0.015	0.002	0.002	NE	NE	EMEP/EEA 2016 - 1A4 - Table 3-9
LPG	74	23	NE	0.78	0.78	0.78	29	0.011	0.0009	0.54	0.1	0.013	0.0026	0.013	0.058	0.73	0.52	7E-04	0.003	0.001	0.001	NE	NE	EMEP/EEA 2016 - 1A4 - Table 3-8
Jet fuel	513	25	NE	20	20	20	66	0.08	0.006	0.12	0.03	0.2	0.22	0.008	0.11	29	1.4	0.002	0.015	0.002	0.002	NE	NE	EMEP/EEA 2016 - 1A4 - Table 3-9
Other kerosene	513	25	NE	20	20	20	66	0.08	0.006	0.12	0.03	0.2	0.22	0.008	0.11	29	1.4	0.002	0.015	0.002	0.002	NE	NE	EMEP/EEA 2016 - 1A4 - Table 3-9
Other liquid	513	25	NE	20	20	20	66	0.08	0.006	0.12	0.03	0.2	0.22	0.008	0.11	29	1.4	0.002	0.015	0.002	0.002	NE	NE	EMEP/EEA 2016 - 1A4 - Table 3-9
Petroleum coke	513	25	NE	20	20	20	66	0.08	0.006	0.12	0.03	0.2	0.22	0.008	0.11	29	1.4	0.002	0.015	0.002	0.002	NE	NE	EMEP/EEA 2016 - 1A2 - Table 3-4
Waste oils	513	25	NE	20	20	20	66	0.08	0.006	0.12	0.03	0.2	0.22	0.008	0.11	29	1.4	0.002	0.015	0.002	0.002	NE	NE	EMEP/EEA 2016 - 1A2 - Table 3-4
Shale oil	513	25	NE	20	20	20	66	0.08	0.006	0.12	0.03	0.2	0.22	0.008	0.11	29	1.4	0.002	0.015	0.002	0.002	NE	NE	EMEP/EEA 2016 - 1A4 - Table 3-9
Coal	173	88.8	NE	108	117	124	931	134	1.8	7.9	4	13.5	17.5	13	1.8	200	203	45.5	58.9	23.7	18.5	0.62	170	EMEP/EEA 2016 - 1A4 - Table 3-7
Coke	173	88.8	NE	108	117	124	931	134	1.8	7.9	4	13.5	17.5	13	1.8	200	203	45.5	58.9	23.7	18.5	0.62	170	EMEP/EEA 2016 - 1A4 - Table 3-7
Oil shale	173	88.8	NE	108	117	124	931	134	1.8	7.9	4	13.5	17.5	13	1.8	200	203	45.5	58.9	23.7	18.5	0.62	170	EMEP/EEA 2016 - 1A4 - Table 3-7
Peat briquettes	173	88.8	NE	108	117	124	931	134	1.8	7.9	4	13.5	17.5	13	1.8	200	203	45.5	58.9	23.7	18.5	0.62	170	EMEP/EEA 2016 - 1A4 - Table 3-7

	NO _x	NM	VOC	NH ₃	PM _{2.5}	PM ₁₀	TSP	CO	Pb	Cd	Hg	As	Cr	Cu	Ni	Se	Zn	PCDD/F	B (a)p	B (b)f	B (k)f	I (1,2,3-cd)P	HCB	PCB	Reference
Unit	g/GJ							mg/GJ									ng I-TEQ/GJ	mg/GJ				μg/GJ	μg/WHO-TEG/GJ		
Peat	173	88.8	NE	108	117	124	931	134	1.8	7.9	4	13.5	17.5	13	1.8	200	203	45.5	58.9	23.7	18.5	0.62	170	EMEP/EEA 2016 - 1A4 - Table 3-7	
Natural gas	74	23	NE	0.78	0.78	0.78	29	0.011	0.0009	0.54	0.1	0.013	0.0026	0.013	0.058	0.73	0.52	7E-04	0.003	0.001	0.001			EMEP/EEA 2016 - 1A4 - Table 3-8	
Wood	91	300	37	140	143	150	570	27	13	0.56	0.19	23	6	2	0.5	512	100	10	16	5	4	5	0.06	EMEP/EEA 2016 - 1A4 - Table 3-10	
Landfill gas	74	23	NE	0.78	0.78	0.78	29	0.011	0.0009	0.54	0.1	0.013	0.0026	0.013	0.058	0.73	0.52	7E-04	0.003	0.001	0.001			EMEP/EEA 2016 - 1A4 - Table 3-8	
Straws	91	300	37	140	143	150	570	27	13	0.56	0.19	23	6	2	0.5	512	100	10	16	5	4	5	0.06	EMEP/EEA 2016 - 1A4 - Table 3-10	
Biodiesel	513	25	NE	20	20	20	66	0.08	0.006	0.12	0.03	0.2	0.22	0.008	0.11	29	1.4	0.002	0.015	0.002	0.002			EMEP/EEA 2016 - 1A4 - Table 3-9	
Off road (1.A.2.f ii, 1.A.4.a ii, 1.A.4.b ii, 1.A.4.c ii, 1.A.4.c iii, 1.A.5.b ii)																									
Unit	g/tonnes fuel							mg/kg									μg/kg								
Gasoline: 2-stroke	2765	227289	3	3762	3762	3762	620793	1990-1998 - 0.00015 1999-2015 - 5.05391	0.01	NE	NE	0.05	1.7	0.07	0.01	1	NE	40	40	NE	NE	NE	NE	EMEP/EEA 2016 - 1A4 Other mobile - Table 3-1	
Gasoline: 4-stroke	7117	18893	4	157	157	157	770368		0.01	NE	NE	0.05	1.7	0.07	0.01	1	NE	40	40	NE	NE	NE	NE	EMEP/EEA 2016 - 1A4 Other mobile - Table 3-1	
Diesel	34457	3542	8	1913	1913	1913	7673	NE	0.01	NE	NE	0.05	1.7	0.07	0.01	1	NE	80	50	NE	NE	NE	NE	EMEP/EEA 2016 - 1A4 Other mobile - Table 3-1	
Unit	kg/Mg							g/Mg									μg/Mg					mg/Mg			
Aviation gasoline	4	19	NE	NE	NE	NE	1200	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	EMEP/EEA 2016 - 1A3d Navigation-shipment - Table 3-2	
Diesel oil (in Fisheries)	78.5	2.8	NE	1.4	1.5	1.5	7.4	0.13	0.01	0.03	0.04	0.05	0.88	1	0.1	1.2	0.13	NE	NE	NE	NE	0.08	0.038	EMEP/EEA 2016 - 1A3a Aviation - Table 3-4	

Table 2 Emission factors in Residential wood burning appliances

		Conventional boilers	Energy efficient stoves	Advanced/ecolabelled stoves	Conventional stoves	Pellet stoves
NO _x	g/GJ	80	80	95	50	80
CO		4000	4000	2000	4000	300
NM ₁₀		350	350	250	600	10
NH ₃		74	37	37	70	12

		Conventional boilers	Energy efficient stoves	Advanced/ecolabelled stoves	Conventional stoves	Pellet stoves
TSP		500	400	100	800	31
PM ₁₀		480	380	95	760	29
PM _{2.5}		470	370	93	740	29
BC		75.2	59.2	26.04	74	4.35
Pb	mg/GJ	27	27	27	27	27
Cd		13	13	13	13	13
Hg		0.56	0.56	0.56	0.56	0.56
As		0.19	0.19	0.19	0.19	0.19
Cr		23	23	23	23	23
Cu		6	6	6	6	6
Ni		2	2	2	2	2
Se		0.5	0.5	0.5	0.5	0.5
Zn		512	512	512	512	512
PCBs	µg/GJ	0.06	0.03	0.007	0.06	0.01
PCDD/F	ng/GJ	550	250	100	800	100
benzo(a)pyrene	mg/GJ	121	121	10	121	10
benzo(b)fluoranthene		111	111	16	111	16
benzo(k)fluoranthene		42	42	5	42	5
indeno(1,2,3-cd)pyrene		71	71	4	71	4
HCB	µg/GJ	5	5	5	5	5
Reference		EMEP/EEA 2016 - 1A1 - Table 3-18	EMEP/EEA 2016 - 1A1 - Table 3-23	EMEP/EEA 2016 - 1A1 - Table 3-24	EMEP/EEA 2016 - 1A1 - Table 3-17	EMEP/EEA 2016 - 1A1 - Table 3-25

Table 3 Sulphur content and SO₂ emission factors used in Energy sector

Fuel	NCV	Sulphur content (%)																				
		1990-95	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Diesel	42.49	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
RFO	40.60	2.00	2.00	2.12	2.10	2.00	2.08	1.98	1.96	2.02	1.38	1.23	0.99	1.21	0.91	0.79	0.91	0.97	0.94	0.80	0.84	0.79
Gasoline	43.97	0.015	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Jet fuel	43.21	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Other liquid fuels	41.86	0.65	0.61	0.59	0.58	0.57	0.56	0.55	0.53	0.52	0.51	0.50	0.48	0.47	0.46	0.45	0.44	0.42	0.41	0.40	0.39	0.40
LPG	45.54	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Shale oil	39.35	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Coal	23.91	1.80	1.80	1.47	1.37	1.06	0.90	0.87	0.78	0.66	0.67	0.72	0.66	0.52	0.45	0.46	0.39	0.41	0.50	0.44	0.48	0.57
Coke	26.79	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60
Oil shale	9.20	1.60	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Peat	10.05	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30
RFO (marine)	40.60	2.00	2.00	2.00	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.00	1.00	1.00	1.00	1.00	1.00
Wood	6.70	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015
Natural gas	Changes annually	0.00029	0.00029	0.00029	0.00029	0.00029	0.00029	0.00029	0.00029	0.00029	0.00029	0.00029	0.00029	0.00029	0.00029	0.00029	0.00029	0.00029	0.00029	0.00029	0.00029	0.00029
EF (kt/PJ)																						
Diesel		0.094	0.094	0.094	0.094	0.094	0.094	0.094	0.094	0.094	0.094	0.094	0.094	0.094	0.047	0.047	0.047	0.047	0.047	0.047	0.047	0.047
RFO		0.966	0.966	1.024	1.013	0.968	1.003	0.957	0.948	0.976	0.665	0.596	0.479	0.583	0.441	0.382	0.442	0.467	0.456	0.389	0.405	0.384
Gasoline		0.0068	0.0068	0.0068	0.0068	0.0068	0.0068	0.0068	0.0068	0.0068	0.0068	0.0068	0.0023	0.0023	0.0023	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Jet fuel		0.046	0.046	0.046	0.046	0.046	0.046	0.046	0.046	0.046	0.046	0.046	0.046	0.046	0.046	0.046	0.046	0.046	0.046	0.046	0.046	0.046
Other liquid fuels		0.311	0.290	0.284	0.278	0.273	0.267	0.261	0.255	0.249	0.243	0.237	0.231	0.226	0.220	0.214	0.208	0.202	0.196	0.190	0.184	0.190
LPG		0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013
Shale oil		0.407	0.407	0.407	0.407	0.407	0.407	0.407	0.407	0.407	0.407	0.407	0.407	0.407	0.407	0.407	0.407	0.407	0.407	0.407	0.407	0.407
Coal		1.138	1.138	0.928	0.865	0.673	0.567	0.551	0.493	0.451	0.459	0.498	0.454	0.357	0.308	0.319	0.266	0.280	0.342	0.328	0.359	0.427
Coke		0.410	0.410	0.410	0.410	0.410	0.410	0.410	0.403	0.403	0.403	0.403	0.403	0.403	0.403	0.403	0.403	0.403	0.403	0.403	0.403	0.403
Oil shale		3.130	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Peat		0.508	0.508	0.508	0.508	0.508	0.508	0.508	0.508	0.508	0.508	0.508	0.508	0.508	0.508	0.508	0.508	0.508	0.508	0.508	0.508	0.508
RFO (marine)		0.966	0.966	0.966	0.724	0.724	0.724	0.724	0.724	0.724	0.724	0.724	0.724	0.724	0.724	0.724	0.483	0.483	0.483	0.483	0.483	0.483
Wood		0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045
Natural gas		0.00017	0.00018	0.00018	0.00018	0.00018	0.00017	0.00017	0.00017	0.00017	0.00017	0.00017	0.00017	0.00017	0.00017	0.00017	0.00017	0.00017	0.00017	0.00017	0.00017	0.00016

Notes:

Gasoline, diesel oil – EU legislation

RFO – EU legislation, average value from database Nr.2-Air

Other liquids – average value from database Nr.2-Air

Coal – average value from database Nr.2-Air

Shale oil – Luik, H. "Coal, oil shale, natural bitumen, heavy oil and peat" Vol. II *Chemicals and Other products from Shale Oil*

Oil shale – Gavrilova, O., Randa, T., Vallner, L., Strandberg, M., Vilu, R. 2005. "Life Cycle Analysis of the Estonian Oil Shale Industry"

Peat, peat briquettes – Latvian Peat Producers Association

Wood – Zandersons, J., Žūriņš, A., Rižikovs, J., Dobeļe, G., Latvian Institute of Wood chemistry "Feasibility of processing and utilisation of used up railway sleepers"

Natural gas – allowed content of mercaptan (3 mg/m³)

Table 4 Distribution of road transport fleet by subsectors and layers, year 2015

Subsector	Technology	Population	Mileage, km
Passenger Cars			
Gasoline <1,4 l	ECE 15/03	178	2700
Gasoline <1,4 l	ECE 15/04	712	3600
Gasoline <1,4 l	PC Euro 1 - 91/441/EEC	1917	5500
Gasoline <1,4 l	PC Euro 2 - 94/12/EEC	6464	9000
Gasoline <1,4 l	PC Euro 3 - 98/69/EC Stage2000	7127	12000
Gasoline <1,4 l	PC Euro 4 - 98/69/EC Stage2005	11283	14000
Gasoline <1,4 l	PC Euro 5 - EC 715/2007	6904	19000
Gasoline <1,4 l	PC Euro 6 - EC 715/2007	1735	19000
Gasoline 1,4 - 2,0 l	ECE 15/00-01	0	0
Gasoline 1,4 - 2,0 l	ECE 15/02	0	0
Gasoline 1,4 - 2,0 l	ECE 15/03	1933	2430
Gasoline 1,4 - 2,0 l	ECE 15/04	7734	3600
Gasoline 1,4 - 2,0 l	PC Euro 1 - 91/441/EEC	47299	7150
Gasoline 1,4 - 2,0 l	PC Euro 2 - 94/12/EEC	40295	12000
Gasoline 1,4 - 2,0 l	PC Euro 3 - 98/69/EC Stage2000	23140	15068
Gasoline 1,4 - 2,0 l	PC Euro 4 - 98/69/EC Stage2005	27703	17000
Gasoline 1,4 - 2,0 l	PC Euro 5 - EC 715/2007	10744	20000
Gasoline 1,4 - 2,0 l	PC Euro 6 - EC 715/2007	1616	22000
Gasoline >2,0 l	ECE 15/00-01	0	0
Gasoline >2,0 l	ECE 15/02	0	0
Gasoline >2,0 l	ECE 15/03	214	2700
Gasoline >2,0 l	ECE 15/04	855	4228
Gasoline >2,0 l	PC Euro 1 - 91/441/EEC	7740	9902
Gasoline >2,0 l	PC Euro 2 - 94/12/EEC	8080	14000
Gasoline >2,0 l	PC Euro 3 - 98/69/EC Stage2000	8250	15000
Gasoline >2,0 l	PC Euro 4 - 98/69/EC Stage2005	8348	19000
Gasoline >2,0 l	PC Euro 5 - EC 715/2007	2397	21000
Gasoline >2,0 l	PC Euro 6 - EC 715/2007	483	21500
Diesel <2,0 l	Conventional	3928	10000
Diesel <2,0 l	PC Euro 1 - 91/441/EEC	19900	11000
Diesel <2,0 l	PC Euro 2 - 94/12/EEC	35953	12000
Diesel <2,0 l	PC Euro 3 - 98/69/EC Stage2000	54926	14000
Diesel <2,0 l	PC Euro 4 - 98/69/EC Stage2005	39650	18374
Diesel <2,0 l	PC Euro 5 - EC 715/2007	18931	24586
Diesel <2,0 l	PC Euro 6 - EC 715/2007	2818	24738
Diesel >2,0 l	Conventional	4103	11872
Diesel >2,0 l	PC Euro 1 - 91/441/EEC	14273	13000
Diesel >2,0 l	PC Euro 2 - 94/12/EEC	21604	14000
Diesel >2,0 l	PC Euro 3 - 98/69/EC Stage2000	51068	15000
Diesel >2,0 l	PC Euro 4 - 98/69/EC Stage2005	28676	18955
Diesel >2,0 l	PC Euro 5 - EC 715/2007	8580	23700
Diesel >2,0 l	PC Euro 6 - EC 715/2007	1476	25039
LPG	Conventional	2563	15000
LPG	PC Euro 1 - 91/441/EEC	10026	17471
LPG	PC Euro 2 - 94/12/EEC	13754	20000
LPG	PC Euro 3 - 98/69/EC Stage2000	10818	21000
LPG	PC Euro 4 - 98/69/EC Stage2005	7012	22040
LPG	PC Euro 5 - EC 715/2007	2619	23690
LPG	PC Euro 6 - EC 715/2007	87	24620
Light Duty Vehicles			
LPG	Conventional	174	30369
LPG	LD Euro 1 - 93/59/EEC	152	30369
LPG	LD Euro 2 - 96/69/EEC	201	31000
LPG	LD Euro 3 - 98/69/EC Stage2000	130	33000
LPG	LD Euro 4 - 98/69/EC Stage2005	261	43074
LPG	LD Euro 5 - 2008 Standards	166	47984
Gasoline <3,5t	Conventional	218	17000

Subsector	Technology	Population	Mileage, km
Gasoline <3,5t	LD Euro 1 - 93/59/EEC	195	18000
Gasoline <3,5t	LD Euro 2 - 96/69/EEC	349	19000
Gasoline <3,5t	LD Euro 3 - 98/69/EC Stage2000	294	21500
Gasoline <3,5t	LD Euro 4 - 98/69/EC Stage2005	586	28000
Gasoline <3,5t	LD Euro 5 - 2008 Standards	366	31000
Gasoline <3,5t	LD Euro 6	59	31000
Diesel <3,5 t	Conventional	2018	25000
Diesel <3,5 t	LD Euro 1 - 93/59/EEC	3300	25000
Diesel <3,5 t	LD Euro 2 - 96/69/EEC	7432	26000
Diesel <3,5 t	LD Euro 3 - 98/69/EC Stage2000	8817	27800
Diesel <3,5 t	LD Euro 4 - 98/69/EC Stage2005	12215	32460
Diesel <3,5 t	LD Euro 5 - 2008 Standards	9344	39000
Diesel <3,5 t	LD Euro 6	247	39000
Heavy Duty Trucks			
LPG	Conventional	262	24000
LPG	HD Euro I - 91/542/EEC Stage I	158	24400
LPG	HD Euro II - 91/542/EEC Stage II	63	26000
Gasoline >3,5 t	Conventional	0	18000
Gasoline >3,5 t	HD Euro I - 91/542/EEC Stage I	947	18500
Gasoline >3,5 t	HD Euro II - 91/542/EEC Stage II	76	18644
Gasoline >3,5 t	HD Euro III - 2000 Standards	13	25057
Rigid <=7,5 t	Conventional	582	20400
Rigid <=7,5 t	HD Euro I - 91/542/EEC Stage I	709	20411
Rigid <=7,5 t	HD Euro II - 91/542/EEC Stage II	599	20411
Rigid <=7,5 t	HD Euro III - 2000 Standards	551	27431
Rigid <=7,5 t	HD Euro IV - 2005 Standards	406	40071
Rigid <=7,5 t	HD Euro V - 2008 Standards	210	42079
Rigid <=7,5 t	HD Euro VI	33	42079
Rigid 7,5 - 12 t	Conventional	311	20600
Rigid 7,5 - 12 t	HD Euro I - 91/542/EEC Stage I	378	20603
Rigid 7,5 - 12 t	HD Euro II - 91/542/EEC Stage II	297	20603
Rigid 7,5 - 12 t	HD Euro III - 2000 Standards	356	28929
Rigid 7,5 - 12 t	HD Euro IV - 2005 Standards	245	40291
Rigid 7,5 - 12 t	HD Euro V - 2008 Standards	96	40565
Rigid 7,5 - 12 t	HD Euro VI	47	40565
Rigid 12 - 14 t	Conventional	100	20700
Rigid 12 - 14 t	HD Euro I - 91/542/EEC Stage I	110	20702
Rigid 12 - 14 t	HD Euro II - 91/542/EEC Stage II	66	20702
Rigid 12 - 14 t	HD Euro III - 2000 Standards	36	23111
Rigid 12 - 14 t	HD Euro IV - 2005 Standards	47	39129
Rigid 12 - 14 t	HD Euro V - 2008 Standards	16	41534
Rigid 12 - 14 t	HD Euro VI	8	41534
Rigid 14 - 20 t	Conventional	546	29000
Rigid 14 - 20 t	HD Euro I - 91/542/EEC Stage I	712	29000
Rigid 14 - 20 t	HD Euro II - 91/542/EEC Stage II	1183	29000
Rigid 14 - 20 t	HD Euro III - 2000 Standards	1810	36000
Rigid 14 - 20 t	HD Euro IV - 2005 Standards	1351	62000
Rigid 14 - 20 t	HD Euro V - 2008 Standards	3073	67000
Rigid 14 - 20 t	HD Euro VI	718	67000
Rigid 20 - 26 t	Conventional	183	38000
Rigid 20 - 26 t	HD Euro I - 91/542/EEC Stage I	244	38000
Rigid 20 - 26 t	HD Euro II - 91/542/EEC Stage II	341	38000
Rigid 20 - 26 t	HD Euro III - 2000 Standards	389	53000
Rigid 20 - 26 t	HD Euro IV - 2005 Standards	360	74000
Rigid 20 - 26 t	HD Euro V - 2008 Standards	583	78000
Rigid 20 - 26 t	HD Euro VI	274	78000
Rigid 26 - 28 t	Conventional	12	38000
Rigid 26 - 28 t	HD Euro I - 91/542/EEC Stage I	20	38000
Rigid 26 - 28 t	HD Euro II - 91/542/EEC Stage II	33	38000
Rigid 26 - 28 t	HD Euro III - 2000 Standards	49	53000

Subsector	Technology	Population	Mileage, km
Rigid 26 - 28 t	HD Euro IV - 2005 Standards	34	74000
Rigid 26 - 28 t	HD Euro V - 2008 Standards	59	78000
Rigid 26 - 28 t	HD Euro VI	42	78000
Rigid 28 - 32 t	Conventional	14	38400
Rigid 28 - 32 t	HD Euro I - 91/542/EEC Stage I	18	38400
Rigid 28 - 32 t	HD Euro II - 91/542/EEC Stage II	55	38400
Rigid 28 - 32 t	HD Euro III - 2000 Standards	59	53000
Rigid 28 - 32 t	HD Euro IV - 2005 Standards	56	74000
Rigid 28 - 32 t	HD Euro V - 2008 Standards	83	78000
Rigid 28 - 32 t	HD Euro VI	30	78000
Rigid >32 t	Conventional	17	38400
Rigid >32 t	HD Euro I - 91/542/EEC Stage I	21	38400
Rigid >32 t	HD Euro II - 91/542/EEC Stage II	39	38400
Rigid >32 t	HD Euro III - 2000 Standards	45	53000
Rigid >32 t	HD Euro IV - 2005 Standards	99	74000
Rigid >32 t	HD Euro V - 2008 Standards	38	78000
Rigid >32 t	HD Euro VI	9	78000
Articulated 14 - 20 t	Conventional	235	29200
Articulated 14 - 20 t	HD Euro I - 91/542/EEC Stage I	305	29500
Articulated 14 - 20 t	HD Euro II - 91/542/EEC Stage II	507	29550
Articulated 14 - 20 t	HD Euro III - 2000 Standards	776	38000
Articulated 14 - 20 t	HD Euro IV - 2005 Standards	579	62000
Articulated 14 - 20 t	HD Euro V - 2008 Standards	1317	67000
Articulated 14 - 20 t	HD Euro VI	308	67000
Articulated 20 - 28 t	Conventional	250	38000
Articulated 20 - 28 t	HD Euro I - 91/542/EEC Stage I	342	38000
Articulated 20 - 28 t	HD Euro II - 91/542/EEC Stage II	489	38000
Articulated 20 - 28 t	HD Euro III - 2000 Standards	586	52000
Articulated 20 - 28 t	HD Euro IV - 2005 Standards	513	74000
Articulated 20 - 28 t	HD Euro V - 2008 Standards	845	78000
Articulated 20 - 28 t	HD Euro VI	433	78000
Articulated 28 - 34 t	Conventional	38	38000
Articulated 28 - 34 t	HD Euro I - 91/542/EEC Stage I	50	38000
Articulated 28 - 34 t	HD Euro II - 91/542/EEC Stage II	121	38000
Articulated 28 - 34 t	HD Euro III - 2000 Standards	135	52000
Articulated 28 - 34 t	HD Euro IV - 2005 Standards	188	74000
Articulated 28 - 34 t	HD Euro V - 2008 Standards	160	78000
Articulated 28 - 34 t	HD Euro VI	51	78000
Buses			
Urban Buses	Conventional	0	29840
Urban Buses	HD Euro I - 91/542/EEC Stage I	0	29840
Urban Buses	HD Euro II - 91/542/EEC Stage II	0	29840
Urban Buses Midi <=15 t	Conventional	130	32567
Urban Buses Midi <=15 t	HD Euro I - 91/542/EEC Stage I	256	32567
Urban Buses Midi <=15 t	HD Euro II - 91/542/EEC Stage II	259	32567
Urban Buses Midi <=15 t	HD Euro III - 2000 Standards	266	43891
Urban Buses Midi <=15 t	HD Euro IV - 2005 Standards	365	56098
Urban Buses Midi <=15 t	HD Euro V - 2008 Standards	622	62520
Urban Buses Midi <=15 t	HD Euro VI	163	62520
Coaches Standard <=18 t	Conventional	185	47805
Coaches Standard <=18 t	HD Euro I - 91/542/EEC Stage I	155	47805
Coaches Standard <=18 t	HD Euro II - 91/542/EEC Stage II	172	47805
Coaches Standard <=18 t	HD Euro III - 2000 Standards	165	59027
Coaches Standard <=18 t	HD Euro IV - 2005 Standards	130	72020
Coaches Standard <=18 t	HD Euro V - 2008 Standards	141	79080
Coaches Standard <=18 t	HD Euro VI	58	79080
Coaches Articulated >18 t	Conventional	48	47805
Coaches Articulated >18 t	HD Euro I - 91/542/EEC Stage I	102	47805
Coaches Articulated >18 t	HD Euro II - 91/542/EEC Stage II	171	47805
Coaches Articulated >18 t	HD Euro III - 2000 Standards	257	59027

Subsector	Technology	Population	Mileage, km
Coaches Articulated >18 t	HD Euro IV - 2005 Standards	80	72020
Coaches Articulated >18 t	HD Euro V - 2008 Standards	18	79080
Coaches Articulated >18 t	HD Euro VI	104	79080
Mopeds and Motorcycles			
<50 cm ³	Conventional	0	1000
<50 cm ³	Mop - Euro I	718	1150
<50 cm ³	Mop - Euro II	13604	2298
<50 cm ³	Mop - Euro III	0	0
2-stroke >50 cm ³	Conventional	1156	1100
2-stroke >50 cm ³	Mot - Euro I	514	1600
2-stroke >50 cm ³	Mot - Euro II	473	1600
2-stroke >50 cm ³	Mot - Euro III	2119	2866
4-stroke <250 cm ³	Mot - Euro III	717	400
4-stroke 250 - 750 cm ³	Conventional	1714	1400
4-stroke 250 - 750 cm ³	Mot - Euro I	782	2000
4-stroke 250 - 750 cm ³	Mot - Euro II	1045	2000
4-stroke 250 - 750 cm ³	Mot - Euro III	1943	4000
4-stroke >750 cm ³	Conventional	839	1800
4-stroke >750 cm ³	Mot - Euro I	729	2000
4-stroke >750 cm ³	Mot - Euro II	816	2000
4-stroke >750 cm ³	Mot - Euro III	1973	5006

Annex II: National energy balance

Table 1 National Energy Balance in 2015, TJ

	Oil products - total	Shale oil	Liquefied petroleum gas	Motor and aviation petrol	Petrol type jet fuel	Kerosene type jet fuel	Kerosene	Diesel oil (oven fuel inclusive)	Residual (heavy) fuel oils	White spirit	Lubricants	Oil bitumen	Paraffin waxes	Other oil products	Used oils	Coal	Peat	Peat briquettes	Coke oven coke	Natural gas	Fuelwood	Used tires	Municipal waste for heating	Charcoal	Bioethanol	Biodiesel	Landfill gas	Sewage sludge gas	Other biogas	Straw
NCV		39.35	45.54	43.97	43.21	43.21	43.2	42.49	40.6	41.86	41.86	41.86	41.86	41.86	29.23	23.91	10.05	0.02	26.79	34.8		27.98	17.05	30	26.8	37.2	19.02	20.49	19.02	14.4
Production	268										268							3			83986				81	2465	350	85	3239	135
Recycled products	29														29						0	84	256							
Imports	101335	39	9567	10470		4512		71066	29	42	1675	3433	335	167		1711		2	0	45435	4093	224	1722	120	306	632				
Imported for bunkering	10666							5226	5440												0									
Exports	40719	39	5510	1988				31485	609		879			209		48		2			33695			330	54	2223				
Bunkering	10666							5226	5440												0									
Interproduct transfers																					0									
Stock changes	-2361		46	176				-3106	607		-42	-84		42		287	10	-2		661	-1823		17	-60	-11	-149				
Statistical difference	4088			264				3824																						
Gross energy consumption	62640		4103	8922		4512		40299	27	42	1022	3349	335	0	29	1950	10	1	0	46096	52561	308	1995	-270	322	725	350	85	3239	135
Transformation	-45		-8					-24	-13							-165				-31791	-14737			330			-217	-85	-3008	-20
Electricity plants																														
Public CHP	-8							-8								-98				-28686	-7850						-28	-85	-2213	
Autoproducer CHP																				-401	-509						-189		-795	
Public Heat Plants	-20		-1					-6	-13							-7				-2026	-4436									
Autoproducer Heat Plants	-17		-7					-10								-60				-678	-1238									-20
Production of peat briquettes																														
Charcoal Production																					-704			330						

