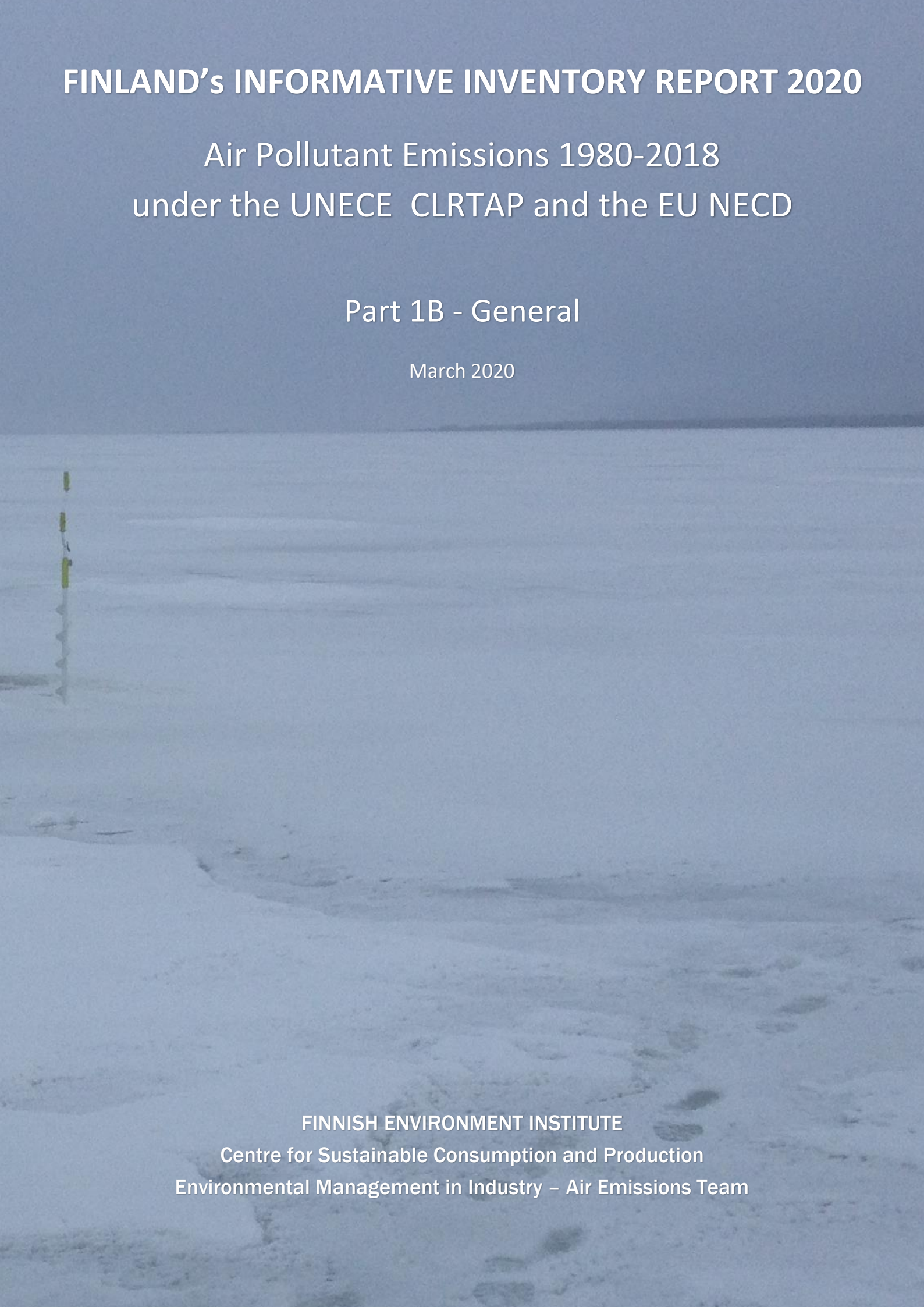
FINLAND's INFORMATIVE INVENTORY REPORT 2020

Air Pollutant Emissions 1980-2018 under the UNECE CLRTAP and the EU NECD

Part 1B - General

March 2020



FINNISH ENVIRONMENT INSTITUTE
Centre for Sustainable Consumption and Production
Environmental Management in Industry – Air Emissions Team

PART 1B - GENERAL

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8 RECALCULATIONS AND IMPROVEMENTS

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February 2020	KS

8.1 Summary of recalculations, explanations and justifications

Requested information

According to the Reporting Guidelines this chapter should include information relevant for assessment of compliance with each Protocol including a description of sources that were not included in the base year but have been added since for sources that were included in the base year and are no longer applicable.

As was no obligation to document this information in the early years of reporting air pollutant emission inventories, but the reporting guidelines have much developed since. Therefore it has not been possible to present the requested information for the early years.

In the IIR sub-chapters "***Source specific recalculations***" of each Sector Chapter information on annually conducted recalcualtions is presented for those years the documentation item already existed.

Recalculations prior to the 2018 submission

The first full recalculation of the time series 1980-2016 was carried out to the submission in 2018. The recalculation of the energy sector time series from the 1990's was initiated in 2002, however, completed first to the 2018 submission. Due to the pending energy sector recalculations, it was not possible to fully recalculate interconnected data due to the complex structure of the inventory as explained in details in Chapter 2.3.2 in Part 1A – General of the IIR. However, individual emission figures and notation keys were corrected in the NFR tables when errors were found, in addition to sources where the activity data did not interfere with data reported by the plants. The ammonia emissions time-series was an exception, and was recalculated because sparce ammonia sources are related to data reported by the operators. The allocation of emissions under consistent reporting categories in the time series was not realized until the full recalculation to the 13 April 2018 resubmission. No impact assessments of the partial recalculations until 2018 were performed due to resource limitations and the fact that the impact on the non-recalculated time series would anyway be highly uncertain.

Recalculations submitted in 2018-2019

For details of the large-scale recalculations see 2018 and 2019 IIRs.

15 Feb 2018 Finland submitted the old time series for the years 1990-2015 and new data for 2016. This was because the energy sector data was not finalized by the deadline of the NFR tables.

15 Mar 2018 Finland submitted the first recalculated time series, however, it would not have been mature for submission due to lack of checks that could not be done in the window between the late finalization of the energy sector data and the 4 weeks time frame for

resubmissions.

13 Apr 2018 Finland submitted a recalculated time series that had undergone several QA/QC procedures, however, still having remaining reallocation issues. Due to the UNECE CLRTAP S3 Review and the EU NECD Technical Review, both in June 2018, the data needed to be available.

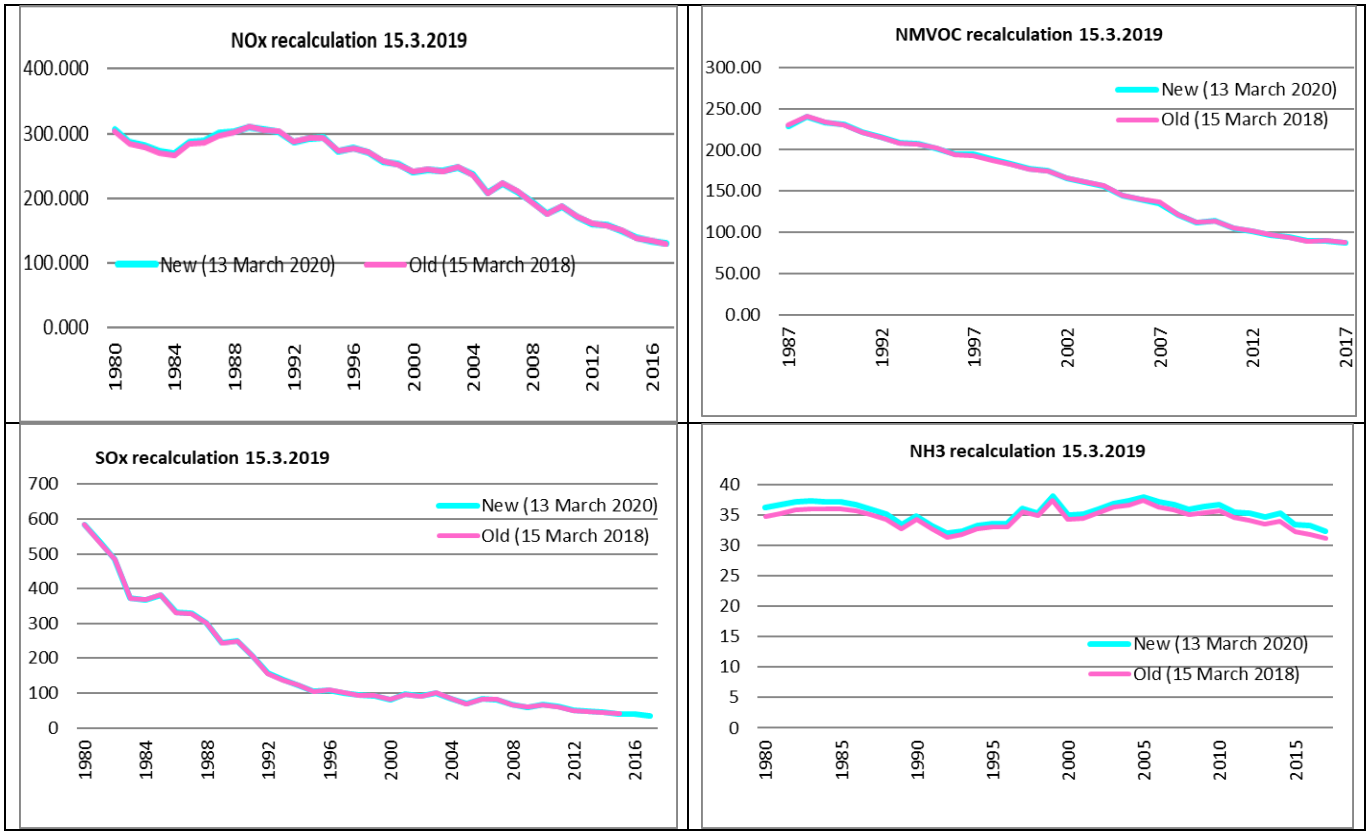
15 Feb 2019 Finland submitted the recalculated time series which included further harmonized emissions allocations in the time series, however, also some errors were discovered after the submission deadline

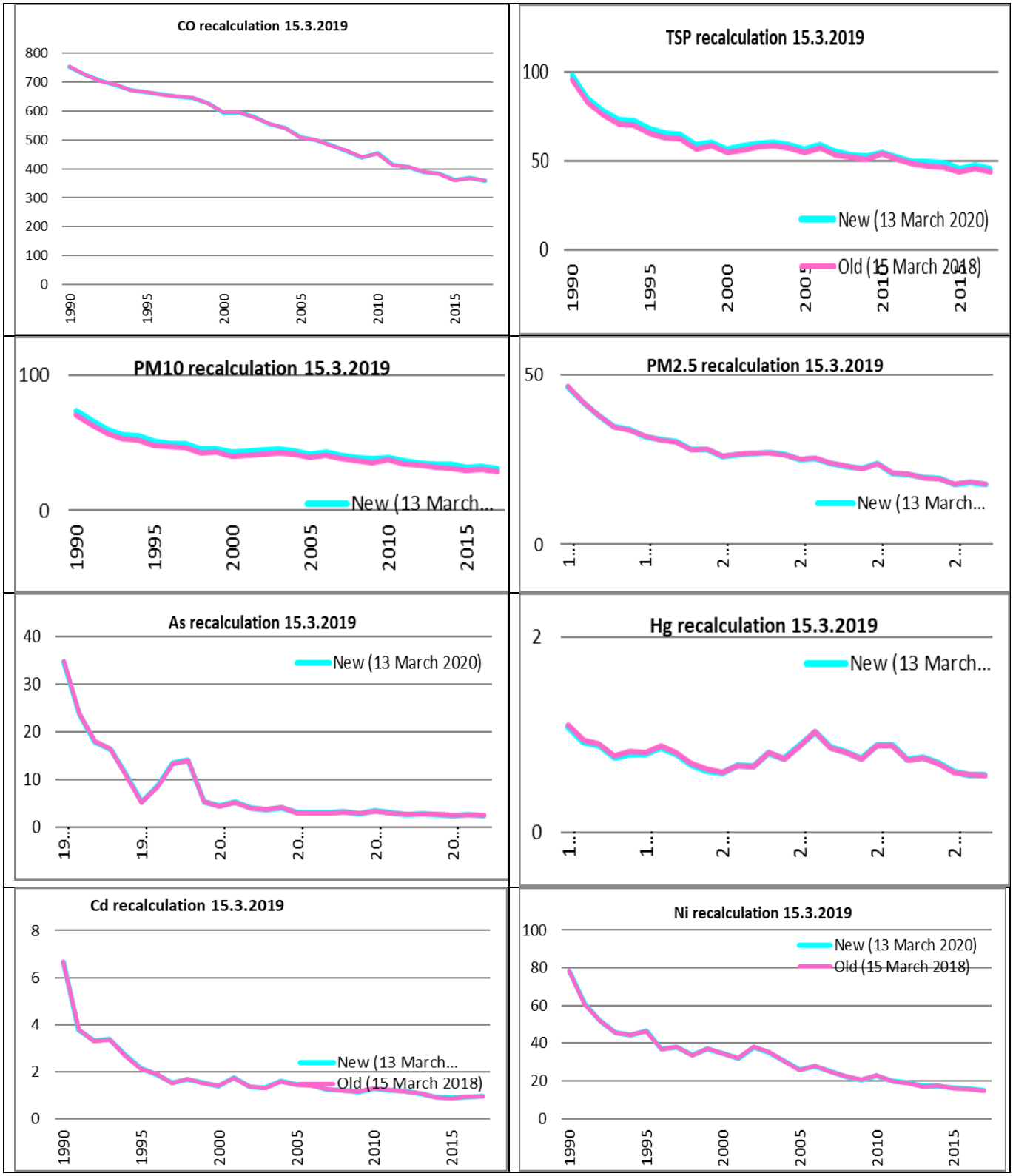
15 Mar 2019 Finland submitted additional corrections to the submission of 15 Feb 2019.

13 Mar 2020 Finland submitted corrections to the submission of 13 Feb 2020 (errors and omissions) due to time constraint caused by unexpected data flows: (1) renewal of the contents of the YLVA database with deletion of technical details used in the energy sector inventory and pre-scheduled initiation of the new energy sector calculation model, (2) errors identified in the agriculture sector calculation model formulas, (3) omission of recalculated values from the submission (agriculture HCB), (4) missing values not captured into the submission 13 February 2020. The impacts of the recalculations are presented in Chapter 8.2.

8.2 Impact of recalculations in the 2020 submission

Impact of recalculations in 2020 to the 2019 submission are presented in Figures 8.1 and Table 8.1




CO recalculation 15.3.2019
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TSP recalculation 15.3.2019
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New (13 March 2020)
Old (15 March 2018)
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PM10 recalculation 15.3.2019
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PM2.5 recalculation 15.3.2019
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As recalculation 15.3.2019
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Hg recalculation 15.3.2019
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Cd recalculation 15.3.2019
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Ni recalculation 15.3.2019
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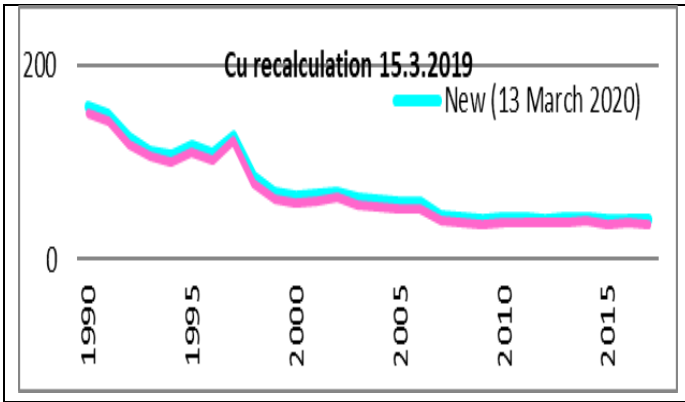
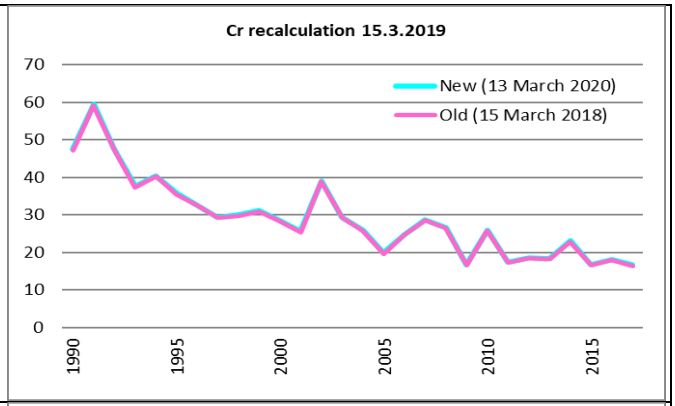
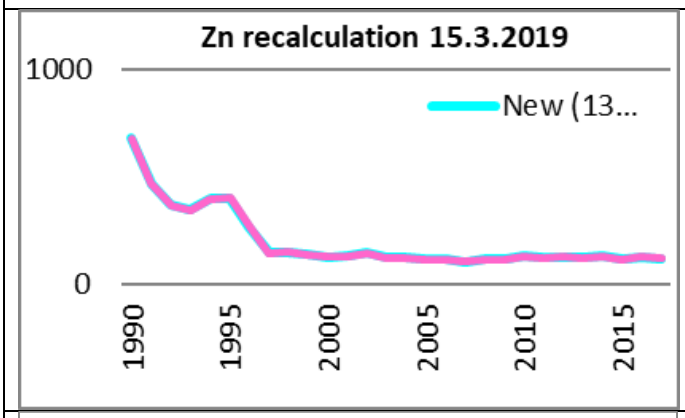
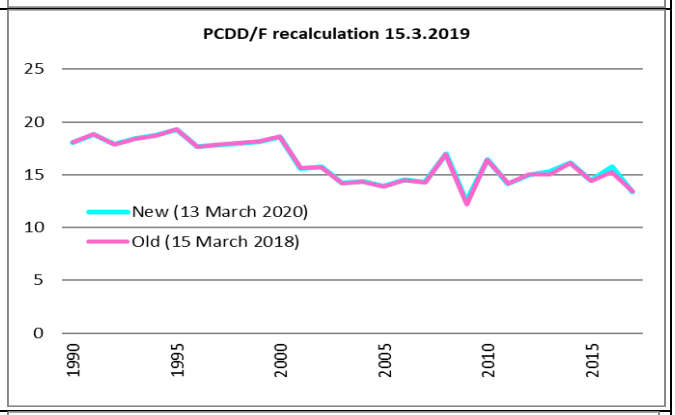
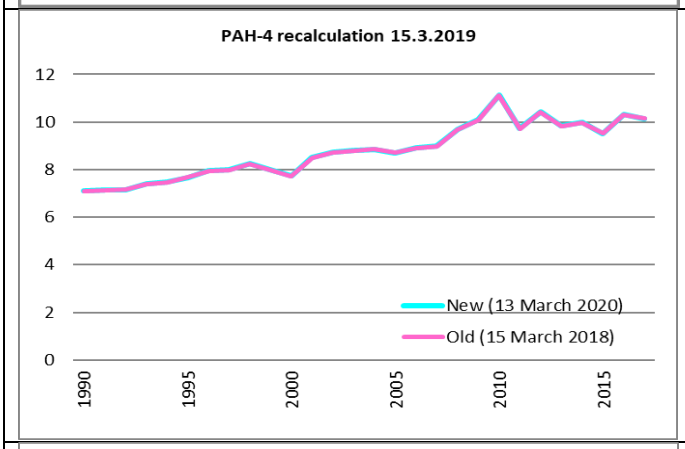
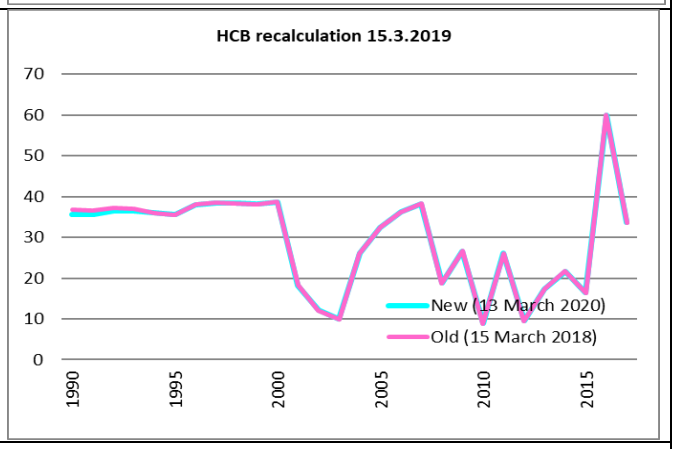