	Oil products - total	Shale oil	Liquefied petroleum gas	Motor and aviation petrol	Petrol type jet fuel	Kerosene type jet fuel	Kerosene	Diesel oil (oven fuel inclusive)	Residual (heavy) fuel oils	White spirit	Lubricants	Oil bitumen	Paraffin waxes	Other oil products	Used oils	Coal	Peat	Peat briquettes	Coke oven coke	Natural gas	Fuelwood	Used tires	Municipal waste for heating	Charcoal	Bioethanol	Biodiesel	Landfill gas	Sewage sludge gas	Other biogas	Straw
Energy sector	255							255												683										
Losses																				338										
Final consumption	62340		4095	8922		4512		40020	14	42	1022	3349	335		29	1785	10	1	0	13284	37824	308	1995	60	322	725	133		231	115
Transport	47641		2687	8585		4512		30895			962														322	632				
International air transport	4494					4494																								
Domestic air transport	24			6		18																								
Road transport	40172		2687	8576				28001			908														322	558				
Rail transport	2819							2765			54															74				
Inland shipping	132			3				129																						
Pipeline transport																														
Industry and construction	5769		406	48				1547	13	42		3349	335		29	1014	10	1	0	5063	14963	308	1995			3			31	29
Manufacture of metals																				406										
Manufacture of chemicals and chemical products	193		139	3				9		42										323	221					1			29	
Manufacture of other fabricated metal products																1				60										
Manufacture of other non-metallic mineral products	281		1	0				280								957			0	1207	3	308	1995			2				
Manufacture of transport equipment	23		5	0				18								0				40	1									
Machinery	27		14	1				12								2		1		171	96									
Mining and quarrying	123			1				122								2	10			41	3									

	Oil products - total	Shale oil	Liquefied petroleum gas	Motor and aviation petrol	Petrol type jet fuel	Kerosene type jet fuel	Kerosene	Diesel oil (oven fuel inclusive)	Residual (heavy) fuel oils	White spirit	Lubricants	Oil bitumen	Paraffin waxes	Other oil products	Used oils	Coal	Peat	Peat briquettes	Coke oven coke	Natural gas	Fuelwood	Used tires	Municipal waste for heating	Charcoal	Bioethanol	Biodiesel	Landfill gas	Sewage sludge gas	Other biogas	Straw
Manufacture of food products, beverages and tobacco	297		148	1				111	8						29	24				1538	209								2	29
Manufacture of paper and paper products	6		4					2												95	5									
Manufacture of wood and of products of wood and cork	495		27	15				327					126							502	14223									
Construction	4087		66	27				641	4			3349				2				432	59									
Manufacture of textiles	6		0					6								24				172	5									
Manufacture of other products	231		2	0				19	1				209			2				76	138									
Other sectors	8930		1002	289				7578	1		60					771		0		8221	22861			60		90	133		200	86
Other consumers - commercial and public sector	2226		137	44				2044	1							263		0		3590	3341					15	133			14
Households	2055		773	220				1062								501				4116	19130			60						
Crop and animal production, hunting and related service activities; forestry and logging	4434		92	25				4258			59					7				512	382					75			200	72
Fishing	215		0	0				214			1									3	8									

Table 2 Fuel consumption in Energy sector (stationary combustion), TJ

1.A.1 Energy Industries

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
1.A.1. Energy Industries																										
Total	94338	88210	73651	57391	53160	50514	51326	52637	54187	48325	42657	44355	43268	43796	41000	40407	41916	39400	38929	37897	45595	42380	40380	46021	43786	46657
Liquid Fuels	40437	33253	28441	27170	30859	20519	27333	17437	20662	17491	7900	5235	5033	3576	3055	2365	1511	1389	905	1194	918	848	662	466	319	283
Solid Fuels	2305	1736	1935	2106	1366	1395	740	541	455	398	371	398	285	209	210	183	105	341	446	472	419	419	513	424	175	105
Peat Total	2089	2343	2814	3007	2841	3430	2974	3083	2157	1275	2351	1230	1005	663	70	60	30	29	20	10	11	9	NO	40	NO	NO
Gaseous Fuels	49029	50288	39788	24246	16770	24107	18644	28165	26802	25464	28803	33510	32497	34074	32371	33306	35181	32613	32650	31236	38687	35607	31872	33926	29870	31395
Biomass	436	590	673	862	1324	1063	1634	3412	4111	3697	3232	3940	4406	5245	5206	4464	5089	5028	4908	4956	5531	5494	7333	11165	13422	14874
Other Fossil Fuels	42	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	42	42	29	88	29	NO	NO	NO	29	29	3	NO	NO	NO	NO
1.A.1.a. Public Electricity and Heat Production																										
Total	92473	86689	71901	55946	51496	48590	48499	51233	50453	44329	39919	42931	41998	42183	39348	39061	40483	38378	37639	36780	44274	40852	39004	44541	42276	45345
Liquid Fuels	40098	33002	28190	26919	30426	20266	26110	17107	18116	14486	6350	5065	4821	3406	2843	2153	1299	1219	693	1031	705	593	492	211	33	28
Solid Fuels	2305	1736	1935	2106	1366	1395	740	541	427	370	371	398	285	209	210	183	105	341	446	472	419	419	513	424	175	105
Peat Total	1378	1703	1945	2437	2246	2703	2403	2600	1764	1046	1970	1125	995	653	60	40	20	20	20	10	11	9	NO	40	NO	NO
Gaseous Fuels	48214	49658	39158	23622	16134	23163	17612	27599	26069	24831	27996	32633	31691	33199	31499	32434	34242	32043	31845	30739	37812	34664	30895	32997	29040	30712
Biomass	436	590	673	862	1324	1063	1634	3386	4077	3596	3232	3668	4164	4687	4648	4222	4817	4755	4635	4499	5298	5164	7104	10869	13028	14500
Other Fossil Fuels	42	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	42	42	29	88	29	NO	NO	NO	29	29	3	NO	NO	NO	NO
Diesel oil	5524	5226	3824	935	382	85	42	297	85	85	127	42	42	42	42	42	42	43	43	16	15	25	127	94	22	14
RFO	32561	26147	23183	24563	30044	20016	25984	16768	17905	14007	5279	4425	4425	3207	2801	2111	1218	1137	650	1015	690	568	365	113	10	13
LPG	46	46	46	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	4	1	1
Other liquid fuels	1967	1583	1137	1421	NO	126	84	42	126	NO	NO	126	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Shale oil	NO	NO	NO	NO	NO	39	NO	NO	NO	394	944	472	354	157	NO	NO	39	39	NO	NO	NO	NO	NO	NO	NO	NO
Coal	2305	1736	1935	2106	1366	1395	740	541	427	370	371	398	285	209	210	183	105	341	446	472	419	419	513	424	175	105
Peat briquettes	31	15	15	15	15	77	62	77	15	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	1	NO	NO	NO	NO	NO
Peat	1347	1688	1930	2422	2231	2626	2341	2523	1749	1046	1970	1125	995	653	60	40	20	20	20	10	10	9	NO	40	NO	NO
Natural gas	48214	49658	39158	23622	16134	23163	17612	27599	26069	24831	27996	32633	31691	33199	31499	32434	34242	32043	31845	30739	37812	34664	30895	32997	29040	30712
Wood	436	590	673	831	1300	1045	1595	3363	4060	3558	3191	3617	4097	4644	4570	4132	4741	4675	4556	4390	5120	4635	5793	9198	11184	12286
Sludge gas	NO	NO	NO	31	24	18	39	23	17	38	41	51	67	43	78	90	76	80	79	100	114	100	105	97	91	99
Landfill gas	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	9	18	22	22	14	16	28
Other biogas	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	37	355	1145	1560	1737	2086
Biodiesel	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	8	52	39	NO	NO	NO
Straws	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	1	NO	NO	NO	NO	NO
Waste oils	42	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	42	42	29	88	29	NO	NO	NO	29	29	3	NO	NO	NO	NO

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
1.A.1.c. Manufacture of Solid Fuels and Other Energy Industries																										
Total	1865	1521	1750	1445	1664	1924	2826	1405	3734	3996	2738	1424	1270	1613	1652	1346	1433	1022	1290	1117	1321	1528	1376	1480	1510	1312
Liquid Fuels	339	251	251	251	433	253	1223	330	2546	3005	1550	170	212	170	212	212	212	170	212	163	213	255	170	255	286	255
Solid Fuels	NO	NO	NO	NO	NO	NO	NO	NO	28	28	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Peat	711	640	869	570	595	727	571	483	393	229	381	105	10	10	10	20	10	9	NO	NO	NO	NO	NO	NO	NO	NO
Gaseous Fuels	815	630	630	624	636	944	1032	566	733	633	807	877	806	875	872	872	939	570	805	497	875	943	977	929	830	683
Biomass	NO	NO	NO	NO	NO	NO	NO	26	34	101	NO	272	242	558	558	242	272	273	273	457	233	330	229	296	394	374
Other Fossil Fuels	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Diesel oil	212	170	170	170	170	212	127	127	127	212	127	170	212	170	212	212	212	170	212	163	213	255	170	255	286	255
RFO	81	81	81	81	81	41	1096	203	487	731	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
LPG	46	NO	NO	NO	182	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Jet fuel	NO	NO	NO	NO	NO	NO	NO	NO	216	346	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Other liquid fuels	NO	NO	NO	NO	NO	NO	NO	NO	1716	1716	1423	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Coal	NO	NO	NO	NO	NO	NO	NO	NO	28	28	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Peat	711	640	869	570	595	727	571	483	393	229	381	105	10	10	10	20	10	9	NO	NO	NO	NO	NO	NO	NO	NO
Natural gas	815	630	630	624	636	944	1032	566	733	633	807	877	806	875	872	872	939	570	805	497	875	943	977	929	830	683
Wood	NO	NO	NO	NO	NO	NO	NO	26	34	101	NO	272	242	558	558	242	272	273	273	457	233	330	229	296	394	374

1.A.2 Manufacturing Industries and Construction

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
1.A.2 Manufacturing Industries and Construction																										
Total	58640	45567	38083	32982	29888	29837	29430	28709	26228	24129	20526	20910	21411	21329	22992	24014	25616	24380	23176	22377	26693	25255	27930	26004	26913	26320
Liquid Fuels	29747	20311	17430	17082	16545	16745	16344	16010	12910	11400	7575	4681	3966	4417	4277	2866	4075	3847	3076	2946	3500	2298	2649	2576	2254	2014
Solid Fuels	1545	882	968	1639	1444	650	592	450	393	421	252	252	253	262	236	971	1394	1967	1997	1363	1861	2229	2149	1406	1336	1014
Peat Total	NO	20	10	NO	15	15	15	25	25	15	NO	NO	NO	NO	10	NO	NO	NO	NO	NO	14	2	2	24	24	11
Gaseous Fuels	25894	23752	19059	12482	9783	10014	9815	9484	9712	9080	9873	11583	12838	12729	13157	13680	13395	12881	11836	9261	10537	7578	7952	6259	5258	5262
Biomass	617	603	616	1779	2101	2414	2664	2740	3188	3186	2733	3926	3487	3391	4795	5584	6462	5415	5895	8674	10319	12399	14301	14624	16762	16771
Other Fossil Fuels	837	NO	NO	NO	NO	NO	NO	NO	NO	26	94	469	866	530	517	914	290	270	372	133	462	749	877	1115	1279	1248
Gasoline	880	220	220	220	132	44	132	88	88	44	44	44	69	44	88	88	88	88	88	44	44	44	44	44	43	48
Diesel oil	5564	5606	4034	3779	1611	1485	1315	1740	1655	1527	1484	1357	1231	1187	1357	1400	1527	1997	1657	1530	1359	1785	1997	1996	1722	1547
RFO	22532	14007	12871	12504	14127	14413	14129	12993	9947	8446	3411	1625	1178	813	487	529	529	451	366	366	335	162	203	81	31	13
LPG	46	46	46	46	46	91	137	137	46	92	46	46	46	46	92	92	137	137	91	91	91	228	366	413	423	406
Jet fuel	NO	NO	NO	NO	NO	NO	43	86	43	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	
Other kerosene	432	432	259	86	43	86	86	129	43	43	43	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	
Other liquid fuels	293	NO	NO	447	586	586	502	837	1088	1130	1130	1215	1047	1214	1047	210	1089	963	795	711	1005	NO	NO	42	35	NO	
Petroleum coke	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	198	956	1088	429	627	132	NO	165	627	NO	NO	NO	NO	NO	
Shale oil	NO	NO	NO	NO	NO	39	NO	NO	NO	118	1417	394	197	157	118	118	78	79	79	39	39	79	39	NO	NO	NO	
Coal	1280	882	968	1534	1365	597	539	397	367	368	226	226	226	235	209	917	1362	1967	1997	1363	1861	2229	2067	1379	1336	1014	
Coke	237	NO	NO	105	79	53	53	53	26	53	26	26	27	27	27	54	32	NO	NO	NO	NO	NO	NO	NO	NO	NO	
Anthracite	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	82	27	NO	NO	
Oil shale	28	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	
Peat briquettes	NO	NO	NO	NO	15	15	15	15	15	15	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	4	NO	NO	4	4	1	
Peat	NO	20	10	NO	NO	NO	NO	10	10	NO	NO	NO	NO	NO	10	NO	NO	NO	NO	NO	10	2	2	20	20	10	
Natural gas	25894	23752	19059	12482	9783	10014	9815	9484	9712	9080	9873	11583	12838	12729	13157	13680	13395	12881	11836	9261	10537	7578	7952	6259	5258	5262	
Wood	617	603	616	1779	2101	2414	2664	2740	3188	3176	2696	3856	3393	3309	4706	5535	6425	5387	5797	8633	9801	11187	12921	13530	15368	15528	
Straws	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	29	
Biodiesel	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	3	2	1	8	8	1	4	2	4	3	
Other biogas	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	18	125	57	124	80	
Municipal wastes (biomass fraction)	NO	NO	NO	NO	NO	NO	NO	NO	NO	10	37	70	94	82	89	49	34	26	98	33	510	1193	1250	1035	1266	1130	
Waste oils	837	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	293	628	322	293	789	205	205	234	88	58	85	58	29	29	29	
Industrial wastes (used tires)	NO	NO	NO	NO	NO	NO	NO	NO	NO	26	94	176	238	208	224	125	85	65	58	15	84	331	242	379	335	273	
Municipal wastes	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	80	30	320	332	577	707	915	946	
1.A.2.a. Iron and Steel																											
Total	6331	4649	4157	3651	4019	3065	3282	5079	5083	4991	5076	5142	4861	4932	5016	4804	5059	5081	4738	4187	4870	1207	1633	583	13	406	
Liquid Fuels	1219	1016	732	731	912	705	785	1162	1088	1130	1172	1042	963	963	963	126	963	963	917	792	1006	NO	NO	NO	NO	NO	
Solid Fuels	NO	NO	NO	28	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	27	27	5	NO	NO	NO	26	27	184	32	NO	NO	
Peat	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	
Gaseous Fuels	4275	3633	3425	2892	3107	2360	2497	3917	3995	3861	3904	4058	3898	3969	4026	4125	4091	4118	3821	3395	3838	1180	1449	551	13	406	
Biomass	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	
Other Fossil Fuels	837	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	42	NO	NO	NO	526	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	
Diesel oil	42	42	42	NO	42	NO	NO	NO	NO	NO	42	NO	NO	NO	NO	42	NO	NO	NO	NO	1	NO	NO	NO	NO	NO	
RFO	1177	974	690	284	284	203	325	325	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	122	81	NO	NO	NO	NO	NO	NO	
Other liquid fuels	NO	NO	NO	447	586	502	460	837	1088	1130	1130	963	963	963	963	84	963	963	795	711	1005	NO	NO	NO	NO	NO	
Shale oil	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	79	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	
Coal	NO	NO	NO	28	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	26	27	102	5	NO	NO	
Coke	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	27	27	5	NO	NO	NO	NO	NO	NO	NO	NO	NO	
Anthracite	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	82	27	NO	NO	
Natural gas	4275	3633	3425	2892	3107	2360	2497	3917	3995	3861	3904	4058	3898	3969	4026	4125	4091	4118	3821	3395	3838	1180	1449	551	13	406	
Waste oils	837	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	42	NO	NO	NO	526	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	
1.A.2.b. Non-Ferrous Metals																											
Total	NO	NO	NO	NO	NO	NO	NO	NO	53	100	168	232	269	302	269	203	204	201	134	101	135	172	173	138	72	61	
Liquid Fuels	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	42	NO	NO	NO	NO	NO	NO	NO	NO	NO	2	3	NO	NO	NO	
Solid Fuels	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	2	1	NO	NO	1	
Peat Total	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	
Gaseous Fuels	NO	NO	NO	NO	NO	NO	NO	NO	53	100	168	190	269	302	269	203	204	201	134	101	135	168	168	138	72	60	
Biomass	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	1	NO	NO	NO	
Other Fossil Fuels	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	
Diesel oil	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	42	NO	NO	NO	NO	NO	NO	NO	NO	NO	2	3	NO	NO	NO	
Coal	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	2	1	NO	NO	1	
Natural gas	NO	NO	NO	NO	NO	NO	NO	NO	53	100	168	190	269	302	269	203	204	201	134	101	135	168	168	138	72	60	
Biodiesel	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	1	NO	NO	NO	NO	
1.A.2.c. Chemicals																											
Total	4070	2642	2098	3638	3977	5645	4160	3529	643	580	486	479	469	449	452	471	539	455	854	773	888	724	807	804	880	770	
Liquid Fuels	3643	2059	1684	2963	3249	4547	3451	3207	325	164	122	164	162	122	NO	NO	NO	NO	124	126	94	131	154	137	159	148	
Solid Fuels	NO	NO	NO	28	28	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	1	NO	NO	NO	NO	
Peat Total	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	20	11	NO	
Gaseous Fuels	427	584	414	643	693	1090	696	302	298	362	317	269	278	308	405	442	480	381	513	518	606	404	371	385	316	330	
Biomass	NO	NO	NO	4	7	7	13	20	20	54	47	46	29	19	47	29	59	74	188	130	188	188	282	262	394	292	
Other Fossil Fuels	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	29	NO	NO	NO	NO	NO	NO	NO	
Diesel oil	127	127	85	NO	42	NO	NO	NO	NO	42	NO	NO	NO	NO	NO	NO	NO	NO	43	85	85	85	17	NO	15	9	

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	
RFO	3127	1543	1340	2963	3207	4547	3451	3207	325	122	122	122	162	122	NO	NO	NO	NO	81	41	9	NO	NO	NO	NO	NO	
LPG	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	46	137	137	144	139	
Other kerosene	389	389	259	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	
Other liquid fuels	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	42	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	
Coal	NO	NO	NO	28	28	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	1	NO	NO	NO	NO	
Peat briquettes	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	1	NO	
Peat	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	20	10	NO	
Natural gas	427	584	414	643	693	1090	696	302	298	362	317	269	278	308	405	442	480	381	513	518	606	404	371	385	316	330	
Wood	NO	NO	NO	4	7	7	13	20	20	54	47	46	29	19	47	29	56	72	187	127	187	169	210	208	278	221	
Biodiesel	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	3	2	1	3	1	1	NO	NO	1	1	
Other biogas	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	18	72	54	115	70	
Waste oils	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	29	NO	NO	NO	NO	NO	NO	NO	
1.A.2.d. Pulp, Paper and Print																											
Total	2956	2827	2562	953	330	326	194	181	142	168	124	176	182	214	213	255	281	217	208	264	260	223	176	200	106	106	
Liquid Fuels	203	162	122	122	41	81	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	3	14	6	NO	6	6	
Solid Fuels	28	28	28	113	56	56	56	57	28	28	NO	28	28	26	26	26	26	NO	NO	NO	NO	NO	NO	NO	NO	NO	
Peat Total	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	
Gaseous Fuels	2724	2637	2412	653	45	101	118	104	94	100	101	135	134	168	167	202	235	201	201	101	101	101	68	103	97	95	
Biomass	NO	NO	NO	65	188	87	20	20	20	40	23	13	20	20	20	27	20	16	7	163	156	108	102	97	3	5	
Other Fossil Fuels	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	
Diesel oil	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	3	14	6	NO	2	2	
RFO	203	162	122	122	41	81	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	
LPG	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	4	4	
Coal	28	28	28	113	56	56	56	57	28	28	NO	28	28	26	26	26	26	NO	NO	NO	NO	NO	NO	NO	NO	NO	
Natural gas	2724	2637	2412	653	45	101	118	104	94	100	101	135	134	168	167	202	235	201	201	101	101	101	68	103	97	95	
Wood	NO	NO	NO	65	188	87	20	20	20	40	23	13	20	20	20	27	20	16	7	163	156	108	102	97	3	5	
1.A.2.e. Food Processing, Beverages and Tobacco																											
Total	15020	11250	10442	11139	8145	8394	9317	8809	8443	7299	6167	5366	5452	4763	5219	5315	5131	4254	3351	3086	2908	2694	2911	2789	2636	2216	
Liquid Fuels	10547	7700	7046	6807	4419	4693	5429	5205	5238	4133	2970	1651	1442	1034	873	912	916	673	420	586	566	376	500	475	378	267	
Solid Fuels	1069	598	655	594	565	309	309	252	168	224	140	140	141	158	105	132	106	79	79	52	52	16	27	25	24	24	
Peat Total	NO	NO	NO	NO	15	NO	NO	15	15	15	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	3	NO	NO	NO	NO	NO	

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	
Gaseous Fuels	3177	2722	2511	3500	2829	3065	3250	3013	2694	2578	2607	2775	2985	2764	3238	3149	3249	2684	2370	1930	1919	1886	1819	1808	1729	1627	
Biomass	228	231	230	238	316	327	330	325	328	349	450	800	842	719	916	1034	772	701	394	488	339	360	536	452	476	269	
Other Fossil Fuels	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	42	88	88	88	88	117	88	30	29	56	29	29	29	29	
Diesel oil	3229	3229	3102	3229	765	552	510	807	722	552	552	467	340	340	340	297	255	213	212	212	170	85	121	170	152	111	
RFO	7105	4425	3898	3532	3654	4060	4791	4223	4384	3492	1745	975	893	609	406	406	447	329	122	244	285	121	203	81	31	8	
LPG	46	46	46	46	NO	NO	NO	46	46	46	NO	46	46	46	46	46	91	91	46	91	72	91	137	182	160	148	
Jet fuel	NO	NO	NO	NO	NO	NO	43	86	43	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	
Other kerosene	NO	NO	NO	NO	NO	NO	43	43	43	43	43	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	
Other liquid fuels	167	NO	NO	NO	NO	42	42	NO	NO	NO	NO	84	84	NO	42	84	84	NO	NO	NO	NO	NO	NO	42	35	NO	
Shale oil	NO	NO	NO	NO	NO	39	NO	NO	NO	NO	630	79	79	39	39	79	39	40	40	39	39	79	39	NO	NO	NO	
Coal	911	598	655	541	512	256	256	199	142	171	114	114	114	131	105	105	79	79	79	52	52	16	27	25	24	24	
Coke	158	NO	NO	53	53	53	53	53	26	53	26	26	27	27	NO	27	27	NO	NO	NO	NO	NO	NO	NO	NO	NO	
Peat briquettes	NO	NO	NO	NO	15	NO	NO	15	15	15	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	3	NO	NO	NO	NO	NO	
Natural gas	3177	2722	2511	3500	2829	3065	3250	3013	2694	2578	2607	2775	2985	2764	3238	3149	3249	2684	2370	1930	1919	1886	1819	1808	1729	1627	
Wood	228	231	230	238	316	327	330	325	328	349	450	800	842	719	916	1034	772	701	394	483	333	360	535	449	467	230	
Straws	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	29	
Biodiesel	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	5	6	NO	1	NO	NO	NO	
Other biogas	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	3	9	10	
Waste oils	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	42	88	88	88	88	117	88	30	29	56	29	29	29	29	
1.A.2.f. Non-metallic minerals																											
Total	9496	5911	5584	2962	3998	4052	3941	3145	3045	3071	2512	2797	3673	3903	3648	4271	4296	4484	4307	2694	4555	5271	5573	5062	5400	4801	
Liquid Fuels	3585	1307	1301	1260	3057	2562	2519	2396	1912	2274	1521	482	358	1367	1209	764	920	379	207	293	864	298	291	297	275	281	
Solid Fuels	170	85	114	199	171	114	57	85	28	28	28	28	28	26	26	682	1127	1809	1888	1285	1757	2136	1910	1299	1254	957	
Peat Total	NO	NO	NO	NO	NO	NO	NO	10	10	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	
Gaseous Fuels	5734	4513	4163	1476	750	1282	1345	634	1066	698	808	1821	2352	1884	1845	2381	1878	1979	1782	942	1010	977	1280	1344	1353	1208	
Biomass	7	6	6	27	20	94	20	20	29	44	61	82	111	184	139	144	169	165	175	100	520	1196	1273	1035	1269	1135	
Other Fossil Fuels	NO	NO	NO	NO	NO	NO	NO	NO	NO	26	94	385	824	442	429	300	202	153	255	74	404	664	819	1086	1250	1219	
Diesel oil	127	127	42	42	169	84	42	42	85	85	42	42	42	42	42	255	212	127	127	128	237	298	291	297	275	280	
RFO	3289	1137	1259	1218	2842	2436	2477	2354	1827	2071	731	162	NO	NO	NO	41	NO	81	41	NO	NO	NO	NO	NO	NO	NO	
LPG	NO	NO	NO	NO	46	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	1	

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	
Other kerosene	43	43	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	
Other liquid fuels	126	NO	NO	NO	NO	42	NO	NO	NO	NO	NO	42	NO	251	NO	NO	42	NO	NO	NO	NO	NO	NO	NO	NO	NO	
Petroleum coke	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	198	956	1088	429	627	132	NO	165	627	NO	NO	NO	NO	NO	
Shale oil	NO	NO	NO	NO	NO	NO	NO	NO	NO	118	748	236	118	118	79	39	39	39	39	NO	NO	NO	NO	NO	NO	NO	
Coal	142	85	114	199	171	114	57	85	28	28	28	28	28	26	26	682	1127	1809	1888	1285	1757	2136	1910	1299	1254	957	
Oil shale	28	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	
Peat	NO	NO	NO	NO	NO	NO	NO	10	10	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	
Natural gas	5734	4513	4163	1476	750	1282	1345	634	1066	698	808	1821	2352	1884	1845	2381	1878	1979	1782	942	1010	977	1280	1344	1353	1208	
Wood	7	6	6	27	20	94	20	20	29	34	24	12	17	102	50	95	135	139	77	67	10	3	23	NO	NO	3	
Biodiesel	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	3	2	
Municipal wastes (biomass fraction)	NO	NO	NO	NO	NO	NO	NO	NO	NO	10	37	70	94	82	89	49	34	26	98	33	510	1193	1250	1035	1266	1130	
Waste oils	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	209	586	234	205	175	117	88	117	29	NO	NO	NO	NO	NO	NO	
Industrial wastes (used tires)	NO	NO	NO	NO	NO	NO	NO	NO	NO	26	94	176	238	208	224	125	85	65	58	15	84	331	242	379	335	273	
Municipal wastes	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	80	30	320	332	577	707	915	946	
1.A.2.g. Other																											
Total	20768	18288	13240	10639	9420	8356	8536	7965	8819	7920	5993	6718	6504	6766	8175	8695	10106	9688	9583	11272	13077	14964	16657	16429	17805	17960	
Liquid Fuels	10551	8067	6546	5199	4867	4156	4160	4039	4347	3699	1790	1300	1041	931	1233	1064	1276	1832	1408	1149	967	1477	1695	1667	1436	1312	
Solid Fuels	278	171	171	677	623	170	169	56	169	141	84	56	56	52	52	104	130	79	30	26	26	47	27	50	58	32	
Peat Total	NO	20	10	NO	NO	15	15	NO	NO	NO	NO	NO	NO	NO	10	NO	NO	NO	NO	NO	11	2	2	4	13	11	
Gaseous Fuels	9557	9664	6134	3318	2360	2115	1910	1515	1512	1380	1968	2335	2922	3334	3208	3177	3258	3318	3014	2275	2928	2862	2797	1930	1678	1536	
Biomass	382	366	380	1445	1570	1899	2281	2355	2791	2699	2152	2985	2485	2449	3673	4350	5442	4459	5132	7793	9116	10547	12107	12778	14620	15069	
Other Fossil Fuels	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	42	NO	NO	NO	NO	NO	NO	NO	29	29	29	29	NO	NO	NO	
Gasoline	880	220	220	220	132	44	132	88	88	44	44	44	69	44	88	88	88	88	88	44	44	44	44	44	43	48	
Diesel oil	2039	2081	763	508	593	849	763	891	848	848	848	806	849	805	975	806	1060	1657	1275	1105	863	1301	1559	1529	1278	1145	
RFO	7632	5766	5563	4385	4099	3086	3085	2883	3411	2761	813	366	123	82	82	82	82	41	NO	NO	41	41	NO	NO	NO	5	
LPG	NO	NO	NO	NO	NO	91	137	91	NO	46	46	NO	NO	NO	46	46	46	46	45	NO	19	91	92	94	115	114	

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Other kerosene	NO	NO	NO	86	43	86	43	86	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Other liquid fuels	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	84	NO	NO	42	42	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Shale oil	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	39	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Coal	199	171	171	625	597	170	169	56	169	141	84	56	56	52	52	104	130	79	30	26	26	47	27	50	58	32
Coke	79	NO	NO	52	26	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Peat briquettes	NO	NO	NO	NO	NO	15	15	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	1	NO	NO	4	3	1
Peat	NO	20	10	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	10	NO	NO	NO	NO	NO	10	2	2	NO	10	10
Natural gas	9557	9664	6134	3318	2360	2115	1910	1515	1512	1380	1968	2335	2922	3334	3208	3177	3258	3318	3014	2275	2928	2862	2797	1930	1678	1536
Wood	382	366	380	1445	1570	1899	2281	2355	2791	2699	2152	2985	2485	2449	3673	4350	5442	4459	5132	7793	9115	10547	12051	12776	14620	15069
Biodiesel	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	1	NO	2	2	NO	NO
Other biogas	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	54	NO	NO	NO
Waste oils	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	42	NO	NO	NO	NO	NO	NO	NO	NO	29	29	29	29	NO	NO

1.A.4 Other Sectors

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
1.A.4 Other Sectors																										
Total	102092	108961	83730	77831	64625	60182	61263	56261	52470	52089	49117	54029	53828	57273	59428	59055	58857	59344	55403	58823	52940	51629	53939	50148	49268	44601
Liquid Fuels	27829	32499	24223	21319	14008	8817	8761	7849	6947	7439	6888	7363	6919	7887	7936	7807	8456	7888	7114	7778	8334	8351	8351	8476	8753	8887
Solid Fuels	22398	19894	15853	13347	9363	5180	5521	4639	3330	2817	2162	2988	2390	2203	2150	2045	1940	1940	1783	1574	2098	1861	983	1075	962	831
Peat Total	1128	880	1030	617	515	391	506	357	266	66	41	15	NO	10	NO	20	40	61	31	16	21	32	32	NO	11	NO
Gaseous Fuels	24289	24628	11751	9338	7002	7150	6732	5434	5670	5865	6218	7061	8098	8795	9651	9632	9983	11027	10959	10241	11819	10343	10477	9809	9670	9101
Biomass	26448	31060	30873	33210	33737	38643	39743	37983	36257	35902	33808	36561	36295	38321	39574	39523	38380	38399	35487	39215	30659	31042	34097	30788	29872	25782
Other Fossil Fuels	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	42	126	58	117	29	58	29	29	NO	8	NO	NO	NO	NO	NO
Gasoline	1672	176	176	176	352	88	176	176	88	132	264	220	195	220	220	308	352	352	308	308	308	440	395	440	354	289
Diesel oil	16189	22860	16189	14574	6840	5267	5098	4248	3611	4419	4589	5099	4886	5651	5863	5566	6288	6288	5566	6365	6942	6902	6896	6981	7234	7588
RFO	6415	6292	5318	3897	4507	1664	1990	1706	1340	1218	772	772	569	528	447	527	406	40	80	41	44	5	NO	NO	NO	1
LPG	2961	2869	2368	2413	2050	1366	1367	1503	1822	1412	1184	1230	1185	1321	1321	1367	1367	1184	1139	1047	1023	1002	1055	1055	1165	1009
Jet fuel	NO	NO	NO	NO	NO	86	43	173	43	130	NO	NO	NO	NO	43	NO	43	24	21	17	17	2	4	NO	NO	NO
Other kerosene	215	302	172	259	259	346	86	43	43	86	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Other liquid fuels	377	NO	NO	NO	NO	NO	NO	NO	NO	42	NO	42	84	167	42	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Shale oil	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	79	NO	NO	NO	NO	39	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Coal	22398	19894	15853	13347	9363	5180	5521	4639	3330	2817	2162	2988	2390	2203	2150	2045	1940	1940	1783	1574	2098	1861	983	1075	962	831

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	
Peat briquettes	836	588	728	527	294	309	355	247	186	46	31	15	NO	NO	NO	NO	NO	1	1	6	1	3	4	NO	1	NO	
Peat	292	292	302	90	221	82	150	110	80	20	10	NO	NO	10	NO	20	40	60	30	10	20	29	28	NO	10	NO	
Natural gas	24289	24628	11751	9338	7002	7150	6732	5434	5670	5865	6218	7061	8098	8795	9651	9632	9983	11027	10959	10241	11819	10343	10477	9809	9670	9101	
Wood	26448	31060	30873	33210	33737	38643	39743	37983	36257	35902	33808	36561	36249	38159	39302	39211	38080	38067	35123	38811	30222	30442	33226	29652	28585	24043	
Charcoal	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	30	60	30	45	60	60	60	60	59	90	90	60	
Landfill gas	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	46	162	242	251	259	271	290	314	314	327	325	357	353	596	
Other biogas	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	91	358	523	673	887	
Straws	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	11	16	14	29	59	43	38	58	99	106	
Biodiesel	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	5	79	90	108	71	90	
Waste oils	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	42	126	58	117	29	58	29	29	NO	8	NO	NO	NO	NO	NO	
1.A.4.a. Commercial/Institutional																											
Total	40346	40142	34150	27786	17464	16517	16581	14795	12297	13125	11356	12366	13179	13856	15142	14292	14964	15997	13248	12578	13329	11772	12743	12526	12038	11959	
Liquid Fuels	13453	16642	11910	10556	5308	2890	2758	2459	2017	2346	1715	1928	1818	2207	2167	1860	2289	1902	1596	1586	1619	1397	1859	1939	2129	2243	
Solid Fuels	14913	11413	10872	7854	4297	2903	3272	2732	2419	2049	1565	1536	1423	1338	1285	1049	1075	1075	918	735	1023	891	354	519	407	323	
Peat Total	672	517	620	288	326	114	250	163	71	15	31	15	NO	10	NO	20	40	61	31	16	1	32	32	NO	11	NO	
Gaseous Fuels	6090	6408	5466	3579	1903	2328	2271	1805	2175	2536	3054	3347	4103	4278	4680	4598	4851	5676	5679	5415	5623	5055	4952	4477	4401	4166	
Biomass	5218	5162	5282	5508	5630	8282	8029	7636	5615	6179	4991	5497	5709	5965	6894	6737	6651	7253	4995	4826	5054	4398	5546	5591	5090	5227	
Other Fossil Fuels	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	42	126	58	117	29	58	29	29	NO	8	NO	NO	NO	NO	NO	
Gasoline	44	44	44	44	220	NO	88	88	44	88	88	77	46	44	44	44	44	44	44	44	44	88	44	88	44	44	
Diesel oil	8116	11515	7436	7478	1529	1189	1147	552	340	935	1020	1190	1317	1530	1657	1275	1700	1657	1360	1393	1418	1251	1713	1755	1924	2054	
RFO	4953	4953	4344	2679	3248	1177	1300	1421	1137	974	528	528	325	284	244	365	365	40	80	41	41	2	NO	NO	NO	1	
LPG	46	NO	NO	182	137	91	137	182	410	91	NO	91	46	182	137	137	137	137	91	91	99	54	98	96	161	144	
Jet fuel	NO	NO	NO	NO	NO	86	43	173	43	130	NO	NO	NO	NO	43	NO	43	24	21	17	17	2	4	NO	NO	NO	
Other kerosene	43	130	86	173	173	346	43	43	43	86	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	
Other liquid fuels	251	NO	NO	NO	NO	NO	NO	NO	NO	42	NO	42	84	167	42	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	
Shale oil	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	79	NO	NO	NO	NO	39	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	
Coal	14913	11413	10872	7854	4297	2903	3272	2732	2419	2049	1565	1536	1423	1338	1285	1049	1075	1075	918	735	1023	891	354	519	407	323	
Peat briquettes	511	356	449	248	155	62	139	93	31	15	31	15	NO	NO	NO	NO	NO	1	1	6	1	3	4	NO	1	NO	
Peat	161	161	171	40	171	52	110	70	40	NO	NO	NO	NO	10	NO	20	40	60	30	10	NO	29	28	NO	10	NO	
Natural gas	6090	6408	5466	3579	1903	2328	2271	1805	2175	2536	3054	3347	4103	4278	4680	4598	4851	5676	5679	5415	5623	5055	4952	4477	4401	4166	
Wood	5218	5162	5282	5508	5630	8282	8029	7636	5615	6179	4991	5497	5663	5803	6652	6485	6381	6966	4691	4482	4680	3997	5163	5087	4603	4512	
Landfill gas	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	46	162	242	251	259	271	290	314	314	327	325	357	353	596	
Other biogas	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	49	69	74	
Straws	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	11	16	14	29	57	43	24	44	53	30	
Biodiesel	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	4	31	34	54	12	15	

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	
Waste oils	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	42	126	58	117	29	58	29	29	NO	8	NO	NO	NO	NO	NO	
1.A.4.b. Residential																											
Total	35751	42489	39047	40790	38562	37659	38588	36043	35336	34027	32851	36298	35666	37702	38261	38948	37955	37271	37067	40809	33561	33797	35117	31228	30846	25862	
Liquid Fuels	4908	5671	5003	4010	2848	1402	1272	1363	1454	1406	1443	1441	1441	1398	1443	1577	1621	1438	1393	2025	2237	2229	2236	2237	2283	2055	
Solid Fuels	6404	7542	4440	5037	4411	1821	1964	1708	797	683	512	1338	854	787	787	944	813	813	813	813	1049	944	577	530	531	501	
Peat Total	425	332	379	258	144	252	241	179	195	51	10	NO	NO	NO	NO	NO	NO	NO	NO	NO	20	NO	NO	NO	NO	NO	
Gaseous Fuels	4004	4275	4905	5089	4359	4181	3762	3063	2896	2829	2659	3001	3293	3667	3958	4193	4326	4587	4693	4304	5219	4480	4481	4266	4252	4116	
Biomass	20010	24669	24320	26396	26800	30003	31349	29730	29994	29058	28227	30518	30078	31850	32073	32234	31195	30433	30168	33667	25036	26144	27823	24195	23780	19190	
Other Fossil Fuels	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	
Gasoline	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	132	132	132	132	132	220	264	264	264	264	264	264	263	264	264	220	
Diesel oil	1912	2762	2592	1827	892	127	42	42	42	85	127	170	170	127	127	127	127	127	127	850	1062	1062	1062	1062	1062	1062	
RFO	41	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	
LPG	2869	2823	2368	2140	1913	1275	1230	1321	1412	1321	1184	1139	1139	1139	1184	1230	1230	1047	1002	911	911	903	911	911	957	773	
Other kerosene	86	86	43	43	43	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	
Coal	6404	7542	4440	5037	4411	1821	1964	1708	797	683	512	1338	854	787	787	944	813	813	813	813	1049	944	577	530	531	501	
Peat briquettes	294	201	248	248	124	232	201	139	155	31	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	
Peat	131	131	131	10	20	20	40	40	40	20	10	NO	NO	NO	NO	NO	NO	NO	NO	NO	20	NO	NO	NO	NO	NO	
Natural gas	4004	4275	4905	5089	4359	4181	3762	3063	2896	2829	2659	3001	3293	3667	3958	4193	4326	4587	4693	4304	5219	4480	4481	4266	4252	4116	
Wood	20010	24669	24320	26396	26800	30003	31349	29730	29994	29058	28227	30518	30078	31850	32043	32174	31165	30388	30108	33607	24974	26084	27764	24105	23690	19130	
Charcoal	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	30	60	30	45	60	60	60	60	59	90	90	60	
Straws	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	2	NO	NO	NO	NO	NO	
1.A.4.c. Agriculture/Forestry/Fisheries																											
Total	25995	26331	10533	9255	8599	6005	6094	5424	4837	4937	4910	5365	4983	5716	6025	5815	5938	6077	5088	5436	6050	6059	6079	6394	6383	6781	
Liquid Fuels	9468	10186	7310	6752	5852	4526	4731	4027	3476	3687	3730	3994	3660	4282	4326	4370	4546	4548	4125	4167	4478	4725	4255	4300	4341	4589	
Solid Fuels	1081	939	541	456	655	456	285	199	114	85	85	113	113	78	78	52	52	52	52	26	26	26	52	26	24	7	
Peat Total	31	31	31	71	45	25	15	15	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	
Gaseous Fuels	14195	13945	1380	670	739	641	699	566	599	500	505	712	702	850	1014	841	806	764	587	521	977	808	1044	1066	1017	819	
Biomass	1220	1229	1271	1306	1307	358	365	617	648	665	590	546	508	506	607	552	534	713	324	722	569	500	727	1002	1001	1366	
Other Fossil Fuels	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	
Gasoline	1628	132	132	132	132	88	88	88	44	44	44	11	17	44	44	44	44	44	NO	NO	NO	88	88	88	46	25	
Diesel oil	6161	8583	6161	5269	4419	3951	3909	3654	3229	3399	3442	3739	3399	3994	4079	4164	4461	4504	4079	4122	4462	4589	4121	4164	4248	4472	
RFO	1421	1339	974	1217	1258	487	691	285	203	244	244	244	244	244	203	162	41	NO	NO	NO	3	3	NO	NO	NO	NO	
LPG	46	46	NO	91	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	46	45	13	45	46	48	47	92	
Other kerosene	86	86	43	43	43	NO	43	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	
Other liquid fuels	126	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Coal	1081	939	541	456	655	456	285	199	114	85	85	113	113	78	78	52	52	52	52	26	26	26	52	26	24	7
Peat briquettes	31	31	31	31	15	15	15	15	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Peat	NO	NO	NO	40	30	10	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Natural gas	14195	13945	1380	670	739	641	699	566	599	500	505	712	702	850	1014	841	806	764	587	521	977	808	1044	1066	1017	819
Wood	1220	1229	1271	1306	1307	358	365	617	648	665	590	546	508	506	607	552	534	713	324	722	568	361	299	460	292	401
Other biogas	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	91	358	474	604	814
Straws	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	14	14	46	76
Biodiesel	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	1	48	56	54	59

1.A.5 Other

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	
1.A.5 Other (Not elsewhere specified)																											
Total	NO	NO	NO	NO	NO	NO	3	1	3	2	2	2	94	84	131	104	103	39	47	73	107	98	100	88	128	130	
Liquid Fuels	NO	NO	NO	NO	NO	NO	3	1	3	2	2	2	94	84	131	104	103	39	47	73	107	98	100	88	128	130	
Solid Fuels	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	
Peat Total	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	
Gaseous Fuels	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	
Biomass	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	
Other Fossil Fuels	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	
Gasoline	NO	NO	NO	NO	NO	NO	3	1	3	2	2	2	2	2	3	2	6	1	5	1	0	NO	NO	NO	NO	NO	
Diesel oil	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	75	65	111	77	73	14	21	49	87	80	79	63	105	112	
Jet fuel	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	17	17	17	24	24	24	21	23	20	18	21	24	23	18	

Annex III: Uncertainties

NOx

NFR category code	Pollutant	1990 Estimate	2015 Estimate	Base year estimate Ex,t	Latest year estimate Ex,t	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	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
1A1a	NOx	10.27	3.95	10.266	3.950	2.00%	50.00%	50.04%	5.41%	-0.06%	4.22%	-0.03%	0.12%	0.12%
1A1b	NOx	NO	NO											
1A1c	NOx	0.28	0.11	0.278	0.108	2.00%	50.00%	50.04%	0.15%	0.00%	0.11%	0.00%	0.00%	0.00%
1A2a	NOx	1.37	0.03	1.371	0.030	2.00%	50.00%	50.04%	0.04%	-0.54%	0.03%	-0.27%	0.00%	0.27%
1A2b	NOx	NO	0.00		0.005	2.00%	50.00%	50.04%	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%
1A2c	NOx	1.90	0.07	1.900	0.065	2.00%	50.00%	50.04%	0.09%	-0.72%	0.07%	-0.36%	0.00%	0.36%
1A2d	NOx	0.31	0.01	0.311	0.009	2.00%	50.00%	50.04%	0.01%	-0.12%	0.01%	-0.06%	0.00%	0.06%
1A2e	NOx	5.83	0.24	5.831	0.236	2.00%	50.00%	50.04%	0.32%	-2.18%	0.25%	-1.09%	0.01%	1.09%
1A2f	NOx	2.29	0.24	2.293	0.244	2.00%	50.00%	50.04%	0.33%	-0.69%	0.26%	-0.35%	0.01%	0.35%
1A2gvii	NOx	0.12	0.01	0.121	0.007	2.00%	50.00%	50.04%	0.01%	-0.04%	0.01%	-0.02%	0.00%	0.02%
1A2gviii	NOx	5.75	2.09	5.751	2.091	2.00%	50.00%	50.04%	2.86%	-0.16%	2.23%	-0.08%	0.06%	0.10%
1A3ai(i)	NOx	0.12	0.14	0.116	0.137	10.00%	30.00%	31.62%	0.12%	0.10%	0.15%	0.03%	0.02%	0.04%
1A3aii(i)	NOx	0.00	0.00	0.000	0.000	10.00%	30.00%	31.62%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1A3bi	NOx	11.03	3.71	11.027	3.710	2.00%	20.00%	20.10%	2.04%	-0.63%	3.96%	-0.13%	0.11%	0.17%
1A3bii	NOx	2.08	1.27	2.080	1.267	2.00%	20.00%	20.10%	0.70%	0.49%	1.35%	0.10%	0.04%	0.10%
1A3biii	NOx	11.11	7.02	11.110	7.016	2.00%	20.00%	20.10%	3.86%	2.86%	7.49%	0.57%	0.21%	0.61%
1A3biv	NOx	0.00	0.01	0.001	0.011	2.00%	20.00%	20.10%	0.01%	0.01%	0.01%	0.00%	0.00%	0.00%
1A3bv	NOx	NA	NA											
1A3bvi	NOx	NA	NA											
1A3bvii	NOx	NA	NA											
1A3c	NOx	8.86	3.50	8.856	3.501	2.00%	35.00%	35.06%	3.36%	0.05%	3.74%	0.02%	0.11%	0.11%
1A3di(ii)	NOx	NO	NE			2.00%	35.00%	35.06%						
1A3dii	NOx	0.02	0.24	0.021	0.239	2.00%	35.00%	35.06%	0.23%	0.25%	0.26%	0.09%	0.01%	0.09%
1A3ei	NOx	IE	IE											
1A3eii	NOx	NO	NO											
1A4ai	NOx	7.68	1.47	7.678	1.466	2.00%	50.00%	50.04%	2.01%	-1.63%	1.56%	-0.82%	0.04%	0.82%
1A4aii	NOx	0.01	0.01	0.006	0.006	2.00%	50.00%	50.04%	0.01%	0.00%	0.01%	0.00%	0.00%	0.00%
1A4bi	NOx	2.95	2.14	2.948	2.138	10.00%	50.00%	50.99%	2.98%	1.05%	2.28%	0.53%	0.32%	0.62%
1A4bii	NOx	NO	0.03		0.030	10.00%	50.00%	50.99%	0.04%	0.03%	0.03%	0.02%	0.00%	0.02%
1A4ci	NOx	1.72	0.21	1.720	0.208	2.00%	50.00%	50.04%	0.28%	-0.49%	0.22%	-0.25%	0.01%	0.25%
1A4cii	NOx	3.80	3.12	3.805	3.125	2.00%	50.00%	50.04%	4.28%	1.75%	3.34%	0.88%	0.09%	0.88%
1A4ciii	NOx	3.31	0.40	3.307	0.395	2.00%	50.00%	50.04%	0.54%	-0.95%	0.42%	-0.48%	0.01%	0.48%
1A5a	NOx	NO	NO											

NFR category code	Pollutant	1990 Estimate	2015 Estimate	Base year estimate Ex,t	Latest year estimate Ex,t	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	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
1A5b	NOx	NO	0.21		0.208	2.00%	50.00%	50.04%	0.28%	0.22%	0.22%	0.11%	0.01%	0.11%
1B1a	NOx	NA	NA											
1B1b	NOx	NO	NO											
1B1c	NOx	NO	NO											
1B2ai	NOx	NO	NO											
1B2aiv	NOx	NO	NO											
1B2av	NOx	NA	NA											
1B2b	NOx	NA	NA											
1B2c	NOx	NA	NA											
1B2d	NOx	NO	NO											
2A1	NOx	0.90	1.86	0.902	1.864	8.00%		8.00%	0.41%	1.61%	1.99%		0.23%	0.23%
2A2	NOx	NE	NE											
2A3	NOx	NE	0.00		0.003					0.00%	0.00%			
2A5a	NOx	NA	NA											
2A5b	NOx	NA	NA											
2A5c	NOx	NA	NA											
2A6	NOx	NA	NA											
2B1	NOx	NO	NO											
2B2	NOx	NO	NO											
2B3	NOx	NO	NO											
2B5	NOx	NO	NO											
2B6	NOx	NO	NO											
2B7	NOx	NO	NA											
2B10a	NOx	NO	NO											
2B10b	NOx	NO	NO											
2C1	NOx	2.81	0.00	2.805	0.002	5.00%	20.00%	20.62%	0.00%	-1.17%	0.00%	-0.23%	0.00%	0.23%
2C2	NOx	NO	NO											
2C3	NOx	NO	NO											
2C4	NOx	NO	NO											
2C5	NOx	NO	NO											
2C6	NOx	NO	NO											
2C7a	NOx	NO	NO											
2C7b	NOx	NO	NO											
2C7c	NOx	NO	NO											
2C7d	NOx	NO	NO											
2D3a	NOx	NA	NA											
2D3b	NOx	NE	NE											
2D3c	NOx	NA	NA											

NFR category code	Pollutant	1990 Estimate	2015 Estimate	Base year estimate Ex,t	Latest year estimate Ex,t	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	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
2D3d	NOx	NA	NA											
2D3e	NOx	NA	NA											
2D3f	NOx	NA	NA											
2D3g	NOx	NA	NA											
2D3h	NOx	NA	NA											
2D3i	NOx	NA	NA											
2G	NOx	0.00	0.00	0.004	0.003	2.00%	10.00%	10.20%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2H1	NOx	NA	NO											
2H2	NOx	NA	NA											
2H3	NOx	NO	NO											
2I	NOx	NA	NA											
2J	NOx	NO	NO											
2K	NOx	NO	NO											
2L	NOx	NO	NO											
3B1a	NOx	0.31	0.09	0.314	0.088	2.00%	50.00%	50.04%	0.12%	-0.04%	0.09%	-0.02%	0.00%	0.02%
3B1b	NOx	0.06	0.02	0.062	0.024	2.00%	50.00%	50.04%	0.03%	0.00%	0.03%	0.00%	0.00%	0.00%
3B2	NOx	0.02	0.01	0.019	0.012	2.00%	50.00%	50.04%	0.02%	0.00%	0.01%	0.00%	0.00%	0.00%
3B3	NOx	0.20	0.02	0.202	0.023	2.00%	50.00%	50.04%	0.03%	-0.06%	0.02%	-0.03%	0.00%	0.03%
3B4a	NOx	NO	NO											
3B4d	NOx	0.00	0.00	0.001	0.002	2.00%	50.00%	50.04%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
3B4e	NOx	0.01	0.00	0.012	0.004	2.00%	50.00%	50.04%	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%
3B4f	NOx	NO	NO											
3B4gi	NOx	0.06	0.01	0.057	0.011	2.00%	50.00%	50.04%	0.01%	-0.01%	0.01%	-0.01%	0.00%	0.01%
3B4gii	NOx	0.01	0.01	0.013	0.012	2.00%	50.00%	50.04%	0.02%	0.01%	0.01%	0.00%	0.00%	0.00%
3B4giii	NOx	0.00	0.00	0.000	0.000	2.00%	50.00%	50.04%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
3B4giv	NOx	0.00	0.00	0.001	0.000	2.00%	50.00%	50.04%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
3B4h	NOx	0.03	0.03	0.031	0.033	2.00%	50.00%	50.04%	0.04%	0.02%	0.03%	0.01%	0.00%	0.01%
3Da1	NOx	5.26	3.03	5.256	3.032	2.00%	50.00%	50.04%	4.15%	1.05%	3.24%	0.52%	0.09%	0.53%
3Da2a	NOx	2.33	0.80	2.334	0.804	2.00%	50.00%	50.04%	1.10%	-0.11%	0.86%	-0.06%	0.02%	0.06%
3Da2b	NOx	NA	NE			50.00%	50.00%	70.71%						
3Da2c	NOx	NA	0.06		0.064	2.00%	50.00%	50.04%	0.09%	0.07%	0.07%	0.03%	0.00%	0.03%
3Da3	NOx	0.69	0.26	0.686	0.259	2.00%	50.00%	50.04%	0.36%	-0.01%	0.28%	0.00%	0.01%	0.01%
3Da4	NOx	NA	NA											
3Db	NOx	NA	NA											
3Dc	NOx	NA	NA											
3Dd	NOx	NA	NA											
3De	NOx	NA	NA											
3Df	NOx	NA	NA											

NFR category code	Pollutant	1990 Estimate	2015 Estimate	Base year estimate Ex,t	Latest year estimate Ex,t	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	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
3F	NOx	NO	NO											
3I	NOx	0.01	0.04	0.007	0.042	10.00%	61.50%	62.31%	0.07%	0.04%	0.05%	0.03%	0.01%	0.03%
5A	NOx	NA	NA											
5B1	NOx	NE	NE											
5B2	NOx	NO	NE											
5C1a	NOx	NO	NO											
5C1bi	NOx	NO	NO											
5C1bii	NOx	0.00	NO	0.000		44.00%	50.00%	66.60%		0.00%		0.00%		0.00%
5C1biii	NOx	0.00	0.00	0.000	0.000	44.00%	50.00%	66.60%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
5C1biv	NOx	NO	NO											
5C1bv	NOx	NO	0.00		0.002		50.00%	50.00%	0.00%	0.00%	0.00%	0.00%		0.00%
5C1bvi	NOx	NO	NO											
5C2	NOx	NO	NO											
5D1	NOx	NA	NA											
5D2	NOx	NA	NA											
5D3	NOx	NA	NA											
5E	NOx	NO	NO											
6A	NOx	0.15	0.05	0.155	0.050	93%	54.5%	107.45%	0.15%	-0.01%	0.05%	-0.01%	0.07%	0.07%
National total for the entire territory		93.66	36.53	93.66	36.53	3.716	22.410	23.645	36.594%	-0.001%	39.007%	-1.338%	1.624%	7.931%
Percentage uncertainty in total inventory									60.49%	Trend uncertainty				28.16%

NMVOC

NFR category code	Pollutant	1990 Estimate	2015 Estimate	Base year estimate Ex,t	Latest year estimate Ex,t	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	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
1A1a	NMVOC	0.21	0.18	0.214	0.176	2.00%	50.00%	50.04%	0.21%	0.08%	0.21%	0.04%	0.01%	0.04%
1A1b	NMVOC	NO	NO											
1A1c	NMVOC	0.00	0.00	0.004	0.005	2.00%	50.00%	50.04%	0.01%	0.00%	0.01%	0.00%	0.00%	0.00%
1A2a	NMVOC	0.15	0.01	0.150	0.009	2.00%	50.00%	50.04%	0.01%	-0.08%	0.01%	-0.04%	0.00%	0.04%
1A2b	NMVOC	NO	0.00		0.001	2.00%	50.00%	50.04%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1A2c	NMVOC	0.10	0.08	0.101	0.079	2.00%	50.00%	50.04%	0.10%	0.03%	0.10%	0.02%	0.00%	0.02%
1A2d	NMVOC	0.07	0.00	0.070	0.004	2.00%	50.00%	50.04%	0.00%	-0.04%	0.00%	-0.02%	0.00%	0.02%
1A2e	NMVOC	0.50	0.12	0.500	0.125	2.00%	50.00%	50.04%	0.15%	-0.16%	0.15%	-0.08%	0.00%	0.08%
1A2f	NMVOC	0.24	0.04	0.239	0.041	2.00%	50.00%	50.04%	0.05%	-0.10%	0.05%	-0.05%	0.00%	0.05%

NFR category code	Pollutant	1990 Estimate	2015 Estimate	Base year estimate Ex,t	Latest year estimate Ex,t	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	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
1A2gvii	NMVOC	1.42	0.08	1.420	0.077	2.00%	50.00%	50.04%	0.09%	-0.78%	0.09%	-0.39%	0.00%	0.39%
1A2gviii	NMVOC	0.60	4.59	0.601	4.591	2.00%	50.00%	50.04%	5.55%	5.22%	5.59%	2.61%	0.16%	2.62%
1A3ai(i)	NMVOC	0.07	0.04	0.074	0.043	10.00%	30.00%	31.62%	0.03%	0.01%	0.05%	0.00%	0.01%	0.01%
1A3aii(i)	NMVOC	0.00	0.00	0.000	0.000	10.00%	30.00%	31.62%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1A3bi	NMVOC	15.76	1.54	15.762	1.544	2.00%	20.00%	20.10%	0.75%	-7.78%	1.88%	-1.56%	0.05%	1.56%
1A3bii	NMVOC	1.94	0.15	1.944	0.146	2.00%	20.00%	20.10%	0.07%	-1.02%	0.18%	-0.20%	0.01%	0.20%
1A3biii	NMVOC	4.21	0.30	4.206	0.300	2.00%	20.00%	20.10%	0.15%	-2.22%	0.36%	-0.44%	0.01%	0.44%
1A3biv	NMVOC	0.27	0.08	0.273	0.080	2.00%	20.00%	20.10%	0.04%	-0.07%	0.10%	-0.01%	0.00%	0.01%
1A3bv	NMVOC	3.18	0.06	3.178	0.061	2.00%	20.00%	20.10%	0.03%	-1.88%	0.07%	-0.38%	0.00%	0.38%
1A3bvi	NMVOC	NA	NA											
1A3bvii	NMVOC	NA	NA											
1A3c	NMVOC	0.79	0.31	0.786	0.311	2.00%	35.00%	35.06%	0.26%	-0.10%	0.38%	-0.04%	0.01%	0.04%
1A3di(ii)	NMVOC	NO	NE											
1A3dii	NMVOC	0.01	0.02	0.011	0.021	2.00%	35.00%	35.06%	0.02%	0.02%	0.03%	0.01%	0.00%	0.01%
1A3ei	NMVOC	IE	IE											
1A3eii	NMVOC	NO	NO											
1A4ai	NMVOC	3.26	1.53	3.263	1.533	2.00%	50.00%	50.04%	1.85%	-0.14%	1.87%	-0.07%	0.05%	0.09%
1A4aii	NMVOC	0.07	0.07	0.071	0.071	2.00%	50.00%	50.04%	0.09%	0.04%	0.09%	0.02%	0.00%	0.02%
1A4bi	NMVOC	9.55	8.70	9.547	8.695	10.00%	50.00%	50.99%	10.72%	4.73%	10.59%	2.36%	1.50%	2.80%
1A4bii	NMVOC	NO	0.36		0.355	10.00%	50.00%	50.99%	0.44%	0.43%	0.43%	0.22%	0.06%	0.22%
1A4ci	NMVOC	0.81	0.18	0.808	0.185	2.00%	50.00%	50.04%	0.22%	-0.27%	0.23%	-0.14%	0.01%	0.14%
1A4cii	NMVOC	2.94	0.32	2.942	0.315	2.00%	50.00%	50.04%	0.38%	-1.42%	0.38%	-0.71%	0.01%	0.71%
1A4ciii	NMVOC	0.12	0.01	0.116	0.014	2.00%	50.00%	50.04%	0.02%	-0.05%	0.02%	-0.03%	0.00%	0.03%
1A5a	NMVOC	NO	NO											
1A5b	NMVOC	NO	0.02		0.015	2.00%	50.00%	50.04%	0.02%	0.02%	0.02%	0.01%	0.00%	0.01%
1B1a	NMVOC	NE	NE											
1B1b	NMVOC	NO	NO											
1B1c	NMVOC	NO	NO											
1B2ai	NMVOC	NO	NO											
1B2aiv	NMVOC	NO	NO											
1B2av	NMVOC	1.22	0.41	1.218	0.406	2.00%	50.00%	50.04%	0.49%	-0.25%	0.49%	-0.13%	0.01%	0.13%
1B2b	NMVOC	2.13	1.68	2.133	1.683		20.00%	20.00%	0.81%	0.74%	2.05%	0.15%		0.15%
1B2c	NMVOC	0.83	0.31	0.832	0.313		20.00%	20.00%	0.15%	-0.13%	0.38%	-0.03%		0.03%
1B2d	NMVOC	NO	NO											
2A1	NMVOC	0.15	0.01	0.154	0.009	8.00%	10.00%	12.81%	0.00%	-0.08%	0.01%	-0.01%	0.00%	0.01%
2A2	NMVOC	NE	NE											
2A3	NMVOC	0.00	0.00	0.001	0.000	2.50%	60.00%	60.05%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2A5a	NMVOC	NA	NA											