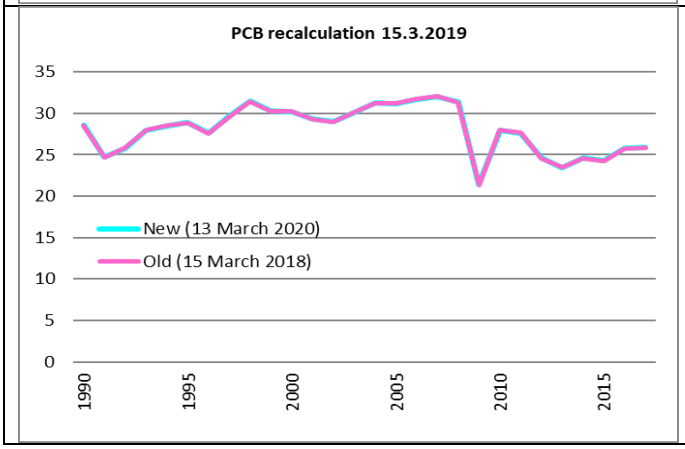


Figure 8.1
Impact of recalculations in 2020 submission to 2019 submission

Nox

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
2020	307.2	286.9	282.3	273.2	269.1	287.0	288.7	300.1	303.1	309.6	306.0	303.1	287.5	292.8	293.4	272.9	277.1	271.3	257.1	252.4
2019	304.0	284.0	279.6	270.7	266.5	284.2	286.0	297.3	302.2	310.0	305.9	303.0	287.5	292.7	293.3	272.8	277.1	271.2	257.1	252.4
kt	3.2	2.9	2.7	2.5	2.6	2.8	2.7	2.8	0.8	-0.4	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0
%	1.0	1.0	1.0	0.9	1.0	1.0	0.9	1.0	0.3	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	2000	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**		
2020	240.9	244.2	242.1	248.5	236.9	207.7	223.6	210.6	193.6	176.4	187.2	171.3	161.4	158.3	150.6	138.6	134.4	130.1		
2019	240.9	244.2	242.1	248.5	236.9	207.7	223.6	210.5	193.6	176.4	187.2	171.3	161.4	158.3	150.6	138.7	134.2	129.8		
kt	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.1	0.2		
%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.1	0.2		

SOx

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
2020	584.4	534.3	484.2	372.2	368.2	382.3	331.2	328.3	302.3	244.3	248.8	205.5	156.2	137.6	122.6	104.5	109.1	100.7	93.4	91.8
2019	583.8	533.8	483.8	371.8	367.8	381.8	330.8	327.8	301.8	243.8	248.8	205.5	156.2	137.6	122.6	104.5	109.1	100.7	93.4	91.8
kt	-0.6	-0.5	-0.4	-0.4	-0.4	-0.4	-0.3	-0.4	-0.4	-0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	2000	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**		
2020	81.8	95.8	90.4	101.1	83.5	69.5	82.9	81.2	66.8	58.9	66.1	60.2	50.0	47.6	44.3	40.8	39.8	35.0		
2019	81.8	95.8	90.4	101.1	83.5	69.5	82.9	81.2	66.8	58.9	66.1	60.2	50.0	47.6	44.3	40.8	39.8	35.0		
kt	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		

NMVOC

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
2020	NE	NE	NE	NE	NE	NE	NE	228.5	239.8	233.2	231.1	221.4	215.3	209.2	207.6	201.9	194.1	194.1	189.2	182.7
2019	NE	NE	NE	NE	NE	NE	NE	229.7	240.9	233.9	230.4	220.8	214.9	208.6	207.3	202.1	193.5	192.5	186.9	182.8
kt	NE	NE	NE	NE	NE	NE	NE	1.2	1.1	0.7	-0.7	-0.6	-0.4	-0.6	-0.3	0.2	-0.6	-1.6	-2.3	0.1
%	NE	NE	NE	NE	NE	NE	NE	0.5	0.5	0.3	-0.3	-0.3	-0.2	-0.3	-0.2	0.1	-0.3	-0.8	-1.2	0.0
	2000	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**		
2020	177.2	174.3	165.7	161.2	156.4	144.3	139.7	135.3	121.1	111.8	113.5	104.3	101.3	96.6	94.0	89.3	89.8	87.7		
2019	177.0	174.3	166.3	161.6	156.7	144.7	140.6	136.4	121.9	112.2	113.9	104.8	101.5	96.7	94.2	89.5	89.9	88.3		
kt	-0.2	0.0	0.6	0.4	0.3	0.4	0.9	1.1	0.8	0.4	0.4	0.5	0.2	0.2	0.2	0.2	0.1	0.6		
%	-0.1	0.0	0.3	0.2	0.2	0.3	0.7	0.8	0.7	0.4	0.3	0.5	0.2	0.2	0.2	0.2	0.1	0.7		

NH3

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
2020	36.2	36.6	37.1	37.2	37.1	37.1	36.7	35.8	35.1	33.4	34.8	33.2	31.9	32.3	33.3	33.5	33.5	36.0	35.3	38.0
2019	34.8	35.2	35.8	36.0	36.0	36.0	35.7	35.0	34.3	32.7	34.2	32.7	31.4	31.8	32.7	33.0	33.0	35.5	34.8	37.4
kt	-1.4	-1.3	-1.3	-1.2	-1.1	-1.0	-0.9	-0.9	-0.8	-0.7	-0.6	-0.6	-0.6	-0.6	-0.6	-0.5	-0.5	-0.5	-0.5	-0.6
%	-4.1	-3.8	-3.5	-3.4	-3.0	-2.9	-2.7	-2.5	-2.2	-2.1	-1.7	-1.8	-1.8	-1.8	-1.7	-1.5	-1.5	-1.4	-1.5	-1.6
	2000	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**		
2020	34.9	35.0	35.9	36.9	37.3	38.0	37.1	36.6	35.9	36.3	36.6	35.4	35.2	34.6	35.2	33.3	33.2	32.3		
2019	34.3	34.4	35.3	36.2	36.6	37.3	36.3	35.8	35.0	35.3	35.6	34.5	34.1	33.5	33.9	32.2	31.8	31.1		
kt	-0.6	-0.6	-0.7	-0.7	-0.7	-0.7	-0.8	-0.8	-0.9	-1.0	-1.0	-0.9	-1.1	-1.1	-1.3	-1.1	-1.4	-1.2		
%	-1.8	-1.9	-1.9	-1.8	-1.8	-1.8	-2.1	-2.3	-2.5	-2.8	-2.9	-2.5	-3.4	-3.4	-3.8	-3.4	-4.3	-4.0		

CO

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
2020	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	754.1	725.5	704.8	690.4	671.6	665.2	656.9	651.2	645.3	626.4
2019	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	754.1	725.5	704.8	690.4	671.6	665.2	656.9	651.2	645.3	626.4
kt	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	2000	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**		
2020	595.3	595.2	579.4	555.9	541.4	509.2	499.7	481.2	462.5	440.2	454.0	413.9	406.8	389.3	383.3	361.1	368.1	359.1		
2019	595.3	595.2	579.4	555.9	541.4	509.2	499.7	481.2	462.5	440.2	454.0	413.9	406.8	389.3	383.3	361.1	367.9	359.1		
kt	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.2	0.0	0.0		
%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	#####		

TSP

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
2020	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	97.9	85.2	77.9	72.6	72.4	67.8	65.0	64.7	58.6	60.3
2019	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	95.3	82.7	75.4	70.3	70.2	65.4	62.7	62.6	56.6	58.3
kt	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	-2.6	-2.5	-2.4	-2.3	-2.2	-2.4	-2.3	-2.1	-2.0	-2.0
%	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	-2.7	-3.0	-3.2	-3.3	-3.2	-3.7	-3.6	-3.4	-3.6	-3.5
	2000	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**		
2020	56.5	58.1	59.4	60.3	58.6	56.3	58.8	55.0	53.3	52.3	54.4	51.4	48.9	49.0	48.4	45.2	47.2	45.1		
2019	54.5	56.1	57.5	58.5	57.2	54.8	57.2	53.5	51.8	50.8	53.6	50.8	48.3	46.9	46.2	43.5	45.6	43.6		
kt	-2.0	-1.9	-1.9	-1.8	-1.5	-1.6	-1.5	-1.6	-1.5	-1.5	-0.8	-0.6	-0.6	-2.1	-2.1	-1.7	-1.6	-1.5		
%	-3.7	-3.4	-3.4	-3.0	-2.6	-2.8	-2.7	-2.9	-3.0	-2.9	-1.5	-1.3	-1.2	-4.5	-4.6	-3.9	-3.6	-3.5		

PM10

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999

2020	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	73.2	66.0	59.8	55.6	54.6	51.1	49.5	49.0	45.1	45.3
2019	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	70.5	63.3	57.1	53.0	52.0	48.4	46.8	46.4	42.6	42.8
kt	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	-2.8	-2.7	-2.7	-2.6	-2.6	-2.7	-2.6	-2.6	-2.5	-2.5
%	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	-3.9	-4.3	-4.7	-5.0	-5.0	-5.5	-5.6	-5.5	-5.8	-5.8

	2000	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**
2020	42.6	43.5	44.1	45.0	43.7	41.4	42.9	40.4	38.9	37.7	39.1	36.1	34.7	34.3	33.8	31.4	32.4	31.0
2019	40.2	41.2	41.7	42.6	41.6	39.3	40.8	38.3	36.7	35.6	37.6	34.6	33.2	32.0	31.5	29.4	30.4	29.2
kt	-2.4	-2.4	-2.4	-2.3	-2.1	-2.2	-2.1	-2.1	-2.2	-2.1	-1.5	-1.5	-1.5	-2.4	-2.4	-2.0	-2.0	-1.8
%	-6.0	-5.8	-5.8	-5.5	-5.0	-5.6	-5.2	-5.5	-5.9	-5.8	-3.9	-4.3	-4.5	-7.4	-7.5	-7.0	-6.7	-6.2

PM2.5

	1980	**1981**	**1982**	**1983**	**1984**	**1985**	**1986**	**1987**	**1988**	**1989**	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**
2020	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	46.4	41.8	38.0	34.7	33.8	31.9	30.9	30.2	27.9	28.0
2019	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	46.5	41.9	38.0	34.7	33.8	31.9	30.9	30.2	27.9	28.0
kt	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

	2000	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**
2020	25.9	26.6	26.9	27.0	26.4	25.1	25.4	24.0	23.1	22.4	23.8	21.0	20.6	19.7	19.4	17.7	18.4	17.8
2019	26.0	26.6	26.9	27.1	26.4	25.2	25.5	24.0	23.2	22.4	23.9	21.0	20.7	19.7	19.4	17.8	18.4	17.8
kt	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0
%	0.0	0.0	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.1	0.3	0.4	0.3	0.1	0.0	0.1	-0.2	-0.1

BC

	1980	**1981**	**1982**	**1983**	**1984**	**1985**	**1986**	**1987**	**1988**	**1989**	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**
2020	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	9.8	9.3	8.9	8.5	8.2	7.8	7.4	7.2	7.0	6.7
2019	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	9.8	9.3	8.9	8.4	8.2	7.8	7.4	7.2	7.0	6.7
kt	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	-0.2	-0.2	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	0.0	0.0

	2000	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**
2020	6.4	6.6	6.5	6.3	6.2	5.6	5.5	5.4	5.4	5.4	5.6	4.9	5.0	4.6	4.5	4.2	4.3	4.1
2019	6.4	6.6	6.5	6.3	6.2	5.7	5.5	5.4	5.4	5.4	5.6	4.9	5.0	4.6	4.5	4.2	4.3	4.1
kt	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%	0.0	0.0	0.0	0.0	0.1	0.1	0.0	-0.1	-0.1	-0.1	-0.1	-0.1	-0.3	-0.3	-0.3	-0.3	-0.3	#####

Pb

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
2020	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	321.4	237.1	165.1	105.1	73.9	72.7	49.2	31.8	37.2	34.8
2019	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	320.4	236.1	164.1	104.1	72.9	71.7	48.2	30.8	36.2	33.9
kt	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-0.9
%	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	-0.3	-0.4	-0.6	-0.9	-1.3	-1.4	-2.0	-3.3	-2.8	-2.7
	2000	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**		
2020	30.6	30.4	30.7	24.9	26.5	21.4	24.9	21.8	19.8	16.8	20.4	19.2	16.3	16.0	16.6	14.7	15.7	15.6		
2019	29.9	29.8	30.2	24.5	26.2	21.4	24.8	21.8	19.8	16.7	20.3	19.2	16.3	15.9	16.6	14.6	15.6	15.6		
kt	-0.8	-0.6	-0.5	-0.4	-0.2	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1		
%	-2.6	-2.2	-1.7	-1.6	-0.8	-0.3	-0.3	-0.3	-0.3	-0.4	-0.3	-0.3	-0.4	-0.4	-0.4	-0.4	-0.5	-0.4		

Cd

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
2020	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	6.7	3.8	3.3	3.4	2.7	2.1	1.9	1.5	1.7	1.5
2019	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	6.7	3.8	3.3	3.4	2.7	2.1	1.9	1.5	1.7	1.5
kt	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	2000	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**		
2020	1.4	1.7	1.4	1.3	1.6	1.5	1.4	1.3	1.2	1.2	1.3	1.2	1.2	1.1	0.9	0.9	0.9	1.0		
2019	1.4	1.7	1.4	1.3	1.6	1.5	1.4	1.3	1.2	1.2	1.3	1.2	1.2	1.1	0.9	0.9	0.9	1.0		
kt	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.3	0.0		

Hg

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
2020	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	1.1	0.9	0.9	0.8	0.8	0.8	0.9	0.8	0.7	0.6
2019	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	1.1	0.9	0.9	0.8	0.8	0.8	0.9	0.8	0.7	0.6
kt	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	1.5	1.8	2.0	2.5	2.4	2.5	2.5	2.5	2.6	2.3
	2000	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**		
2020	0.6	0.7	0.7	0.8	0.8	0.9	1.0	0.9	0.8	0.8	0.9	0.9	0.7	0.8	0.7	0.6	0.6	0.6		
2019	0.6	0.7	0.7	0.8	0.8	0.9	1.0	0.9	0.8	0.8	0.9	0.9	0.7	0.8	0.7	0.6	0.6	0.6		
kt	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
%	1.8	0.3	0.3	0.2	0.2	0.0	-0.2	-0.3	-0.4	-0.5	-0.6	-0.6	-1.1	-0.6	-0.5	-0.7	-0.4	-0.2		

As

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999

2020	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	34.8	23.9	18.0	16.4	11.0	5.2	8.5	13.5	14.0	5.3
2019	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	34.8	23.8	18.0	16.4	11.0	5.2	8.5	13.4	14.0	5.3
kt	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0	0.0	-0.1

	2000	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**
2020	4.4	5.2	4.0	3.7	4.1	3.0	2.9	3.0	3.1	2.9	3.4	3.0	2.6	2.8	2.7	2.5	2.6	2.4
2019	4.4	5.2	4.0	3.7	4.1	3.0	2.9	3.0	3.1	2.9	3.4	3.0	2.6	2.7	2.7	2.5	2.6	2.4
kt	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%	-0.1	-0.1	-0.1	-0.1	-0.1	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.3	-0.2

Cr

	1980	**1981**	**1982**	**1983**	**1984**	**1985**	**1986**	**1987**	**1988**	**1989**	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**
2020	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	47.5	59.5	47.4	37.6	40.4	35.8	32.7	29.4	30.0	31.1
2019	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	47.2	59.2	47.2	37.4	40.2	35.5	32.5	29.2	29.8	30.9
kt	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	-0.3	-0.3	-0.3	-0.2	-0.2	-0.3	-0.2	-0.2	-0.2	-0.2
%	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	-0.6	-0.5	-0.6	-0.5	-0.5	-0.7	-0.8	-0.8	-0.7	-0.7

	2000	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**
2020	28.5	25.6	39.0	29.4	26.0	19.8	24.9	28.7	26.6	16.7	26.0	17.4	18.6	18.4	23.1	16.7	18.2	16.6
2019	28.3	25.4	38.8	29.2	25.8	19.7	24.7	28.5	26.4	16.6	25.8	17.3	18.4	18.2	22.9	16.5	17.9	16.5
kt	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2
%	-0.8	-0.9	-0.5	-0.7	-0.7	-0.9	-0.7	-0.7	-0.7	-1.1	-0.7	-1.1	-1.0	-1.0	-0.8	-1.1	-1.2	-1.1

Cu

	1980	**1981**	**1982**	**1983**	**1984**	**1985**	**1986**	**1987**	**1988**	**1989**	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**
2020	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	156.9	148.8	124.3	111.5	106.2	116.5	109.5	127.9	84.5	68.1
2019	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	150.0	142.2	117.6	104.9	99.6	109.8	102.8	121.0	77.4	61.2
kt	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	-6.9	-6.7	-6.6	-6.6	-6.6	-6.7	-6.7	-6.9	-7.0	-6.9
%	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	-4.6	-4.7	-5.6	-6.3	-6.6	-6.1	-6.6	-5.7	-9.1	-11.4

	2000	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**
2020	65.3	66.2	69.3	61.9	60.0	58.0	58.6	44.1	42.1	40.4	42.0	42.4	41.2	42.4	43.1	40.7	41.6	40.6
2019	58.6	59.7	62.9	55.6	53.9	52.1	52.7	39.9	37.9	36.3	37.8	38.3	37.1	38.2	38.9	36.5	37.4	36.4
kt	-6.7	-6.6	-6.4	-6.3	-6.1	-5.9	-5.9	-4.2	-4.2	-4.1	-4.1	-4.1	-4.1	-4.1	-4.2	-4.2	-4.3	-4.2
%	-11.5	-11.0	-10.2	-11.2	-11.3	-11.3	-11.2	-10.5	-11.0	-11.2	-10.9	-10.8	-11.1	-10.9	-10.8	-11.5	-11.4	-11.5

Ni

	1980	**1981**	**1982**	**1983**	**1984**	**1985**	**1986**	**1987**	**1988**	**1989**	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**

2020	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	78.3	60.7	52.1	45.5	44.4	46.6	36.7	38.1	33.5	37.0
2019	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	78.3	60.7	52.0	45.5	44.4	46.5	36.7	38.0	33.5	37.0
kt	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.1	-0.1

	2000	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**
2020	34.5	32.0	37.9	35.2	30.5	25.9	27.8	24.9	22.4	20.5	22.9	20.0	18.9	17.1	17.3	16.1	15.7	14.8
2019	34.5	32.0	37.9	35.2	30.5	25.9	27.8	24.9	22.4	20.5	22.8	19.9	18.9	17.1	17.3	16.1	15.7	14.8
kt	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0
%	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.2	-0.2	-0.2	-0.4	-0.2