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2A5b	NMVOC	NA	NA											
2A5c	NMVOC	NA	NA											
2A6	NMVOC	NA	NA											
2B1	NMVOC	NO	NO											
2B2	NMVOC	NO	NO											
2B3	NMVOC	NO	NO											
2B5	NMVOC	NO	NO											
2B6	NMVOC	NO	NO											
2B7	NMVOC	NO	NA											
2B10a	NMVOC	NO	NO											
2B10b	NMVOC	NO	NO											
2C1	NMVOC	0.01	0.00	0.011	0.001	5.00%	20.00%	20.62%	0.00%	-0.01%	0.00%	0.00%	0.00%	0.00%
2C2	NMVOC	NO	NO											
2C3	NMVOC	NO	NO											
2C4	NMVOC	NO	NO											
2C5	NMVOC	NO	NO											
2C6	NMVOC	NO	NO											
2C7a	NMVOC	NO	NO											
2C7b	NMVOC	NO	NO											
2C7c	NMVOC	NO	NO											
2C7d	NMVOC	NO	NO											
2D3a	NMVOC	2.05	1.04	2.049	1.040	25.00%	10.00%	26.93%	0.68%	0.01%	1.27%	0.00%	0.45%	0.45%
2D3b	NMVOC	0.00	0.02	0.000	0.021	20.00%	70.00%	72.80%	0.04%	0.03%	0.03%	0.02%	0.01%	0.02%
2D3c	NMVOC	0.00	0.02	0.001	0.019	20.00%	70.00%	72.80%	0.03%	0.02%	0.02%	0.02%	0.01%	0.02%
2D3d	NMVOC	4.74	4.27	4.741	4.272	25.00%	10.00%	26.93%	2.78%	2.29%	5.20%	0.23%	1.84%	1.85%
2D3e	NMVOC	0.05	IE	0.051						-0.03%				
2D3f	NMVOC	IE	IE											
2D3g	NMVOC	2.84	2.81	2.837	2.806	25.00%	10.00%	26.93%	1.83%	1.68%	3.42%	0.17%	1.21%	1.22%
2D3h	NMVOC	0.26	0.39	0.262	0.395	25.00%	10.00%	26.93%	0.26%	0.32%	0.48%	0.03%	0.17%	0.17%
2D3i	NMVOC	1.17	1.86	1.174	1.865	25.00%	10.00%	26.93%	1.21%	1.55%	2.27%	0.16%	0.80%	0.82%
2G	NMVOC	0.01	0.01	0.012	0.008	25.00%	10.00%	26.93%	0.01%	0.00%	0.01%	0.00%	0.00%	0.00%
2H1	NMVOC	NA	NO											
2H2	NMVOC	3.38	1.30	3.382	1.303	2.00%	20.00%	20.10%	0.63%	-0.49%	1.59%	-0.10%	0.04%	0.11%
2H3	NMVOC	NO	NO											
2I	NMVOC	NA	NA											
2J	NMVOC	NO	NO											
2K	NMVOC	NO	NO											
2L	NMVOC	NO	NO											

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3B1a	NMVOC	8.69	3.99	8.692	3.995	2.00%	50.00%	50.04%	4.83%	-0.47%	4.87%	-0.24%	0.14%	0.27%
3B1b	NMVOC	2.72	1.06	2.722	1.057	2.00%	50.00%	50.04%	1.28%	-0.38%	1.29%	-0.19%	0.04%	0.20%
3B2	NMVOC	0.04	0.02	0.037	0.023	2.00%	50.00%	50.04%	0.03%	0.01%	0.03%	0.00%	0.00%	0.00%
3B3	NMVOC	1.06	0.25	1.055	0.249	2.00%	50.00%	50.04%	0.30%	-0.35%	0.30%	-0.17%	0.01%	0.17%
3B4a	NMVOC	NO	NO											
3B4d	NMVOC	0.00	0.01	0.003	0.007	2.00%	50.00%	50.04%	0.01%	0.01%	0.01%	0.00%	0.00%	0.00%
3B4e	NMVOC	0.19	0.06	0.186	0.058	2.00%	50.00%	50.04%	0.07%	-0.04%	0.07%	-0.02%	0.00%	0.02%
3B4f	NMVOC	NO	NO											
3B4gi	NMVOC	1.33	0.39	1.328	0.385	2.00%	50.00%	50.04%	0.47%	-0.35%	0.47%	-0.17%	0.01%	0.17%
3B4gii	NMVOC	0.25	0.22	0.245	0.220	2.00%	50.00%	50.04%	0.27%	0.12%	0.27%	0.06%	0.01%	0.06%
3B4giii	NMVOC	0.00	0.00	0.005	0.002	2.00%	50.00%	50.04%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
3B4giv	NMVOC	0.03	0.00	0.030	0.005	2.00%	50.00%	50.04%	0.01%	-0.01%	0.01%	-0.01%	0.00%	0.01%
3B4h	NMVOC	0.51	0.53	0.505	0.528	2.00%	50.00%	50.04%	0.64%	0.33%	0.64%	0.17%	0.02%	0.17%
3Da1	NMVOC	NA	NA											
3Da2a	NMVOC	IE	IE											
3Da2b	NMVOC	NA	NA											
3Da2c	NMVOC	NA	NA											
3Da3	NMVOC	IE	IE											
3Da4	NMVOC	NA	NA											
3Db	NMVOC	NA	NA											
3Dc	NMVOC	NA	NA											
3Dd	NMVOC	NA	NA											
3De	NMVOC	1.40	1.01	1.399	1.005	2.00%	100%	100.02%	2.43%	0.37%	1.22%	0.37%	0.03%	0.37%
3Df	NMVOC	NA	NA											
3F	NMVOC	NO	NO											
3I	NMVOC	0.02	0.11	0.019	0.111	2%	100%	100.02%	0.27%	0.12%	0.13%	0.12%	0.00%	0.12%
5A	NMVOC	0.70	0.79	0.703	0.786	7.00%	100.00%	100.24%	1.90%	0.53%	0.96%	0.53%	0.09%	0.53%
5B1	NMVOC	NE	NE											
5B2	NMVOC	NO	NE											
5C1a	NMVOC	NO	NO											
5C1bi	NMVOC	NO	NO											
5C1bii	NMVOC	0.00	NO	0.002		44.00%	50.00%	66.60%		0.00%		0.00%		0.00%
5C1biii	NMVOC	0.00	0.00	0.000	0.000	44.00%	50.00%	66.60%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
5C1biv	NMVOC	NO	NO											
5C1bv	NMVOC	NO	0.00		0.000		50.00%	50.00%	0.00%	0.00%	0.00%	0.00%		0.00%
5C1bvi	NMVOC	NO	NO											
5C2	NMVOC	NO	NO											
5D1	NMVOC	IE	IE											

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5D2	NMVOC	IE	IE											
5D3	NMVOC	0.01	0.00	0.009	0.003	9.00%	30.00%	31.32%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
5E	NMVOC	NO	NO											
6A	NMVOC	NA	NA											
National total for the entire territory		82.08	41.37	82.08	41.37	4.255	25.600	27.125	42.686%	0.010%	50.404%	2.096%	6.808%	16.988%
Percentage uncertainty in total inventory									65.33%	Trend uncertainty				41.22%

SO₂

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1A1a	SO ₂	35.93	0.61	35.934	0.606	2.00%	10.00%	10.20%	1.69%	-0.70%	0.60%	-0.07%	0.02%	0.07%
1A1b	SO ₂	NO	NO											
1A1c	SO ₂	0.46	0.03	0.459	0.029	2.00%	10.00%	10.20%	0.08%	0.01%	0.03%	0.00%	0.00%	0.00%
1A2a	SO ₂	1.40	0.00	1.401	0.000	2.00%	10.00%	10.20%	0.00%	-0.05%	0.00%	-0.01%	0.00%	0.01%
1A2b	SO ₂	NO	0.00		0.000	2.00%	10.00%	10.20%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1A2c	SO ₂	3.05	0.01	3.049	0.010	2.00%	10.00%	10.20%	0.03%	-0.10%	0.01%	-0.01%	0.00%	0.01%
1A2d	SO ₂	0.23	0.00	0.229	0.000	2.00%	10.00%	10.20%	0.00%	-0.01%	0.00%	0.00%	0.00%	0.00%
1A2e	SO ₂	8.33	0.04	8.328	0.036	2.00%	10.00%	10.20%	0.10%	-0.27%	0.04%	-0.03%	0.00%	0.03%
1A2f	SO ₂	3.48	0.04	3.479	0.039	2.00%	10.00%	10.20%	0.11%	-0.09%	0.04%	-0.01%	0.00%	0.01%
1A2gvii	SO ₂	0.01	0.00	0.006	0.000	2.00%	35.00%	35.06%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1A2gviii	SO ₂	7.84	0.75	7.838	0.750	2.00%	10.00%	10.20%	2.09%	0.46%	0.75%	0.05%	0.02%	0.05%
1A3ai(i)	SO ₂	0.01	0.02	0.013	0.020	10.00%	10.00%	14.14%	0.08%	0.02%	0.02%	0.00%	0.00%	0.00%
1A3aii(i)	SO ₂	0.00	0.00	0.000	0.000	10.00%	10.00%	14.14%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1A3bi	SO ₂	0.12	0.01	0.122	0.009	2.00%	10.00%	10.20%	0.03%	0.01%	0.01%	0.00%	0.00%	0.00%
1A3bii	SO ₂	0.03	0.00	0.033	0.002	2.00%	10.00%	10.20%	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%
1A3biii	SO ₂	0.21	0.01	0.206	0.006	2.00%	10.00%	10.20%	0.02%	0.00%	0.01%	0.00%	0.00%	0.00%
1A3biv	SO ₂	0.00	0.00	0.000	0.000	2.00%	10.00%	10.20%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

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1A3bv	SO ₂	NA	NA											
1A3bvi	SO ₂	NA	NA											
1A3bvii	SO ₂	NA	NA											
1A3c	SO ₂	0.68	0.13	0.676	0.134	2.00%	10.00%	10.20%	0.37%	0.11%	0.13%	0.01%	0.00%	0.01%
1A3di(ii)	SO ₂	NO	NE											
1A3dii	SO ₂	0.00	0.00	0.000	0.003	2.00%	10.00%	10.20%	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%
1A3ei	SO ₂	IE	IE											
1A3eii	SO ₂	NO	NO											
1A4ai	SO ₂	23.18	0.44	23.180	0.441	2.00%	10.00%	10.20%	1.23%	-0.40%	0.44%	-0.04%	0.01%	0.04%
1A4aii	SO ₂	0.00	0.00	0.000	0.000	2.00%	50.00%	50.04%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1A4bi	SO ₂	8.63	1.12	8.627	1.123	10.00%	10.00%	14.14%	4.34%	0.80%	1.12%	0.08%	0.16%	0.18%
1A4bii	SO ₂	NO	0.00		0.000	10.00%	50.00%	50.99%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1A4ci	SO ₂	2.25	0.03	2.253	0.030	2.00%	10.00%	10.20%	0.08%	-0.05%	0.03%	-0.01%	0.00%	0.01%
1A4cii	SO ₂	0.47	0.20	0.466	0.198	2.00%	50.00%	50.04%	2.71%	0.18%	0.20%	0.09%	0.01%	0.09%
1A4ciii	SO ₂	0.59	0.01	0.590	0.010	2.00%	50.00%	50.04%	0.14%	-0.01%	0.01%	-0.01%	0.00%	0.01%
1A5a	SO ₂	NO	NO											
1A5b	SO ₂	NO	0.01		0.006	2.00%	50.00%	50.04%	0.08%	0.01%	0.01%	0.00%	0.00%	0.00%
1B1a	SO ₂	NA	NA											
1B1b	SO ₂	NO	NO											
1B1c	SO ₂	NO	NO											
1B2ai	SO ₂	NO	NO											
1B2aiv	SO ₂	NO	NO											
1B2av	SO ₂	NE	NE											
1B2b	SO ₂	NA	NA											
1B2c	SO ₂	NA	NA											
1B2d	SO ₂	NO	NO											
2A1	SO ₂	3.41	0.19	3.409	0.191	8.00%		8.00%	0.42%	0.07%	0.19%		0.02%	0.02%
2A2	SO ₂	NE	NE											
2A3	SO ₂	NE	0.00		0.002					0.00%	0.00%			
2A5a	SO ₂	NA	NA											
2A5b	SO ₂	NA	NA											
2A5c	SO ₂	NA	NA											
2A6	SO ₂	NA	NA											
2B1	SO ₂	NO	NO											
2B2	SO ₂	NO	NO											
2B3	SO ₂	NO	NO											
2B5	SO ₂	NO	NO											
2B6	SO ₂	NO	NO											

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2B7	SO ₂	NO	NA											
2B10a	SO ₂	NO	NO											
2B10b	SO ₂	NO	NO											
2C1	SO ₂	0.09	0.00	0.088	0.001	5.00%	20.00%	20.62%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2C2	SO ₂	NO	NO											
2C3	SO ₂	NO	NO											
2C4	SO ₂	NO	NO											
2C5	SO ₂	NO	NO											
2C6	SO ₂	NO	NO											
2C7a	SO ₂	NO	NO											
2C7b	SO ₂	NO	NO											
2C7c	SO ₂	NO	NO											
2C7d	SO ₂	NO	NO											
2D3a	SO ₂	NA	NA											
2D3b	SO ₂	NE	NE											
2D3c	SO ₂	NA	NA											
2D3d	SO ₂	NA	NA											
2D3e	SO ₂	NA	NA											
2D3f	SO ₂	NA	NA											
2D3g	SO ₂	NA	NA											
2D3h	SO ₂	NA	NA											
2D3i	SO ₂	NA	NA											
2G	SO ₂	0.00	0.00	0.000	0.000	2.00%	10.00%	10.20%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2H1	SO ₂	0.07	NO	0.073		5.00%	50.00%	50.25%		0.00%		0.00%		0.00%
2H2	SO ₂	NA	NA											
2H3	SO ₂	NO	NO											
2I	SO ₂	NA	NA											
2J	SO ₂	NO	NO											
2K	SO ₂	NO	NO											
2L	SO ₂	NO	NO											
3B1a	SO ₂	NA	NA											
3B1b	SO ₂	NA	NA											
3B2	SO ₂	NA	NA											
3B3	SO ₂	NA	NA											
3B4a	SO ₂	NO	NO											
3B4d	SO ₂	NA	NA											
3B4e	SO ₂	NA	NA											
3B4f	SO ₂	NO	NO											

NFR category code	Pollutant	1990 Estimate	2015 Estimate	Base year estimate Ex,t	Latest year estimate Ex,t	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	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
3B4gi	SO ₂	NA	NA											
3B4gii	SO ₂	NA	NA											
3B4giii	SO ₂	NA	NA											
3B4giv	SO ₂	NA	NA											
3B4h	SO ₂	NA	NA											
3Da1	SO ₂	NA	NA											
3Da2a	SO ₂	NA	NA											
3Da2b	SO ₂	NA	NA											
3Da2c	SO ₂	NA	NA											
3Da3	SO ₂	NA	NA											
3Da4	SO ₂	NA	NA											
3Db	SO ₂	NA	NA											
3Dc	SO ₂	NA	NA											
3Dd	SO ₂	NA	NA											
3De	SO ₂	NA	NA											
3Df	SO ₂	NA	NA											
3F	SO ₂	NO	NO											
3I	SO ₂	0.00	0.01	0.002	0.010	10.00%	61.50%	62.31%	0.17%	0.01%	0.01%	0.01%	0.00%	0.01%
5A	SO ₂	NA	NA											
5B1	SO ₂	NE	NE											
5B2	SO ₂	NO	NE											
5C1a	SO ₂	NO	NO											
5C1bi	SO ₂	NO	NO											
5C1bii	SO ₂	0.00	NO	0.000		44.00%	50.00%	66.60%		0.00%		0.00%		0.00%
5C1biii	SO ₂	0.00	0.00	0.000	0.000	44.00%	50.00%	66.60%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
5C1biv	SO ₂	NO	NO											
5C1bv	SO ₂	NO	0.00		0.000		50.00%	50.00%	0.00%	0.00%	0.00%	0.00%		0.00%
5C1bvi	SO ₂	NO	NO											
5C2	SO ₂	NO	NO											
5D1	SO ₂	NA	NA											
5D2	SO ₂	NA	NA											
5D3	SO ₂	NA	NA											
5E	SO ₂	NO	NO											
6A	SO ₂	NA	NA											
National total for the entire territory		100.46	3.66	100.46	3.66	2.020	7.765	8.366	13.793%	0.003%	3.643%	0.067%	0.249%	0.545%
Percentage uncertainty in total inventory									37.14%	Trend uncertainty				7.38%

NH₃

NFR category code	Pollutant	1990 Estimate	2015 Estimate	Base year estimate Ex,t	Latest year estimate Ex,t	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	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
1A1a	NH ₃	NE	NE											
1A1b	NH ₃	NO	NO											
1A1c	NH ₃	NE	NE											
1A2a	NH ₃	NE	NE											
1A2b	NH ₃	NO	NE											
1A2c	NH ₃	NE	0.01		0.008	2.00%	50.00%	50.04%	0.02%	0.02%	0.02%	0.01%	0.00%	0.01%
1A2d	NH ₃	NE	0.00		0.000	2.00%	50.00%	50.04%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1A2e	NH ₃	0.01	0.01	0.008	0.010	2.00%	50.00%	50.04%	0.03%	0.01%	0.02%	0.01%	0.00%	0.01%
1A2f	NH ₃	0.00	0.00	0.000	0.000	2.00%	50.00%	50.04%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1A2gvii	NH ₃	0.00	0.00	0.000	0.000	20.00%	100.00%	101.98%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1A2gviii	NH ₃	0.01	0.56	0.014	0.558	2.00%	50.00%	50.04%	1.49%	1.27%	1.28%	0.64%	0.04%	0.64%
1A3ai(i)	NH ₃	NE	NE											
1A3aii(i)	NH ₃	NE	NE											
1A3bi	NH ₃	0.01	0.22	0.010	0.223	2.00%	20.00%	20.10%	0.24%	0.50%	0.51%	0.10%	0.01%	0.10%
1A3bii	NH ₃	0.00	0.00	0.001	0.005	2.00%	20.00%	20.10%	0.00%	0.01%	0.01%	0.00%	0.00%	0.00%
1A3biii	NH ₃	0.00	0.01	0.003	0.007	2.00%	20.00%	20.10%	0.01%	0.01%	0.02%	0.00%	0.00%	0.00%
1A3biv	NH ₃	0.00	0.00	0.000	0.000	2.00%	20.00%	20.10%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1A3bv	NH ₃	NA	NA											
1A3bvi	NH ₃	NA	NA											
1A3bvii	NH ₃	NA	NA											
1A3c	NH ₃	0.00	0.00	0.001	0.000	2.00%	35.00%	35.06%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1A3di(ii)	NH ₃	NO	NE											
1A3dii	NH ₃	0.00	0.00	0.000	0.000	2.00%	35.00%	35.06%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1A3ei	NH ₃	IE	IE											
1A3eii	NH ₃	NO	NO											
1A4ai	NH ₃	0.19	0.17	0.193	0.168	2.00%	50.00%	50.04%	0.45%	0.19%	0.39%	0.10%	0.01%	0.10%
1A4aii	NH ₃	0.00	0.00	0.000	0.000	2.00%	50.00%	50.04%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1A4bi	NH ₃	1.29	1.43	1.294	1.426	10.00%	50.00%	50.99%	3.88%	2.00%	3.29%	1.00%	0.46%	1.10%
1A4bii	NH ₃	NO	0.00		0.000	10.00%	50.00%	50.99%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1A4ci	NH ₃	0.05	0.02	0.045	0.018	2.00%	50.00%	50.04%	0.05%	0.00%	0.04%	0.00%	0.00%	0.00%
1A4cii	NH ₃	0.00	0.00	0.001	0.001	2.00%	50.00%	50.04%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1A4ciii	NH ₃	NE	NE											
1A5a	NH ₃	NO	NO											
1A5b	NH ₃	NO	NE											
1B1a	NH ₃	NA	NA											
1B1b	NH ₃	NO	NO											

NFR category code	Pollutant	1990 Estimate	2015 Estimate	Base year estimate Ex,t	Latest year estimate Ex,t	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	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
1B1c	NH ₃	NO	NO											
1B2ai	NH ₃	NO	NO											
1B2aiv	NH ₃	NO	NO											
1B2av	NH ₃	NA	NA											
1B2b	NH ₃	NA	NA											
1B2c	NH ₃	NA	NA											
1B2d	NH ₃	NO	NO											
2A1	NH ₃	NA	NA											
2A2	NH ₃	NA	NA											
2A3	NH ₃	NE	NE											
2A5a	NH ₃	NA	NA											
2A5b	NH ₃	NA	NA											
2A5c	NH ₃	NA	NA											
2A6	NH ₃	NA	NA											
2B1	NH ₃	NO	NO											
2B2	NH ₃	NO	NO											
2B3	NH ₃	NO	NO											
2B5	NH ₃	NO	NO											
2B6	NH ₃	NO	NO											
2B7	NH ₃	NO	NA											
2B10a	NH ₃	NO	NO											
2B10b	NH ₃	NO	NO											
2C1	NH ₃	NE	NE											
2C2	NH ₃	NO	NO											
2C3	NH ₃	NO	NO											
2C4	NH ₃	NO	NO											
2C5	NH ₃	NO	NO											
2C6	NH ₃	NO	NO											
2C7a	NH ₃	NO	NO											
2C7b	NH ₃	NO	NO											
2C7c	NH ₃	NO	NO											
2C7d	NH ₃	NO	NO											
2D3a	NH ₃	NA	NA											
2D3b	NH ₃	NA	NA											
2D3c	NH ₃	NA	NA											
2D3d	NH ₃	NA	NA											
2D3e	NH ₃	NA	NA											
2D3f	NH ₃	NA	NA											

NFR category code	Pollutant	1990 Estimate	2015 Estimate	Base year estimate Ex,t	Latest year estimate Ex,t	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	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
2D3g	NH ₃	NA	NA											
2D3h	NH ₃	NA	NA											
2D3i	NH ₃	NA	NA											
2G	NH ₃	0.01	0.01	0.010	0.007	2.00%	10.00%	10.20%	0.00%	0.01%	0.02%	0.00%	0.00%	0.00%
2H1	NH ₃	NE	NO											
2H2	NH ₃	NA	NA											
2H3	NH ₃	NO	NO											
2I	NH ₃	NA	NA											
2J	NH ₃	NO	NO											
2K	NH ₃	NO	NO											
2L	NH ₃	NO	NO											
3B1a	NH ₃	9.04	3.34	9.044	3.343	2.00%	50%	50.04%	8.92%	-1.30%	7.70%	-0.65%	0.22%	0.69%
3B1b	NH ₃	2.16	0.74	2.158	0.741	2.00%	50%	50.04%	1.98%	-0.44%	1.71%	-0.22%	0.05%	0.23%
3B2	NH ₃	0.47	0.29	0.474	0.286	2.00%	50%	50.04%	0.76%	0.19%	0.66%	0.09%	0.02%	0.09%
3B3	NH ₃	8.81	1.55	8.811	1.552	2.00%	50%	50.04%	4.14%	-5.19%	3.58%	-2.59%	0.10%	2.60%
3B4a	NH ₃	NO	NO											
3B4d	NH ₃	0.02	0.04	0.018	0.042	2.00%	50%	50.04%	0.11%	0.08%	0.10%	0.04%	0.00%	0.04%
3B4e	NH ₃	0.35	0.11	0.354	0.106	2.00%	50%	50.04%	0.28%	-0.11%	0.25%	-0.05%	0.01%	0.05%
3B4f	NH ₃	NO	NO											
3B4gi	NH ₃	1.75	0.49	1.752	0.490	2.00%	50%	50.04%	1.31%	-0.62%	1.13%	-0.31%	0.03%	0.31%
3B4gii	NH ₃	0.27	0.24	0.272	0.244	2.00%	50%	50.04%	0.65%	0.29%	0.56%	0.15%	0.02%	0.15%
3B4giii	NH ₃	0.01	0.00	0.006	0.002	2.00%	50%	50.04%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
3B4giv	NH ₃	0.01	0.00	0.015	0.003	2.00%	50%	50.04%	0.01%	-0.01%	0.01%	0.00%	0.00%	0.00%
3B4h	NH ₃	0.53	0.56	0.531	0.555	2.00%	50%	50.04%	1.48%	0.75%	1.28%	0.38%	0.04%	0.38%
3Da1	NH ₃	8.59	5.10	8.594	5.099	2.00%	100.00%	100.02%	27.19%	3.18%	11.75%	3.18%	0.33%	3.20%
3Da2a	NH ₃	8.52	3.17	8.522	3.165	2.00%	100.00%	100.02%	16.88%	-1.19%	7.29%	-1.19%	0.21%	1.21%
3Da2b	NH ₃	NA	NE											
3Da2c	NH ₃	NA	0.15		0.154	2.00%	100.00%	100.02%	0.82%	0.36%	0.36%	0.36%	0.01%	0.36%
3Da3	NH ₃	1.02	0.35	1.015	0.346	2.00%	100.00%	100.02%	1.85%	-0.21%	0.80%	-0.21%	0.02%	0.21%
3Da4	NH ₃	NA	NA											
3Db	NH ₃	NA	NA											
3Dc	NH ₃	NA	NA											
3Dd	NH ₃	NA	NA											
3De	NH ₃	NA	NA											
3Df	NH ₃	NA	NA											
3F	NH ₃	NO	NO											
3I	NH ₃	0.00	0.01	0.002	0.010	10.00%	61.50%	62.31%	0.03%	0.02%	0.02%	0.01%	0.00%	0.01%
5A	NH ₃	NE	NE											

NFR category code	Pollutant	1990 Estimate	2015 Estimate	Base year estimate Ex,t	Latest year estimate Ex,t	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	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
5B1	NH ₃	0.06	0.07	0.057	0.069	37%	100%	106.63%	0.39%	0.10%	0.16%	0.10%	0.08%	0.13%
5B2	NH ₃	NO	NE											
5C1a	NH ₃	NO	NO											
5C1bi	NH ₃	NO	NO											
5C1bii	NH ₃	NE	NO											
5C1biii	NH ₃	NE	NE											
5C1biv	NH ₃	NO	NO											
5C1bv	NH ₃	NO	NA											
5C1bvi	NH ₃	NO	NO											
5C2	NH ₃	NO	NO											
5D1	NH ₃	0.19	0.12	0.187	0.120	9.00%	30.00%	31.32%	0.20%	0.09%	0.28%	0.03%	0.04%	0.04%
5D2	NH ₃	NA	IE											
5D3	NH ₃	NA	IE											
5E	NH ₃	NO	NO											
6A	NH ₃	NA	NA											
National total for the entire territory		43.39	18.76	43.39	18.76	1.580	19.515	19.658	73.171%	0.009%	43.226%	0.946%	1.703%	11.668%
Percentage uncertainty in total inventory									85.54%	Trend uncertainty				34.16%

PM_{2.5}

NFR category code	Pollutant	2000 Estimate	2015 Estimate	Base year estimate Ex,t	Latest year estimate Ex,t	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	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
1A1a	PM _{2.5}	0.56	1.66	0.560	1.664	2.00%	50.00%	50.04%	4.70%	5.61%	7.77%	2.80%	0.22%	2.81%
1A1b	PM _{2.5}	NO	NO											
1A1c	PM _{2.5}	0.00	0.05	0.003	0.051	2.00%	50.00%	50.04%	0.14%	0.22%	0.24%	0.11%	0.01%	0.11%
1A2a	PM _{2.5}	0.03	0.00	0.026	0.000	2.00%	50.00%	50.04%	0.00%	-0.10%	0.00%	-0.05%	0.00%	0.05%

NFR category code	Pollutant	2000 Estimate	2015 Estimate	Base year estimate Ex,t	Latest year estimate Ex,t	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	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
1A2b	PM _{2.5}	0.00	0.00	0.000	0.000	2.00%	50.00%	50.04%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1A2c	PM _{2.5}	0.01	0.03	0.009	0.032	2.00%	50.00%	50.04%	0.09%	0.11%	0.15%	0.06%	0.00%	0.06%
1A2d	PM _{2.5}	0.00	0.00	0.003	0.001	2.00%	50.00%	50.04%	0.00%	-0.01%	0.00%	0.00%	0.00%	0.00%
1A2e	PM _{2.5}	0.14	0.04	0.140	0.043	2.00%	50.00%	50.04%	0.12%	-0.34%	0.20%	-0.17%	0.01%	0.17%
1A2f	PM _{2.5}	0.04	0.01	0.037	0.013	2.00%	50.00%	50.04%	0.04%	-0.08%	0.06%	-0.04%	0.00%	0.04%
1A2gvii	PM _{2.5}	0.00	0.00	0.001	0.001	2.00%	50.00%	50.04%	0.00%	0.00%	0.01%	0.00%	0.00%	0.00%
1A2gviii	PM _{2.5}	0.35	2.14	0.346	2.139	2.00%	50.00%	50.04%	6.05%	8.65%	9.98%	4.32%	0.28%	4.33%
1A3ai(i)	PM _{2.5}	0.00	0.00	0.001	0.002	10.00%	30.00%	31.62%	0.00%	0.01%	0.01%	0.00%	0.00%	0.00%
1A3aii(i)	PM _{2.5}	0.00	0.00	0.000	0.000	10.00%	30.00%	31.62%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1A3bi	PM _{2.5}	0.15	0.21	0.153	0.213	2.00%	20.00%	20.10%	0.24%	0.41%	1.00%	0.08%	0.03%	0.09%
1A3bii	PM _{2.5}	0.08	0.08	0.077	0.083	2.00%	20.00%	20.10%	0.09%	0.09%	0.39%	0.02%	0.01%	0.02%
1A3biii	PM _{2.5}	0.32	0.12	0.317	0.125	2.00%	20.00%	20.10%	0.14%	-0.64%	0.58%	-0.13%	0.02%	0.13%
1A3biv	PM _{2.5}	0.00	0.00	0.001	0.002	2.00%	20.00%	20.10%	0.00%	0.00%	0.01%	0.00%	0.00%	0.00%
1A3bv	PM _{2.5}	NA	NA											
1A3bvi	PM _{2.5}	0.09	0.18	0.086	0.177	5.00%	35.00%	35.36%	0.35%	0.49%	0.82%	0.17%	0.06%	0.18%
1A3bvii	PM _{2.5}	0.05	0.07	0.048	0.072	5.00%	35.00%	35.36%	0.14%	0.15%	0.34%	0.05%	0.02%	0.06%
1A3c	PM _{2.5}	0.09	0.09	0.089	0.092	2.00%	35.00%	35.06%	0.18%	0.08%	0.43%	0.03%	0.01%	0.03%
1A3di(ii)	PM _{2.5}	NO	NA											
1A3dii	PM _{2.5}	0.00	0.00	0.001	0.005	2.00%	35.00%	35.06%	0.01%	0.02%	0.02%	0.01%	0.00%	0.01%
1A3ei	PM _{2.5}	IE	IE											
1A3eii	PM _{2.5}	NO	NO											
1A4ai	PM _{2.5}	0.89	0.70	0.891	0.697	2.00%	50.00%	50.04%	1.97%	-0.18%	3.25%	-0.09%	0.09%	0.13%
1A4aii	PM _{2.5}	0.00	0.00	0.002	0.001	2.00%	50.00%	50.04%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1A4bi	PM _{2.5}	14.70	10.73	14.704	10.732	10.00%	50.00%	50.99%	30.92%	-6.55%	50.09%	-3.28%	7.08%	7.80%
1A4bii	PM _{2.5}	0.00	0.01	0.003	0.005	10.00%	50.00%	50.99%	0.02%	0.01%	0.02%	0.01%	0.00%	0.01%
1A4ci	PM _{2.5}	0.09	0.07	0.092	0.070	2.00%	50.00%	50.04%	0.20%	-0.03%	0.33%	-0.01%	0.01%	0.02%
1A4cii	PM _{2.5}	0.08	0.14	0.084	0.142	2.00%	50.00%	50.04%	0.40%	0.34%	0.66%	0.17%	0.02%	0.17%
1A4ciii	PM _{2.5}	0.06	0.01	0.064	0.007	2.00%	50.00%	50.04%	0.02%	-0.22%	0.03%	-0.11%	0.00%	0.11%
1A5a	PM _{2.5}	NO	NO											
1A5b	PM _{2.5}	NE	0.00		0.004	2.00%	50.00%	50.04%	0.01%	0.02%	0.02%	0.01%	0.00%	0.01%
1B1a	PM _{2.5}	0.00	0.00	0.000	0.000	50.00%	100.00%	111.80%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1B1b	PM _{2.5}	NO	NO											
1B1c	PM _{2.5}	NO	NO											
1B2ai	PM _{2.5}	NO	NO											
1B2aiv	PM _{2.5}	NO	NO											
1B2av	PM _{2.5}	NA	NA											
1B2b	PM _{2.5}	NA	NA											
1B2c	PM _{2.5}	NA	NA											

NFR category code	Pollutant	2000 Estimate	2015 Estimate	Base year estimate Ex,t	Latest year estimate Ex,t	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	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
1B2d	PM _{2.5}	NO	NO											
2A1	PM _{2.5}	0.03	0.02	0.030	0.019	8.00%		8.00%	0.01%	-0.03%	0.09%		0.01%	0.01%
2A2	PM _{2.5}	0.01	0.00	0.006	0.000	8.00%	50.00%	50.64%	0.00%	-0.02%	0.00%	-0.01%	0.00%	0.01%
2A3	PM _{2.5}	0.00	NE	0.002		2.50%	60.00%	60.05%		-0.01%		0.00%		0.00%
2A5a	PM _{2.5}	NE	NE											
2A5b	PM _{2.5}	NE	NE											
2A5c	PM _{2.5}	NE	NE											
2A6	PM _{2.5}	NA	NA											
2B1	PM _{2.5}	NO	NO											
2B2	PM _{2.5}	NO	NO											
2B3	PM _{2.5}	NO	NO											
2B5	PM _{2.5}	NO	NO											
2B6	PM _{2.5}	NO	NO											
2B7	PM _{2.5}	NE	NE											
2B10a	PM _{2.5}	NO	NO											
2B10b	PM _{2.5}	NO	NO											
2C1	PM _{2.5}	0.30	0.00	0.300	0.000	5.00%	20.00%	20.62%	0.00%	-1.16%	0.00%	-0.23%	0.00%	0.23%
2C2	PM _{2.5}	NO	NO											
2C3	PM _{2.5}	NO	NO											
2C4	PM _{2.5}	NO	NO											
2C5	PM _{2.5}	NO	NO											
2C6	PM _{2.5}	NO	NO											
2C7a	PM _{2.5}	NO	NO											
2C7b	PM _{2.5}	NO	NO											
2C7c	PM _{2.5}	NO	NO											
2C7d	PM _{2.5}	NO	NO											
2D3a	PM _{2.5}	NA	NA											
2D3b	PM _{2.5}	0.15	0.53	0.153	0.531	20.00%	70.00%	72.80%	2.18%	1.89%	2.48%	1.32%	0.70%	1.50%
2D3c	PM _{2.5}	0.00	0.01	0.003	0.012	20.00%	70.00%	72.80%	0.05%	0.04%	0.06%	0.03%	0.02%	0.03%
2D3d	PM _{2.5}	NA	NA											
2D3e	PM _{2.5}	NA	NA											
2D3f	PM _{2.5}	NA	NA											
2D3g	PM _{2.5}	NA	NA											
2D3h	PM _{2.5}	NA	NA											
2D3i	PM _{2.5}	NA	NA											
2G	PM _{2.5}	0.06	0.04	0.057	0.045	2.00%	10.00%	10.20%	0.03%	-0.01%	0.21%	0.00%	0.01%	0.01%
2H1	PM _{2.5}	NO	NO											
2H2	PM _{2.5}	NE	NE											

NFR category code	Pollutant	2000 Estimate	2015 Estimate	Base year estimate Ex,t	Latest year estimate Ex,t	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	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
2H3	PM _{2.5}	NO	NO											
2I	PM _{2.5}	NA	NA											
2J	PM _{2.5}	NO	NO											
2K	PM _{2.5}	NO	NO											
2L	PM _{2.5}	NO	NO											
3B1a	PM _{2.5}	0.08	0.07	0.084	0.067	2.00%	50.00%	50.04%	0.19%	-0.01%	0.31%	-0.01%	0.01%	0.01%
3B1b	PM _{2.5}	0.02	0.04	0.023	0.036	2.00%	50.00%	50.04%	0.10%	0.08%	0.17%	0.04%	0.00%	0.04%
3B2	PM _{2.5}	0.00	0.00	0.001	0.002	2.00%	50.00%	50.04%	0.01%	0.01%	0.01%	0.00%	0.00%	0.00%
3B3	PM _{2.5}	0.00	0.00	0.003	0.002	2.00%	50.00%	50.04%	0.01%	0.00%	0.01%	0.00%	0.00%	0.00%
3B4a	PM _{2.5}	NO	NO											
3B4d	PM _{2.5}	0.00	0.00	0.000	0.000	2.00%	50.00%	50.04%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
3B4e	PM _{2.5}	0.00	0.00	0.003	0.001	2.00%	50.00%	50.04%	0.00%	0.00%	0.01%	0.00%	0.00%	0.00%
3B4f	PM _{2.5}	NO	NO											
3B4gi	PM _{2.5}	0.01	0.01	0.006	0.007	2.00%	50.00%	50.04%	0.02%	0.01%	0.03%	0.00%	0.00%	0.00%
3B4gii	PM _{2.5}	0.00	0.00	0.001	0.004	2.00%	50.00%	50.04%	0.01%	0.01%	0.02%	0.01%	0.00%	0.01%
3B4giii	PM _{2.5}	0.00	0.00	0.000	0.000	2.00%	50.00%	50.04%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
3B4giv	PM _{2.5}	0.00	0.00	0.001	0.000	2.00%	50.00%	50.04%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
3B4h	PM _{2.5}	0.00	0.00	0.000	0.001	2.00%	50.00%	50.04%	0.00%	0.00%	0.01%	0.00%	0.00%	0.00%
3Da1	PM _{2.5}	NA	NA											
3Da2a	PM _{2.5}	NA	NA											
3Da2b	PM _{2.5}	NA	NA											
3Da2c	PM _{2.5}	NA	NA											
3Da3	PM _{2.5}	NA	NA											
3Da4	PM _{2.5}	NA	NA											
3Db	PM _{2.5}	NA	NA											
3Dc	PM _{2.5}	0.09	0.15	0.087	0.145	2.00%	50.00%	50.04%	0.41%	0.34%	0.68%	0.17%	0.02%	0.17%
3Dd	PM _{2.5}	NA	NA											
3De	PM _{2.5}	NA	NA											
3Df	PM _{2.5}	NA	NA											
3F	PM _{2.5}	NO	NO											
3I	PM _{2.5}	0.03	0.05	0.032	0.046	10.00%	61.50%	62.31%	0.16%	0.09%	0.21%	0.06%	0.03%	0.06%
5A	PM _{2.5}	0.00	0.00	0.000	0.000	7%	100%	100.24%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
5B1	PM _{2.5}	NE	NE											
5B2	PM _{2.5}	NO	NE											
5C1a	PM _{2.5}	NO	NO											
5C1bi	PM _{2.5}	NO	NO											
5C1bii	PM _{2.5}	0.00	NO	0.000		44.00%	50.00%	66.60%		0.00%		0.00%		0.00%
5C1biii	PM _{2.5}	NE	NE											

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5C1biv	PM _{2.5}	NO	NO											
5C1bv	PM _{2.5}	0.00	0.00	0.000	0.000		50.00%	50.00%	0.00%	0.00%	0.00%	0.00%		0.00%
5C1bvi	PM _{2.5}	NO	NO											
5C2	PM _{2.5}	NO	NO											
5D1	PM _{2.5}	NA	NA											
5D2	PM _{2.5}	NA	NA											
5D3	PM _{2.5}	NA	NA											
5E	PM _{2.5}	NO	NO											
6A	PM _{2.5}	2.89	0.41	2.895	0.408	93%	433.0%	442.79%	10.20%	-9.24%	1.90%	-40.02%	2.49%	40.10%
National total for the entire territory		21.43	17.70	21.43	17.70	3.871	28.545	29.164	59.244%	0.055%	82.605%	-34.685%	11.172%	58.544%
Percentage uncertainty in total inventory									76.97%	Trend uncertainty				76.51%

PM₁₀

NFR category code	Pollutant	2000 Estimate	2015 Estimate	Base year estimate Ex,t	Latest year estimate Ex,t	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	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
1A1a	PM ₁₀	0.67	1.93	0.674	1.935	2.00%	50.00%	50.04%	4.14%	5.24%	7.80%	2.62%	0.22%	2.63%
1A1b	PM ₁₀	NO	NO											
1A1c	PM ₁₀	0.01	0.06	0.009	0.059	2.00%	50.00%	50.04%	0.13%	0.21%	0.24%	0.10%	0.01%	0.10%
1A2a	PM ₁₀	0.03	0.00	0.026	0.000	2.00%	50.00%	50.04%	0.00%	-0.10%	0.00%	-0.05%	0.00%	0.05%
1A2b	PM ₁₀	0.00	0.00	0.000	0.000	2.00%	50.00%	50.04%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1A2c	PM ₁₀	0.01	0.03	0.009	0.032	2.00%	50.00%	50.04%	0.07%	0.09%	0.13%	0.05%	0.00%	0.05%
1A2d	PM ₁₀	0.00	0.00	0.003	0.001	2.00%	50.00%	50.04%	0.00%	-0.01%	0.00%	0.00%	0.00%	0.00%
1A2e	PM ₁₀	0.14	0.04	0.142	0.044	2.00%	50.00%	50.04%	0.09%	-0.36%	0.18%	-0.18%	0.01%	0.18%
1A2f	PM ₁₀	0.04	0.01	0.038	0.014	2.00%	50.00%	50.04%	0.03%	-0.09%	0.06%	-0.04%	0.00%	0.04%
1A2gvii	PM ₁₀	0.00	0.00	0.001	0.001	2.00%	50.00%	50.04%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1A2gviii	PM ₁₀	0.35	2.18	0.353	2.184	2.00%	50.00%	50.04%	4.68%	7.46%	8.81%	3.73%	0.25%	3.74%
1A3ai(i)	PM ₁₀	0.00	0.00	0.001	0.002	10.00%	30.00%	31.62%	0.00%	0.01%	0.01%	0.00%	0.00%	0.00%
1A3aii(i)	PM ₁₀	0.00	0.00	0.000	0.000	10.00%	30.00%	31.62%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1A3bi	PM ₁₀	0.15	0.21	0.153	0.213	2.00%	20.00%	20.10%	0.18%	0.28%	0.86%	0.06%	0.02%	0.06%
1A3bii	PM ₁₀	0.08	0.08	0.077	0.083	2.00%	20.00%	20.10%	0.07%	0.04%	0.33%	0.01%	0.01%	0.01%
1A3biii	PM ₁₀	0.32	0.12	0.317	0.125	2.00%	20.00%	20.10%	0.11%	-0.70%	0.50%	-0.14%	0.01%	0.14%
1A3biv	PM ₁₀	0.00	0.00	0.001	0.002	2.00%	20.00%	20.10%	0.00%	0.00%	0.01%	0.00%	0.00%	0.00%
1A3bv	PM ₁₀	NA	NA											

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1A3bvi	PM ₁₀	0.17	0.33	0.167	0.333	5.00%	35.00%	35.36%	0.50%	0.71%	1.34%	0.25%	0.10%	0.27%
1A3bvii	PM ₁₀	0.09	0.13	0.089	0.133	5.00%	35.00%	35.36%	0.20%	0.20%	0.54%	0.07%	0.04%	0.08%
1A3c	PM ₁₀	0.09	0.10	0.094	0.096	2.00%	35.00%	35.06%	0.14%	0.03%	0.39%	0.01%	0.01%	0.02%
1A3di(ii)	PM ₁₀	NO	NA											
1A3dii	PM ₁₀	0.00	0.01	0.001	0.005	2.00%	35.00%	35.06%	0.01%	0.02%	0.02%	0.01%	0.00%	0.01%
1A3ei	PM ₁₀	IE	IE											
1A3eii	PM ₁₀	NO	NO											
1A4ai	PM ₁₀	0.92	0.72	0.922	0.715	2.00%	50.00%	50.04%	1.53%	-0.62%	2.88%	-0.31%	0.08%	0.32%
1A4aii	PM ₁₀	0.00	0.00	0.002	0.001	2.00%	50.00%	50.04%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1A4bi	PM ₁₀	15.07	11.00	15.072	10.996	10.00%	50.00%	50.99%	23.99%	-12.88%	44.34%	-6.44%	6.27%	8.99%
1A4bii	PM ₁₀	0.00	0.01	0.003	0.005	10.00%	50.00%	50.99%	0.01%	0.01%	0.02%	0.00%	0.00%	0.01%
1A4ci	PM ₁₀	0.10	0.07	0.095	0.072	2.00%	50.00%	50.04%	0.15%	-0.07%	0.29%	-0.04%	0.01%	0.04%
1A4cii	PM ₁₀	0.08	0.14	0.084	0.142	2.00%	50.00%	50.04%	0.30%	0.25%	0.57%	0.13%	0.02%	0.13%
1A4ciii	PM ₁₀	0.07	0.01	0.070	0.008	2.00%	50.00%	50.04%	0.02%	-0.24%	0.03%	-0.12%	0.00%	0.12%
1A5a	PM ₁₀	NO	NO											
1A5b	PM ₁₀	NE	0.00		0.004	2.00%	50.00%	50.04%	0.01%	0.02%	0.02%	0.01%	0.00%	0.01%
1B1a	PM ₁₀	0.00	0.00	0.000	0.000	50.00%	100.00%	111.80%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1B1b	PM ₁₀	NO	NO											
1B1c	PM ₁₀	NO	NO											
1B2ai	PM ₁₀	NO	NO											
1B2aiv	PM ₁₀	NO	NO											
1B2av	PM ₁₀	NA	NA											
1B2b	PM ₁₀	NA	NA											
1B2c	PM ₁₀	NA	NA											
1B2d	PM ₁₀	NO	NO											
2A1	PM ₁₀	0.09	0.03	0.085	0.029	8.00%		8.00%	0.01%	-0.21%	0.12%		0.01%	0.01%
2A2	PM ₁₀	0.03	0.00	0.028	0.000	8.00%	50.00%	50.64%	0.00%	-0.10%	0.00%	-0.05%	0.00%	0.05%
2A3	PM ₁₀	0.00	NE	0.002		2.50%	60.00%	60.05%		-0.01%		0.00%		0.00%
2A5a	PM ₁₀	NE	NE											
2A5b	PM ₁₀	NE	NE											
2A5c	PM ₁₀	NE	NE											
2A6	PM ₁₀	NA	NA											
2B1	PM ₁₀	NO	NO											
2B2	PM ₁₀	NO	NO											
2B3	PM ₁₀	NO	NO											
2B5	PM ₁₀	NO	NO											
2B6	PM ₁₀	NO	NO											
2B7	PM ₁₀	NE	NE											

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2B10a	PM ₁₀	NO	NO											
2B10b	PM ₁₀	NO	NO											
2C1	PM ₁₀	0.40	0.00	0.400	0.000	5.00%	20.00%	20.62%	0.00%	-1.52%	0.00%	-0.30%	0.00%	0.30%
2C2	PM ₁₀	NO	NO											
2C3	PM ₁₀	NO	NO											
2C4	PM ₁₀	NO	NO											
2C5	PM ₁₀	NO	NO											
2C6	PM ₁₀	NO	NO											
2C7a	PM ₁₀	NO	NO											
2C7b	PM ₁₀	NO	NO											
2C7c	PM ₁₀	NO	NO											
2C7d	PM ₁₀	NO	NO											
2D3a	PM ₁₀	NA	NA											
2D3b	PM ₁₀	1.14	3.98	1.144	3.982	20.00%	70.00%	72.80%	12.40%	11.70%	16.06%	8.19%	4.54%	9.37%
2D3c	PM ₁₀	0.02	0.06	0.017	0.059	20.00%	70.00%	72.80%	0.18%	0.17%	0.24%	0.12%	0.07%	0.14%
2D3d	PM ₁₀	NA	NA											
2D3e	PM ₁₀	NA	NA											
2D3f	PM ₁₀	NA	NA											
2D3g	PM ₁₀	NA	NA											
2D3h	PM ₁₀	NA	NA											
2D3i	PM ₁₀	NA	NA											
2G	PM ₁₀	0.06	0.04	0.057	0.045	2.00%	10.00%	10.20%	0.02%	-0.04%	0.18%	0.00%	0.01%	0.01%
2H1	PM ₁₀	NO	NO											
2H2	PM ₁₀	NE	NE											
2H3	PM ₁₀	NO	NO											
2I	PM ₁₀	NA	NA											
2J	PM ₁₀	NO	NO											
2K	PM ₁₀	NO	NO											
2L	PM ₁₀	NO	NO											
3B1a	PM ₁₀	0.13	0.10	0.129	0.102	2.00%	50.00%	50.04%	0.22%	-0.08%	0.41%	-0.04%	0.01%	0.04%
3B1b	PM ₁₀	0.03	0.06	0.035	0.055	2.00%	50.00%	50.04%	0.12%	0.09%	0.22%	0.04%	0.01%	0.05%
3B2	PM ₁₀	0.00	0.01	0.002	0.006	2.00%	50.00%	50.04%	0.01%	0.02%	0.02%	0.01%	0.00%	0.01%
3B3	PM ₁₀	0.06	0.05	0.057	0.048	2.00%	50.00%	50.04%	0.10%	-0.02%	0.20%	-0.01%	0.01%	0.01%
3B4a	PM ₁₀	NO	NO											
3B4d	PM ₁₀	0.00	0.00	0.001	0.001	2.00%	50.00%	50.04%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
3B4e	PM ₁₀	0.00	0.00	0.004	0.002	2.00%	50.00%	50.04%	0.00%	-0.01%	0.01%	0.00%	0.00%	0.00%
3B4f	PM ₁₀	NO	NO											
3B4gi	PM ₁₀	0.08	0.09	0.079	0.093	2.00%	50.00%	50.04%	0.20%	0.08%	0.38%	0.04%	0.01%	0.04%

NFR category code	Pollutant	2000 Estimate	2015 Estimate	Base year estimate Ex,t	Latest year estimate Ex,t	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	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
3B4gii	PM ₁₀	0.01	0.04	0.011	0.041	2.00%	50.00%	50.04%	0.09%	0.12%	0.16%	0.06%	0.00%	0.06%
3B4giii	PM ₁₀	0.00	0.00	0.001	0.000	2.00%	50.00%	50.04%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
3B4giv	PM ₁₀	0.01	0.00	0.011	0.002	2.00%	50.00%	50.04%	0.00%	-0.03%	0.01%	-0.02%	0.00%	0.02%
3B4h	PM ₁₀	0.00	0.00	0.001	0.002	2.00%	50.00%	50.04%	0.00%	0.01%	0.01%	0.00%	0.00%	0.00%
3Da1	PM ₁₀	NA	NA											
3Da2a	PM ₁₀	NA	NA											
3Da2b	PM ₁₀	NA	NA											
3Da2c	PM ₁₀	NA	NA											
3Da3	PM ₁₀	NA	NA											
3Da4	PM ₁₀	NA	NA											
3Db	PM ₁₀	NA	NA											
3Dc	PM ₁₀	0.75	1.15	0.753	1.146	2.00%	50.00%	50.04%	2.45%	1.76%	4.62%	0.88%	0.13%	0.89%
3Dd	PM ₁₀	NA	NA											
3De	PM ₁₀	NA	NA											
3Df	PM ₁₀	NA	NA											
3F	PM ₁₀	NO	NO											
3I	PM ₁₀	0.04	0.06	0.039	0.056	10.00%	61.50%	62.31%	0.15%	0.08%	0.22%	0.05%	0.03%	0.06%
5A	PM ₁₀	0.00	0.00	0.000	0.000	7%	100%	100.24%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
5B1	PM ₁₀	NE	NE											
5B2	PM ₁₀	NO	NE											
5C1a	PM ₁₀	NO	NO											
5C1bi	PM ₁₀	NO	NO											
5C1bii	PM ₁₀	0.00	NO	0.000		44.00%	50.00%	66.60%		0.00%		0.00%		0.00%
5C1biii	PM ₁₀	NE	NE											
5C1biv	PM ₁₀	NO	NO											
5C1bv	PM ₁₀	0.00	0.00	0.000	0.000		50.00%	50.00%	0.00%	0.00%	0.00%	0.00%		0.00%
5C1bvi	PM ₁₀	NO	NO											
5C2	PM ₁₀	NO	NO											
5D1	PM ₁₀	NA	NA											
5D2	PM ₁₀	NA	NA											
5D3	PM ₁₀	NA	NA											
5E	PM ₁₀	NO	NO											
6A	PM ₁₀	3.54	0.50	3.538	0.499	93%	355.0%	366.88%	7.82%	-11.42%	2.01%	-40.55%	2.63%	40.64%
National total for the entire territory		24.80	23.38	24.80	23.38	3.871	27.765	28.405	60.177%	0.087%	94.273%	-31.871%	14.527%	68.693%
Percentage uncertainty in total inventory									77.57%	Trend uncertainty				82.88%

TSP

NFR category code	Pollutant	2000 Estimate	2015 Estimate	Base year estimate Ex,t	Latest year estimate Ex,t	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	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
1A1a	TSP	0.79	2.14	0.795	2.144	2.00%	50.00%	50.04%	2.61%	3.48%	6.35%	1.74%	0.18%	1.75%
1A1b	TSP	NO	NO											
1A1c	TSP	0.02	0.07	0.015	0.067	2.00%	50.00%	50.04%	0.08%	0.14%	0.20%	0.07%	0.01%	0.07%
1A2a	TSP	0.03	0.00	0.026	0.000	2.00%	50.00%	50.04%	0.00%	-0.09%	0.00%	-0.05%	0.00%	0.05%
1A2b	TSP	0.00	0.00	0.000	0.000	2.00%	50.00%	50.04%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1A2c	TSP	0.01	0.03	0.010	0.034	2.00%	50.00%	50.04%	0.04%	0.06%	0.10%	0.03%	0.00%	0.03%
1A2d	TSP	0.00	0.00	0.004	0.001	2.00%	50.00%	50.04%	0.00%	-0.01%	0.00%	-0.01%	0.00%	0.01%
1A2e	TSP	0.15	0.05	0.146	0.046	2.00%	50.00%	50.04%	0.06%	-0.39%	0.14%	-0.20%	0.00%	0.20%
1A2f	TSP	0.04	0.01	0.038	0.014	2.00%	50.00%	50.04%	0.02%	-0.09%	0.04%	-0.05%	0.00%	0.05%
1A2gvii	TSP	0.00	0.00	0.001	0.001	2.00%	50.00%	50.04%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1A2gviii	TSP	0.37	2.29	0.369	2.290	2.00%	50.00%	50.04%	2.79%	5.45%	6.79%	2.73%	0.19%	2.73%
1A3ai(i)	TSP	0.00	0.00	0.001	0.002	10.00%	30.00%	31.62%	0.00%	0.00%	0.01%	0.00%	0.00%	0.00%
1A3aii(i)	TSP	0.00	0.00	0.000	0.000	10.00%	30.00%	31.62%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1A3bi	TSP	0.15	0.21	0.153	0.213	2.00%	20.00%	20.10%	0.10%	0.08%	0.63%	0.02%	0.02%	0.02%
1A3bii	TSP	0.08	0.08	0.077	0.083	2.00%	20.00%	20.10%	0.04%	-0.03%	0.25%	-0.01%	0.01%	0.01%
1A3biii	TSP	0.32	0.12	0.317	0.125	2.00%	20.00%	20.10%	0.06%	-0.77%	0.37%	-0.15%	0.01%	0.16%
1A3biv	TSP	0.00	0.00	0.001	0.002	2.00%	20.00%	20.10%	0.00%	0.00%	0.01%	0.00%	0.00%	0.00%
1A3bv	TSP	NA	NA											
1A3bvi	TSP	0.28	0.43	0.278	0.434	5.00%	35.00%	35.36%	0.37%	0.28%	1.29%	0.10%	0.09%	0.13%
1A3bvii	TSP	0.18	0.27	0.177	0.266	5.00%	35.00%	35.36%	0.23%	0.15%	0.79%	0.05%	0.06%	0.08%
1A3c	TSP	0.10	0.10	0.099	0.102	2.00%	35.00%	35.06%	0.09%	-0.06%	0.30%	-0.02%	0.01%	0.02%
1A3di(ii)	TSP	NO	NA											
1A3dii	TSP	0.00	0.01	0.001	0.005	2.00%	35.00%	35.06%	0.00%	0.01%	0.02%	0.00%	0.00%	0.00%
1A3ei	TSP	IE	IE											
1A3eii	TSP	NO	NO											
1A4ai	TSP	0.97	0.75	0.968	0.749	2.00%	50.00%	50.04%	0.91%	-1.28%	2.22%	-0.64%	0.06%	0.64%
1A4aii	TSP	0.00	0.00	0.002	0.001	2.00%	50.00%	50.04%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1A4bi	TSP	15.80	11.52	15.802	11.524	10.00%	50.00%	50.99%	14.28%	-22.82%	34.15%	-11.41%	4.83%	12.39%
1A4bii	TSP	0.00	0.01	0.003	0.005	10.00%	50.00%	50.99%	0.01%	0.00%	0.02%	0.00%	0.00%	0.00%
1A4ci	TSP	0.10	0.08	0.100	0.075	2.00%	50.00%	50.04%	0.09%	-0.14%	0.22%	-0.07%	0.01%	0.07%

NFR category code	Pollutant	2000 Estimate	2015 Estimate	Base year estimate Ex,t	Latest year estimate Ex,t	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	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
1A4cii	TSP	0.08	0.14	0.084	0.142	2.00%	50.00%	50.04%	0.17%	0.12%	0.42%	0.06%	0.01%	0.06%
1A4ciii	TSP	0.07	0.01	0.070	0.008	2.00%	50.00%	50.04%	0.01%	-0.23%	0.02%	-0.12%	0.00%	0.12%
1A5a	TSP	NO	NO											
1A5b	TSP	NE	0.00		0.004	2.00%	50.00%	50.04%	0.00%	0.01%	0.01%	0.01%	0.00%	0.01%
1B1a	TSP	0.00	0.00	0.001	0.001	50.00%	100.00%	111.80%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1B1b	TSP	NO	NO											
1B1c	TSP	NO	NO											
1B2ai	TSP	NO	NO											
1B2aiv	TSP	NO	NO											
1B2av	TSP	NA	NA											
1B2b	TSP	NA	NA											
1B2c	TSP	NA	NA											
1B2d	TSP	NO	NO											
2A1	TSP	0.10	0.03	0.100	0.030	8.00%		8.00%	0.01%	-0.27%	0.09%		0.01%	0.01%
2A2	TSP	0.07	0.00	0.071	0.000	8.00%	50.00%	50.64%	0.00%	-0.26%	0.00%	-0.13%	0.00%	0.13%
2A3	TSP	0.00	0.00	0.002	0.001	2.50%	60.00%	60.05%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2A5a	TSP	NE	NE											
2A5b	TSP	NE	NE											
2A5c	TSP	NE	NE											
2A6	TSP	NA	NA											
2B1	TSP	NO	NO											
2B2	TSP	NO	NO											
2B3	TSP	NO	NO											
2B5	TSP	NO	NO											
2B6	TSP	NO	NO											
2B7	TSP	NE	NE											
2B10a	TSP	NO	NO											
2B10b	TSP	NO	NO											
2C1	TSP	0.50	0.00	0.500	0.000	5.00%	20.00%	20.62%	0.00%	-1.81%	0.00%	-0.36%	0.00%	0.36%
2C2	TSP	NO	NO											
2C3	TSP	NO	NO											
2C4	TSP	NO	NO											
2C5	TSP	NO	NO											
2C6	TSP	NO	NO											
2C7a	TSP	NO	NO											
2C7b	TSP	NO	NO											
2C7c	TSP	NO	NO											
2C7d	TSP	NO	NO											