Zn

	1980	**1981**	**1982**	**1983**	**1984**	**1985**	**1986**	**1987**	**1988**	**1989**	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**
2020	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	679.3	469.3	370.7	346.0	401.0	402.6	268.6	145.7	149.4	139.5
2019	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	678.1	468.1	369.5	344.8	399.8	401.4	267.4	144.5	148.1	138.1
kt	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	-1.3	-1.2	-1.2	-1.2	-1.2	-1.2	-1.2	-1.3	-1.3	-1.3
%	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	-0.2	-0.3	-0.3	-0.4	-0.3	-0.3	-0.5	-0.9	-0.9	-1.0

	2000	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**
2020	126.9	129.9	146.1	125.7	123.2	115.9	118.2	106.2	118.1	117.4	130.3	125.5	127.9	124.4	131.9	118.6	127.3	119.9
2019	125.6	128.6	144.7	124.3	121.7	114.4	116.6	105.1	117.0	116.3	129.2	124.4	126.8	123.3	130.8	117.5	125.5	118.7
kt	-1.4	-1.4	-1.4	-1.4	-1.5	-1.5	-1.5	-1.2	-1.1	-1.1	-1.1	-1.1	-1.1	-1.1	-1.2	-1.2	-1.9	-1.2
%	-1.1	-1.1	-1.0	-1.2	-1.2	-1.3	-1.3	-1.1	-1.0	-1.0	-0.9	-0.9	-0.9	-0.9	-0.9	-1.0	-1.5	-1.0

PCDD/F

	1980	**1981**	**1982**	**1983**	**1984**	**1985**	**1986**	**1987**	**1988**	**1989**	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**
2020	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	18.1	18.8	17.9	18.4	18.7	19.3	17.7	17.8	18.0	18.1
2019	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	18.1	18.8	17.9	18.4	18.7	19.3	17.7	17.8	18.0	18.1
kt	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

	2000	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**
2020	18.6	15.6	15.7	14.2	14.4	13.9	14.5	14.3	17.0	12.5	16.4	14.2	15.0	15.3	16.1	14.4	15.7	13.4
2019	18.6	15.6	15.7	14.2	14.4	13.9	14.5	14.3	17.0	12.2	16.4	14.2	15.0	15.0	16.1	14.4	15.2	13.4
kt	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.3	0.0	0.0	0.0	-0.3	0.0	0.0	-0.5	0.0
%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-2.1	0.0	0.0	0.0	-1.7	0.0	0.0	-3.3	0.0

PAH-4

	1980	**1981**	**1982**	**1983**	**1984**	**1985**	**1986**	**1987**	**1988**	**1989**	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**
2020	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	7.1	7.1	7.2	7.4	7.5	7.7	8.0	8.0	8.3	8.0

2019	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	7.1	7.1	7.1	7.4	7.5	7.7	7.9	8.0	8.2	8.0
kt	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	-0.1	-0.1	-0.1	-0.1	-0.1	-0.2	-0.2	-0.2	-0.2	-0.2

	2000	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**
2020	7.7	8.5	8.7	8.8	8.9	8.7	8.9	9.0	9.7	10.1	11.1	9.7	10.4	9.8	10.0	9.5	10.3	10.1
2019	7.7	8.5	8.7	8.8	8.8	8.7	8.9	9.0	9.7	10.1	11.1	9.7	10.4	9.8	10.0	9.5	10.3	10.1
kt	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%	-0.2	-0.2	-0.2	-0.2	-0.1	-0.2	-0.2	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.2	0.0

HCB

	1980	**1981**	**1982**	**1983**	**1984**	**1985**	**1986**	**1987**	**1988**	**1989**	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**
2020	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	35.7	35.6	36.4	36.4	36.1	35.6	38.0	38.5	38.4	38.2
2019	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	36.8	36.7	37.1	37.0	36.0	35.6	38.0	38.4	38.3	38.1
kt	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	1.1	1.1	0.8	0.6	-0.1	0.0	-0.1	-0.1	-0.1	-0.1
%	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	3.1	3.0	2.0	1.7	-0.2	-0.1	-0.2	-0.2	-0.2	-0.2

	2000	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**
2020	38.7	18.2	12.1	10.0	26.1	32.4	36.2	38.2	18.8	26.6	8.9	26.2	9.5	17.4	21.7	16.4	60.0	33.6
2019	38.6	18.2	12.1	10.0	26.1	32.4	36.2	38.2	18.8	26.6	8.8	26.1	9.5	17.4	21.7	16.4	59.9	33.6
kt	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.2	-0.1	-0.1	0.0	0.0	0.0	0.0	
%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-1.7	-0.4	-0.6	0.0	-0.1	0.0	0.0	

PCB

	1980	**1981**	**1982**	**1983**	**1984**	**1985**	**1986**	**1987**	**1988**	**1989**	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**
2020	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	28.6	24.7	25.8	28.0	28.5	28.9	27.6	29.7	31.5	30.3
2019	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	28.6	24.7	25.8	28.0	28.5	28.9	27.6	29.7	31.5	30.3
kt	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

	2000	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**
2020	30.3	29.3	29.0	30.1	31.3	31.2	31.7	32.1	31.3	21.4	28.0	27.7	24.6	23.5	24.6	24.3	25.8	25.9
2019	30.3	29.3	29.0	30.1	31.3	31.2	31.7	32.1	31.3	21.4	28.0	27.7	24.6	23.5	24.6	24.3	25.7	25.9
kt	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	
%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.2	

8.3 Planned improvements

8.3.1 Inventory improvement programme at Finnish Environment Institute

Identification of further development needs in the Finnish UNECE CLRTAP inventory is carried out on a continuous basis according to annual work programmes (Table 1.01). although larger scale improvements are possible only when the necessary resources for the improvement projects are available.

In the past years the inventory improvement programme was strongly linked with the national emission data production methods provided to the operators in their reporting to emission registers such as the E-PRTR. Finnish Environment Institute maintains information on emission estimation methodologies and emission factors on a website (http://www.ymparisto.fi/fi-FI/Asiointi_luvat_ja_ymparistovaikutusten_arviointi/Luvat_ilmoitukset_ja_rekisterointi/Paastotiedon_ilmoittaminen__paastorekistereihin_PRTR) (in Finnish). These methods should be applied in the E-PRTR reporting by the plant operators whenever no plant specific data is available. This procedure has been developed to ensure consistency between the data reported by the plants and the emission inventory.

The programme has thus far included studies in the energy production sector (boilers >50 MW), industrial processes (pulp and paper, iron and steel), agriculture and waste sectors and resulted in updating or developing of several emission factors. The studies involve also examination of the applicability of the default methods presented in the Guidebook for the national conditions.

National emission factors are derived from data reported by the plants when these are based on site-specific measurements and other site-specific data. In the later years, the obligation to use the latest version of the Guidebook emission factors has been more dominant. After the full recalculation of the time series emphasis will be given to check and further develop national emission factors based on data reported by the plants and replace the Guidebook EFs with these where feasible.

The results of the uncertainty analysis are used to prioritise the improvements.

The overall scheme of the inventory improvement programme is presented in Chapter 14 in Table 1.01.

Information of the Nordic cooperation in harmonization and improvement of air pollutant emission inventories in the Nordic countries is presented in Chapter 8.5.2

Sector-specific improvements that have already been implemented due to the QA/QC work and the inventory improvement programme are presented in Table 1.02 and those still remaining in Table 1.03

8.3.2 Review, Improvement and Harmonization of the Nordic Air Emission Inventories in the Nordic Air Emission Experts Group

Changes in chapter	
March 2018	KS

Since 2004 the Nordic countries (Denmark, Finland, Iceland, Norway and Sweden) have carried out several projects on reviewing. improving and harmonizing the national air pollutant emission inventories. The work has been funded by the Nordic Councilof Ministers. The target of the cooperation is to share knowledge and resources and to increase the quality of the Nordic CLRTAP air emission inventories with

respect to accuracy, comparability, transparency and completeness. Until now, POP, NMVOC, particle and partly also heavy metal emission inventories in the Nordic countries have improved. Several improvements to the national inventories have been made in all Nordic countries due to the results of the work, for instance in NMVOC and particle emission inventories.

In addition to the overall review (2004), the following specific sectors have been under work:

- particulate emissions from small scale wood combustion and road transport (2006)
- emissions from the use of products (2006-2011)
- NMVOC inventories from the domestic product use sector (2010)
- SLCP emissions (2014-2017)
- POP and heavy metals from all sectors (2016-2018).
- POP and heavy metals and particles (2019-2021)

8.4 Improvements in the Finnish Inventory due to the Inventory Review Processes

8.4.1 CLRTAP S3 Review and EU Technical Review under the NECD in 2018

The improvements made to the inventory in response to the 2018 S3 review under the CLRTAP and to the EU Technical Review under the NECD in 2018 are presented in Table 1.03.

Table 1.03 Improvements made in response to the 2019 EU Technical Review under the NECD (Final Review Report)

NOTE – Responses to NECD Projections Review are provided under the Projections Chapter below.

Table 2: Recommendations from the NECD Review 2018 for NO_X, NMVOC, SO_2, NH_3, $PM_{2.5}$ that have not been implemented in the inventory submission 2019

Initial recommendation number of years	KC	NFR, Pollutant(s), Year(s)	RE or TC in 2018/ 2019	Response
FI-1A3b-2017-0009 (3)	No	**Recommendation made in previous review report** The TERT notes with reference to IIR Section 2.2 for 1A3bi-iv for all pollutants and years that there is a lack of transparency regarding the lubricant consumption calculation and the associated reporting. This observation was raised during the 2017 NECD review (observation FI-1A3b-2017-0009). However, the IIR explains that Finland does not have data required to separate 2-stroke and 4-stroke oil consumption and emissions and all lubricant use is reported under 1A2bviii. The TERT notes that the 2016 EMEP/EEA Guidebook provides a method for estimating 2-stroke and 4-stroke lubricant consumption for different vehicle types which would allow an allocation of the lubricant consumption currently allocated to 1A2bviii to 1A3b. In response to a question raised during the review, Finland explained that it did not have the resources to do this development work due to the extensive recalculation of the time series carried out in 2018. The activity data to this improvement will need detailed work and will be included on the improvement plan included in the 2019 submission. The TERT notes that this issue does not relate to an over- or under-estimate and that this is a minor issue but continues to recommend that this improvement is carried out for inclusion in the 2019 submission or plans are made to carry out these improvements in the following year. **Assessment of Implementation** Following a recommendation from previous reviews in 2017 and 2018, FI-1A3b-2017-0009, related to correctly allocating the consumption of lubricants from 2- and 4-stroke engines to the appropriate NFR categories, the TERT studied the 2019 IIR and found on p. 21 of Part 1B - General that: "The issue is scheduled to be solved to the 2020 submission". In response to a question raised during the review, Finland answered by providing an excel file with some preliminary calculations of the use of lubricants in 2-stroke engines to be reported under the appropriate NFR 1A3b Road Transport categories, while the breakdown of lubricant use of 4-stroke engines will be included in the 2020 submission. **The TERT accepts this answer and recommends that Finland finalises these calculations in time for the 2020 submission.**	No	Lubricant use for 2-stroke engines is provided in IIR Part 3 Transport page 9. Lubricant use for 4-stroke engines will be clarified and reported in the 2021 submission.

Initial recommendation number of years	KC	NFR, Pollutant(s), Year(s)	RE or TC in 2018/ 2019	Response
FI-1A3b-2017-0007 (3)	No	**Recommendation made in previous review report** For 1A3b all years, the TERT noted that there is a lack of transparency regarding how biomass consumption is reported in NFR tables. This was raised during the 2017 NECD review (observation FI-1A3b-2017-0007). The TERT notes that the biomass share of transport fuels is clearly reported in the IIR, but as 'NA' in the NFR tables which is not an appropriate notation. In response to a question raised during the review, Finland explained that it did not have the resources to do this development work due to the extensive recalculation of the time series carried out in 2018. Finland explained that the activity data needed will require more detailed work due to the structure of the domestic model, but that the issue will be included on the improvement plan included in the 2019 submission. Finland also indicated that the notation key will be corrected to 'IE' to the next submission. The TERT notes that this issue does not relate to an over or under estimate and continues to recommend that to improve transparency this improvement is carried out for the 2019 submission, noting that activity data for biomass combustion are already presented in the IIR tables, just not in the NFR tables. **Assessment of Implementation** Following a recommendation from previous reviews 2017 and 2018, FI-1A3b-2017-0007, the TERT analysed the 2019 NFR 1A3b Road Transport categories and found that biomass activity data is now provided for passenger cars, but for other road vehicle categories it is still reported as 'NA'. The TERT also studied the 2019 IIR and found on p. 22 of "Part 1B - General" the answer: "The data is included in the 2019 submission in the NFR tables". Hence, there was some inconsistency between NFR and IIR. In response to a question raised during the review, Finland answered that the use of biomass is currently available only as the sum that is allocated under passenger cars and indeed this was not explained in the IIR. Furthermore, Finland is currently studying the possibility to report the data by vehicle classes in the 2020 submission. The TERT asked Finland if it would be possible to make an effort to correctly split/allocate biomass in the road transport subcategories during the current review. Finland answered that this is not possible now because the data is not readily available and is only under initial consideration/preliminary work. **The TERT notes that this issue does not relate to an over- or under-estimate of emissions and recommends that this observation is checked again in 2020.**	No	Biomass consumption is provided both in the NFR table and in the IIR Part 3 Transport pages 7-8.

Initial recommendation number of years	KC	NFR, Pollutant(s), Year(s)	RE or TC in 2018/ 2019	Response
FI-1B1b-2018-0001 (2)	No	**Recommendation made in previous review report** For category 1B1b Fugitive Emission from Solid Fuels: Solid Fuel Transformation and pollutant NO_X for all year the TERT noted that there was a potential under-estimate of emissions as these are reported as 'NA'. In response to a question raised during the review, Finland explained that these emissions are estimated and included in 1A2a. Finland stated that the possibility to split between energy and process emissions will be studied and the allocation of emissions documented in the 2019 submission. The TERT notes that this does not related to an over-or under- estimate of emissions and recommends that Finland investigate the division of process and combustion emissions from this source, transparently document the findings, else update the notation key in 1B1b to 'IE' if this split is not possible for the 2019 submission and include the explanation of where the emissions are allocated. **Assessment of Implementation** For NO_X from 1B1b Fugitive Emission from Solid Fuels: Solid Fuel Transformation, years 1990-2016, the TERT noted that there is a lack of transparency regarding the use of 'IE' for this source that is now included in 1A2a. This was first raised during the 2018 NECD review. Furthermore, the TERT noted that no reference to the effort Finland made towards a possible split of these sources was found. This issue does not relate to an over- or under-estimate of emissions. In response to a question raised during the review, Finland explained that from a study on the issue it concluded that the sources cannot be split and that the explanation on this will be included in the 2020 submission. **The TERT recommends that Finland provides information of the study in the next submission**	No	The emissions are allocated under 1A2a and reported as “IE” see IIR Part 2 Energy, please see explanations on page 56

Table 3: Additional recommendations made during the NECD Review 2019 for NO_X, NMVOC, SO_2, NH_3, $PM_{2.5}$

Observation	KC	Recommendation	RE, TC or PTC in 2019	Response
FI-2D3a-2019-0002	Yes	For category 2D3a Domestic Solvent Use including Fungicides and pollutant NMVOC, the TERT noted that no emissions were calculated for pharmaceuticals, office products, DIY products, adhesives and sealants. In response to a question raised during the review, Finland explained that paint thinner and paint removers are included in category 2D3d. Finland provided a revised estimate for years 1990-2017 and stated that it will be included in the next submission. The TERT agreed with the revised estimate provided by Finland. **The TERT recommends that Finland includes the revised estimate in its 2020 NFR and IIR submission.**	RE	Emissions from pharmaceuticals are included in the 2020 submission.
FI-5D1-2019-0001	No	For category 5D1 Domestic Wastewater Handling and NH_3 for years 2014-2017, the TERT noted that a significant increase (>3000%) has been reported without any further explanation. In response to a question raised during the review, Finland explained that some point sources have accidentally been excluded in 2012, 2014 and 2015. Finland provided a revised estimate for the years 2012-2017. The TERT agreed with the revised estimate provided by Finland for 2012, 2014 and 2015, which is below the threshold of significance. **The TERT recommends that Finland recalculates its NH_3 emissions from 5D1 in its next submission to reflect the corrections made.**	RE	The emissions have been corrected to the 2020 submission.
FI-2D3i-2019-0001	Yes	For category 2D3i Other Solvent Use and pollutant NMVOC, the TERT noted that the NMVOC emissions in 2002 were recalculated. In response to a question raised during the review, Finland explained that the data for the use of pesticides has been changed unintentionally for 2002 to equal to the value for 2001. The TERT noted that the issue is below the threshold of significance for a technical correction. **The TERT recommends that Finland corrects the NMVOC emission from 2D3i in 2002 in the next submission.**	No	The emissions have been corrected to the 2020 submission.
FI-5B2-2019-0001	No	For category 5B2 Biological Treatment of Waste - Anaerobic Digestion at Biogas Facilities and pollutant NH_3 for years 2000-2017, the TERT noted that Finland reported NH_3 as 'not estimated (NE)', although a Tier 1 methodology is provided in the 2016 EMEP/EEA Guidebook. In response to a question raised during the review, Finland explained that it will establish a separate project to collect the activity data. The TERT agreed with the explanation provided by Finland and notes that emissions from this source are likely below the threshold of significance. **The TERT recommends that Finland collects the needed activity data and reports in its next submission NH_3 emissions from this source. If this is not possible, information on progress made should be included in the next IIR.**	No	The activity data ”total annual amount of nitrogen in the feedstock entering the biogas plants” required by the T1 method is not available in Finland. To obtain this data there is need to establish a project which could be possible earliest in 2022-2025 depending if funding for this project will be available. After assessing the impact of the emissions, we have a strong understanding that emissions would be very low, far below the threshold of significance.

Table 4: Recommendations from the NECD Review 2018 of POPs and heavy metals that have not been implemented in the inventory submission 2019

Initial recommendation (number of years)	KC	Recommendation	RE, TC or PTC in 2019	Response
FI-2C3-2018-0001 (2)	No	**Recommendation made in previous review report** In response to the review, Finland indicated that HCB and PCDD/F emissions for secondary Aluminium Production are included in the inventory but were incorrectly allocated to the category 2C7c in the NFR tables. The source category and emission estimation methodologies are described in the correct IIR chapter for NFR 2C3 (Chapter 3.19). Finland provided correct PCDD/F and HCB emissions for category 2C3 for the years 1990-2016 and indicated that the allocation of emissions will be corrected for the 2019 inventory submission. The TERT recommends that Finland makes this correction in their 2019 submission. **Assessment of Implementation** For category 2C3 Aluminium Production and pollutant dioxin, the TERT noted that emissions have been reallocated from 2C7c to 2C3, but the TERT noted that the emissions in the 2019 submission were lower than the 2018 submission (for the years 2009, 2013 and 2016). In response to a question raised during the review, Finland explained that dioxin emissions in category 2C3 in 2009, 2013 and 2016 are incorrect. Finland provided a revised estimate for year 2009, 2013 and 2016 and stated that it will be included in the next submission. The revised estimate for 2C3 is equal to the emissions that were allocated in 2C7c in the 2018 submission. The TERT agreed with the revised estimate provided by Finland. **The TERT recommends that Finland includes the revised estimate in its 2020 NFR and IIR submission**	RE	The emissions have been corrected to the 2020 submission.
FI-5C1bv-2018-0001 (2)	No	Rec**ommendation made in previous review report** For 5C1bv Cremation, the TERT noted with reference to Hg emissions, that there is a lack of transparency regarding the emissions factor (EF) applied which is twice smaller than the default proposed in the 2016 EMEP/EEA Guidebook. In response to a question raised during the review, Finland explained that since 2012 the Hg EF from Sweden is used and that for previous years the EF is based on some other sources. Finland plans to clarify these sources and assess any needs for changes the EF and indicated that a justification for the EFs will be included in the next submission. The TERT notes that this issue does not relate to an over-or under-estimate and recommends that increase the transparency of its report concerning Hg emissions from 5C1bv. **Assessment of Implementation** For 5C1bv Cremation the TERT noted that the applied emission factor to calculate Hg emissions was inconsistent and two times smaller than the default value in the 2016 EMEP/EEA Guidebook. This was first raised during the 2018 NECD review. In response to a question raised by the 2019 TERT, Finland explained that it has carried out sector specific improvements taking into account the amalgam in deceased and cremated bodies. The applied emission factor considers flue gas abatement from 2012 onwards. Therefore, two different EF (default Tier 1 for cremation without abatement and a Swedish EF for cremation with abatement) are applied. Finland provided a revised estimate for Hg for the years 1990-2017 and stated that it will be included in the next submission. The TERT agreed with the revised estimate provided by Finland. **The TERT recommends that Finland includes the revised estimate in its 2020 NFR and IIR submission.**	RE	The emissions are included in the 2020 submission.

Initial recommendation (number of years)	KC	Recommendation	RE, TC or PTC in 2019	Response
FI-2C1-2018-0001 (2)	No	**Recommendation made in previous review report** The TERT identified a number of observations on the trend and its use of EFs that were not country specific or consistent with the guidebook for 2C1 Iron and Steel production and PAH emission for 2006-2016. In response to a question raised during the review Finland provided additional information on the estimation method and the trends. The TERT recommends that Finland includes this information in its IIR and considers using the 2016 EMEP/EEA Guidebook emission factors if no better country specific emission factors are available. **Assessment of Implementation** For category 2C1 Iron and Steel Production and pollutant PAH, the TERT noted that there is a lack of transparency in the IIR regarding the use of EFs that are not country specific or consistent with the guidebook for 2C1 Iron and Steel Production and PAH emission for 2006-2017. This does not relate to an over- or under-estimate of emissions. This issue was first raised during the 2018 NECD review. In response to a question raised during the review, Finland explained that they have forgotten to include the explanation provided to the previous TERT in the IIR, and that they have already inserted the explanation in the 2020 IIR. **The TERT reiterates the recommendation that Finland includes this information in its IIR and considers using the 2016 EMEP/EEA Guidebook emission factors if no better country specific emission factors are available.**	No	Information is included to the IPPU-IIR on page 49.
FI-5-2018-0001 (2)	No	**Recommendation made in previous review report** For 5C2 - Open Burning of Waste, the TERT noted that 'NO' is reported in the NFR tables and no information is provided in the IIR. In response to a question raised during the review, Finland explained that the chapter for NFR 5C2 has accidentally been dropped out of the IIR and will be returned in the 2019 submission. The TERT recommends that Finland includes this chapter along with the justification of the notation key 'NO' in its next IIR. **Assessment of Implementation** For 5C2 - Open Burning of Waste, the TERT noted that 'NO' is reported in the NFR tables and no information is provided in the IIR. This issue has already been addressed during the review in 2018. In response to a question raised during the review, Finland explained that the chapter for NFR 5C2 has been accidentally dropped out of the IIR and will be put in again for the 2020 submission. Finland states that waste incineration by households is forbidden according to the Environmental Protection Act and therefore no emissions are expected from this category. **The TERT recommends that Finland includes the chapter 5C2 and the explanation for using the notation key 'NO' in its next IIR. The TERT also notes that 5C2 is mainly about agriculture waste burned off-field, not household waste.**	No	The chapter that accidentally dropped out has been returned in the IIR of the 2020 submission.

Table 5: Additional recommendations made during the NECD Review 2019 for POPs and heavy metals

Observation	KC	Recommendation	RE, TC or PTC in 2019	Response
FI-0A-2019-0001	No	Scanning the 2019 NFR tables submitted by Finland, the TERT noted that there are zero (0) emissions or blank entries reported where a notation key or emission should be provided. The TERT included a detailed list of these instances as part of the communication with Finland. In response to the question raised during the review, Finland provided the missing data and explained that those will be included in future submissions. **The TERT recommends that Finland carefully checks its NFR tables before the next submission and does not report zero values or blank cells in the future.**	No	Empty cells and erroneous zero values have been corrected to the 2020 submission. There are 0.000 values due to the low emission level, and the TERT can verify the existing emissions by clicking in the cell to see the value.
FI-0A-2019-0002	No	For some source categories in the energy sector and pollutants PAHs, the TERT noted that Finland does not report PAHs separately, but only includes the total PAH value in the NFR tables. In response to a question raised during the review, Finland explained that there is no easy solution to this issue due to the use of plant data provided by operators, but that this will be looked into and improved for the next submissions. The TERT agreed with the explanation provided by Finland. **The TERT recommends that Finland reports PAHs as a total and individually for all relevant source categories as required by the Reporting Guidelines.**	No	PAH species values are provided where it has been possible to estimate the value. However, the plants have an obligation to report PAH-4 (EPRTR) and not for the species. Not all species are relevant to all activities and it has not been possible to identify the specific species by each plant. This is a question related to the differences in reporting obligations (CLRTAP/NECD and EPRTR). Using plant level data ensures the accuracy of emissions while calculating emissions using surrogate AD and Guidebook EFs would increase inaccuracies and likely overestimate emissions. The split has, however, been done for industry emissions after interviewing the plants. For the energy sector, it is not possible to interview all operators regarding all boilers. We consider it better to report accurate PAH-4 values (as the reduction requirement is for PAH-4) than to report inaccurate PAH emissions by PAH species.

Observation	KC	Recommendation	RE, TC or PTC in 2019	Response
FI-1A1b-2019-0001	Yes	For Pb and $PM_{2.5}$ emissions from 1A1b Petroleum Refining, years 2005, 2016 and 2017, the TERT noted the ratio of Pb compared to PM_{10} emissions are high outliers when compared to all other Member States. Additionally, the TERT noted that there is a strong drop of the $PM_{2.5}$ emissions in 2017. In response to a question raised during the review, Finland answered that the Pb emissions are likely over-estimated because information on existing abatement technique is not available for all plants under this category. Furthermore, Finland answered that necessary corrections will be made in the 2020 submission and explained the strong drop in $PM_{2.5}$ emissions in 2017. **The TERT recommends that Finland updates the information on abatement techniques in the inventory and includes the new estimates in the 2020 submission.**	No	The case was corrected to the 2020 submission.
FI-1A2f-2019-0001	Yes	For Pb emissions from 1A2f Stationary Combustion in Manufacturing Industries and Construction: Non-metallic Minerals, year 2005, the TERT noted that the ratio of Pb to PM_{10} emissions is a high outlier when compared to all other Member States. In response to a question raised during the review, Finland answered that the Pb emissions are likely over-estimated because of information on existing abatement technique is not available for all plants under this category. Finland agreed to implement the necessary corrections in the 2020 submission. **The TERT recommends that Finland updates the information on abatement techniques in the inventory and includes the new estimates in the 2020 submission.**	No	The case was corrected to the 2020 submission.
FI-2K-2019-0001	No	For category 2K Consumption of POPs and Heavy Metals (e.g. Electrical and Scientific Equipment), pollutants PCB and Hg, the TERT noted that there is a lack of transparency regarding reasons why emissions are reported as 'NO' (not occurring). In response to a question raised during the review, Finland explained that the use of PCBs in open systems was banned in the 1970s and PCB containing products have been banned since the 1990s. Mercury releases from products is mostly a waste management issue and mercury containing products have been regarded as hazardous waste and treated as such since the 1990s. **The TERT recommends that Finland includes a description of the reasons for not reporting PCB and Hg in the IIR in the next submission.**	No	The explanation is included in IIR Part 4 IPPU on p 113.
FI-3Df-2019-0001	No	The TERT noted with reference to the IIR, chapter 3Df Use of Pesticides, that Finland reports HCB emissions from 3Df Use of Pesticides on the basis of Environment Canada (2006), explaining that the EF for HCB emissions presented in the 2016 EMEP/EEA Guidebook was considered to be inaccurate compared to the EFs currently in use in the inventory as they are available for each active ingredients. However, the TERT noted that the October 2018 update version of the EMEP/EEA Guidebook includes a Tier 1 approach for HCB containing pesticides. Table 3 of the Guidebook includes a proposed maximum HCB concentration (impurity factor) in active substances used in Europe from 1990 onwards taken into account the implemented EU regulation. Specific EFs differ significantly from those used by Finland (e.g. Chlorothalonil). In response to a question raised during the review, Finland explained that Chlorothalnoil has been used only in 1993-1995 and in 2011 and that Finland was unaware of the updated EFs in the October 2018 version of the Guidebook. Finland explained that it will collect information on the use of branded and non-branded products and will recalculate the emissions to the 2020 submission. **The TERT recommends that Finland provides updated estimates in its next submission as announced in its answer to the review.**	No	The emissions are corrected to the 2020 submission.

Table 1.03 Improvements made in response to the 2018 CLRTAP S3 review and the 2018 EU Technical Review under the NECD

ENERGY

Observation	Key Category	NFR, Pollutant(s), Year(s)	Recommendation made in the review report	RE or TC in 2017	Response
CLRTAP 2018 Recommendation nr 29		Transparency	The ERT encourages Finland to explain the trends for each Key Trends in the IIR. Regarding the IIR, the trends are already explained in the general part of the IIR and it is planned to include the explanations on the trends by NFR category in the submission 2019.		The trend description was improved to the 2019 submission, and will be developed further in the next submissions
CLRTAP 2018 Recommendation nr 30		1A1 and 1A2 Transparency	The ERT notes that in the IIR Finland provides tables which show the evolution of fuel consumption per fuel, per year and by NFR code (1A1, 1A2,..). The ERT commends Finland for providing these detailed explanations as recommended in the previous review. However, these tables have been taken from Finland's NIR and are not consistent with the energy use reported in the NFR tables. The ERT encourages Finland to update the IIR with the data in the NFR tables to be consistent.		The tables have been changed to correspond the contents of the IPTJ calculation system at SYKE.
CLRTAP 2018 Recommendation nr 32		1A1 and 1A2 Transparency	The ERT notes that the number of Finnish energy plants is given in the IIR for the NFR codes 1A1 and 1A2 in the tables 2.9 and 2.12. The ERT encourages Finland to provide, in the energy part of the IIR, the list of sub-sectors included in NFR codes 1A2f and 1A2gvii to improve transparency.		A list will be developed to the 2020 submission.
CLRTAP 2018 Recommendation nr 33		Transparency	The ERT encourages Finland to include the answers that were provided to questions raised by the ERT during the review week in future submissions (see Sub-sector Specific Recommendations).		The information provided during the review is incorporated into the IIR.
CLRTAP 2018 Recommendation nr 36		Transparency	The ERT encourages Finland to justify most of the outliers and to include explanations for all large fluctuations highlighted during the stage 2 review.		See the response under CLRTAP Recommendation 37

Observation	Key Category	NFR, Pollutant(s), Year(s)	Recommendation made in the review report	RE or TC in 2017	Response
CLRTAP 2018 Recommendation nr 37		1A1 and 1A2 Transparency	The ERT encourages Finland to correct the data in order to remove outliers. During the review, mistakes in the inventory leading to outliers were highlighted: misallocation of SO2 emissions in 2001 (1A2b), missing petroleum coke entry from one facility operator in 1997 (1A1b), erroneous entries by facility operators in 2008 (1A1a) and in 1991 and 1999 (1A2gviii). ERT recommends Finland to investigate further and to correct these inaccuracies if necessary.		The corrections have been made to the 2019 submision.
CLRTAP 2018 Recommendation nr 40		Transparency	The ERT commends Finland for providing a comparison between the CRF tables and the NFR tables. However, this comparison only explains a small part of the differences. In response to the review, Finland indicated that they will investigate and harmonize where possible the allocation of emissions between the greenhouse gas inventory and the air pollutant inventory to the next submission in 2019. ERT commends Finland for this future investigation. ERT encourages Finland to do the same work for the activity data		Regarding the recommendation it has not been possible to allocate all air pollutant emissions under NFR categories that might seem harmonized with CRF categories due to the facts that (a) the air pollutant emissions are not generated in the same sources as ghgs, (b) the allocation of CFR data changes yearly according to possible outsourcing or purchasing of the energy production units between the energy companies and the industrial plant – as this happens almost annually, there are no resources to do this in the air pollutant inventory (c)
CLRTAP 2018 Recommendation nr 46		1A1 and 1A2 Stationary combustion PCBs	The ERT noted that according to the NFR tables, the emissions of PCBs are not applicable (NA) for the combustion in some sectors in 1A1 and 1A2 while the EMEP EEA Emission Inventory Guidebook 2016 suggests emission factors for PCBs for solid fuels and biomass. Finland answered that following the recalculation of the time series 1990-2015 there was no time to thorough checks and these emissions were not included in the 2018 submission. However, PCBs emissions from these categories will be calculated and reported in the 2019 submission. ERT recommends strongly Finland to estimate PCBs emissions from stationary combustion.		PCB emissions have been included
NECD Review FI-1A1a-2018-0001	No	1A1a Public Electricity and Heat Production, PCBs, 1990, 2005, 2016	For category 1A1a and pollutants PCBs the TERT noted that Finland reported 'NA' when there is a methodology in the 2016 EMEP/EEA Guidebook which suggested a potential under-estimate. In response to a question raised during the review, Finland explained that these emissions were not included in the 2018 submission, thus the notation key is incorrect and should be 'NE'. Finland stated that the emissions will be calculated and reported for the first time in the 2019 submission. The TERT recommends that Finland include the new estimate in its next submission.	No	The emissions are included
NECD Review FI-1A2-2018-0001	No	1A2 Stat CombMan Ind Const:, PCBs, HCB, 1990-2016	For category 1A2a-f and pollutant PCBs for all years the TERT noted that there is a potential under-estimate as these are reported as the notation key 'NA', when there is an emission factor and method in the 2016 EMEP/EEA Guidebook for solid fuels and biomass. The TERT also noted that for category 1A2b, pollutant HCB, Finland report 'NA' for all years except 1992. In response to a question raised during the review, Finland explained that due to resource constraints PCB emissions from categories 1A2a-f were not included in the 2018 submission and that the emissions will be calculated and reported in the 2019 submission. Finland also explained that in 1992 boilers in 1A2b used biomass, so HCB emissions were estimated, but biomass was not used for other years. The TERT recommends that Finland include 1A2a-f PCB emission estimates in the 2019 submission. The TERT also recommends that Finland correct the notation		PCB emissions are included.

Observation	Key Category	NFR, Pollutant(s), Year(s)	Recommendation made in the review report	RE or TC in 2017	Response
			key for HCB 1A2b from 'NA' to 'NO' if the relevant activity is not occurring for the rest of the time series, but also to include the HCB emission estimates from other solid fuels in 1A2a-f in the 2019 submission.		
NECD Review FI-1A2a-2018-0001	No	1A2a Stat CombMan Ind Const:: Iron and Steel, Hg, 1990-2016	For category 1A2a and pollutant Hg the TERT noted that there was a lack of transparency regarding the time series consistency. In response to a question raised during the review, Finland explained that one plant was incorrectly allocated to 1A2a for some years, causing strong fluctuations in emissions. Finland stated this will be corrected in the 2019 submission. The TERT recommends that Finland reviews the time series data and plant allocation to ensure time series consistency, and transparently document this update in the 2019 submission.		An incorrect value for 2009 has been corrected- In 1990-1997 the emissions are higher due to inclusion of a sintering plant under the category. Since 1998 the emissions are reported under 2C1 and the emissions do not fluctuate after that. An explanation is included in the relevant IIR chapters. A change in the allocation of the point source data before 1998 was not yet possible.
NECD Review FI-1A2b-2018-0001	No	1A2b Stat CombMan Ind Const: Non-Ferrous Cd, Hg, Pb, 1990-2016	For category 1A2b Stationary Combustion in Manufacturing Industries and Construction: Non-Ferrous Metals, pollutants Cd, Pb the TERT noted that there was a lack of transparency regarding the time series consistency. In response to a question raised during the review, Finland explained that emissions from 2C7c had incorrectly been allocated to 1A2b for several years. Finland stated that the allocation will be made consistent across the time series for the 2019 submission. The TERT recommends that Finland review the emissions allocation to ensure time series consistency, and to include transparency information regarding the method across the time series, in the 2019 submission.		Errors in Cd emissions have been corrected. Regarding Hg and Pb emissions in the early 1990's the emissions from zinc production are due to the use of coal, which varied strongly between the years and is reflected in the emissions. Use of coal has decreased strongly after that. Since 1995 the emissions of the zinc production are reported by the plant and allocated under 2C6. A change in the allocation of the point source data before 1995 was not yet possible.
CLRTAP 2018 Recommendation nr 47		1A2 Stationary combustion NH3	The ERT noted that according to the NFR tables, the emissions of NH3 are not applicable (NA) for the combustion in some sectors in 1A2 while the EMEP EEA Emission Inventory Guidebook 2016 suggests emission factors for NH3 for biomass. Finland responded that they had checked the possibility of ammonia emissions with the plants in 2015 and the conclusion from the discussions with energy industry emission experts was that ammonium emissions are not occurring and it would be incorrect to calculate these as ammonia emissions can be expected only from NOx abatement using SNCR/SCR techniques, however, these units are rare in Finland. Following the EMEP EEA Emission Inventory guidebook, the NH3 EF for biomass in 1A2 is 37 g/GJ and the source is : Roe S.M., Spivey, M.D., Lindquist, H.C., Kirstin B. Thesing, K.B., Randy P. Strait, R.P & Pechan,E.H. & Associates, Inc, 2004:Estimating Ammonia Emissions from Anthropogenic Non-Agricultural sources. Draft Final Report April 2004. In this report, it's noticed that the emission factors are established considering that "all emissions are assumed to be uncontrolled". Others emission factors are included in this report in the case of SCR or SNCR. ERT recommends strongly Finland to estimate NH3 emissions from stationary combustion while being aware that there will be a likely revision of the Tier 1 NH3 emission factor for biomass in these sectors in the guidebook.		After consultation with the energy industries Finland still believes that there is an error in the Guidebook EF and thus does not see it appropriate to include the emissions in the inventory. However, those plants that have SCR/SNCR techniques, are already reporting the emissions and those are included in the inventory. Finland continues to study the issue as due to the revision of the IED, the BAT for measurements will require ammonia measurements after 2021.
FI-1A2-2018-0002	No	1A2 Stat CombMan Ind	For category 1A2 Stationary Combustion in Manufacturing Industries and Construction and pollutant NH3 the TERT noted that there was a potential under-estimate of emissions as these are		