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2D3a	TSP	NA	NA											
2D3b	TSP	5.34	18.58	5.338	18.581	20.00%	70.00%	72.80%	32.88%	35.72%	55.06%	25.01%	15.57%	29.46%
2D3c	TSP	0.07	0.24	0.068	0.236	20.00%	70.00%	72.80%	0.42%	0.45%	0.70%	0.32%	0.20%	0.37%
2D3d	TSP	NA	NA											
2D3e	TSP	NA	NA											
2D3f	TSP	NA	NA											
2D3g	TSP	NA	NA											
2D3h	TSP	NA	NA											
2D3i	TSP	NA	NA											
2G	TSP	0.06	0.04	0.057	0.045	2.00%	10.00%	10.20%	0.01%	-0.07%	0.13%	-0.01%	0.00%	0.01%
2H1	TSP	NO	NO											
2H2	TSP	NE	NE											
2H3	TSP	NO	NO											
2I	TSP	NE	NE											
2J	TSP	NO	NO											
2K	TSP	NO	NO											
2L	TSP	NO	NO											
3B1a	TSP	0.28	0.22	0.282	0.224	2.00%	50.00%	50.04%	0.27%	-0.36%	0.66%	-0.18%	0.02%	0.18%
3B1b	TSP	0.08	0.12	0.075	0.119	2.00%	50.00%	50.04%	0.15%	0.08%	0.35%	0.04%	0.01%	0.04%
3B2	TSP	0.00	0.01	0.004	0.014	2.00%	50.00%	50.04%	0.02%	0.03%	0.04%	0.01%	0.00%	0.01%
3B3	TSP	0.38	0.33	0.384	0.327	2.00%	50.00%	50.04%	0.40%	-0.42%	0.97%	-0.21%	0.03%	0.21%
3B4a	TSP	NO	NO											
3B4d	TSP	0.00	0.00	0.001	0.002	2.00%	50.00%	50.04%	0.00%	0.00%	0.01%	0.00%	0.00%	0.00%
3B4e	TSP	0.01	0.00	0.010	0.005	2.00%	50.00%	50.04%	0.01%	-0.02%	0.01%	-0.01%	0.00%	0.01%
3B4f	TSP	NO	NO											
3B4gi	TSP	0.38	0.44	0.376	0.444	2.00%	50.00%	50.04%	0.54%	-0.04%	1.31%	-0.02%	0.04%	0.04%
3B4gii	TSP	0.02	0.08	0.023	0.081	2.00%	50.00%	50.04%	0.10%	0.16%	0.24%	0.08%	0.01%	0.08%
3B4giii	TSP	0.00	0.00	0.001	0.000	2.00%	50.00%	50.04%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
3B4giv	TSP	0.01	0.00	0.011	0.002	2.00%	50.00%	50.04%	0.00%	-0.03%	0.01%	-0.02%	0.00%	0.02%
3B4h	TSP	0.00	0.00	0.002	0.005	2.00%	50.00%	50.04%	0.01%	0.01%	0.01%	0.00%	0.00%	0.00%
3Da1	TSP	NA	NA											
3Da2a	TSP	NA	NA											
3Da2b	TSP	NA	NA											
3Da2c	TSP	NA	NA											
3Da3	TSP	NA	NA											
3Da4	TSP	NA	NA											
3Db	TSP	NA	NA											
3Dc	TSP	1.37	1.82	1.375	1.823	2.00%	100.00%	100.02%	4.43%	0.44%	5.40%	0.44%	0.15%	0.46%

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3Dd	TSP	NA	NA											
3De	TSP	NA	NA											
3Df	TSP	NA	NA											
3F	TSP	NO	NO											
3I	TSP	0.06	0.09	0.060	0.086	10.00%	61.50%	62.31%	0.13%	0.04%	0.25%	0.02%	0.04%	0.04%
5A	TSP	0.00	0.00	0.000	0.000	7%	100%	100.24%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
5B1	TSP	NE	NE											
5B2	TSP	NO	NE											
5C1a	TSP	NO	NO											
5C1bi	TSP	NO	NO											
5C1bii	TSP	0.00	NO	0.000		44.00%	50.00%	66.60%		0.00%		0.00%		0.00%
5C1biii	TSP	0.00	0.00	0.001	0.000		50.00%	50.00%	0.00%	0.00%	0.00%	0.00%		0.00%
5C1biv	TSP	NO	NO											
5C1bv	TSP	0.00	0.00	0.000	0.000		50.00%	50.00%	0.00%	0.00%	0.00%	0.00%		0.00%
5C1bvi	TSP	NO	NO											
5C2	TSP	NO	NO											
5D1	TSP	NA	NA											
5D2	TSP	NA	NA											
5D3	TSP	NA	NA											
5E	TSP	NO	NO											
6A	TSP	5.47	0.77	5.467	0.770	93%	282.0%	296.81%	5.56%	-17.44%	2.28%	-49.17%	2.99%	49.26%
National total for the entire territory		33.75	41.14	33.75	41.14	3.871	28.035	28.704	66.910%	0.078%	121.896%	-32.091%	24.558%	99.317%
Percentage uncertainty in total inventory									81.80%	Trend uncertainty				99.66%

BC

NFR category code	Pollutant	2000 Estimate	2015 Estimate	Base year estimate Ex,t	Latest year estimate Ex,t	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	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
1A1a	BC	0.02	0.05	0.021	0.055	2.00%	50.00%	50.04%	0.94%	1.16%	1.88%	0.58%	0.05%	0.58%
1A1b	BC	NO	NO											
1A1c	BC	0.00	0.00	0.000	0.002	2.00%	50.00%	50.04%	0.03%	0.04%	0.06%	0.02%	0.00%	0.02%
1A2a	BC	0.01	0.00	0.013	0.000	2.00%	50.00%	50.04%	0.00%	-0.46%	0.00%	-0.23%	0.00%	0.23%
1A2b	BC	0.00	0.00	0.000	0.000	2.00%	50.00%	50.04%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1A2c	BC	0.00	0.01	0.003	0.009	2.00%	50.00%	50.04%	0.15%	0.19%	0.30%	0.10%	0.01%	0.10%

NFR category code	Pollutant	2000 Estimate	2015 Estimate	Base year estimate Ex,t	Latest year estimate Ex,t	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	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
1A2d	BC	0.00	0.00	0.001	0.000	2.00%	50.00%	50.04%	0.00%	-0.02%	0.01%	-0.01%	0.00%	0.01%
1A2e	BC	0.05	0.01	0.052	0.012	2.00%	50.00%	50.04%	0.21%	-1.38%	0.41%	-0.69%	0.01%	0.69%
1A2f	BC	0.02	0.00	0.018	0.004	2.00%	50.00%	50.04%	0.06%	-0.50%	0.13%	-0.25%	0.00%	0.25%
1A2gvii	BC	0.00	0.00	0.000	0.000	2.00%	50.00%	50.04%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1A2gviii	BC	0.10	0.60	0.104	0.604	2.00%	50.00%	50.04%	10.33%	17.14%	20.74%	8.57%	0.59%	8.59%
1A3ai(i)	BC	0.00	0.00	0.000	0.001	10.00%	30.00%	31.62%	0.01%	0.03%	0.04%	0.01%	0.01%	0.01%
1A3aii(i)	BC	0.00	0.00	0.000	0.000	10.00%	30.00%	31.62%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1A3bi	BC	0.08	0.16	0.083	0.164	2.00%	20.00%	20.10%	1.13%	2.77%	5.63%	0.55%	0.16%	0.58%
1A3bii	BC	0.05	0.06	0.046	0.063	2.00%	20.00%	20.10%	0.43%	0.57%	2.15%	0.11%	0.06%	0.13%
1A3biii	BC	0.17	0.08	0.167	0.081	2.00%	20.00%	20.10%	0.55%	-2.98%	2.77%	-0.60%	0.08%	0.60%
1A3biv	BC	0.00	0.00	0.000	0.000	2.00%	20.00%	20.10%	0.00%	0.01%	0.01%	0.00%	0.00%	0.00%
1A3bv	BC	NA	NA											
1A3bvi	BC	0.01	0.02	0.011	0.018	5.00%	35.00%	35.36%	0.21%	0.22%	0.61%	0.08%	0.04%	0.09%
1A3bvii	BC	NA	NA											
1A3c	BC	0.06	0.06	0.058	0.059	2.00%	35.00%	35.06%	0.71%	0.05%	2.04%	0.02%	0.06%	0.06%
1A3di(ii)	BC	NO	NA											
1A3dii	BC	0.00	0.00	0.000	0.001	2.00%	35.00%	35.06%	0.02%	0.04%	0.05%	0.02%	0.00%	0.02%
1A3ei	BC	IE	IE											
1A3eii	BC	NO	NO											
1A4ai	BC	0.22	0.19	0.217	0.193	2.00%	50.00%	50.04%	3.30%	-0.85%	6.62%	-0.42%	0.19%	0.46%
1A4aii	BC	0.00	0.00	0.000	0.000	2.00%	50.00%	50.04%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1A4bi	BC	2.01	1.52	2.012	1.521	10.00%	50.00%	50.99%	26.50%	-17.07%	52.21%	-8.54%	7.38%	11.29%
1A4bii	BC	0.00	0.00	0.000	0.000	10.00%	50.00%	50.99%	0.00%	0.00%	0.01%	0.00%	0.00%	0.00%
1A4ci	BC	0.02	0.02	0.024	0.020	2.00%	50.00%	50.04%	0.33%	-0.15%	0.67%	-0.08%	0.02%	0.08%
1A4cii	BC	0.05	0.09	0.051	0.086	2.00%	50.00%	50.04%	1.47%	1.21%	2.96%	0.60%	0.08%	0.61%
1A4ciii	BC	0.01	0.00	0.014	0.002	2.00%	50.00%	50.04%	0.04%	-0.41%	0.08%	-0.20%	0.00%	0.20%
1A5a	BC	NO	NO											
1A5b	BC	NE	0.00		0.001	2.00%	50.00%	50.04%	0.02%	0.04%	0.04%	0.02%	0.00%	0.02%
1B1a	BC	NA	NA											
1B1b	BC	NO	NO											
1B1c	BC	NO	NO											
1B2ai	BC	NO	NO											
1B2aiv	BC	NO	NO											
1B2av	BC	NA	NA											
1B2b	BC	NA	NA											
1B2c	BC	NA	NA											
1B2d	BC	NO	NO											
2A1	BC	0.00	0.00	0.001	0.000	8.00%	50.00%	50.64%	0.00%	-0.02%	0.01%	-0.01%	0.00%	0.01%

NFR category code	Pollutant	2000 Estimate	2015 Estimate	Base year estimate Ex,t	Latest year estimate Ex,t	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	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
2A2	BC	0.00	0.00	0.000	0.000	8.00%	50.00%	50.64%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2A3	BC	0.00	NE	0.000		2.50%	60.00%	60.05%		0.00%		0.00%		0.00%
2A5a	BC	NA	NA											
2A5b	BC	NA	NA											
2A5c	BC	NA	NA											
2A6	BC	NA	NA											
2B1	BC	NO	NO											
2B2	BC	NO	NO											
2B3	BC	NO	NO											
2B5	BC	NO	NO											
2B6	BC	NO	NO											
2B7	BC	NE	NE											
2B10a	BC	NO	NO											
2B10b	BC	NO	NO											
2C1	BC	0.01	0.00	0.007	0.000	5.00%	20.00%	20.62%	0.00%	-0.25%	0.00%	-0.05%	0.00%	0.05%
2C2	BC	NO	NO											
2C3	BC	NO	NO											
2C4	BC	NO	NO											
2C5	BC	NO	NO											
2C6	BC	NO	NO											
2C7a	BC	NO	NO											
2C7b	BC	NO	NO											
2C7c	BC	NO	NO											
2C7d	BC	NO	NO											
2D3a	BC	NA	NA											
2D3b	BC	0.01	0.03	0.009	0.030	20.00%	70.00%	72.80%	0.75%	0.74%	1.04%	0.52%	0.29%	0.60%
2D3c	BC	0.00	0.00	0.000	0.000	20.00%	70.00%	72.80%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2D3d	BC	NA	NA											
2D3e	BC	NA	NA											
2D3f	BC	NA	NA											
2D3g	BC	NA	NA											
2D3h	BC	NA	NA											
2D3i	BC	NA	NA											
2G	BC	NE	NE											
2H1	BC	NO	NO											
2H2	BC	NE	NE											
2H3	BC	NO	NO											
2I	BC	NA	NA											

NFR category code	Pollutant	2000 Estimate	2015 Estimate	Base year estimate Ex,t	Latest year estimate Ex,t	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	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
2J	BC	NO	NO											
2K	BC	NO	NO											
2L	BC	NO	NO											
3B1a	BC	NA	NA											
3B1b	BC	NA	NA											
3B2	BC	NA	NA											
3B3	BC	NA	NA											
3B4a	BC	NO	NO											
3B4d	BC	NA	NA											
3B4e	BC	NA	NA											
3B4f	BC	NO	NO											
3B4gi	BC	NA	NA											
3B4gii	BC	NA	NA											
3B4giii	BC	NA	NA											
3B4giv	BC	NA	NA											
3B4h	BC	NA	NA											
3Da1	BC	NA	NA											
3Da2a	BC	NA	NA											
3Da2b	BC	NA	NA											
3Da2c	BC	NA	NA											
3Da3	BC	NA	NA											
3Da4	BC	NA	NA											
3Db	BC	NA	NA											
3Dc	BC	NA	NA											
3Dd	BC	NA	NA											
3De	BC	NA	NA											
3Df	BC	NA	NA											
3F	BC	NO	NO											
3I	BC	NA	NA											
5A	BC	NA	NA											
5B1	BC	NE	NE											
5B2	BC	NO	NE											
5C1a	BC	NO	NO											
5C1bi	BC	NO	NO											
5C1bii	BC	0.00	NO	0.000		44.00%	50.00%	66.60%		0.00%		0.00%		0.00%
5C1biii	BC	0.00	0.00	0.000	0.000	44.00%	50.00%	66.60%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
5C1biv	BC	NO	NO											
5C1bv	BC	NE	NE											

NFR category code	Pollutant	2000 Estimate	2015 Estimate	Base year estimate Ex,t	Latest year estimate Ex,t	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	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
5C1bvi	BC	NO	NO											
5C2	BC	NO	NO											
5D1	BC	NA	NA											
5D2	BC	NA	NA											
5D3	BC	NA	NA											
5E	BC	NO	NO											
6A	BC	NA	NA											
National total for the entire territory		2.91	2.93	2.91	2.93	2.405	15.650	16.125	47.214%	0.113%	100.458%	0.119%	9.045%	25.276%
Percentage uncertainty in total inventory									68.71%	Trend uncertainty			50.27%	

CO

NFR category code	Pollutant	1990 Estimate	2015 Estimate	Base year estimate Ex,t	Latest year estimate Ex,t	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	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
1A1a	CO	2.57	2.39	2.567	2.391	2.00%	50.00%	50.04%	0.91%	0.39%	0.62%	0.20%	0.02%	0.20%
1A1b	CO	NO	NO											
1A1c	CO	0.04	0.06	0.044	0.064	2.00%	50.00%	50.04%	0.02%	0.01%	0.02%	0.01%	0.00%	0.01%
1A2a	CO	0.26	0.01	0.260	0.012	2.00%	50.00%	50.04%	0.00%	-0.02%	0.00%	-0.01%	0.00%	0.01%
1A2b	CO	NO	0.00		0.003	2.00%	50.00%	50.04%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1A2c	CO	0.25	0.14	0.253	0.142	2.00%	50.00%	50.04%	0.05%	0.01%	0.04%	0.01%	0.00%	0.01%
1A2d	CO	0.12	0.01	0.119	0.006	2.00%	50.00%	50.04%	0.00%	-0.01%	0.00%	0.00%	0.00%	0.00%
1A2e	CO	1.91	0.23	1.912	0.232	2.00%	50.00%	50.04%	0.09%	-0.11%	0.06%	-0.05%	0.00%	0.05%
1A2f	CO	0.57	0.11	0.565	0.111	2.00%	50.00%	50.04%	0.04%	-0.02%	0.03%	-0.01%	0.00%	0.01%
1A2gvii	CO	14.66	0.80	14.659	0.800	2.00%	50.00%	50.04%	0.31%	-1.08%	0.21%	-0.54%	0.01%	0.54%
1A2gviii	CO	1.39	8.75	1.392	8.753	2.00%	50.00%	50.04%	3.34%	2.14%	2.27%	1.07%	0.06%	1.07%
1A3ai(i)	CO	0.24	0.38	0.242	0.377	10.00%	30.00%	31.62%	0.09%	0.08%	0.10%	0.02%	0.01%	0.03%

NFR category code	Pollutant	1990 Estimate	2015 Estimate	Base year estimate Ex,t	Latest year estimate Ex,t	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	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
1A3aii(i)	CO	0.00	0.00	0.000	0.001	10.00%	30.00%	31.62%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1A3bi	CO	160.26	10.48	160.259	10.483	2.00%	20.00%	20.10%	1.61%	-11.33%	2.71%	-2.27%	0.08%	2.27%
1A3bii	CO	18.01	0.93	18.010	0.931	2.00%	20.00%	20.10%	0.14%	-1.34%	0.24%	-0.27%	0.01%	0.27%
1A3biii	CO	9.85	2.22	9.850	2.217	2.00%	20.00%	20.10%	0.34%	-0.29%	0.57%	-0.06%	0.02%	0.06%
1A3biv	CO	0.43	0.22	0.433	0.223	2.00%	20.00%	20.10%	0.03%	0.02%	0.06%	0.00%	0.00%	0.00%
1A3bv	CO	NA	NA											
1A3bvi	CO	NA	NA											
1A3bvii	CO	NA	NA											
1A3c	CO	1.81	0.71	1.808	0.715	2.00%	35.00%	35.06%	0.19%	0.03%	0.19%	0.01%	0.01%	0.01%
1A3di(ii)	CO	NO	NA											
1A3dii	CO	0.03	0.06	0.035	0.062	2.00%	35.00%	35.06%	0.02%	0.01%	0.02%	0.00%	0.00%	0.00%
1A3ei	CO	IE	IE											
1A3eii	CO	NO	NO											
1A4ai	CO	18.20	3.12	18.201	3.117	2.00%	50.00%	50.04%	1.19%	-0.79%	0.81%	-0.40%	0.02%	0.40%
1A4aii	CO	0.73	0.73	0.733	0.733	2.00%	50.00%	50.04%	0.28%	0.13%	0.19%	0.06%	0.01%	0.06%
1A4bi	CO	112.89	87.40	112.889	87.398	10.00%	50.00%	50.99%	33.97%	12.66%	22.63%	6.33%	3.20%	7.09%
1A4bii	CO	NO	3.67		3.667	10.00%	50.00%	50.99%	1.43%	0.95%	0.95%	0.47%	0.13%	0.49%
1A4ci	CO	2.19	0.33	2.192	0.333	2.00%	50.00%	50.04%	0.13%	-0.11%	0.09%	-0.05%	0.00%	0.05%
1A4cii	CO	28.21	1.37	28.210	1.366	2.00%	50.00%	50.04%	0.52%	-2.13%	0.35%	-1.06%	0.01%	1.06%
1A4ciii	CO	0.31	0.04	0.311	0.037	2.00%	50.00%	50.04%	0.01%	-0.02%	0.01%	-0.01%	0.00%	0.01%
1A5a	CO	NO	NO											
1A5b	CO	NO	0.52		0.523	2.00%	50.00%	50.04%	0.20%	0.14%	0.14%	0.07%	0.00%	0.07%
1B1a	CO	NA	NE											
1B1b	CO	NO	NO											
1B1c	CO	NO	NO											
1B2ai	CO	NO	NO											
1B2aiv	CO	NO	NO											
1B2av	CO	NA	NA											
1B2b	CO	NA	NA											
1B2c	CO	NA	NA											
1B2d	CO	NO	NO											
2A1	CO	NE	1.64		1.644	8.00%		8.00%	0.10%	0.43%	0.43%		0.05%	0.05%
2A2	CO	NE	NE											
2A3	CO	NE	0.00		0.001					0.00%	0.00%			
2A5a	CO	NA	NA											
2A5b	CO	NA	NA											
2A5c	CO	NA	NA											
2A6	CO	NA	NA											

NFR category code	Pollutant	1990 Estimate	2015 Estimate	Base year estimate Ex,t	Latest year estimate Ex,t	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	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
2B1	CO	NO	NO											
2B2	CO	NO	NO											
2B3	CO	NO	NO											
2B5	CO	NO	NO											
2B6	CO	NO	NO											
2B7	CO	NO	NA											
2B10a	CO	NO	NO											
2B10b	CO	NO	NO											
2C1	CO	0.00	0.00	0.001	0.000	5.00%	20.00%	20.62%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2C2	CO	NO	NO											
2C3	CO	NO	NO											
2C4	CO	NO	NO											
2C5	CO	NO	NO											
2C6	CO	NO	NO											
2C7a	CO	NO	NO											
2C7b	CO	NO	NO											
2C7c	CO	NO	NO											
2C7d	CO	NO	NO											
2D3a	CO	NA	NA											
2D3b	CO	NE	NE											
2D3c	CO	0.00	0.00	0.000	0.001	20.00%	70.00%	72.80%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2D3d	CO	NA	NA											
2D3e	CO	NA	NA											
2D3f	CO	NA	NA											
2D3g	CO	NA	NA											
2D3h	CO	NA	NA											
2D3i	CO	NA	NA											
2G	CO	0.13	0.09	0.131	0.093	2.00%	10.00%	10.20%	0.01%	0.01%	0.02%	0.00%	0.00%	0.00%
2H1	CO	NA	NO											
2H2	CO	NA	NA											
2H3	CO	NO	NO											
2I	CO	NA	NA											
2J	CO	NO	NO											
2K	CO	NO	NO											
2L	CO	NO	NO											
3B1a	CO	NA	NA											
3B1b	CO	NA	NA											
3B2	CO	NA	NA											

NFR category code	Pollutant	1990 Estimate	2015 Estimate	Base year estimate Ex,t	Latest year estimate Ex,t	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	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
3B3	CO	NA	NA											
3B4a	CO	NO	NO											
3B4d	CO	NA	NA											
3B4e	CO	NA	NA											
3B4f	CO	NO	NO											
3B4gi	CO	NA	NA											
3B4gii	CO	NA	NA											
3B4giii	CO	NA	NA											
3B4giv	CO	NA	NA											
3B4h	CO	NA	NA											
3Da1	CO	NA	NA											
3Da2a	CO	NA	NA											
3Da2b	CO	NA	NA											
3Da2c	CO	NA	NA											
3Da3	CO	NA	NA											
3Da4	CO	NA	NA											
3Db	CO	NA	NA											
3Dc	CO	NA	NA											
3Dd	CO	NA	NA											
3De	CO	NA	NA											
3Df	CO	NA	NA											
3F	CO	NO	NO											
3I	CO	0.21	1.21	0.207	1.215	10.00%	30.80%	32.38%	0.30%	0.30%	0.31%	0.09%	0.04%	0.10%
5A	CO	NE	NE											
5B1	CO	NE	NE											
5B2	CO	NO	NE											
5C1a	CO	NO	NO											
5C1bi	CO	NO	NO											
5C1bii	CO	0.00	NO	0.000		44.00%	50.00%	66.60%		0.00%		0.00%		0.00%
5C1biii	CO	0.00	0.00	0.000	0.000		50.00%	50.00%	0.00%	0.00%	0.00%	0.00%		0.00%
5C1biv	CO	NO	NO											
5C1bv	CO	NO	0.00		0.000		50.00%	50.00%	0.00%	0.00%	0.00%	0.00%		0.00%
5C1bvi	CO	NO	NO											
5C2	CO	NO	NO											
5D1	CO	NA	NA											
5D2	CO	NA	NA											
5D3	CO	NA	NA											
5E	CO	NO	NO											

NFR category code	Pollutant	1990 Estimate	2015 Estimate	Base year estimate Ex,t	Latest year estimate Ex,t	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	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
6A	CO	10.97	3.53	10.974	3.535	93%	39.7%	100.75%	2.71%	-0.05%	0.92%	-0.02%	1.20%	1.20%
National total for the entire territory		386.26	131.19	386.26	131.19	2.656	14.305	15.277	48.044%	0.013%	33.964%	3.599%	4.883%	15.138%
Percentage uncertainty in total inventory									69.31%	Trend uncertainty				38.91%

Pb

NFR category code	Pollutant	1990 Estimate	2015 Estimate	Base year estimate Ex,t	Latest year estimate Ex,t	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	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
1A1a	Pb	0.23	0.25	0.226	0.254	2.00%	50.00%	50.04%	3.93%	0.10%	0.10%	0.05%	0.00%	0.05%
1A1b	Pb	NO	NO											
1A1c	Pb	0.01	0.01	0.012	0.009	2.00%	50.00%	50.04%	0.14%	0.00%	0.00%	0.00%	0.00%	0.00%
1A2a	Pb	0.00	0.00	0.000	0.000	2.00%	50.00%	50.04%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1A2b	Pb	NO	0.00		0.000	2.00%	50.00%	50.04%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1A2c	Pb	0.00	0.01	0.000	0.006	2.00%	50.00%	50.04%	0.09%	0.00%	0.00%	0.00%	0.00%	0.00%
1A2d	Pb	0.00	0.00	0.004	0.000	2.00%	50.00%	50.04%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1A2e	Pb	0.15	0.01	0.150	0.010	2.00%	50.00%	50.04%	0.16%	0.00%	0.00%	0.00%	0.00%	0.00%
1A2f	Pb	0.02	0.01	0.023	0.008	2.00%	50.00%	50.04%	0.13%	0.00%	0.00%	0.00%	0.00%	0.00%
1A2gvii	Pb	3.03	0.01	3.032	0.006	2.00%	50.00%	50.04%	0.09%	-0.01%	0.00%	-0.01%	0.00%	0.01%
1A2gviii	Pb	0.05	0.41	0.048	0.413	2.00%	50.00%	50.04%	6.39%	0.16%	0.16%	0.08%	0.00%	0.08%
1A3ai(i)	Pb	NE	NE											
1A3aii(i)	Pb	NE	NE											
1A3bi	Pb	54.25	1.17	54.255	1.172	2.00%	20.00%	20.10%	7.28%	0.19%	0.45%	0.04%	0.01%	0.04%
1A3bii	Pb	7.75	0.08	7.750	0.077	2.00%	20.00%	20.10%	0.48%	-0.01%	0.03%	0.00%	0.00%	0.00%
1A3biii	Pb	20.74	0.17	20.744	0.173	2.00%	20.00%	20.10%	1.07%	-0.03%	0.07%	-0.01%	0.00%	0.01%
1A3biv	Pb	0.11	0.01	0.112	0.009	2.00%	20.00%	20.10%	0.06%	0.00%	0.00%	0.00%	0.00%	0.00%
1A3bv	Pb	NA	NA											
1A3bvi	Pb	NA	NA											
1A3bvii	Pb	NA	NA											
1A3c	Pb	NE	NE											
1A3di(ii)	Pb	NO	NA											
1A3dii	Pb	NE	NE											
1A3ei	Pb	IE	IE											
1A3eii	Pb	NO	NO											
1A4ai	Pb	2.26	0.17	2.256	0.170	2.00%	50.00%	50.04%	2.63%	0.05%	0.07%	0.03%	0.00%	0.03%

NFR category code	Pollutant	1990 Estimate	2015 Estimate	Base year estimate Ex,t	Latest year estimate Ex,t	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	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
1A4aii	Pb	0.15	0.01	0.152	0.005	2.00%	50.00%	50.04%	0.08%	0.00%	0.00%	0.00%	0.00%	0.00%
1A4bi	Pb	1.91	0.74	1.906	0.740	10.00%	50.00%	50.99%	11.66%	0.27%	0.28%	0.14%	0.04%	0.14%
1A4bii	Pb	NO	0.03		0.025	10.00%	50.00%	50.99%	0.40%	0.01%	0.01%	0.00%	0.00%	0.01%
1A4ci	Pb	0.18	0.01	0.185	0.014	2.00%	50.00%	50.04%	0.22%	0.00%	0.01%	0.00%	0.00%	0.00%
1A4cii	Pb	5.61	0.00	5.610	0.003	2.00%	50.00%	50.04%	0.04%	-0.03%	0.00%	-0.01%	0.00%	0.01%
1A4ciii	Pb	0.01	0.00	0.006	0.001	2.00%	50.00%	50.04%	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%
1A5a	Pb	NO	NO											
1A5b	Pb	NO	0.00		0.000	2.00%	50.00%	50.04%	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%
1B1a	Pb	NE	NE											
1B1b	Pb	NO	NO											
1B1c	Pb	NO	NO											
1B2ai	Pb	NO	NO											
1B2aiv	Pb	NO	NO											
1B2av	Pb	NA	NA											
1B2b	Pb	NA	NA											
1B2c	Pb	NA	NA											
1B2d	Pb	NO	NO											
2A1	Pb	NE	NE											
2A2	Pb	NE	NE											
2A3	Pb	0.07	NE	0.074		2.50%	60.00%	60.05%		0.00%		0.00%		0.00%
2A5a	Pb	NA	NA											
2A5b	Pb	NA	NA											
2A5c	Pb	NA	NA											
2A6	Pb	NA	NA											
2B1	Pb	NO	NO											
2B2	Pb	NO	NO											
2B3	Pb	NO	NO											
2B5	Pb	NO	NO											
2B6	Pb	NO	NO											
2B7	Pb	NO	NA											
2B10a	Pb	NO	NO											
2B10b	Pb	NO	NO											
2C1	Pb	165.00	0.03	165.000	0.032	5.00%	20.00%	20.62%	0.21%	-0.76%	0.01%	-0.15%	0.00%	0.15%
2C2	Pb	NO	NO											
2C3	Pb	NO	NO											
2C4	Pb	NO	NO											
2C5	Pb	NO	NO											
2C6	Pb	NO	NO											