Observation	Key Category	NFR, Pollutant(s), Year(s)	Recommendation made in the review report	RE or TC in 2017	Response
		Const:, NH3, 1990-2016	reported as the notation key 'NA'. In response to a question raised during the review, Finland explained that they had checked the possibility of NH3 emissions with the plants in 2015 and the conclusion from the discussions with energy industry emission experts was that NH3 emissions are not occurring and it would be incorrect to calculate these as NH3 emissions can be expected only from NOX abatement using SNCR/SCR techniques, which are rare in Finland. Following the 2016 EMEP EEA Emission Inventory Guidebook, the NH3 EF for biomass in 1A2 is 37 g/GJ and the source is Roe S.M., Spivey, M.D., Lindquist, H.C., Kirstin B. Thesing, K.B., Randy P. Strait, R.P & Pechan, E.H. & Associates, Inc, 2004: Estimating Ammonia Emissions from Anthropogenic Non-Agricultural sources. Draft Final Report April 2004. In this report, its noted that the emission factors are established considering that overall emissions are assumed to be uncontrolled. Others emission factors are included in this report in the case of SCR or SNCR. However, the emission factor in the Guidebook is likely to be revised. The TERT notes that using the 2016 EMEP/EEA Guidebook emission factor this under-estimation would be above the threshold of significance for a technical correction. However, as the NH3 emission factor is due to be revised and is expected to reduce, the TERT recommends that Finland estimate NH3 emissions in future submissions while being aware that there will be a likely revision of the Tier 1 NH3 emission factor for biomass in these sectors in the guidebook.		
CLRTAP 2018 Recommendation nr 44		1A1c Manufacture of solid fuels and other… all pollutants	In source category 1.A.1.c all emissions are flagged as NO. However there is coke production in Finland. Finland responded that all emissions from fuel use in coking are allocated to the category 1A2a. The coking plant is part of a very large steel factory complex and at the moment all fuel based emissions from that complex are allocated under the category 1A2a. However, the fuel use based emissions in the greenhouse gas inventory from coking are allocated to the category 1A1c. Therefore, the difference between the NFR and CRF tables is due to differences in allocation of emissions. The ERT encourages Finland to change the notation keys for this sector or to consider the need of changing the allocation of the emissions.		The notation key was changed to IE..
FI-1A2gviii-2018-0001	No	1A2gviii Stat CombMan Ind Const:: Other, PCBs, 1990-2016	For category 1A2gviii Stationary Combustion in Manufacturing Industries and Construction: Other, pollutant PCBs the TERT noted that there was a lack of transparency regarding the time series consistency. In response to a question raised during the review, Finland explained that there was duplication of data reported by plants for 1993-2006. Finland stated that this will be corrected for the 2019 submission. The TERT recommends that Finland reviews the activity data and update the time series in its next submission.		The double entries were corrected to the 2019 submission.
NECD Review FI-1A4bi-2018-0002	Yes	1A4bi Residential: Stationary, PAHs, PCBs, PCDD/F, 1990-2016	With reference to NFR 1A1a, 1A2d, PCDD/F are key categories, but emission factors are inconsistent with the 2016 EMEP/EEA Guidebook. With reference to 1A4bi, PCDD/F, PAH, and PCB are key categories but the emission factors for fuels other than wood combustion are inconsistent with the 2016 EMEP/EEA Guidebook. The TERT notes that in the 2018 IIR Finland states that a comparison of their EFs will be made with the 2016 EMEP/EEA Guidebook, and recalculations made where necessary, for the 2019 submission. The TERT recommends that this comparison is performed and, where necessary, estimates are updated to be consistent with the 2016 EMEP/EEA Guidebook or Tier 2 methods for key categories.		For 1A1 and 1A2 Finland uses national EFs listed in Annex 2 “Emission factor tables for point sources”, which are based on national research and thus considered to be representative for the national conditions. For 1A4 other fuels than wood Finland uses EFs presented in the energy IIR in table 2.22 (p. 41) and considered to be representative for the national conditions.

Observation	Key Category	NFR, Pollutant(s), Year(s)	Recommendation made in the review report	RE or TC in 2017	Response
FI-1A5a-2018-0001	No	1A5a Other Stationary (Including Military), SO2, 2005, 2010, 2015	For category 1A5a Other Stationary (Including Military), SOX for years 2005, 2010, 2015 the TERT noted that emissions have been recalculated from the previous submission and the change is above the threshold of significance. No explanation is given in the IIR. In response to a question raised during the review, Finland explained that recalculations were made throughout the inventory for the whole time series 1990-2015, during which many of the allocations of emissions were harmonized. For 1A5a this included the addition of areas sources to harmonize with the Finnish GHG inventory allocations. The TERT accepted this explanation and recommends that Finland includes and explanation of the recalculations in its 2019 submission.		The explanation is provided in Annex 9 for recalculations
CLRTAP 2018 Recommendation nr 45		1B1b Fugitive emissions from solid fuels NOx and CO	In source category 1.B.1.b, according to the NFR tables, the emissions of NOx and CO are not applicable (NA) for the fugitive emissions from the production of coke while the EMEP EEA Emission Inventory Guidebook 2016 suggests emission factors in the table 3-1. Finland answered that these emissions are allocated under the category 1A2a and they will investigate the possibility to split between energy and process emissions for the 2019 submission. The ERT encourages Finland to change the notation keys for these pollutants or to try to split these emissions.		The notation key was changed into IE.
NECD Review FI-1B1b-2018-0001	No	1B1b Fugitive Emission from Solid Fuels: Solid Fuel Transformation, NOX, 1990-2016	For category 1B1b Fugitive Emission from Solid Fuels: Solid Fuel Transformation and pollutant NOX for all year the TERT noted that there was a potential under-estimate of emissions as these are reported as 'NA'. In response to a question raised during the review, Finland explained that these emissions are estimated and included in 1A2a. Finland stated that the possibility to split between energy and process emissions will be studied and the allocation of emissions documented in the 2019 submission. The TERT notes that this does not related to an over-or under- estimate of emissions and recommends that Finland investigate the division of process and combustion emissions from this source, transparently document the findings, else update the notation key in 1B1b to 'IE' if this split is not possible for the 2019 submission and include the explanation of where the emissions are allocated.		
NECD Review FI-1B2aiv-2018-0001	No	1B2aiv Fugitive Emissions Oil: Refining / Storage, SO2, NOX, NH3, PM2.5, Cd, Hg, Pb, PCDD/F, 1990-2016	For category 1B2aiv Fugitive Emissions Oil: Refining / Storage and pollutants SOX, NOX, NH3, PM2.5, Cd, Hg, Pb, PCDD/Fs for all years the TERT noted that there was a lack of transparency of emissions allocation as these were reported as 'IE', but no explanation was given for where these emissions were included. In response to a question raised during the review, Finland explained that this was due to resource constraints, and that the allocations and notation keys will be checked for the next submission. The TERT notes that this does not relate to an over or under estimate and recommends that Finland review the allocation and notation keys, and transparently document the information in the 2019 submission.		The documentation of the allocation is provided in General Part 1A of the IIR Table 1.8c
NECD Review FI-1B2aiv-2018-0002	No	1B2aiv Fugitive Emissions Oil: Refining /	For category 1B2aiv and pollutant PCBs for all years the TERT noted that Finland is the only Member State that reports emissions for this category and that the 2016 EMEP/EEA Guidebook documents PCB emissions as 'NA' for 1B2aiv. In response to a question raised during the review, Finland highlighted a lack of confidence in its estimate and the underlying EF used. The TERT		The emissions have been removed as there is no method provided in the Guidebook.

Observation	Key Category	NFR, Pollutant(s), Year(s)	Recommendation made in the review report	RE or TC in 2017	Response
		Storage, PCBs, 1990-2016	recommends that Finland reviews the estimate to ensure that emissions are not over-estimated and reports on its conclusion with any associated revised estimates or notation key in its next IIR.		
CLRTAP 2018 Recommendation nr x		1B2b Fugitive emissions from solid fuels NMVOC	Concerning the sector 1B2b, ERT noticed that there is no source of the activity data in the IIR and the activity data is not included in the NFR tables. Finland answered that the activity data presented in the IIR is from the Energy Statistics (Statistics Finland, 2017). The ERT encourages Finland to include information on the activity data source in the IIR and to include the figures in the NFR tables.		Reference included in the IIR and AD in the NFR.
TRA CLRTAP Recommendation nr 50	Transparency		Finland has provided a detailed and generally transparent emissions inventory. Estimates are provided at the most detailed level for all transport subsectors. Finland's methodology and emission factors in the IIR are considered by the ERT to be transparent. The ERT encourages Finland to include more details in the IIR including a better description of the emission factors included in Finland's national model LIPASTO.		The documentation has been improved and will be further improved to the next submissions.
TRA CLRTAP recommendation nr 51	Transpareny		Finland has recalculated most of the transport sector using updated fuel consumption figures and has provided the related information in the IIR. Finland has also recalculated the emissions for selected pollutants and years in other subsectors based on updated methodology (e.g. using the latest 2016 version of the Guidebook). The ERT encourages Finland to document the differences in emissions in the IIR.		The documentation has been improved and will be further improved to the next submissions.
TRA CLRTAP recommendation nr. 53 and 54	Transparency		Finland has used different versions of the Guidebook for calculating emissions from the transport sector. Finland is planning to update the road transport inventory to be consistent with the 2016 Guidebook version for their next submission. The ERT identified possible underestimates in the road transport emissions as a result of using a previous (2013) version of the Guidebook. The ERT welcomes Finland's plan to use the latest 2016 version for their next submission		All EFs are updated according to Guidebook 2016
TRA CLRTAP recommendation 56	Transparency		ERT commends Finland for having undertaken a quantitative uncertainty analysis for the transport sector. The IIR does not specify if the results are used to prioritize improvements in the transport sector. The ERT notes that the inherently high uncertainty of some of the default emission factors needs to be kept in mind when interpreting the results of the uncertainty analysis.		Information on the use of the UCA results in improvement of the inventory has been added.
TRA CLRTAP recommendation nr 57	Transparency		Finland has undertaken QA/QC checks for the Transport sector. The ERT encourages Finland to provide a more detailed description and the relevant outcomes of these QA/QC checks in the IIR.		This documentation will be added to the 2020 submission.

Observation	Key Category	NFR, Pollutant(s), Year(s)	Recommendation made in the review report	RE or TC in 2017	Response
TRA CLRTAP recommendation (general)			The ERT notes that Finland indicates in its IIR that it will recalculate road transport emissions for the entire time series following a scheduled update of the LIPASTO model to be aligned with the latest (2016) Guidebook version. The ERT commends Finland for its commitment to complete a consistent time series and encourages Finland to implement the planned improvements		This is carried out to the 2019 submission
FI-1A3b-2018-0003	No	1A3b Road Transport, SO2, NOX, NH3, NMVOC, PM2.5, 1990-2015	For 1A3b Road Transport, all pollutants and years, the TERT noted that there was no evidence that the consumption of lubricants was accounted for in the energy balance for road transport used in the inventory. In response to a question raised during the review, Finland explained that all lubricant use related emissions are reported under IPPU. The TERT notes that this issue represents a minor double-count as emissions contribution from lubricant use under 1A3b are included in the exhaust emission factors. The TERT recommends Finland to take into account the contribution of lubricants to the energy consumption assigned to 1A3b in the future submissions and correct assignment is applied to 2-stroke engines in 1A3b and 4-stroke engines in IPPU sectors NFR 2D3 Solvent Use/2G Other Product Use, also avoiding a double-count for the IPPU sector. Assessment of the implementation in the 2018 submission: The TERT notes with reference to IIR Section 2.2 for 1A3bi-iv for all pollutants and years that there is a lack of transparency regarding the lubricant consumption calculation and the associated reporting. This observation was raised during the 2017 NECD review (observation FI-1A3b-2017-0009). However, the IIR explains that Finland does not have data required to separate 2-stroke and 4-stroke oil consumption and emissions and all lubricant use is reported under 1A2bviii. The TERT notes that the 2016 EMEP/EEA Guidebook provides a method for estimating 2-stroke and 4-stroke lubricant consumption for different vehicle types which would allow an allocation of the lubricant consumption currently allocated to 1A2bviii to 1A3b. In response to a question raised during the review, Finland explained that it did not have the resources to do this development work due to the extensive recalculation of the time series carried out in 2018. The activity data to this improvement will need detailed work and will be included on the improvement plan included in the 2019 submission. The TERT notes that this issue does not relate to an over- or under-estimate and that this is a minor issue but continues to recommend that this improvement is carried out for inclusion in the 2019 submission or plans are made to carry out these improvements in the following year.	No	The issue is scheduled to be solved to the 2020 submission.
FI-1A3b-2018-0002	No	1A3b Road Transport, SO_2, NO_X, NH_3, NMVOC, $PM_{2.5}$, 2005, 2010, 2015	For 1A3b Road Transport the TERT noted that no biomass consumption is reported in the NFR tables. In response to a question raised during the review, Finland explained that biogenic shares of road transport fuels are included in liquid fuels and gaseous fuels respectively. The TERT notes that this issue does not relate to an over- or under-estimate and recommends that Finland reports its biomass consumption separately or use the appropriate notation key in future NFR tables for transparency purposes. Assessment of the implementation in the 2018 submission: For 1A3b all years, the TERT noted that there is a lack of transparency regarding how biomass consumption is reported in NFR tables. This was raised during the 2017 NECD review (observation FI-1A3b-2017-0007). The TERT notes that the biomass share of transport fuels is clearly reported in the IIR, but as 'NA' in the NFR tables which is not an appropriate notation. In	No	The data is included in the 2019 submission in the NFR tables.

Observation	Key Category	NFR, Pollutant(s), Year(s)	Recommendation made in the review report	RE or TC in 2017	Response
			response to a question raised during the review, Finland explained that it did not have the resources to do this development work due to the extensive recalculation of the time series carried out in 2018. Finland explained that the activity data needed will require more detailed work due to the structure of the domestic model, but that the issue will be included on the improvement plan included in the 2019 submission. Finland also indicated that the notation key will be corrected to 'IE' to the next submission. The TERT notes that this issue does not relate to an over or under estimate and continues to recommend that to improve transparency this improvement is carried out for the 2019 submission, noting that activity data for biomass combustion are already presented in the IIR tables, just not in the NFR tables.		
1A3b CLRTAP recommendation nr. 64		Road Transport – all emissions	The ERT noted that in the NFR tables there is no activity data included for biomass and the NA notation key has been used. However, in the IIR it is mentioned that different types of biofuels are used for road transport purposes (e.g. bioethanol, biodiesel, ETBE, etc). During the review week Finland have clarified that the notation key "NA" in the NFR table will be replace by "IE" in the next submission. The ERT recommends Finland to make an effort to report biofuels separately.		See the response on the above row,
FI-1A3bv-2018-0001	Yes	1A3bv Road Transport: Gasoline Evaporation, NMVOC, 1990-2015	1A3bv Road Transport: Gasoline Evaporation is a key category in Finland's NMVOC inventory. The TERT noted that the methodology used by Finland to estimate emissions from 1A3bv is not comparable with the 2016 EMEP/EEA Guidebook method. In response to a question raised during the review Finland explained that its 1A3bv emissions were calculated from two factors (0.6 g VOC/km for vehicles not equipped with a catalyst and 0.06 g VOC/km for vehicles equipped with catalysts) which are based on VTT's expert judgement/ literature analysis. Finland also provided evidence that the impact of a revision (using Tier 1 default factors from the 2016 EMEP/EEA Guidebook) is below the threshold of significance. The TERT recommends that Finland updates its methodology to be in line with at least the Tier 2 method from the 2016 EMEP/EEA Guidebook in the next submission. Assessment of the implementation in the 2018 submission: The TERT notes with reference to the NFR tables and IIR Section 2.5/Table 2.26 for 1A3bv evaporative emissions of NMVOCs that the methodology of the EMEP/EEA 2016 Guidebook has not been implemented following recommendations made in the 2017 NECD Review because activity data were not available. 1A3bv is a key category in Finland's NMVOC inventory. In response to a question raised during the review, Finland explained that the possibilities to revise the calculation have been studied and a calculation model to do this has already been developed. Unfortunately, the activity data was not available to match the information required by the Guidebook method. Finland continues to study ways to implement the method presented in the Guidebook in Autumn 2018 for the 2019 submission. The TERT notes that this issue does not relate to an over- or under- estimate and understands the difficulties in finding the relevant activity data for the Tier 3 method in the Guidebook. The TERT recommends that Finland continues to look for the appropriate fleet data or use expert judgement or assumptions made in neighbouring countries to enable the Tier 3 method to be used in the next 2019 submission.	No	A new calculation model has been developed and the results are included in the 2019 submission.

Observation	Key Category	NFR, Pollutant(s), Year(s)	Recommendation made in the review report	RE or TC in 2017	Response
1A3b CLRTAP recommendation nr 62		Road transport – all Pollutants	The ERT noted that in the IIR it is stated that "LIPASTO calculation system uses evaporation emission factors of 0.6 g VOC/km for vehicles not equipped with a catalyst and 0.06 g VOC/km to vehicles equipped with catalysts". The ERT also noted that the presence of a catalyst in road vehicles is irrelevant for evaporation emissions, unless it was assumed that catalyst-equipped vehicles are also equipped with an evaporation control system (such as a carbon canister for example). During the review week Finland have clarified that they are working on improving the methodology for estimating emissions from fuel evaporation. The ERT recommends Finland to apply a more detailed methodology (at least Tier 2 and preferably Tier 3) for the estimation of emissions from fuel evaporation for the next submission.		See the response on the above row.
1A3b CLRTAP recommendation nr 59		Road Transport All pollutants	The ERT noted that emissions of most pollutants from the road transport sector calculated with the LIPASTO model seem to be underestimated. Whereas the emission factors reported in the LIPASTO website are consistent with the latest Guidebook version 2016, the emissions reported in the NFR table are much lower than the activity levels reported in the IIR. For example, an average emission factor of 0.33 g/km is reported for NOx for passenger cars. A value of 41.2 billion kilometres is reported for passenger cars in the IIR (table 2.21, page 54). A simple multiplication gives a NOx emission value of 13.6 kt, which is much higher than the reported value of 9.95 kt. The same observation is true for most vehicle categories and most pollutants calculated with the LIPASTO model. During the review week Finland have indicated the emissions were calculated with the 2013 version of the Guidebook and that an update of the LIPASTO model to become consistent with the latest 2016 Guidebook is ongoing.		The calculation is updated to correspond to the Guidebook 2016 EFs in the 2019 submission.
1A3b CLRTAP recommendation nr 60		Road transport – all Pollutants	The ERT noted that in the IIR it is stated that "For each automobile type, the cold driving emission and fuel consumption surplus is calculated according to the EMEP/EEA emission inventory guidebook 2016". However, it is not clear whether these calculations are included in the LIPASTO model or not and hence it is not clear whether the average emission factors reported in the relevant webpage include cold start emissions or not. During the review week Finland have clarified that the emission factors included in the webpage of the LIPASTO model were actually not used in the calculations and cold start emissions were calculated with the 2013 Guidebook version.		As explainded in the IIR, the country specific EFs have been replace by GB16 EFs to the 2019 submission. A detailed explanation of the methodology will be included in the 2020 submission.
1A3b CLRTAP recommendation nr 61		Road transport – all Pollutants	The ERT noted that in the IIR the method for calculating NMVOC emissions from off-road machinery is described on page 62. The relevant section is included in chapter 2.5 (gasoline evaporation) which implies that NMVOC emissions from off-road machinery are included in NFR code 1A3bv. During the review week Finland have clarified that the description of NMVOC emissions from off-road machinery is included in the wrong chapter and that emissions are reported in the correct NFR code.		The IIR description corrected to the 2019 submission
FI-1A3b-2018-0005		1A3b Road Transport, Pb, 1990	For 1A3b Road Transport: liquid fuels the TERT noted there had been very little change in Pb emissions and the Pb emission factor for 1A3bi, 1A3bii and 1A3biv over the time series 1990-2016, with no sharp reduction expected with the phasing out of leaded petrol. In response to a question raised during the review, Finland explained that prior to the 2017 submission, the NFR tables included only emissions of leaded gasoline 1990-1994 and this time series was		The corrections have been made to the 2019 submission.

Observation	Key Category	NFR, Pollutant(s), Year(s)	Recommendation made in the review report	RE or TC in 2017	Response
			completed for the previous years from 1980 to the 2018 submission. Heavy metal emissions from engine wear and lubricant use calculated with 2016 EMEP/EEA Guidebook EFs were included to the 2017 submission. However, in the compilation of the 2018 submission, the emissions of leaded gasoline 1990-1994 were incorrectly left out and only emissions calculated with the 2016 EMEP/EEA Guidebook EFs were included for 1990-1994. Finland provided corrected values for Pb emissions from 1A3bi, 1A3bii and 1A3biv. The TERT agrees with these new estimates and recommends that these corrections are included in the 2019 submission.		
FI-1A3dii-2018-0002	Yes	1A3dii National Navigation (Shipping), NOX, 2015	For 1A3dii Domestic Navigation the TERT noted a discontinuity in emissions of NOX in the NFR tables for 2015 reflected by a lower IEF in this year relative to adjacent years. In response to a question raised during the review, Finland explained that there was a mistake in the 2018 submission regarding cargo ship emissions and provided corrected values for all pollutants. The TERT agrees with these new estimates and notes that this issue does not relate to an over or under estimate and recommends that these corrections are included in the 2019 submission.		The correction has been made to the 2019 submission.

INDUSTRY

Observation	Kay Category	NFR Pollutant(s), Year(s)	Recommendation made in the review report	RE or TC	Response
IPPU CLRTAP Review recommendation nr. 64			Finland provided a detailed and generally transparent emissions inventory for the industrial processes sector. The IIR and the NFR tables are detailed enough to enable reviewers to fully assess methods, activity data, emission factors and other inventory parameters. Nevertheless, it appears during the review that methodology descriptions in the IIR have not been updated for some categories, due to lack of time. Finland provided the ERT with detailed methodology for those categories during the review. The ERT commends Finland for it and recommends Finland to update methodology descriptions and emission factors in the IIR for the next submission.		Documentation has been improved to the 2019 submission and work will continue to the 2020 submission
IPPU CLRTAP recommendation 65		Transparency	The ERT noted that Finland did not include any activity data in the NFR table and used the notation key NA for most of the sectors although activity data are described in the IIR. The ERT recommends Finland to report activity data in the next submission and to use appropriate notation keys (e.g. NO where emissions are “Not Occurring”, NE where emissions are “Not Estimates”, IE where emissions are “Included Elsewhere” and NA where emissions are "Not Applicable") for reporting of activity data where estimates are not available or not necessary.		Efforts have been made to include AD where possible. However, there are some obstacles to do this: (1) The same AD is not valid for all emissions included under a NFR (2) There are less than 3 units under the NFR and the AD thus falls under confidentiality (C would be used when this is the only reason to not include AD, however, often there is a mix of reasons) (3) Only part of the emissions are calculated from an AD while there are emissions reported by plants. It is not possible to provide representative AD for the whoe category as incorrect interpretations are likely if calculating IEFs from such data. (4)

IPPU CLRTAP recommendation nr 66		Transparency	The ERT noted that in the IIR, trends are not transparently described for all categories and that the reasons for possible dips and jump are not included in the descriptions. The ERT encourages therefore Finland to include more detailed trends descriptions in the IIR for the next submission.		The recalculations are documented in Annex 9 to be submitted by 1 May 2019
IPPU CLRTAP recommendation nr 67		Completeness	The ERT noted that Finland uses the notation key NE for Cr emissions from copper production although the 2016 EMEP/EEA Guidebook provides a default emission factors for Cr from copper production. The ERT encourages Finland to estimate Cr emissions from Copper production using the emission factor provided by the 2016 EMEP/EEA Guidebook and to include these emissions in its next submission		Cr emissions are included in the 2019 submission and are reported by the plants. Also all other heavy metal emissions are reported by the plants.
IPPU CLRTAP recommendation nr. 71		Consistency	For some categories, the ERT noted that emissions of some pollutants have been reported only for some years and that the notation key IE has been used for the rest of the time series. Finland explained during the review that, due to lack of time, all consistency check have not been run for those categories and that it will be done for the next submission. The ERT recommends Finland to run all consistency check for the next submission.		Further improvement of allocations of emissions has been carried out to the 2019 submission.
FI-2B10a-2018-0002	No	2B10a Chemical Industry: Other, SO_2, 2010, 2015	For 2B10a Chemical Industry: Other, for SO_2 emissions for 2010 and 2015 the TERT noted that Finland made recalculations but did not provide the detailed information in the IPPU chapter of the IIR. In response to a question raised during the review, Finland explained that major recalculations were made in the current submission and that only a general explanation in the general chapter as there was not time to include detailed explanations in the sector chapters. Finland also explained that for 2B10a that changes are due to a reallocation of emissions from the Energy sector to the IPPU sector. The TERT agreed with the response provided by Finland. The TERT recommends that Finland includes the detailed explanation on the changes for 2B10a in its next IIR.		The emissions have been reallocated between the Energy sector to the IPPU sector as far as possible and in a consistent manner over the time series. The reallocation does not introduce changes into total emission levels. Detailed information on the allocations is provided in Annex 9.
FI-2B10a-2018-0001	Yes	2B10a Chemical Industry: Other, HCB, 1990-2016	The TERT noted that for HCB emissions from 2B10a Chemical Industry: Other, for the entire time series there is significant fluctuation in emissions for the period 2001-2016. Though the fluctuations are explained in the IIR the TERT recommends Finland to follow its suggestion to include the information regarding the estimation of emissions in 1990-2000 and correct the description in the IIR to include the current abatement.		The explanation is included in the IIR.
FI-2C1-2018-0001	No	2C1 Iron and Steel Production, PAHs, 1990-2016	The TERT identified a number of observations on the trend and its use of EFs that were not country specific or consistent with the guidebook for 2C1 Iron and Steel production and PAH emission for 2006-2016. In response to a question raised during the review Finland provided additional information on the estimation method and the trends. The TERT recommends that Finland include this information in its IIR and considers using the 2016 EMEP/EEA Guidebook emission factors if no better country specific emission factors are available.		Finland has compared the EF used with other Nordic countries with the understanding that the unit of the EF in the Guidebook is likely incorrect and is thousand times too large. While waiting a response to the question from the TFEIP Combustion and Industry panel, Finland has continued to use the EF that is considered to be most representative for national emissions.
FI-2C1-2018-0002	Yes	2C1 Iron and Steel Production, $PM_{2.5}$, 2010	For 2C1 Iron and Steel Production for $PM_{2.5}$ emissions for 2010 the TERT noted that Finland made recalculations but did not provide the detailed information in the IPPU chapter of the IIR. In response to a question raised during the review, Finland explained that it made major recalculations in its current submission and referred to the summarized explanation in the general chapter and that it had no time to include detailed explanations in the sector chapters. Finland did not provide the detailed explanation for this specific recalculation. The TERT recommends that Finland includes the detailed explanation on the recalculation in its next IIR.		Detailed information on recalculations is provided in Annex 9 to be submitted by 1 May 2019.
FI-2C3-2018-0002	No	2C3 Aluminium Production,	For 2C3 Aluminium Production the TERT noted that in response to a question raised during the review Finland agreed with the TERT that emissions from secondary aluminium production should be allocated to NFR 2C3 and that particle distribution factors should be updated to match the 2016 EMEP/EEA Guidebook. The TERT noted that the issue is below the threshold of significance	No	Further improvement of allocations of emissions has been carried out to the 2019 submission Particle fraction factors were updated according to GB16.

		PM2.5, 1990-2015	for a technical correction. The TERT recommends that Finland includes the improvements mentioned above in the next submission. Assessment of the implementation of the 2018 recommendation: The TERT noted that Finland, following the 2017 recommendation [FI-2C3-2017-0001], changed the allocation of some but not all aluminium production allocation to NFR 2C3. The TERT recommends Finland to follow its plan to report all the emissions under the correct category in the 2019 submission		
FI-2C3-2018-0001	No	2C3 Aluminium Production, PCDD/F, HCB, 1990, 2005, 2016	In response to the review, Finland indicated that HCB and PCDD/F emissions for secondary Aluminium Production are included in the inventory but were incorrectly allocated to the category 2C7c in the NFR tables. The source category and emission estimation methodologies are described in the correct IIR chapter for NFR 2C3 (Chapter 3.19). Finland provided correct PCDD/F and HCB emissions for category 2C3 for the years 1990-2016 and indicated that the allocation of emissions will be corrected for the 2019 inventory submission. The TERT recommends that Finland makes this correction in their 2019 submission.	No	The emissions have been corrected to the 2019 submission
FI-2C7a-2018-0001	No	2C7a Copper Production, SO2, PM2.5, 2015.00	For category 2C7a Copper Production the TERT noted that in response to a question raised during the review Finland explained that only secondary copper production occurs in Finland and that emissions from one plant are missing from the data reported in the NFR. Finland provided a revised estimate for 2015 that solved the issue of the very low IEF. The TERT noted that the under-estimate is below the threshold of significance. The TERT recommends that Finland includes emissions from all producers in the next submission. Assessment of implementation in the 2018 submission: For category Copper Production (2C7a) and pollutant SO2 and PM2.5 for years 2014 and 2015 the TERT notes that Finland did not revise the estimates in accordance with its 2017 NECD review revised estimate [FI-2C7a-2017-0001]. In response to a question during the review Finland confirmed that it was accidentally left out of the 2018 submission and provided an updated revised estimate. The TERT were unable to verify the revised estimates as it had no accompanying description or documentation and was not consistent with the revised estimate provided in 2017 as the values for 2015 and 2014 are transposed. The TERT also notes that the revised estimates are well below the threshold of significance. The TERT recommends that Finland review its revised estimates and includes them in its 2019 submission.	RE	The emissions have been corrected to the 2019 submission

FI-2D3a-2018-0001	No	2D3a Domestic Solvent Use Including Fungicides, Hg, 1990, 2005, 2016	For 2D3a Domestic Solvent Use Including Fungicides, for HG, for 1990, 2005 and 2016, the TERT noted that emissions are reported as 'NA' in the NFR table and that no reference is made to emission estimates from this pollutant in the IIR while the 2016 EMEP/EEA Guidebook includes a Tier 1 method and an emission factor for emissions from this source. In response to a question raised during the review, Finland explained that it will start searching for the activity data to include mercury emissions from fluorescent tubes. The TERT recommends Finland to include this emission source in its next inventory submission.	No	There is unclarity of the EF presented in the Guidebook. We do not assume emissions from lamps in use but only when they are disposed. The emissions from disposal are included under NFR 1A1a in the emissions from hazardous waste treatment plants.
FI-2D3c-2018-0001	No	2D3c Asphalt Roofing, PM2.5, 2005, 2010, 2015	For category 2D3c Asphalt Roofing and the pollutant PM2.5 the TERT noted that Finland reported 'NA'. In response to a question raised during the review, Finland explained that there are two plants that fall under NFR 2D3c. At one plant the particle emission levels are below 0.0001 kt/a and considered to be negligible and therefore 'NA'. The maximum production rate in the other plant is 44,000 shingles per year, by using 2016 EMEP/EEA Guidebook EF the PM2.5 emissions would be 0.0035 kt. The TERT notes that this issue does not relate to a significant over- or under-estimate. However, the TERT still recommends that Finland includes the PM2.5 emissions in the next inventory. Assessment of the implementation in the 2018 submission or category 2D3c Asphalt roofing and the pollutant PM2.5 for the years 2005, 2015 and 2016 the TERT noted that Finland reported emissions as 'IE'. In response to a question raised during the review Finland explained that Finland has incorrectly changed the previous notation key 'NA' into 'IE'. Finland further explained that all particle emissions from asphalt roofing are energy related and reported under 1A2f and result from the use of LFO and confirmed that no process related emissions are generated, because the dust emitted is removed and treated through a specifically designed equipment (dust filters with continuous operation control) and that also particle emissions to the air are monitored through continuous measurements. The TERT recommends Finland to follow its plan to correct the notation key back to 'NA' and add the explanation in the IIR in its the next submission.	No	The notation key is corrected back to NA and an explanation included under the IPPU category 2D3c
FI-2D3g-2018-0001 -	Yes	2D3g Chemical Products, PAHs, 1990, 2005, 2016	The TERT notes with reference to the 2018 NFR Table, for 2D3g (for asphalt blowing), for PAHs (and NMVOCs, heavy metals and TSP (and PM2,5 and PM_{10} derived from TSP), for the entire time series, the notation key 'NA' is reported for PAHs while the 2016 EMEP/EEA Guidebook provides a Tier 2 methodology and a Tier 2 emission factor for benzo(a)pyrene for asphalt blowing (Tables 3-8 to 3-10 in the 2.D.3.g Chemical products 2016 Chapter). In response to a question during the Review Finland explained that no asphalt blowing occurs or has occurred in the past in Finland. The TERT recommends Finland to change the notation key to 'NO' and to correct the information provided in the IIR in its next submission.		Information has been included in the IIR regarding the period when the emissions occurred in Finland.

AGRICULTURE

FI-3B-2018-0001	No	3B Manure Management, PM2.5, 2005, 2010, 2015	For category 3B Manure Management, Sheep (3B2) and Goats (3B4d) and pollutants PM2.5 for years 2005, 2010 and 2015 the TERT noted that Finland reports 'NA' for PM2.5 emissions from sheep and goats. However, default EFs are available in the 2016 EMEP/EEA Guidebook and Finland reports animal numbers for sheep and goats in its NFR. The impact of the potential under-estimate is probably below the threshold of significance. In response to a question raised during the review, Finland explained that it is currently using the 2009 EMEP/EEA Guidebook Tier 2 emission factors (no EF for	No	The emissions are included in the 2019 submission.

			sheep and goats) and will revise its method according the 2016 EMEP/EEA Guidebook in the 2018 submission. Assessment of the implementation in the 2018 submission: Finland has in its 2018 submission estimated PM2.5 emissions from goats (3B4d), however Finland have not estimated PM2.5 emissions from sheep (3B2) as raised in observation FI-3B-2017-0001. In response to this observation Finland estimated that the effect of the inclusion of emissions from both of the above sources would equate to 0.015 % of all PM2.5 emissions in 2015. Furthermore, Finland has explicitly stated in its IIR (page 26 of the agriculture chapter) that "The particle emissions calculation will be revised to the next submission due to integration in the Finnish Agriculture Emissions Calculation model to the submission in 2019". Furthermore, in its 2018 submission Finland states that it currently uses the emission factors from the 2013 EMEP/EEA guidebook to estimate emissions of PM2.5 for the species for which it currently reports. The TERT recommends that Finland estimate emissions of PM2.5 from 3B2 sheep and include emissions in its 2019 submission.		
FI-3B2-2018-0001	No	3B2 Manure Management - Sheep, NH_3, 2000,2005,2010,2015,2016	For category 3B2 Manure Management - Sheep and pollutants NH_3 for all years the TERT noted that the implied emission factor increases from 0.63 kg/head in 2000 to 0.664 kg/head in 2005, 0.894 kg/head in 2010 and 0.996 kg/head in 2015 and that there is a lack of transparency regarding rationale behind the increased emission factor for NH_3 emissions from sheep across the time series in the IIR. In response to a question raised during the review, Finland explained that the rationale for the increase in the emission factor is twofold, namely that the housing period for sheep in Finland is relatively short (in comparison to the 2016 EMEP/EEA Guidebook) and that changes in manure management practices in addition to increases in nitrogen excretion rates combine to result in the increase in implied emission factor. The TERT agreed with the explanation provided by Finland. The TERT recommends that Finland explain the increase in emission factor across the time series for category 3B2 in the IIR of future submissions.		The explanation is added to the IIR chapter 3B.
FI-3F-2018-0002	No	3F Field Burning of Agricultural Residues, SO_2, NO_X, NH_3, NMVOC, $PM_{2.5}$, PAHs, Cd, Hg, Pb, PCDD/F, 1990-2016	For category 3F Field Burning of Agricultural Residues and pollutants SO_2, NO_X, NH_3, NMVOC, $PM_{2.5}$, PAHs, Cd, Hg, Pb, PCDD/F for years 1990-2016 the TERT noted that there is a lack of transparency in the methodological description provided in the IIR. In response to a question raised during the review, Finland provided additional data with respect to the kg dm burning for specific crops types. The TERT agreed with the explanation provided by Finland. The TERT recommends that Finland provide information with respect to the kg dm burned per crop type in the IIR of future submissions to enhance transparency.		The methodology follows the EMEP//EEA Guidebook 2016 and is now explained in the Chapter 3F.
FI-3F-2018-0001	No	3F Field Burning of Agricultural Residues, SO_2, NO_X, NH_3, NMVOC, $PM_{2.5}$, PAHs, PCBs, HCB, Cd, Hg, Pb, PCDD/F, 1990-2016	For category 3.F Field Burning of Agricultural Waste and pollutants SO_2, NO_X, NH_3, NMVOC, $PM_{2.5}$, Pb, CD, Hg and PCDD/F for years 1990-2016 the TERT noted a lack of transparency in the methodological description in the IIR. In response to a question raised during the review, Finland provided further additional information on the methodological approach and calculation procedures. The TERT agreed with the explanation provided by Finland. The TERT recommends that Finland provide, in the IIR of future submissions, further information with respect to the methodological approach, activity data and emission factors used in the estimation of emissions from category 3.F.		The methodology follows the EMEP//EEA Guidebook 2016 and is now explained in the Chapter 3F.

WASTE

FI-5B1-2018-0001	No	5B1 Biological Treatment of Waste - Composting, NMVOC, 2005,2010,2015	For 5B1 Biological Treatment of Waste - Composting the TERT noted that Finland is using a Country Specific (CS) methodology to estimate NMVOC emissions. The TERT notes that this issue is related to a non-mandatory pollutant for the 5B1 category. However, concerning 5B1 Composting, which is an aerobic process, the TERT is not convinced that the NMVOC fraction is similar to the one in landfill gas. Moreover, the carbon mass balance approach is not clear as C is emitted as CH4, CO2 and various species of NMVOC during the composting process and a fraction remains in the produced compost. The TERT recommends that Finland checks its CS methodology and the underlying assumptions before using it in the next submission. Assessment of the implementation in the 2018 submission For category 5B2- biogas production, the TERT noted that NMVOC are estimated although no default EF is proposed in the 2016 EMEP/EEA Guidebook and that the country-specific methodology is not completely clear. The TERT recommends that Finland provide more transparency on the methods, data sources and assumptions used to estimate NMVOC emissions from 5B2 in future submissions.	No	The emissions have been removed in the 2019 submission.
FI-5D-2018-0001	No	5D Wastewater Handling, NMVOC, 2005,2010,2015	For NMVOC emissions from 5D1 Domestic Wastewater Handling and 5D2 Industrial Wastewater Handling the TERT noted that in response to a question raised during the review Finland provided a more detailed description of the methodology applied. NMVOC are calculated on the basis of a NMVOC/CH_4 ratio and CH_4 emissions are estimated using the IPCC 2006 methodology. In the NIR, it is not clear if only sludge digestion is considered as a source of CH_4 (MCF are not provided) and it is not indicated if the biogas recovery is considered (or if the default value for R, i.e. 0, is applied). In the TERT's opinion this approach is not relevant as CH_4 and NMVOC are not produced through the same chemical process in waste water treatment plants (WWTP) and moreover there is no reason to apply the NMVOC/CH_4 of landfill biogas to WWTP. For instance, in digesters the CH_4 fraction in biogas is much higher than in landfill gas. The TERT noted that Finland has the highest NMVOC per inhabitant from 5D1 and 5D2 in the EU and the highest contribution of 5D1 and 5D2 in the national NMVOC total emissions. However, the issue is below the threshold of significance for a technical correction. The TERT strongly recommends that Finland checks if its country specific methodology is relevant in its next submission. Assessment of the implementation in the 2018 submission: For category 5D Wastewater Handling, the TERT noted that recommendation FI-5D-2017-0001 from the 2017 NECD review was not implemented and considers that the current country specific methodology is inappropriate. In response to a question raised during the review, FI did a first estimate using the 2016 EMEP/EEA Guidebook Tier 1 methodology and indicated that these estimates will be included in future submissions. FI highlighted that the default EFs may not be very well adapted to Nordic conditions and aims to study this more in future years when resources allow. The TERT notes that the impact on NMVOC total emissions is far below the threshold for a technical	No	The methodology has been changed according to the one presented in the Guidebook and the emissions are included in the 2019 submission.

			correction. The TERT agrees with the approach taken by Finland and recommends that Finland includes its revised estimates in its next submission.		
FI-5C1bv-2018-0001	No	5C1bv Cremation, Hg, 1990-2016	For 5C1bv Cremation, the TERT noted with reference to Hg emissions, that there is a lack of transparency regarding the emissions factor (EF) applied which is twice smaller than the default proposed in the 2016 EMEP/EEA Guidebook. In response to a question raised during the review, Finland explained that since 2012 the Hg EF from Sweden is used and that for previous years the EF is based on some other sources. Finland plans to clarify these sources and assess any needs for changes the EF and indicated that a justification for the EFs will be included in the next submission. The TERT notes that this issue does not relate to an over-or under-estimate and recommends that increase the transparency of its report concerning Hg emissions from 5C1bv.		Finland will investigate the suitability of the GB EF to the 2020 submission. The documentation of the method will be checked for the 2020 submission.
FI-5-2018-0001	No	5 Waste, SO_2, NO_X, NMVOC, $PM_{2.5}$, PAHs, Cd, Hg, Pb, PCDD/F, 1990-2016	For 5C2 - Open Burning of Waste, the TERT noted that 'NO' is reported in the NFR tables and no information is provided in the IIR. In response to a question raised during the review, Finland explained that the chapter for NFR 5C2 has accidentally been dropped out of the IIR and will be returned in the 2019 submission. The TERT recommends that Finland includes this chapter along with the justification of the notation key 'NO' in its next IIR.		The chapter accidentally deleted has been included in the 2019 submission

8.6.2 NECD Technical Review 2017

Implementation of the recommendations of the 2017 NECD Technical Review are provided in Table 1.04.