NFR category code	Pollutant	1990 Estimate	2015 Estimate	Base year estimate Ex,t	Latest year estimate Ex,t	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	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
2C7a	Pb	NO	NO											
2C7b	Pb	NO	NO											
2C7c	Pb	NO	NO											
2C7d	Pb	NO	NO											
2D3a	Pb	NA	NA											
2D3b	Pb	NA	NA											
2D3c	Pb	NE	NE											
2D3d	Pb	NA	NA											
2D3e	Pb	NA	NA											
2D3f	Pb	NA	NA											
2D3g	Pb	NA	NA											
2D3h	Pb	NA	NA											
2D3i	Pb	NA	NA											
2G	Pb	0.01	0.11	0.006	0.106	2.00%	10.00%	10.20%	0.34%	0.04%	0.04%	0.00%	0.00%	0.00%
2H1	Pb	NA	NO											
2H2	Pb	NA	NA											
2H3	Pb	NO	NO											
2I	Pb	NA	NA											
2J	Pb	NO	NO											
2K	Pb	NO	NO											
2L	Pb	NO	NO											
3B1a	Pb	NA	NA											
3B1b	Pb	NA	NA											
3B2	Pb	NA	NA											
3B3	Pb	NA	NA											
3B4a	Pb	NO	NO											
3B4d	Pb	NA	NA											
3B4e	Pb	NA	NA											
3B4f	Pb	NO	NO											
3B4gi	Pb	NA	NA											
3B4gii	Pb	NA	NA											
3B4giii	Pb	NA	NA											
3B4giv	Pb	NA	NA											
3B4h	Pb	NA	NA											
3Da1	Pb	NA	NA											
3Da2a	Pb	NA	NA											
3Da2b	Pb	NA	NA											
3Da2c	Pb	NA	NA											

NFR category code	Pollutant	1990 Estimate	2015 Estimate	Base year estimate Ex,t	Latest year estimate Ex,t	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	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
3Da3	Pb	NA	NA											
3Da4	Pb	NA	NA											
3Db	Pb	NA	NA											
3Dc	Pb	NA	NA											
3Dd	Pb	NA	NA											
3De	Pb	NA	NA											
3Df	Pb	NA	NA											
3F	Pb	NO	NO											
3I	Pb	NA	NA											
5A	Pb	NA	NA											
5B1	Pb	NE	NA											
5B2	Pb	NO	NE											
5C1a	Pb	NO	NO											
5C1bi	Pb	NO	NO											
5C1bii	Pb	0.00	NO	0.000		44.00%	50.00%	66.60%		0.00%		0.00%		0.00%
5C1biii	Pb	0.01	0.00	0.005	0.001	44.00%	50.00%	66.60%	0.02%	0.00%	0.00%	0.00%	0.00%	0.00%
5C1biv	Pb	NO	NO											
5C1bv	Pb	NO	0.00		0.000		50.00%	50.00%	0.00%	0.00%	0.00%	0.00%		0.00%
5C1bvi	Pb	NO	NO											
5C2	Pb	NO	NO											
5D1	Pb	NA	NA											
5D2	Pb	NA	NA											
5D3	Pb	NA	NA											
5E	Pb	NO	NO											
6A	Pb	NA	NA											
National total for the entire territory		261.56	3.23	261.56	3.23	1.575	12.200	12.571	35.423%	0.004%	1.237%	0.168%	0.069%	0.536%
Percentage uncertainty in total inventory									59.52%	Trend uncertainty				7.32%

Cd

NFR category code	Pollutant	1990 Estimate	2015 Estimate	Base year estimate Ex,t	Latest year estimate Ex,t	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	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
1A1a	Cd	0.05	0.02	0.055	0.022	2.00%	50.00%	50.04%	1.74%	-1.54%	2.31%	-0.77%	0.07%	0.77%
1A1b	Cd	NO	NO											
1A1c	Cd	0.00	0.00	0.002	0.001	2.00%	50.00%	50.04%	0.08%	-0.01%	0.11%	-0.01%	0.00%	0.01%
1A2a	Cd	0.00	0.00	0.000	0.000	2.00%	50.00%	50.04%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1A2b	Cd	NO	0.00		0.000	2.00%	50.00%	50.04%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1A2c	Cd	0.00	0.00	0.000	0.003	2.00%	50.00%	50.04%	0.23%	0.30%	0.30%	0.15%	0.01%	0.15%
1A2d	Cd	0.00	0.00	0.000	0.000	2.00%	50.00%	50.04%	0.01%	0.00%	0.01%	0.00%	0.00%	0.00%
1A2e	Cd	0.00	0.00	0.005	0.003	2.00%	50.00%	50.04%	0.27%	0.01%	0.36%	0.01%	0.01%	0.01%
1A2f	Cd	0.00	0.00	0.000	0.000	2.00%	50.00%	50.04%	0.01%	-0.01%	0.02%	-0.01%	0.00%	0.01%
1A2gvii	Cd	0.00	0.00	0.000	0.000	2.00%	50.00%	50.04%	0.00%	-0.01%	0.00%	-0.01%	0.00%	0.01%
1A2gviii	Cd	0.01	0.20	0.006	0.196	2.00%	50.00%	50.04%	15.66%	20.40%	20.80%	10.20%	0.59%	10.22%
1A3ai(i)	Cd	NE	NE											
1A3aii(i)	Cd	NE	NE											
1A3bi	Cd	0.00	0.01	0.004	0.006	2.00%	20.00%	20.10%	0.19%	0.31%	0.61%	0.06%	0.02%	0.06%
1A3bii	Cd	0.00	0.00	0.001	0.001	2.00%	20.00%	20.10%	0.04%	0.08%	0.14%	0.02%	0.00%	0.02%
1A3biii	Cd	0.00	0.00	0.004	0.004	2.00%	20.00%	20.10%	0.12%	0.12%	0.39%	0.02%	0.01%	0.03%
1A3biv	Cd	0.00	0.00	0.000	0.000	2.00%	20.00%	20.10%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1A3bv	Cd	NA	NA											
1A3bvi	Cd	NA	NA											
1A3bvii	Cd	NA	NA											
1A3c	Cd	0.00	0.00	0.002	0.001	2.00%	50.00%	50.04%	0.05%	-0.05%	0.07%	-0.02%	0.00%	0.02%
1A3di(ii)	Cd	NO	NA											
1A3dii	Cd	0.00	0.00	0.000	0.000	2.00%	50.00%	50.04%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1A3ei	Cd	IE	IE											
1A3eii	Cd	NO	NO											
1A4ai	Cd	0.10	0.06	0.104	0.061	2.00%	50.00%	50.04%	4.86%	-0.87%	6.46%	-0.43%	0.18%	0.47%
1A4aii	Cd	0.00	0.00	0.000	0.000	2.00%	50.00%	50.04%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1A4bi	Cd	0.28	0.31	0.281	0.310	10.00%	50.00%	50.99%	25.20%	13.01%	32.84%	6.51%	4.64%	7.99%
1A4bii	Cd	NO	0.00		0.000	10.00%	50.00%	50.99%	0.00%	0.01%	0.01%	0.00%	0.00%	0.00%
1A4ci	Cd	0.02	0.01	0.019	0.006	2.00%	50.00%	50.04%	0.50%	-0.64%	0.67%	-0.32%	0.02%	0.32%
1A4cii	Cd	0.00	0.00	0.002	0.001	2.00%	50.00%	50.04%	0.08%	0.00%	0.11%	0.00%	0.00%	0.00%
1A4ciii	Cd	0.00	0.00	0.001	0.000	2.00%	50.00%	50.04%	0.00%	-0.03%	0.01%	-0.02%	0.00%	0.02%
1A5a	Cd	NO	NO											
1A5b	Cd	NO	0.00		0.000	2.00%	50.00%	50.04%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1B1a	Cd	NE	NE											
1B1b	Cd	NO	NO											
1B1c	Cd	NO	NO											
1B2ai	Cd	NO	NO											

NFR category code	Pollutant	1990 Estimate	2015 Estimate	Base year estimate Ex,t	Latest year estimate Ex,t	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	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
1B2aiv	Cd	NO	NO											
1B2av	Cd	NA	NA											
1B2b	Cd	NA	NA											
1B2c	Cd	NA	NA											
1B2d	Cd	NO	NO											
2A1	Cd	NE	NE											
2A2	Cd	NE	NE											
2A3	Cd	0.01	NE	0.006		2.50%	60.00%	60.05%		-0.40%		-0.24%		0.24%
2A5a	Cd	NA	NA											
2A5b	Cd	NA	NA											
2A5c	Cd	NA	NA											
2A6	Cd	NA	NA											
2B1	Cd	NO	NO											
2B2	Cd	NO	NO											
2B3	Cd	NO	NO											
2B5	Cd	NO	NO											
2B6	Cd	NO	NO											
2B7	Cd	NO	NA											
2B10a	Cd	NO	NO											
2B10b	Cd	NO	NO											
2C1	Cd	0.44	0.00	0.440	0.002	5.00%	20.00%	20.62%	0.08%	-30.62%	0.26%	-6.12%	0.02%	6.12%
2C2	Cd	NO	NO											
2C3	Cd	NO	NO											
2C4	Cd	NO	NO											
2C5	Cd	NO	NO											
2C6	Cd	NO	NO											
2C7a	Cd	NO	NO											
2C7b	Cd	NO	NO											
2C7c	Cd	NO	NO											
2C7d	Cd	NO	NO											
2D3a	Cd	NA	NA											
2D3b	Cd	NA	NA											
2D3c	Cd	NE	NE											
2D3d	Cd	NA	NA											
2D3e	Cd	NA	NA											
2D3f	Cd	NA	NA											
2D3g	Cd	NA	NA											
2D3h	Cd	NA	NA											

NFR category code	Pollutant	1990 Estimate	2015 Estimate	Base year estimate Ex,t	Latest year estimate Ex,t	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	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
2D3i	Cd	NA	NA											
2G	Cd	0.01	0.01	0.013	0.009	2.00%	10.00%	10.20%	0.15%	0.07%	0.98%	0.01%	0.03%	0.03%
2H1	Cd	NA	NO											
2H2	Cd	NA	NA											
2H3	Cd	NO	NO											
2I	Cd	NA	NA											
2J	Cd	NO	NO											
2K	Cd	NO	NO											
2L	Cd	NO	NO											
3B1a	Cd	NA	NA											
3B1b	Cd	NA	NA											
3B2	Cd	NA	NA											
3B3	Cd	NA	NA											
3B4a	Cd	NO	NO											
3B4d	Cd	NA	NA											
3B4e	Cd	NA	NA											
3B4f	Cd	NO	NO											
3B4gi	Cd	NA	NA											
3B4gii	Cd	NA	NA											
3B4giii	Cd	NA	NA											
3B4giv	Cd	NA	NA											
3B4h	Cd	NA	NA											
3Da1	Cd	NA	NA											
3Da2a	Cd	NA	NA											
3Da2b	Cd	NA	NA											
3Da2c	Cd	NA	NA											
3Da3	Cd	NA	NA											
3Da4	Cd	NA	NA											
3Db	Cd	NA	NA											
3Dc	Cd	NA	NA											
3Dd	Cd	NA	NA											
3De	Cd	NA	NA											
3Df	Cd	NA	NA											
3F	Cd	NO	NO											
3I	Cd	NA	NA											
5A	Cd	NA	NA											
5B1	Cd	NE	NA											
5B2	Cd	NO	NE											

NFR category code	Pollutant	1990 Estimate	2015 Estimate	Base year estimate Ex,t	Latest year estimate Ex,t	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	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
5C1a	Cd	NO	NO											
5C1bi	Cd	NO	NO											
5C1bii	Cd	0.00	NO	0.000		44.00%	50.00%	66.60%		0.00%		0.00%		0.00%
5C1biii	Cd	0.00	0.00	0.001	0.000	44.00%	50.00%	66.60%	0.02%	-0.03%	0.02%	-0.02%	0.01%	0.02%
5C1biv	Cd	NO	NO											
5C1bv	Cd	NO	0.00		0.000		50.00%	50.00%	0.00%	0.00%	0.00%	0.00%		0.00%
5C1bvi	Cd	NO	NO											
5C2	Cd	NO	NO											
5D1	Cd	NA	NA											
5D2	Cd	NA	NA											
5D3	Cd	NA	NA											
5E	Cd	NO	NO											
6A	Cd	NA	NA											
National total for the entire territory		0.94	0.63	0.94	0.63	1.615	13.200	13.572	49.298%	0.105%	66.458%	9.016%	5.616%	26.536%
Percentage uncertainty in total inventory									70.21%	Trend uncertainty				51.51%

Hg

NFR category code	Pollutant	1990 Estimate	2015 Estimate	Base year estimate Ex,t	Latest year estimate Ex,t	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	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
1A1a	Hg	0.03	0.02	0.034	0.022	2.00%	50.00%	50.04%	14.56%	4.58%	7.95%	2.29%	0.22%	2.30%
1A1b	Hg	NO	NO											
1A1c	Hg	0.00	0.00	0.002	0.001	2.00%	50.00%	50.04%	0.65%	0.11%	0.35%	0.06%	0.01%	0.06%
1A2a	Hg	0.00	0.00	0.003	0.000	2.00%	50.00%	50.04%	0.14%	-0.17%	0.08%	-0.09%	0.00%	0.09%
1A2b	Hg	NO	0.00		0.000	2.00%	50.00%	50.04%	0.03%	0.01%	0.01%	0.01%	0.00%	0.01%
1A2c	Hg	0.00	0.00	0.001	0.000	2.00%	50.00%	50.04%	0.28%	0.08%	0.15%	0.04%	0.00%	0.04%
1A2d	Hg	0.00	0.00	0.002	0.000	2.00%	50.00%	50.04%	0.04%	-0.15%	0.02%	-0.07%	0.00%	0.07%
1A2e	Hg	0.01	0.00	0.012	0.001	2.00%	50.00%	50.04%	0.87%	-0.67%	0.48%	-0.33%	0.01%	0.33%
1A2f	Hg	0.00	0.00	0.005	0.001	2.00%	50.00%	50.04%	0.76%	-0.06%	0.42%	-0.03%	0.01%	0.03%
1A2gvii	Hg	NE	NE											
1A2gviii	Hg	0.01	0.01	0.009	0.010	2.00%	50.00%	50.04%	6.49%	2.68%	3.54%	1.34%	0.10%	1.34%
1A3ai(i)	Hg	NE	NE											
1A3aii(i)	Hg	NE	NE											
1A3bi	Hg	NA	NA											

NFR category code	Pollutant	1990 Estimate	2015 Estimate	Base year estimate Ex,t	Latest year estimate Ex,t	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	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
1A3bii	Hg	NA	NA											
1A3biii	Hg	NA	NA											
1A3biv	Hg	NA	NA											
1A3bv	Hg	NA	NA											
1A3bvi	Hg	NA	NA											
1A3bvii	Hg	NA	NA											
1A3c	Hg	NE	NE											
1A3di(ii)	Hg	NO	NA											
1A3dii	Hg	NE	NE											
1A3ei	Hg	IE	IE											
1A3eii	Hg	NO	NO											
1A4ai	Hg	0.13	0.01	0.135	0.009	2.00%	50.00%	50.04%	5.69%	-10.13%	3.11%	-5.07%	0.09%	5.07%
1A4aii	Hg	NE	NE											
1A4bi	Hg	0.05	0.02	0.053	0.017	10.00%	50.00%	50.99%	11.38%	0.86%	6.10%	0.43%	0.86%	0.96%
1A4bii	Hg	NO	NE											
1A4ci	Hg	0.02	0.00	0.018	0.001	2.00%	50.00%	50.04%	0.86%	-1.27%	0.47%	-0.63%	0.01%	0.64%
1A4cii	Hg	NE	NE											
1A4ciii	Hg	0.00	0.00	0.001	0.000	2.00%	50.00%	50.04%	0.10%	-0.06%	0.05%	-0.03%	0.00%	0.03%
1A5a	Hg	NO	NO											
1A5b	Hg	NO	0.00		0.000	2.00%	50.00%	50.04%	0.05%	0.03%	0.03%	0.01%	0.00%	0.01%
1B1a	Hg	NE	NE											
1B1b	Hg	NO	NO											
1B1c	Hg	NO	NO											
1B2ai	Hg	NO	NO											
1B2aiv	Hg	NO	NO											
1B2av	Hg	NA	NA											
1B2b	Hg	NA	NA											
1B2c	Hg	NA	NA											
1B2d	Hg	NO	NO											
2A1	Hg	NE	0.01		0.008	8.00%		8.00%	0.81%	2.76%	2.76%		0.31%	0.31%
2A2	Hg	NE	NE											
2A3	Hg	0.00	NE	0.000		2.50%	60.00%	60.05%		-0.01%		-0.01%		0.01%
2A5a	Hg	NA	NA											
2A5b	Hg	NA	NA											
2A5c	Hg	NA	NA											
2A6	Hg	NA	NA											
2B1	Hg	NO	NO											
2B2	Hg	NO	NO											

NFR category code	Pollutant	1990 Estimate	2015 Estimate	Base year estimate Ex,t	Latest year estimate Ex,t	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	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
2B3	Hg	NO	NO											
2B5	Hg	NO	NO											
2B6	Hg	NO	NO											
2B7	Hg	NO	NA											
2B10a	Hg	NO	NO											
2B10b	Hg	NO	NO											
2C1	Hg	NE	0.00		0.001	5.00%	20.00%	20.62%	0.17%	0.23%	0.23%	0.05%	0.02%	0.05%
2C2	Hg	NO	NO											
2C3	Hg	NO	NO											
2C4	Hg	NO	NO											
2C5	Hg	NO	NO											
2C6	Hg	NO	NO											
2C7a	Hg	NO	NO											
2C7b	Hg	NO	NO											
2C7c	Hg	NO	NO											
2C7d	Hg	NO	NO											
2D3a	Hg	NA	NA											
2D3b	Hg	NA	NA											
2D3c	Hg	NE	NE											
2D3d	Hg	NA	NA											
2D3e	Hg	NA	NA											
2D3f	Hg	NA	NA											
2D3g	Hg	NA	NA											
2D3h	Hg	NA	NA											
2D3i	Hg	NA	NA											
2G	Hg	0.00	0.00	0.000	0.000	2.00%	10.00%	10.20%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2H1	Hg	NA	NO											
2H2	Hg	NA	NA											
2H3	Hg	NO	NO											
2I	Hg	NA	NA											
2J	Hg	NO	NO											
2K	Hg	NO	NO											
2L	Hg	NO	NO											
3B1a	Hg	NA	NA											
3B1b	Hg	NA	NA											
3B2	Hg	NA	NA											
3B3	Hg	NA	NA											
3B4a	Hg	NO	NO											

NFR category code	Pollutant	1990 Estimate	2015 Estimate	Base year estimate Ex,t	Latest year estimate Ex,t	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	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
3B4d	Hg	NA	NA											
3B4e	Hg	NA	NA											
3B4f	Hg	NO	NO											
3B4gi	Hg	NA	NA											
3B4gii	Hg	NA	NA											
3B4giii	Hg	NA	NA											
3B4giv	Hg	NA	NA											
3B4h	Hg	NA	NA											
3Da1	Hg	NA	NA											
3Da2a	Hg	NA	NA											
3Da2b	Hg	NA	NA											
3Da2c	Hg	NA	NA											
3Da3	Hg	NA	NA											
3Da4	Hg	NA	NA											
3Db	Hg	NA	NA											
3Dc	Hg	NA	NA											
3Dd	Hg	NA	NA											
3De	Hg	NA	NA											
3Df	Hg	NA	NA											
3F	Hg	NO	NO											
3I	Hg	NA	NA											
5A	Hg	NE	NE											
5B1	Hg	NE	NA											
5B2	Hg	NO	NE											
5C1a	Hg	NO	NO											
5C1bi	Hg	NO	NO											
5C1bii	Hg	0.00	NO	0.000		44.00%	50.00%	66.60%		0.00%		0.00%		0.00%
5C1biii	Hg	0.00	0.00	0.004	0.001	44.00%	50.00%	66.60%	0.70%	-0.06%	0.29%	-0.03%	0.18%	0.18%
5C1biv	Hg	NO	NO											
5C1bv	Hg	NO	0.00		0.004		50.00%	50.00%	2.36%	1.29%	1.29%	0.64%		0.64%
5C1bvi	Hg	NO	NO											
5C2	Hg	NO	NO											
5D1	Hg	NA	NA											
5D2	Hg	NA	NA											
5D3	Hg	NA	NA											
5E	Hg	NO	NO											
6A	Hg	NA	NA											

NFR category code	Pollutant	1990 Estimate	2015 Estimate	Base year estimate Ex,t	Latest year estimate Ex,t	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	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
National total for the entire territory		0.28	0.08	0.28	0.08	1.415	9.400	9.836	45.933%	0.042%	27.326%	-1.428%	1.841%	12.183%
Percentage uncertainty in total inventory									67.77%	Trend uncertainty			34.90%	

PCDD

NFR category code	Pollutant	1990 Estimate	2015 Estimate	Base year estimate Ex,t	Latest year estimate Ex,t	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	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
1A1a	PCDD/F	0.17	0.63	0.168	0.632	2.00%	50.00%	50.04%	2.01%	2.21%	2.70%	1.11%	0.08%	1.11%
1A1b	PCDD/F	NO	NO											
1A1c	PCDD/F	0.01	0.02	0.008	0.019	2.00%	50.00%	50.04%	0.06%	0.06%	0.08%	0.03%	0.00%	0.03%
1A2a	PCDD/F	0.01	0.00	0.005	0.000	2.00%	50.00%	50.04%	0.00%	-0.01%	0.00%	-0.01%	0.00%	0.01%
1A2b	PCDD/F	NO	0.00		0.000	2.00%	50.00%	50.04%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1A2c	PCDD/F	0.01	0.02	0.005	0.022	2.00%	50.00%	50.04%	0.07%	0.08%	0.10%	0.04%	0.00%	0.04%
1A2d	PCDD/F	0.01	0.00	0.007	0.001	2.00%	50.00%	50.04%	0.00%	-0.02%	0.00%	-0.01%	0.00%	0.01%
1A2e	PCDD/F	0.26	0.03	0.256	0.032	2.00%	50.00%	50.04%	0.10%	-0.60%	0.14%	-0.30%	0.00%	0.30%
1A2f	PCDD/F	0.04	0.01	0.043	0.013	2.00%	50.00%	50.04%	0.04%	-0.07%	0.06%	-0.03%	0.00%	0.03%
1A2gvii	PCDD/F	NE	NE											
1A2gviii	PCDD/F	0.11	1.52	0.113	1.518	2.00%	50.00%	50.04%	4.82%	6.15%	6.48%	3.08%	0.18%	3.08%
1A3ai(i)	PCDD/F	NA	NA											
1A3aii(i)	PCDD/F	NA	NE											
1A3bi	PCDD/F	0.18	0.12	0.182	0.121	2.00%	20.00%	20.10%	0.15%	-0.01%	0.51%	0.00%	0.01%	0.01%
1A3bii	PCDD/F	IE	IE											
1A3biii	PCDD/F	IE	IE											
1A3biv	PCDD/F	IE	IE											
1A3bv	PCDD/F	NA	NA											
1A3bvi	PCDD/F	NA	NA											

NFR category code	Pollutant	1990 Estimate	2015 Estimate	Base year estimate Ex,t	Latest year estimate Ex,t	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	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
1A3bvii	PCDD/F	NA	NA											
1A3c	PCDD/F	NA	NA											
1A3di(ii)	PCDD/F	NO	NA											
1A3dii	PCDD/F	NA	NA											
1A3ei	PCDD/F	IE	IE											
1A3eii	PCDD/F	NO	NO											
1A4ai	PCDD/F	3.72	0.53	3.724	0.528	2.00%	50.00%	50.04%	1.68%	-8.42%	2.25%	-4.21%	0.06%	4.21%
1A4aii	PCDD/F	NE	NE											
1A4bi	PCDD/F	14.43	11.84	14.435	11.836	10.00%	50.00%	50.99%	38.28%	9.02%	50.50%	4.51%	7.14%	8.45%
1A4bii	PCDD/F	NO	NE											
1A4ci	PCDD/F	0.36	0.05	0.358	0.050	2.00%	50.00%	50.04%	0.16%	-0.81%	0.21%	-0.41%	0.01%	0.41%
1A4cii	PCDD/F	NE	NE											
1A4ciii	PCDD/F	0.01	0.00	0.010	0.001	2.00%	50.00%	50.04%	0.00%	-0.02%	0.00%	-0.01%	0.00%	0.01%
1A5a	PCDD/F	NO	NO											
1A5b	PCDD/F	NO	0.00		0.000	2.00%	100.00%	100.02%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1B1a	PCDD/F	NA	NA											
1B1b	PCDD/F	NO	NO											
1B1c	PCDD/F	NO	NO											
1B2ai	PCDD/F	NO	NO											
1B2aiv	PCDD/F	NO	NO											
1B2av	PCDD/F	NE	NE											
1B2b	PCDD/F	NA	NA											
1B2c	PCDD/F	NA	NA											
1B2d	PCDD/F	NO	NO											
2A1	PCDD/F	NA	NA											
2A2	PCDD/F	NA	NA											
2A3	PCDD/F	NE	NE											
2A5a	PCDD/F	NA	NA											
2A5b	PCDD/F	NA	NA											
2A5c	PCDD/F	NA	NA											
2A6	PCDD/F	NA	NA											
2B1	PCDD/F	NO	NO											
2B2	PCDD/F	NO	NO											
2B3	PCDD/F	NO	NO											
2B5	PCDD/F	NO	NO											
2B6	PCDD/F	NO	NO											
2B7	PCDD/F	NO	NA											
2B10a	PCDD/F	NO	NO											

NFR category code	Pollutant	1990 Estimate	2015 Estimate	Base year estimate Ex,t	Latest year estimate Ex,t	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	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
2B10b	PCDD/F	NO	NO											
2C1	PCDD/F	0.00	0.00	0.000	0.000	5.00%	20.00%	20.62%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2C2	PCDD/F	NO	NO											
2C3	PCDD/F	NO	NO											
2C4	PCDD/F	NO	NO											
2C5	PCDD/F	NO	NO											
2C6	PCDD/F	NO	NO											
2C7a	PCDD/F	NO	NO											
2C7b	PCDD/F	NO	NO											
2C7c	PCDD/F	NO	NO											
2C7d	PCDD/F	NO	NO											
2D3a	PCDD/F	NA	NA											
2D3b	PCDD/F	NA	NA											
2D3c	PCDD/F	NA	NA											
2D3d	PCDD/F	NA	NA											
2D3e	PCDD/F	NA	NA											
2D3f	PCDD/F	NA	NA											
2D3g	PCDD/F	NA	NA											
2D3h	PCDD/F	NA	NA											
2D3i	PCDD/F	NA	NA											
2G	PCDD/F	0.00	0.00	0.000	0.000	2.00%	10.00%	10.20%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2H1	PCDD/F	NA	NO											
2H2	PCDD/F	NA	NA											
2H3	PCDD/F	NO	NO											
2I	PCDD/F	NA	NA											
2J	PCDD/F	NO	NO											
2K	PCDD/F	NO	NO											
2L	PCDD/F	NO	NO											
3B1a	PCDD/F	NA	NA											
3B1b	PCDD/F	NA	NA											
3B2	PCDD/F	NA	NA											
3B3	PCDD/F	NA	NA											
3B4a	PCDD/F	NO	NO											
3B4d	PCDD/F	NA	NA											
3B4e	PCDD/F	NA	NA											
3B4f	PCDD/F	NO	NO											
3B4gi	PCDD/F	NA	NA											
3B4gii	PCDD/F	NA	NA											

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3B4giii	PCDD/F	NA	NA											
3B4giv	PCDD/F	NA	NA											
3B4h	PCDD/F	NA	NA											
3Da1	PCDD/F	NA	NA											
3Da2a	PCDD/F	NA	NA											
3Da2b	PCDD/F	NA	NA											
3Da2c	PCDD/F	NA	NA											
3Da3	PCDD/F	NA	NA											
3Da4	PCDD/F	NA	NA											
3Db	PCDD/F	NA	NA											
3Dc	PCDD/F	NA	NA											
3Dd	PCDD/F	NA	NA											
3De	PCDD/F	NA	NA											
3Df	PCDD/F	NA	NA											
3F	PCDD/F	NO	NO											
3I	PCDD/F	0.00	0.03	0.004	0.025	10.00%	90.00%	90.55%	0.15%	0.10%	0.11%	0.09%	0.02%	0.09%
5A	PCDD/F	NA	NA											
5B1	PCDD/F	NE	NA											
5B2	PCDD/F	NO	NE											
5C1a	PCDD/F	NO	NO											
5C1bi	PCDD/F	NO	NO											
5C1bii	PCDD/F	0.11	NO	0.106		44.00%	50.00%	66.60%		-0.31%		-0.15%		0.15%
5C1biii	PCDD/F	3.31	0.74	3.310	0.740	44.00%	50.00%	66.60%	3.13%	-6.33%	3.16%	-3.17%	1.96%	3.73%
5C1biv	PCDD/F	NO	NO											
5C1bv	PCDD/F	NO	0.00		0.000		50.00%	50.00%	0.00%	0.00%	0.00%	0.00%		0.00%
5C1bvi	PCDD/F	NO	NO											
5C2	PCDD/F	NO	NO											
5D1	PCDD/F	NA	NA											
5D2	PCDD/F	NA	NA											
5D3	PCDD/F	NA	NA											
5E	PCDD/F	NO	NO											
6A	PCDD/F	0.70	0.23	0.703	0.227	93%	200%	220.40%	3.17%	-1.05%	0.97%	-2.10%	1.27%	2.45%
National total for the entire territory		23.44	15.77	23.44	15.77	2.356	12.400	12.966	53.816%	-0.033%	67.263%	-1.553%	10.742%	24.123%
Percentage uncertainty in total inventory									73.36%	Trend uncertainty				49.12%