Table 1.04 Implementation of recommendations of the 2017 NECD Technical Review

Observation	IMPLEMENTED	Key Category	NFR, Pollutant(s), Year(s)	Recommendation	RE or TC
FI-1A3b-2017-0003	Submission 2018	Yes	1A3b Road Transport, $PM_{2.5}$, 1990-2015	For Road Transport categories 1A3bi-iv, the TERT noted that the ratio of $PM_{10}/PM_{2.5}$ emissions is 1.14. However, the 2016 EMEP/EEA Guidebook considers all PM exhaust emissions are $PM_{2.5}$, as the coarse fraction ($PM_{2.5}$-10) is negligible in vehicle exhausts. In response to a question raised during the review, Finland explained that its $PM_{2.5}$ and PM_{10} size fractions of TSP emissions have been calculated with fractions from a 2002 TNO study. Finland indicated its plan to revise the $PM_{2.5}$ emissions for 1A3bi-iv to be in line with the 2016 EMEP/EEA Guidebook in the next submission. Finland has provided evidence that the impact of a revision is below the threshold of significance. The TERT recommends that Finland carries out this improvement plan in its next submission.	no
FI-1A3b-2017-0004	Will be revised if the Guidebook will be revised	No	1A3b Road Transport, NH_3, 1990-2015	For 1A3b Road Transport - diesel vehicles and pollutant NH_3, the TERT noted that Finland has used the NH_3 factors presented in Table 3-21 and Table 3-23 of the 2016 EMEP/EEA Guidebook. During the review, the TERT found that there is inconsistency in the NH_3 factors for diesel vehicles as presented in the 2016 EMEP/EEA Guidebook between Table 3-21, Table 3-23 and Table 3-100 (in particular, different factors are suggested for Euro VI heavy duty vehicles). This issue will be raised to the Guidebook team. The TERT noted that the impact of a revision should be below the threshold of significance. The TERT recommends that Finland checks potential amendments of these NH_3 factors presented in the 2016 EMEP/EEA Guidebook in the near future.	no
FI-1A3b-2017-0005	Submission 2018 IIR Part 2, page 49	Yes	1A3b Road transport, SO_2, NO_X, NH_3, NMVOC, $PM_{2.5}$, 1990-2015	For 1A3b Road Transport the TERT noted that there is a lack of transparency in the IIR regarding the source of emission factors used to estimate 1A3b emissions and whether the impact of emission degradation has been taken into account. In response to a question raised during the review, Finland clarified that the emission factors are sourced from a combination of the 2016 EMEP/EEA Guidebook and VTT's own measurements, and that emission degradation has been taken into account according to the 2013 EMEP/EEA Guidebook. The TERT recommends that Finland provides such information in future IIRs and particularly, tables of implied emission factors (broken down by Euro standard, fuel and vehicle type) for transparency and comparability purposes.	no
FI-1A3b-2017-0007	Submission 2018 IIR Part 3, page 46	No	1A3b Road Transport, SO_2, NO_X, NH_3, NMVOC, $PM_{2.5}$, 2005, 2010, 2015	For 1A3b Road Transport the TERT noted that no biomass consumption is reported in the NFR tables. In response to a question raised during the review, Finland explained that biogenic shares of road transport fuels are included in liquid fuels and gaseous fuels respectively. The TERT notes that this issue does not relate to an over- or under-estimate and recommends that Finland reports its biomass consumption separately or use the appropriate notation key in future NFR tables for transparency purposes.	no
FI-1A3b-2017-0009	Submission 2018 IIR part 2, page 35	No	1A3b Road transport, SO_2, NO_X, NH_3,	For 1A3b Road Transport, all pollutants and years, the TERT noted that there was no evidence that the consumption of lubricants was accounted for in the energy	no

			NMVOC, $PM_{2.5}$, 1990-2015	balance for road transport used in the inventory. In response to a question raised during the review, Finland explained that all lubricant use related emissions are reported under IPPU. The TERT notes that this issue represents a minor double-count as emissions contribution from lubricant use under 1A3b are included in the exhaust emission factors. The TERT recommends Finland to take into account the contribution of lubricants to the energy consumption assigned to 1A3b in the future submissions and correct assignment is applied to 2-stroke engines in 1A3b and 4-stroke engines in IPPU sectors NFR 2D3 Solvent Use/2G Other Product Use, also avoiding a double-count for the IPPU sector.	
FI-1A3bv-2017-0001	Submission 2019. The method is under development to the 2019 submission (see IIR part 2, page 56)	Yes	1A3bv Road transport: Gasoline evaporation, NMVOC, 1990-2015	1A3bv Road Transport: Gasoline Evaporation is a key category in Finland's NMVOC inventory. The TERT noted that the methodology used by Finland to estimate emissions from 1A3bv is not comparable with the 2016 EMEP/EEA Guidebook method. In response to a question raised during the review Finland explained that its 1A3bv emissions were calculated from two factors (0.6 g VOC/km for vehicles not equipped with a catalyst and 0.06 g VOC/km for vehicles equipped with catalysts) which are based on VTT's expert judgement/ literature analysis. Finland also provided evidence that the impact of a revision (using Tier 1 default factors from the 2016 EMEP/EEA Guidebook) is below the threshold of significance. The TERT recommends that Finland updates its methodology to be in line with at least the Tier 2 method from the 2016 EMEP/EEA Guidebook in the next submission.	no
FI-1B1a-2017-0001	Submission 2018 NK changed from “NA” to “IE” in the	No	1B1a Fugitive Emission from Solid fuels: Coal Mining and Handling, $PM_{2.5}$, 2000-2015	For category 1B1a Fugitive Emission from Solid fuels: Coal Mining and Handling and pollutant $PM_{2.5}$ the TERT noted that emissions are reported as ‘NA’ while coal is being used (and therefore also handled) in Finland. In response to a question raised during the review, Finland explained that these emissions are included in category 2A5c Storage, Handling and Transport of Mineral Products. The TERT agreed with the explanation provided by Finland. The TERT recommends that Finland reports emissions from coal handling in category 1B1a. In case that is not possible, the TERT recommends changing the notation key from ‘NA’ to ‘IE’ and clearly document where emissions from coal handling are reported in the IIR.	no
FI-1B1c-2017-0001	Submission 2018 IIR Part 2, pages 99, 100	Yes	1B1c Other Fugitive Emissions from Solid Fuels, $PM_{2.5}$, 2000-2015	For category 1B1c Other Fugitive Emissions from Solid Fuels and pollutant $PM_{2.5}$ the TERT noted that emissions from wood pellet production are described in the IIR, but seemed not to be included in the NFR table. In response to a question raised during the review, Finland explained these emissions are reported by the plants according to their monitoring and reporting requirements in their environmental permits and allocated in the inventory under NFR 1A2gviii Stationary Combustion in Manufacturing Industries and Construction: Other (and previously in other source categories). The TERT recommends that Finland describes this allocation in the IIR.	no
FI-1B2b-2017-0001	Submission 2018 NMVOC emissions included in the NFR table and in the IIR Part 2, page 110	No	1B2b Fugitive Emissions from Natural Gas (exploration, production, processing, transmission, storage, distribution and other), NMVOC, 2000-2015	For category 1B2b Fugitive Emissions from Natural Gas and pollutant NMVOC for all years the TERT noted that emissions are reported as ‘NA’ (Not Applicable). While natural gas production does not take place in Finland, natural gas is used and therefore also transport, compressed and distributed. In response to a question raised during the review, Finland explained that emissions from compressor stations are reported under 1A3ei Pipeline Transport and no other emissions occur. The TERT agrees with the allocation of compressor stations but does not agree with the assumption no other emissions occur. Emissions of NMVOC are likely to occur during distribution and transport of gas (e.g. leakages)	no

				although these may be small quantities. The TERT therefore recommends that Finland reports these emissions, or alternatively change the notation key from 'NA' to 'NE' (Not Estimated). Additionally, it should be explained in the IIR how emissions from this source have been estimated (or why they have not been estimated in case of 'NE').	
FI-2C3-2017-0001	2nd Submission of 2018, which includes the NFR including the recalculated time series (see IIR Part 3, pages 53-54)	No	2C3 Aluminium Production, $PM_{2.5}$, 1990-2015	For 2C3 Aluminium Production the TERT noted that in response to a question raised during the review Finland agreed with the TERT that emissions from secondary aluminium production should be allocated to NFR 2C3 and that particle distribution factors should be updated to match the 2016 EMEP/EEA Guidebook. The TERT noted that the issue is below the threshold of significance for a technical correction. The TERT recommends that Finland includes the improvements mentioned above in the next submission.	no
FI-2C6-2017-0001	Submission 2018 - - IIR Part 3, page 55 explanation for the not occurring SO2 emissions -The notation key "NA" has not been changed to "NO" because the activity exists (NO means it does not) and the notation key NA means, as is the case, that the emissions are not relevant.	No	2C6 Zinc Production, SO_2, NO_X, NMVOC, 2015	For category 2C6 Zinc Production the TERT noted that in response to a question raised during the review Finland explained that zinc production occurs alongside sulphur productions and that SO_2 emissions from zinc production are utilised in the sulphur production. Therefore, SO_2 emissions are not emitted from zinc production except in exceptional situations such as malfunctioning or during start-up and shut-down periods. The TERT noted that this is a transparency issue and not related to the reported data. ***The TERT recommends that Finland improves the transparency in the next submission by providing explanations in the IIR*** necessary to understand the data reported in the NFR and correcting notation keys in the NFR, e.g. SO_2 from 2C6 from 'NA' to the proper 'NO'.	no
FI-2C7a-2017-0001	Submission 2018 IIR Part 3 page 57-58. Corrections for the other pollutants and the time series will be carried out in the recalculated time series (2nd submission 2018).	No	2C7a Copper Production, SO_2, $PM_{2.5}$, 2015	For category 2C7a Copper Production the TERT noted that in response to a question raised during the review Finland explained that only secondary copper production occurs in Finland and that emissions from one plant are missing from the data reported in the NFR. Finland provided a revised estimate for 2015 that solved the issue of the very low IEF. The TERT noted that the under-estimate is below the threshold of significance. The TERT recommends that Finland includes emissions from all producers in the next submission.	RE
FI-2D3c-2017-0001	There was no error in the emissions, after all, as explained in the IIR Part 3, page 74. The notation key is changed to "IE" as the emissions are included under 2D3b (calculated from the	No	2D3c Asphalt Roofing, $PM_{2.5}$, 2005, 2010, 2015	For category 2D3c Asphalt Roofing and the pollutant $PM_{2.5}$ the TERT noted that Finland reported 'NA'. In response to a question raised during the review, Finland explained that there are two plants that fall under NFR 2D3c. At one plant the particle emission levels are below 0.0001 kt/a and considered to be negligible and therefore 'NA'. The maximum production rate in the other plant is 44,000 shingles per year, by using 2016 EMEP/EEA Guidebook EF the $PM_{2.5}$ emissions would be 0.0035 kt. The TERT notes that this issue does not relate to a significant over- or under-estimate. However, the TERT still recommends that Finland includes the $PM_{2.5}$ emissions in the next inventory.	no

	production of bitumen)				
FI-2H2-2017-0001	2nd Submission of which includes the NFR including the recalculated time series . IIR Part 3 page xx	Yes	2H2 Food and Beverages Industry, $PM_{2.5}$, 2015	For the key category 2H2 Food and Beverages Industry, the pollutant $PM_{2.5}$ and the year 2015 the TERT noted a dip in the emissions in 2015. In response to a question raised during the review, Finland explained the reason for this and also stated that a full recalculation of the time series in underway to the 2018 submission and will thus be reflected in the IIR. The TERT recommends that the explanation for this recalculation is included in the IIR.	no
FI-3B-2017-0001	Submission 2019 Integration of the calculation into the Finnish Agriculture Emissions Model is scheduled to the second half of 2018. (IIR Part 4 page 22, 34)	No	3B Manure Management, $PM_{2.5}$, 2005, 2010, 2015	For category 3B Manure Management, Sheep (3B2) and Goats (3B4d) and pollutants $PM_{2.5}$ for years 2005, 2010 and 2015 the TERT noted that Finland reports 'NA' for $PM_{2.5}$ emissions from sheep and goats. However, default EFs are available in the 2016 EMEP/EEA Guidebook and Finland reports animal numbers for sheep and goats in its NFR. The impact of the potential under-estimate is probably below the threshold of significance. In response to a question raised during the review, Finland explained that it is currently using the 2009 EMEP/EEA Guidebook Tier 2 emission factors (no EF for sheep and goats) and will revise its method according the 2016 EMEP/EEA Guidebook in the 2018 submission.	no

9 PROJECTIONS

Changes in chapter	
Update of text	KS, KM, JG, MS. TF, JMP
Update of projections	Every 1-3 years, since 2020 every 2 years

9.1 Projections for 2020, 2025 and 2030

With existing measures (WM) projections

Finland reports projected emission data with existing measures. A without measures projection (WOM) would not be possible to present as the impact of measures cannot be estimated backwards when part of the measures have been implemented for a longer period. A with additional measures projection (WAM) is not needed, as Finland expects to reach the reduction targets with the existing measures.

Projections for 2020, 2025, 2030, 2040 and 2050

Emission projections for 2020, 2025 and 2030 are reported in the NFR reporting table for nitrogen oxides, sulphur oxides, non-methane volatile organic compounds, ammonia and small particles <2.5um. For black carbon projections are reported for 2030 only. For all compounds, projection estimates are made for some NFR categories, however, not for all, and thus these are reported as NE.

For agriculture and transport sectors, emission scenarios are available up to 2050. For IPPU, fugitive emissions and waste sector, expert estimates were made also for the years 2040 and 2050 for the 2020 submission, however, these will be further developed in the coming years.

The current projected emission values are presented in Table 1.05.

Table 1.05. Projected national total emissions for 2015, 2020 and 2030 as reported on 13 March 2020

Pollutant	Unit	WM projections		
		2020	2025	2030
Sulphur oxides (SO_x as SO_2)	kt	30	26	25
Nitrogen oxides (NO_x as NO_2)*	kt	116	91	83
Non-methane volatile organic compounds (NMVOC)*	kt	80	76	74
Ammonia (NH_3) (without adjustments)	kt	30	29	28
$PM_{2.5}$	kt	15	13	13
BC	kt	3.2	2.8	2.6

Projections for Energy

Projections for sulphur dioxide, nitrogen oxides, NMVOC, PM_{10} , $PM_{2.5}$ and BC emissions in 2015, 2020 and 2025/2030 are estimated in the Finnish Regional Emission Scenarios (FRES) model (Karvosenoja 2008), which is used to support Finnish air pollution polices and in assessing the co-benefits and trade-offs of climate change strategies on air pollution. Projections for PM10 emissions are available in the model, however, PM10 is not one of the pollutants to be included in the NFR reporting table. FRES scenarios were last updated in 2018. In addition, some corrections were made to those estimates during the NECD Review in summer 2019.

For ammonia, the projections are expert estimates based on knowledge of fuel use at plants.

For NFRs 1A1 and 1A2 the projections have been divided with the share from the inventory as the boilers are allocated differently in FRES model and in the inventory, while their sum equals that in FRES. In some cases the projection may be higher than the emission in the latest historical year. These cases can occur, as the years are different regarding the heating and energy need and the use of fuels. Annual fluctuations cannot be predicted into the projections, but they are based on general expectations in the sector.

Projections for Transport

Emissions calculations and projections for transport and working machines are produced using VTT's LIPASTO system, which has a time series of 1980-2050. Calculation results are available on the LIPASTO website http://lipasto.vtt.fi/en/inventaarioe.htm

Ammonia

In transport, most of NH_3 emissions originate from passenger cars equipped with catalytic converters. Improvements in technology have substantially reduced NH_3 emissions from passenger cars after 2005 and development is continuing in the projections. On the other hand, the introduction of the urea additive in heavy vehicles since Euro V significantly increases their ammonia emissions. However, since heavy-duty NH_3 emissions are one-tenth of NH_3 emissions from passenger cars, emissions from passenger cars dominate and overall emissions are decreasing in projections.

Road transport

In road transport, the projections are based on the authorities' (The Finnish Transport Infrastructure Agency) forecast of vehicle kilometrage for 2030 and 2050. In the LIISA model, sales forecasts for vehicles are adjusted so that the national kilometrage forecast is achieved. The fleet is thus linked to the projected kilometrage development. Sales forecasts consider both new sales and used vehicle imports (in Finland a significant amount). Scrappage rate is based on an estimate based on actual changes in the fleet. The model considers the penetration of the Euro classes and the fuel efficiency development of the vehicles.

The modelled fleet is divided into 40 different sub-types: 5 main types, passenger cars (with and without catalytic converter), vans, buses, trucks without a trailer and trucks with a trailer. These, in turn, are divided into seven propulsion groups: gasoline, diesel, E85, ED95, gas, electricity and hydrogen. Each of these has its own forecasts. In addition, fuels consider the proportions of different fuel components (fossil, renewables).

Baseline forecasts (expert estimate, VTT) that new passenger car sales will be on average 4.7% annually in 2016-2020, 5.1% on average in 2021-2030 and 5.3% on average in 2031-2050. Corresponding figures for vans are: 4.8% 5.0% 4.8% and for trucks: 4.0% 3.9% 3.7%. Finland's specialty is very heavy trucks (gigatrucks), which reduces the number of trucks with trailer. The

increase in the number and kilometrage of motorcycles and mopeds is expected to stabilise in the coming years.

Railways

The forecast for rail transport is based on the expert estimation of the development of diesel train transport volume. The proportion of diesel trains has decreased significantly in recent years and they are mainly used in non-electrified, smaller rail sections. The diesel train transport has stabilised, and no major changes are expected.