PAH

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1A1a	PAHs	0.00	0.02	0.002	0.015	2.00%	50.00%	50.04%	0.08%	0.08%	0.09%	0.04%	0.00%	0.04%
1A1b	PAHs	NO	NO											
1A1c	PAHs	0.00	0.00	0.000	0.000	2.00%	50.00%	50.04%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1A2a	PAHs	0.00	0.00	0.000	0.000	2.00%	50.00%	50.04%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1A2b	PAHs	NO	0.00		0.000	2.00%	50.00%	50.04%	0.00%	0.00%	0.00%	0.000430088179470545%	0.00%	0.00%
1A2c	PAHs	0.00	0.01	0.000	0.008	2.00%	50.00%	50.04%	0.04%	0.05%	0.05%	0.02%	0.00%	0.02%
1A2d	PAHs	0.00	0.00	0.004	0.000	2.00%	50.00%	50.04%	0.00%	-0.01%	0.00%	-0.01%	0.00%	0.01%
1A2e	PAHs	0.16	0.01	0.165	0.013	2.00%	50.00%	50.04%	0.07%	-0.47%	0.07%	-0.24%	0.00%	0.24%
1A2f	PAHs	0.03	0.01	0.025	0.009	2.00%	50.00%	50.04%	0.05%	-0.03%	0.05%	-0.02%	0.00%	0.02%
1A2gvii	PAHs	0.00	0.00	0.002	0.000	2.00%	50.00%	50.04%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1A2gviii	PAHs	0.05	0.53	0.054	0.534	2.00%	50.00%	50.04%	2.77%	2.94%	3.12%	1.47%	0.09%	1.47%
1A3ai(i)	PAHs	NA	NA											
1A3aii(i)	PAHs	NA	NE											
1A3bi	PAHs	0.04	0.07	0.038	0.067	2.00%	20.00%	20.10%	0.14%	0.26%	0.39%	0.05%	0.01%	0.05%
1A3bii	PAHs	IE	IE											
1A3biii	PAHs	IE	IE											
1A3biv	PAHs	IE	IE											
1A3bv	PAHs	NA	NA											
1A3bvi	PAHs	NA	NA											
1A3bvii	PAHs	NA	NA											
1A3c	PAHs	0.01	0.01	0.014	0.005	2.00%	35.00%	35.06%	0.02%	-0.01%	0.03%	0.00%	0.00%	0.00%
1A3di(ii)	PAHs	NO	NA											
1A3dii	PAHs	0.00	0.00	0.000	0.000	2.00%	35.00%	35.06%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1A3ei	PAHs	IE	IE											
1A3eii	PAHs	NO	NO											
1A4ai	PAHs	2.47	0.21	2.468	0.206	2.00%	50.00%	50.04%	1.07%	-6.95%	1.21%	-3.47%	0.03%	3.47%
1A4aii	PAHs	0.00	0.00	0.000	0.000	10.00%	50.00%	50.99%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1A4bi	PAHs	11.75	7.54	11.753	7.539	10.00%	50.00%	50.99%	39.81%	5.21%	44.13%	2.61%	6.24%	6.76%
1A4bii	PAHs	NO	0.40		0.400	2.00%	50.00%	50.04%	2.07%	2.34%	2.34%	1.17%	0.07%	1.17%
1A4ci	PAHs	0.21	0.02	0.206	0.018	2.00%	50.00%	50.04%	0.09%	-0.58%	0.10%	-0.29%	0.00%	0.29%
1A4cii	PAHs	0.00	0.00	0.003	0.000	2.00%	50.00%	50.04%	0.00%	-0.01%	0.00%	0.00%	0.00%	0.00%
1A4ciii	PAHs	NE	NE											
1A5a	PAHs	NO	NO											
1A5b	PAHs	NO	NE											
1B1a	PAHs	NA	NA											
1B1b	PAHs	NO	NO											
1B1c	PAHs	NO	NO											

NFR category code	Pollutant	1990 Estimate	2015 Estimate	Base year estimate Ex,t	Latest year estimate Ex,t	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	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
1B2ai	PAHs	NO	NO											
1B2aiv	PAHs	NO	NO											
1B2av	PAHs	NA	NA											
1B2b	PAHs	NA	NA											
1B2c	PAHs	NA	NA											
1B2d	PAHs	NO	NO											
2A1	PAHs	NE	NE											
2A2	PAHs	NA	NA											
2A3	PAHs	NE	NE											
2A5a	PAHs	NA	NA											
2A5b	PAHs	NA	NA											
2A5c	PAHs	NA	NA											
2A6	PAHs	NA	NA											
2B1	PAHs	NO	NO											
2B2	PAHs	NO	NO											
2B3	PAHs	NO	NO											
2B5	PAHs	NO	NO											
2B6	PAHs	NO	NO											
2B7	PAHs	NO	NA											
2B10a	PAHs	NO	NO											
2B10b	PAHs	NO	NO											
2C1	PAHs	0.01	0.01	0.006	0.006	5.00%	20.00%	20.62%	0.01%	0.02%	0.04%	0.00%	0.00%	0.00%
2C2	PAHs	NO	NO											
2C3	PAHs	NO	NO											
2C4	PAHs	NO	NO											
2C5	PAHs	NO	NO											
2C6	PAHs	NO	NO											
2C7a	PAHs	NO	NO											
2C7b	PAHs	NO	NO											
2C7c	PAHs	NO	NO											
2C7d	PAHs	NO	NO											
2D3a	PAHs	NA	NA											
2D3b	PAHs	NE	NE											
2D3c	PAHs	NE	NE											
2D3d	PAHs	NA	NA											
2D3e	PAHs	NA	NA											
2D3f	PAHs	NA	NA											
2D3g	PAHs	NA	NA											

NFR category code	Pollutant	1990 Estimate	2015 Estimate	Base year estimate Ex,t	Latest year estimate Ex,t	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	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
2D3h	PAHs	NA	NA											
2D3i	PAHs	NA	NA											
2G	PAHs	0.00	0.00	0.001	0.000	2.00%	10.00%	10.20%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2H1	PAHs	NE	NO											
2H2	PAHs	NA	NA											
2H3	PAHs	NO	NO											
2I	PAHs	NA	NA											
2J	PAHs	NO	NO											
2K	PAHs	NO	NO											
2L	PAHs	NO	NO											
3B1a	PAHs	NA	NA											
3B1b	PAHs	NA	NA											
3B2	PAHs	NA	NA											
3B3	PAHs	NA	NA											
3B4a	PAHs	NO	NO											
3B4d	PAHs	NA	NA											
3B4e	PAHs	NA	NA											
3B4f	PAHs	NO	NO											
3B4gi	PAHs	NA	NA											
3B4gii	PAHs	NA	NA											
3B4giii	PAHs	NA	NA											
3B4giv	PAHs	NA	NA											
3B4h	PAHs	NA	NA											
3Da1	PAHs	NA	NA											
3Da2a	PAHs	NA	NA											
3Da2b	PAHs	NA	NA											
3Da2c	PAHs	NA	NA											
3Da3	PAHs	NA	NA											
3Da4	PAHs	NA	NA											
3Db	PAHs	NA	NA											
3Dc	PAHs	NA	NA											
3Dd	PAHs	NA	NA											
3De	PAHs	NA	NA											
3Df	PAHs	NA	NA											
3F	PAHs	NO	NO											
3I	PAHs	0.01	0.08	0.014	0.084	10.00%	90.00%	90.55%	0.79%	0.44%	0.49%	0.40%	0.07%	0.40%
5A	PAHs	NA	NA											
5B1	PAHs	NE	NA											

NFR category code	Pollutant	1990 Estimate	2015 Estimate	Base year estimate Ex,t	Latest year estimate Ex,t	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	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
5B2	PAHs	NO	NE											
5C1a	PAHs	NO	NO											
5C1bi	PAHs	NO	NO											
5C1bii	PAHs	0.00	NO	0.000		44.00%	50.00%	66.60%		0.00%		0.00%		0.00%
5C1biii	PAHs	0.00	0.00	0.000	0.000	44.00%	50.00%	66.60%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
5C1biv	PAHs	NO	NO											
5C1bv	PAHs	NO	0.00		0.000		50.00%	50.00%	0.00%	0.00%	0.00%	0.00%		0.00%
5C1bvi	PAHs	NO	NO											
5C2	PAHs	NO	NO											
5D1	PAHs	NA	NA											
5D2	PAHs	NA	NA											
5D3	PAHs	NA	NA											
5E	PAHs	NO	NO											
6A	PAHs	2.33	0.75	2.330	0.750	93%	200%	220.40%	17.13%	-3.31%	4.39%	-6.62%	5.75%	8.77%
National total for the entire territory		17.08	9.66	17.08	9.66	2.516	13.600	14.177	64.140%	-0.021%	56.518%	-4.881%	12.277%	22.744%
Percentage uncertainty in total inventory									80.09%	Trend uncertainty				47.69%

HCB

NFR category code	Pollutant	1990 Estimate	2015 Estimate	Base year estimate Ex,t	Latest year estimate Ex,t	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	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
1A1a	HCB	0.03	0.06	0.027	0.062	2.00%	50.00%	50.04%	10.77%	11.47%	31.79%	5.74%	0.90%	5.81%
1A1b	HCB	NO	NO											
1A1c	HCB	0.00	0.00	0.005	0.002	2.00%	50.00%	50.04%	0.32%	-2.64%	0.96%	-1.32%	0.03%	1.32%
1A2a	HCB	NE	NE											
1A2b	HCB	NO	0.00		0.000	2.00%		2.00%	0.00%	0.00%	0.00%		0.00%	0.00%
1A2c	HCB	NE	0.00		0.001	2.00%	50.00%	50.04%	0.19%	0.57%	0.57%	0.28%	0.02%	0.28%
1A2d	HCB	0.00	0.00	0.000	0.000	2.00%	50.00%	50.04%	0.00%	0.00%	0.01%	0.00%	0.00%	0.00%

NFR category code	Pollutant	1990 Estimate	2015 Estimate	Base year estimate Ex,t	Latest year estimate Ex,t	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	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
1A2e	HCB	0.00	0.00	0.002	0.001	2.00%	50.00%	50.04%	0.23%	-0.69%	0.67%	-0.35%	0.02%	0.35%
1A2f	HCB	0.00	0.00	0.000	0.000	2.00%	50.00%	50.04%	0.01%	-0.08%	0.03%	-0.04%	0.00%	0.04%
1A2gvii	HCB	NE	NE											
1A2gviii	HCB	0.00	0.08	0.002	0.075	2.00%	100.00%	100.02%	26.11%	36.99%	38.56%	36.99%	1.09%	37.00%
1A3ai(i)	HCB	NA	NA											
1A3aii(i)	HCB	NA	NE											
1A3bi	HCB	NA	NA											
1A3bii	HCB	NA	NA											
1A3biii	HCB	NA	NA											
1A3biv	HCB	NA	NA											
1A3bv	HCB	NA	NA											
1A3bvi	HCB	NA	NA											
1A3bvii	HCB	NA	NA											
1A3c	HCB	NA	NA											
1A3di(ii)	HCB	NO	NA											
1A3dii	HCB	NA	NA											
1A3ei	HCB	IE	IE											
1A3eii	HCB	NO	NO											
1A4ai	HCB	0.04	0.02	0.036	0.023	2.00%	50.00%	50.04%	3.97%	-15.28%	11.72%	-7.64%	0.33%	7.65%
1A4aii	HCB	NE	NE											
1A4bi	HCB	0.10	0.12	0.104	0.119	10.00%	50.00%	50.99%	20.97%	-17.96%	60.77%	-8.98%	8.59%	12.43%
1A4bii	HCB	NO	NE											
1A4ci	HCB	0.01	0.00	0.007	0.002	2.00%	50.00%	50.04%	0.41%	-3.91%	1.22%	-1.95%	0.03%	1.95%
1A4cii	HCB	NE	NE											
1A4ciii	HCB	0.00	0.00	0.004	0.000	2.00%	50.00%	50.04%	0.07%	-2.88%	0.21%	-1.44%	0.01%	1.44%
1A5a	HCB	NO	NO											
1A5b	HCB	NO	0.00		0.000	2.00%	50.00%	50.04%	0.04%	0.11%	0.11%	0.05%	0.00%	0.05%
1B1a	HCB	NA	NA											
1B1b	HCB	NO	NO											
1B1c	HCB	NO	NO											
1B2ai	HCB	NO	NO											
1B2aiv	HCB	NO	NO											
1B2av	HCB	NA	NA											
1B2b	HCB	NA	NA											
1B2c	HCB	NA	NA											
1B2d	HCB	NO	NO											
2A1	HCB	NE	NA											
2A2	HCB	NA	NA											

NFR category code	Pollutant	1990 Estimate	2015 Estimate	Base year estimate Ex,t	Latest year estimate Ex,t	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	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
2A3	HCB	NE	NE											
2A5a	HCB	NA	NA											
2A5b	HCB	NA	NA											
2A5c	HCB	NA	NA											
2A6	HCB	NA	NA											
2B1	HCB	NO	NO											
2B2	HCB	NO	NO											
2B3	HCB	NO	NO											
2B5	HCB	NO	NO											
2B6	HCB	NO	NO											
2B7	HCB	NO	NA											
2B10a	HCB	NO	NO											
2B10b	HCB	NO	NO											
2C1	HCB	NE	NE											
2C2	HCB	NO	NO											
2C3	HCB	NO	NO											
2C4	HCB	NO	NO											
2C5	HCB	NO	NO											
2C6	HCB	NO	NO											
2C7a	HCB	NO	NO											
2C7b	HCB	NO	NO											
2C7c	HCB	NO	NO											
2C7d	HCB	NO	NO											
2D3a	HCB	NA	NA											
2D3b	HCB	NE	NE											
2D3c	HCB	NE	NE											
2D3d	HCB	NA	NA											
2D3e	HCB	NA	NA											
2D3f	HCB	NA	NA											
2D3g	HCB	NA	NA											
2D3h	HCB	NA	NA											
2D3i	HCB	NA	NA											
2G	HCB	NA	NA											
2H1	HCB	NE	NO											
2H2	HCB	NA	NA											
2H3	HCB	NO	NO											
2I	HCB	NA	NA											
2J	HCB	NO	NO											

NFR category code	Pollutant	1990 Estimate	2015 Estimate	Base year estimate Ex,t	Latest year estimate Ex,t	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	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
2K	HCB	NO	NO											
2L	HCB	NO	NO											
3B1a	HCB	NA	NA											
3B1b	HCB	NA	NA											
3B2	HCB	NA	NA											
3B3	HCB	NA	NA											
3B4a	HCB	NO	NO											
3B4d	HCB	NA	NA											
3B4e	HCB	NA	NA											
3B4f	HCB	NO	NO											
3B4gi	HCB	NA	NA											
3B4gii	HCB	NA	NA											
3B4giii	HCB	NA	NA											
3B4giv	HCB	NA	NA											
3B4h	HCB	NA	NA											
3Da1	HCB	NA	NA											
3Da2a	HCB	NA	NA											
3Da2b	HCB	NA	NA											
3Da2c	HCB	NA	NA											
3Da3	HCB	NA	NA											
3Da4	HCB	NA	NA											
3Db	HCB	NA	NA											
3Dc	HCB	NA	NA											
3Dd	HCB	NA	NA											
3De	HCB	NA	NA											
3Df	HCB	NE	NE											
3F	HCB	NO	NO											
3I	HCB	NA	NA											
5A	HCB	NA	NA											
5B1	HCB	NE	NA											
5B2	HCB	NO	NE											
5C1a	HCB	NO	NO											
5C1bi	HCB	NO	NO											
5C1bii	HCB	0.00	NO	0.001		44.00%	50.00%	66.60%		-0.46%		-0.23%		0.23%
5C1biii	HCB	0.01	0.00	0.008	0.002	44.00%	50.00%	66.60%	0.43%	-5.31%	0.95%	-2.65%	0.59%	2.72%
5C1biv	HCB	NO	NO											
5C1bv	HCB	NO	0.00		0.000		50.00%	50.00%	0.06%	0.18%	0.18%	0.09%		0.09%
5C1bvi	HCB	NO	NO											

NFR category code	Pollutant	1990 Estimate	2015 Estimate	Base year estimate Ex,t	Latest year estimate Ex,t	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	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
5C2	HCB	NO	NO											
5D1	HCB	NA	NA											
5D2	HCB	NA	NA											
5D3	HCB	NA	NA											
5E	HCB	NO	NO											
6A	HCB	NA	NA											
National total for the entire territory		0.20	0.29	0.20	0.29	1.220	8.000	8.366	63.582%	0.109%	147.742%	18.547%	11.611%	71.362%
Percentage uncertainty in total inventory									79.74%	Trend uncertainty				84.48%

PCB

NFR category code	Pollutant	1990 Estimate	2015 Estimate	Base year estimate Ex,t	Latest year estimate Ex,t	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	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
1A1a	PCB	0.00	0.04	0.002	0.043	2.00%	50.00%	50.04%	10.20%	1.00%	1.01%	0.50%	0.03%	0.50%
1A1b	PCB	NO	NO											
1A1c	PCB	0.00	0.00	0.000	0.001	2.00%	50.00%	50.04%	0.31%	0.03%	0.03%	0.02%	0.00%	0.02%
1A2a	PCB	NE	NE											
1A2b	PCB	NO	0.00		0.000	2.00%	50.00%	50.04%	0.04%	0.00%	0.00%	0.00%	0.00%	0.00%
1A2c	PCB	NE	0.00		0.000	2.00%	50.00%	50.04%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1A2d	PCB	0.00	0.00	0.005	0.000	2.00%	50.00%	50.04%	0.00%	-0.01%	0.00%	0.00%	0.00%	0.00%
1A2e	PCB	0.18	0.00	0.182	0.004	2.00%	50.00%	50.04%	0.97%	-0.11%	0.10%	-0.06%	0.00%	0.06%
1A2f	PCB	0.03	0.01	0.029	0.010	2.00%	50.00%	50.04%	2.41%	0.20%	0.24%	0.10%	0.01%	0.10%
1A2gvii	PCB	NE	NE											
1A2gviii	PCB	0.05	0.01	0.047	0.008	2.00%	50.00%	50.04%	1.95%	0.14%	0.19%	0.07%	0.01%	0.07%
1A3ai(i)	PCB	NA	NA											
1A3aii(i)	PCB	NA	NE											
1A3bi	PCB	NA	NA											
1A3bii	PCB	NA	NA											
1A3biii	PCB	NA	NA											
1A3biv	PCB	NA	NA											
1A3bv	PCB	NA	NA											
1A3bvi	PCB	NA	NA											
1A3bvii	PCB	NA	NA											
1A3c	PCB	NA	NA											

NFR category code	Pollutant	1990 Estimate	2015 Estimate	Base year estimate Ex,t	Latest year estimate Ex,t	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	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
1A3di(ii)	PCB	NO	NA											
1A3dii	PCB	NA	NA											
1A3ei	PCB	IE	IE											
1A3eii	PCB	NO	NO											
1A4ai	PCB	2.65	0.06	2.650	0.055	2.00%	50.00%	50.04%	13.09%	-1.76%	1.29%	-0.88%	0.04%	0.88%
1A4aii	PCB	NE	NE											
1A4bi	PCB	1.16	0.09	1.162	0.086	10.00%	50.00%	50.99%	20.86%	0.68%	2.02%	0.34%	0.29%	0.44%
1A4bii	PCB	NO	NE											
1A4ci	PCB	0.19	0.00	0.189	0.001	2.00%	50.00%	50.04%	0.29%	-0.19%	0.03%	-0.09%	0.00%	0.09%
1A4cii	PCB	NE	NE											
1A4ciii	PCB	0.01	0.00	0.008	0.000	2.00%	50.00%	50.04%	0.05%	0.00%	0.00%	0.00%	0.00%	0.00%
1A5a	PCB	NO	NO											
1A5b	PCB	NO	0.00		0.000	2.00%	50.00%	50.04%	0.02%	0.00%	0.00%	0.00%	0.00%	0.00%
1B1a	PCB	NA	NA											
1B1b	PCB	NO	NO											
1B1c	PCB	NO	NO											
1B2ai	PCB	NO	NO											
1B2aiv	PCB	NO	NO											
1B2av	PCB	NA	NA											
1B2b	PCB	NA	NA											
1B2c	PCB	NA	NA											
1B2d	PCB	NO	NO											
2A1	PCB	NA	NA											
2A2	PCB	NA	NA											
2A3	PCB	NA	NA											
2A5a	PCB	NA	NA											
2A5b	PCB	NA	NA											
2A5c	PCB	NA	NA											
2A6	PCB	NA	NA											
2B1	PCB	NO	NO											
2B2	PCB	NO	NO											
2B3	PCB	NO	NO											
2B5	PCB	NO	NO											
2B6	PCB	NO	NO											
2B7	PCB	NO	NA											
2B10a	PCB	NO	NO											
2B10b	PCB	NO	NO											
2C1	PCB	NA	0.00		0.000	5.00%	20.00%	20.62%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

NFR category code	Pollutant	1990 Estimate	2015 Estimate	Base year estimate Ex,t	Latest year estimate Ex,t	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	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
2C2	PCB	NO	NO											
2C3	PCB	NO	NO											
2C4	PCB	NO	NO											
2C5	PCB	NO	NO											
2C6	PCB	NO	NO											
2C7a	PCB	NO	NO											
2C7b	PCB	NO	NO											
2C7c	PCB	NO	NO											
2C7d	PCB	NO	NO											
2D3a	PCB	NA	NA											
2D3b	PCB	NA	NA											
2D3c	PCB	NA	NA											
2D3d	PCB	NA	NA											
2D3e	PCB	NA	NA											
2D3f	PCB	NA	NA											
2D3g	PCB	NA	NA											
2D3h	PCB	NA	NA											
2D3i	PCB	NA	NA											
2G	PCB	NA	NO											
2H1	PCB	NA	NO											
2H2	PCB	NA	NA											
2H3	PCB	NO	NO											
2I	PCB	NA	NA											
2J	PCB	NO	NO											
2K	PCB	NO	NO											
2L	PCB	NO	NO											
3B1a	PCB	NA	NA											
3B1b	PCB	NA	NA											
3B2	PCB	NA	NA											
3B3	PCB	NA	NA											
3B4a	PCB	NO	NO											
3B4d	PCB	NA	NA											
3B4e	PCB	NA	NA											
3B4f	PCB	NO	NO											
3B4gi	PCB	NA	NA											
3B4gii	PCB	NA	NA											
3B4giii	PCB	NA	NA											
3B4giv	PCB	NA	NA											

NFR category code	Pollutant	1990 Estimate	2015 Estimate	Base year estimate Ex,t	Latest year estimate Ex,t	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	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
3B4h	PCB	NA	NA											
3Da1	PCB	NA	NA											
3Da2a	PCB	NA	NA											
3Da2b	PCB	NA	NA											
3Da2c	PCB	NA	NA											
3Da3	PCB	NA	NA											
3Da4	PCB	NA	NA											
3Db	PCB	NA	NA											
3Dc	PCB	NA	NA											
3Dd	PCB	NA	NA											
3De	PCB	NA	NA											
3Df	PCB	NA	NA											
3F	PCB	NO	NO											
3I	PCB	NA	NA											
5A	PCB	NA	NA											
5B1	PCB	NE	NA											
5B2	PCB	NO	NE											
5C1a	PCB	NO	NO											
5C1bi	PCB	NO	NO											
5C1bii	PCB	NA	NO											
5C1biii	PCB	NA	NA											
5C1biv	PCB	NO	NO											
5C1bv	PCB	NO	0.00		0.001		50.00%	50.00%	0.23%	0.02%	0.02%	0.01%		0.01%
5C1bvi	PCB	NO	NO											
5C2	PCB	NO	NO											
5D1	PCB	NA	NA											
5D2	PCB	NA	NA											
5D3	PCB	NA	NA											
5E	PCB	NO	NO											
6A	PCB	NA	NA											
National total for the entire territory		4.27	0.21	4.27	0.21	0.390	7.200	7.221	50.424%	0.009%	4.937%	0.004%	0.368%	2.185%
Percentage uncertainty in total inventory									71.01%	Trend uncertainty				14.78%

Annex IV: List of NFR codes

NFR Code	Longname
1A1a	Public electricity and heat production
1A1b	Petroleum refining
1A1c	Manufacture of solid fuels and other energy industries
1A2a	Stationary combustion in manufacturing industries and construction: Iron and steel
1A2b	Stationary combustion in manufacturing industries and construction: Non-ferrous metals
1A2c	Stationary combustion in manufacturing industries and construction: Chemicals
1A2d	Stationary combustion in manufacturing industries and construction: Pulp, Paper and Print
1A2e	Stationary combustion in manufacturing industries and construction: Food processing, beverages and tobacco
1A2f	Stationary combustion in manufacturing industries and construction: Non-metallic minerals
1A2gvii	Mobile Combustion in manufacturing industries and construction: (please specify in the IIR)
1A2gviii	Stationary combustion in manufacturing industries and construction: Other (please specify in the IIR)
1A3ai(i)	International aviation LTO (civil)
1A3aii(i)	Domestic aviation LTO (civil)
1A3bi	Road transport: Passenger cars
1A3bii	Road transport: Light duty vehicles
1A3biii	Road transport: Heavy duty vehicles and buses
1A3biv	Road transport: Mopeds & motorcycles
1A3bv	Road transport: Gasoline evaporation
1A3bvi	Road transport: Automobile tyre and brake wear
1A3bvii	Road transport: Automobile road abrasion
1A3c	Railways
1A3di(ii)	International inland waterways
1A3dii	National navigation (shipping)
1A3ei	Pipeline transport
1A3eii	Other (please specify in the IIR)
1A4ai	Commercial/institutional: Stationary
1A4aii	Commercial/institutional: Mobile
1A4bi	Residential: Stationary
1A4bii	Residential: Household and gardening (mobile)
1A4ci	Agriculture/Forestry/Fishing: Stationary
1A4cii	Agriculture/Forestry/Fishing: Off-road vehicles and other machinery
1A4ciii	Agriculture/Forestry/Fishing: National fishing
1A5a	Other stationary (including military)
1A5b	Other, Mobile (including military, land based and recreational boats)
1B1a	Fugitive emission from solid fuels: Coal mining and handling
1B1b	Fugitive emission from solid fuels: Solid fuel transformation
1B1c	Other fugitive emissions from solid fuels
1B2ai	Fugitive emissions oil: Exploration, production, transport
1B2aiv	Fugitive emissions oil: Refining / storage
1B2av	Distribution of oil products
1B2b	Fugitive emissions from natural gas (exploration, production, processing, transmission, storage, distribution and other)
1B2c	Venting and flaring (oil, gas, combined oil and gas)
1B2d	Other fugitive emissions from energy production
2A1	Cement production
2A2	Lime production
2A3	Glass production
2A5a	Quarrying and mining of minerals other than coal

NFR Code	Longname
2A5b	Construction and demolition
2A5c	Storage, handling and transport of mineral products
2A6	Other mineral products (please specify in the IIR)
2B1	Ammonia production
2B2	Nitric acid production
2B3	Adipic acid production
2B5	Carbide production
2B6	Titanium dioxide production
2B7	Soda ash production
2B10a	Chemical industry: Other (please specify in the IIR)
2B10b	Storage, handling and transport of chemical products (please specify in the IIR)
2C1	Iron and steel production
2C2	Ferroalloys production
2C3	Aluminium production
2C4	Magnesium production
2C5	Lead production
2C6	Zinc production
2C7a	Copper production
2C7b	Nickel production
2C7c	Other metal production (please specify in the IIR)
2C7d	Storage, handling and transport of metal products (please specify in the IIR)
2D3a	Domestic solvent use including fungicides
2D3b	Road paving with asphalt
2D3c	Asphalt roofing
2D3d	Coating applications
2D3e	Degreasing
2D3f	Dry cleaning
2D3g	Chemical products
2D3h	Printing
2D3i	Other solvent use (please specify in the IIR)
2G	Other product use (please specify in the IIR)
2H1	Pulp and paper industry
2H2	Food and beverages industry
2H3	Other industrial processes (please specify in the IIR)
2I	Wood processing
2J	Production of POPs
2K	Consumption of POPs and heavy metals (e.g. electrical and scientific equipment)
2L	Other production, consumption, storage, transportation or handling of bulk products (please specify in the IIR)
3B1a	Manure management - Dairy cattle
3B1b	Manure management - Non-dairy cattle
3B2	Manure management - Sheep
3B3	Manure management - Swine
3B4a	Manure management - Buffalo
3B4d	Manure management - Goats
3B4e	Manure management - Horses
3B4f	Manure management - Mules and asses
3B4gi	Manure management - Laying hens
3B4gii	Manure management - Broilers
3B4giii	Manure management - Turkeys

NFR Code	Longname
3B4giv	Manure management - Other poultry
3B4h	Manure management - Other animals (please specify in IIR)
3Da1	Inorganic N-fertilizers (includes also urea application)
3Da2a	Animal manure applied to soils
3Da2b	Sewage sludge applied to soils
3Da2c	Other organic fertilisers applied to soils (including compost)
3Da3	Urine and dung deposited by grazing animals
3Da4	Crop residues applied to soils
3Db	Indirect emissions from managed soils
3Dc	Farm-level agricultural operations including storage, handling and transport of agricultural products
3Dd	Off-farm storage, handling and transport of bulk agricultural products
3De	Cultivated crops
3Df	Use of pesticides
3F	Field burning of agricultural residues
3I	Agriculture other (please specify in the IIR)
5A	Biological treatment of waste - Solid waste disposal on land
5B1	Biological treatment of waste - Composting
5B2	Biological treatment of waste - Anaerobic digestion at biogas facilities
5C1a	Municipal waste incineration
5C1bi	Industrial waste incineration
5C1bii	Hazardous waste incineration
5C1biii	Clinical waste incineration
5C1biv	Sewage sludge incineration
5C1bv	Cremation
5C1bvi	Other waste incineration (please specify in the IIR)
5C2	Open burning of waste
5D1	Domestic wastewater handling
5D2	Industrial wastewater handling
5D3	Other wastewater handling
5E	Other waste (please specify in IIR)
6A	Other (included in national total for entire territory) (please specify in IIR)
Memo items (not to be included in national totals)	
1A3ai(ii)	International aviation cruise (civil)
1A3aii(ii)	Domestic aviation cruise (civil)
1A3di(i)	International maritime navigation
1A5c	Multilateral operations
1A3	Transport (fuel used)
6B	Other not included in national total of the entire territory (please specify in the IIR)
11A	Volcanoes
11B	Forest fires
11C	Other natural emissions (please specify in the IIR)