National navigation

In maritime transport, the calculation of the MEERI model is mainly based on the number of port calls at Finnish ports. The forecasts therefore focus on experts' (The Finnish Transport Infrastructure Agency's) estimation of the development of port calls. Emission factor forecasts are based on expert estimation on the development of different Tier emission levels in ships and the use of different fuels (HFO, HFO with scrubbers, MDO/MGO, diesel, LPG). For icebreakers, where emissions are dependent on highly changing yearly ice conditions, forecasts are based on a 10-year average.
In work vessels, ferry boats, fishing vessels and leisure boats the situation has been stabilised and no changes are expected.

Working machines

For working machines, the forecasts are based on expert judgment on the evolution of fleet (50 different machine types) and the penetration of emission standards (Stage levels). Mechanisation of the work has reached its maximum and the sales of new machines is mainly replacing scrapped machines and the number of most of the machine types is stabilised. Increased efficiency of machines and work and emission restrictions and increasing electrification of machines will reduce emissions in projections.

Projections for IPPU and Waste

Projections earlier based on FRES model were updated as expert estimates to the 2020 submission, based on knowledge of the development of the sector in Finland and the general expectations and forecasts (population forecast, GDP) for future years. Further work will be carried out in for the next submissions to find suitable surrogates for the development of the emissions in the different sectors.

Projections for Agriculture

Projections for agriculture are based the national Agriculture sector calculation model available up to 2050. The animal numbers, development of nitrogen excretion and mineral fertilizers and land use areas are forecasts by LUKE are based on the Dynamic Regional Sector Model of Finnish Agriculture, Dremfia, except for fur animals and reindeer, for which the numbers are estimated from existing statistics assuming that there will not be major changes in the coming years. (Heikki Lehtonen, 2019).

9.2 FRES model

The FRES model (Karvosenoja 2008) covers the emissions of sulfur dioxide (SO_2), nitrogen oxides (NO_x), ammonia (NH_3), non-methane volatile organic compounds (NMVOCs) and primary particulate matter (TSP,. PM_{10}, $PM_{2.5}$, PM_1 and $PM_{0.1}$). Primary PM includes the fractionation to main chemical species (black and organic carbon. sulfate. main heavy metals and mineral matter).

Transport sector emissions included in the model are calculated with the global GAINS model (http://gains.iiasa.ac.at) (Amann ym. 2011 and agriculture emissions with the national nitrogen (Grönroos et al. 2009).

The national FRES model is developed to be consistent with the GAINS model in respect to source sectors in order to be able to cross-check differences in the scenarios. FRES model, however, gives more accurate information than GAINS for Finland, due to inclusion of e.g. 400 point sources detailed techniques and emission factors. In addition, certain sectors, such as residential combustion, has been calculated at a more detailed level (14 different national techniques).

Parametres used in the FRES model are optimized for every five historical years (2010, 2015 etc.) and to target years according to specific needs. The intermediate years are presented linearly.

Activity data in the FRES model

The emissions are calculated from the parameters of activity levels. emission factors and emission control technology removal efficiencies and utilization rates. The energy comsumption and industrial production scenarios used in planning the national Energy and climate strategy (Huttunen, 2017) are used as input to the model (Table 1.06). In the FRES model the activity unit for combustion processes is annual primary energy use (e.g. PJ a-1) and for industrial non-combustion processes annual production or raw material use (e.g. Mg a-1). Other activity units include e.g. animal numbers and manure application for NH3 emissions from agriculture and driven vehicle km for non-exhaust primaryPM from road traffic.

Emission factors and abatement techniques

Emission factors in the FRES model are assumed to be constant over time. Changes in emission factors are thus to be described by changes in the use of emission control technologies. Emission factor changes due to e.g. modernization of combustion appliance stock can be described by corresponding source sector disaggregation and relative changes in activity levels.

The FRES model describes removal effi ciencies and costs of emission control technologies.
The technologies include e.g. end-of-pipe and process modifi cation measures of energy production and industry sources. technologies applied in traffic vehicles and manipulations of fuel qualities. Emission abatement techniques are defined according to current legislation (CLE) and with measures (WM).

The current and future use of emission control technologies is to a large extent defined by the requirements of the environmental legislation. Nowadays different EU directives and national legisladtion define emission limit values for different emission sources. Major emission legislations include:

- Industrial Emissions directive (2010/75/EU) and the BAT Reference Documents that set limit values/BAT levels for SO2. NOx and primary PM (TSP) emission factors for combustion plants larger than 50 MWth (thermal capacity)
- Medium Combustion Plants directive (EU) 2015/2193 that set limit values for SO2, NOx and primary PM (TSP) emission factors for combustion plants smaller than 50 MWth (thermal capacity)

- EURO standards (e.g. EC 1998) that give increasingly tightening emission limits for new traffic vehicles. and NMVOCs directives (EC 1999b. 1994) for solvents and fuel handling practices to reduce NMVOCs emissions.
- Ecodesign directive and Commission regulations 2015/1195 and 2015/1189 for residential combustion.

Sources

The basic spatial and temporal domains of the model are the country of Finland and one year. respectively. which are then disaggregated to 250m x 250 m and 1 hour resolutions. respectively. The emission sources are aggregated into source sector categories. The FRES aggregation is mainly convergent with the GAINS model categories. with more refined structure for some sectors with specific national characteristics that are not described in RAINS with adequate disaggregation (e.g. domestic wood combustion).

The source sectors include combustion-related activities (centralized and industrial energy production plants. domestic combustion. road traffic. off-road and machinery). industrial non-combustion process plants. and various sources associated with NH3 (agriculture), primary PM (several fugitive dust and other small non-combustion sources) and NMVOCs (solvents use, fuel evaporation). Combustionrelated source sectors are described as sector fuel combinations (e.g. industrial boilers – coal). the numbers of sectors and fuels being 101 and 15. respectively. The number of noncombustion source sectors is 53. The emission sources are described with a combined bottom-up and top-down approach for large point sources and area sources. respectively. Emissions of most significant individual polluters are calculated as point sources. i.e. on an individual plant basis (bottom-up).

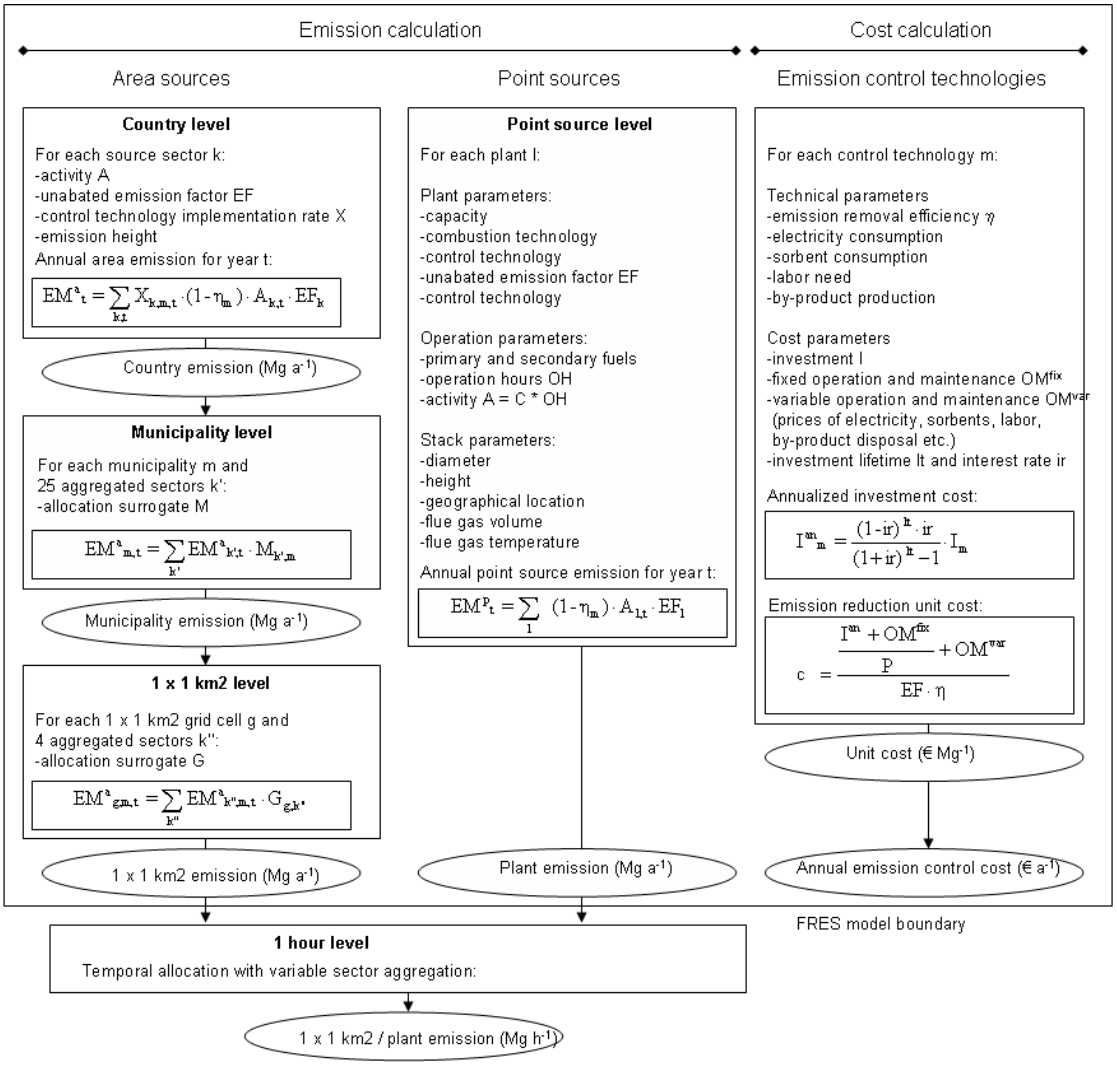


Figure 1.02. Structure of the FRES model.

9.3 Emission reductions based on existing measures and measures that have been adopted in the legislation

The base line scenario is based on fuel use according to the national energy and climate strategy from 2017 (Huttunen, 2017). The baseline scenario includes all relevant legislation currently in effect of approved including those mentioned above.

Sulphur emissions as SOx

Sulphur dioxide emissions originate mainly from energy production and industrial processes. Emissions from industry decreased already between 2005-2010 in line with the limits presented in the LCPD (2001/80/EY), although the uses of both coal and peat in 2010 were higher than in 2005. Between 2010 and 2020 emissions from energy production are projected to decrease sharply due to decreasing combustion of coal, peat and HFO and the limitations in the IED. From 2020 to 2030 combustion of coal will further decrease.

Emissions from industrial processes follow the projected increase of production volumes, while a slight decrease is projected to the emission factors for metal industry and refineries due to technical improvements of processes.

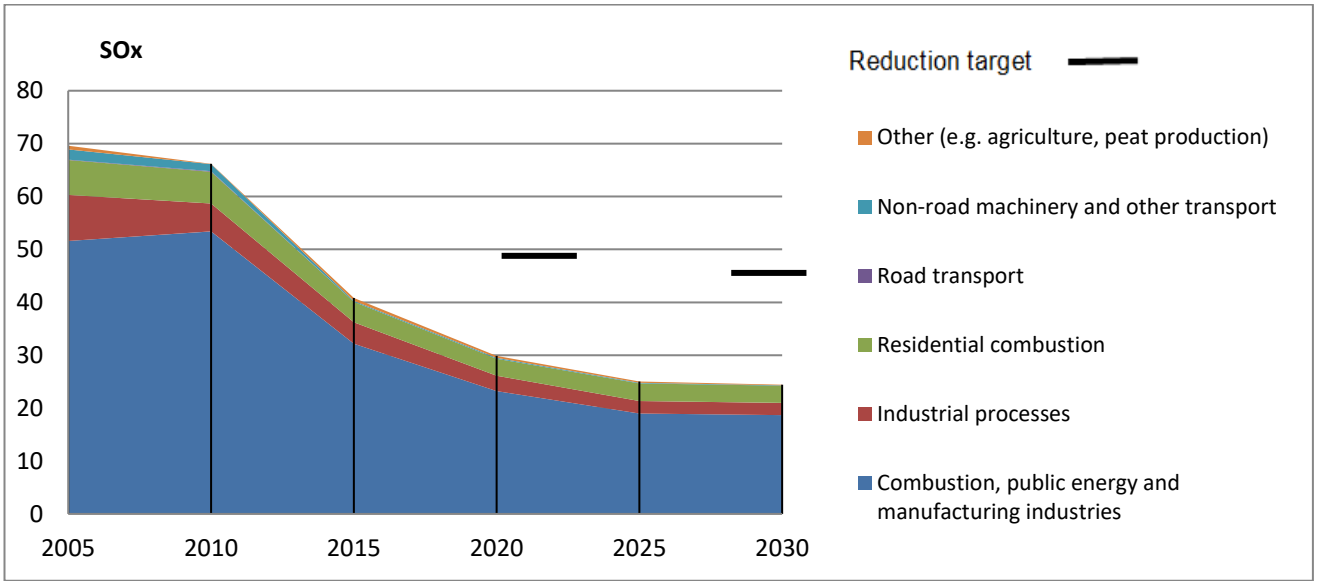


Figure 1.03. Development of SOx emissions by sectors according to the baseline

Nitrogen oxides

The main sources for NOx are road transport, off-road machinery and energy production. Emissions from the transport sector are projected to decrease due to EU legislation although transport volumes increase. The main contributor to decreases will be the implementation of EURO6 standards from 2015 onwards,

NOx emissions from energy production decreased only slightly between 2005-2010 when the uses of peat, coal and biomass were restored to the normal level from their exceptional levels in 2005 when the lock-out in forest industries and the extraordinary good water situation in production of hydroelectric power decreased the demand of fuels.

The IED restricts emissions from the use of coal and biomass. The use of coal and peat also decrease notably towards 2020-2030, although biomass use is expected to increase.

Emissions from industrial processes depend on the development of production volumes and in small scale combustion on the amount of wood combusted. Impacts to emission levels from small technical improvements in both the process industry and small scale combustion are included in the projections.

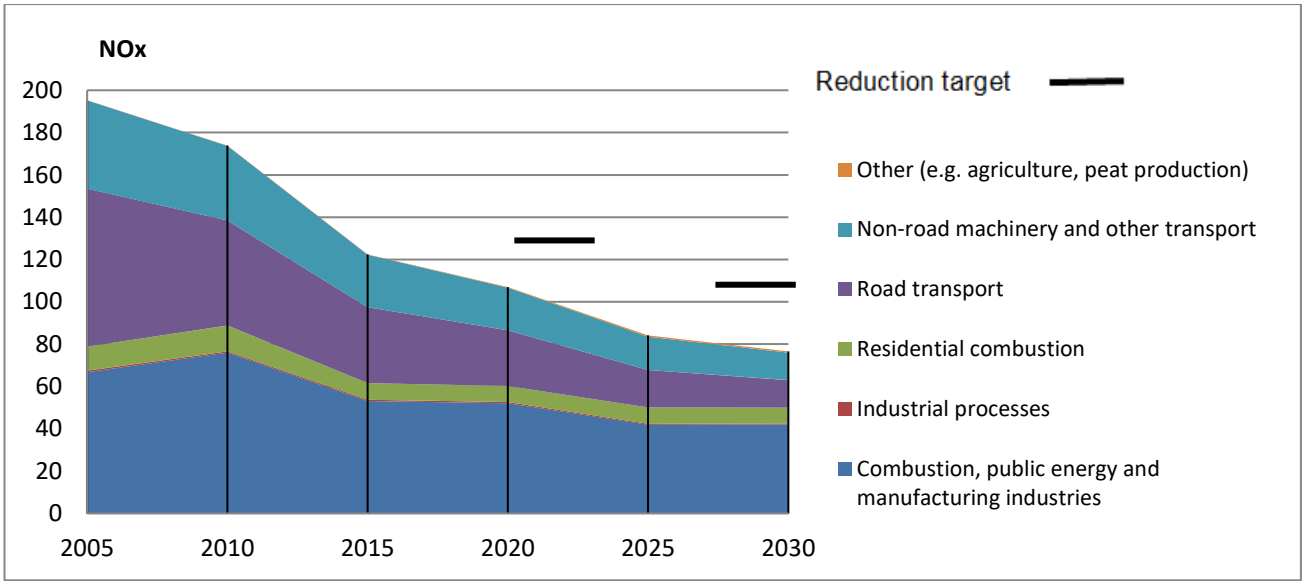


Figure 1.04. Development of NOx emissions by sectors according to the baseline

Particles

Important particulate matter sources are residential wood combustion, traffic, industry and peat production. In the national energy strategy it is assumed that the combustion volume will increase slightly from 2015 to 2030, but particulate emissions will decrease due to the renewal of the combustion equipment stock.

In transport, exhaust gas emissions decrease due to the increasing number of EURO6 standard vehicles. Although direct particulate emissions in exhaust gases almost cease by 2030, traffic dust will still remain an issue. PM emissions from traffic are a significant contributor to health impacts because the emissions occur at the height of inhalation and concentrate in high density population areas.

Emissions from peat production, i.e. operations related to extraction of peat, vary annually due to peat producton volumes which depend on weather (for instance between 2005–2012 from 2.7 to 5.5 kt. In the scenarios these emissions are projected to follow the projected use of peat each target year.

The increasingly stringent emission regulation in combustion plants decrease emissions only slightly, since biomass consumption is expected to increase significantly

For industrial processes, no changes have been made in emission factors over the years and the emissions follow development of production volumes.

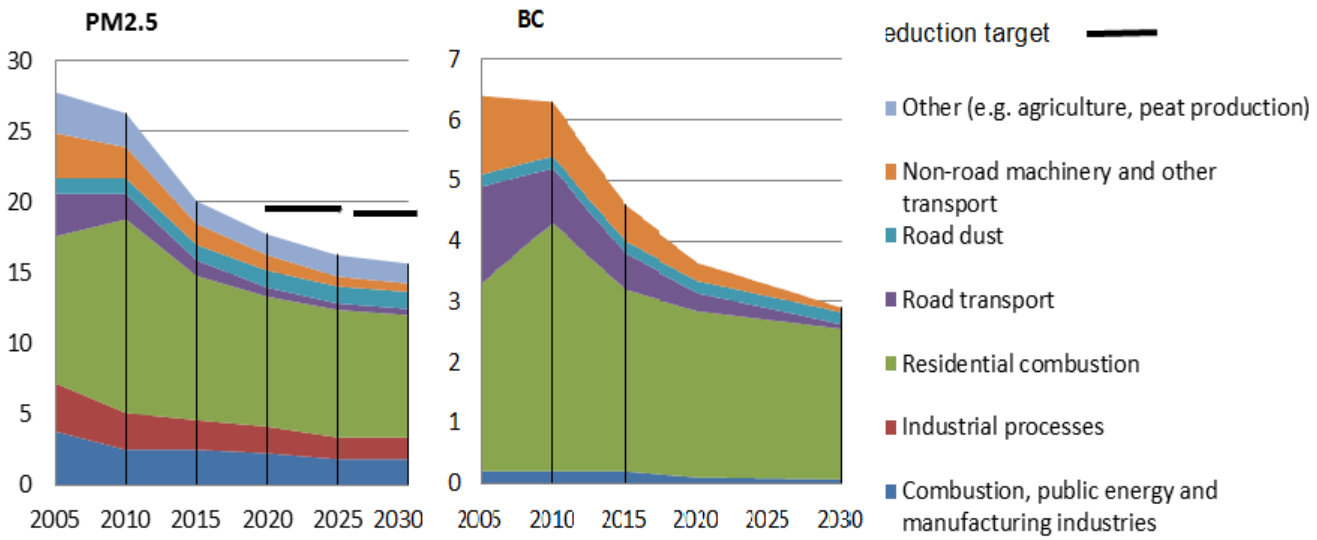


Figure 1.05. Development of small particle and black carbon emissions by sectors according to the baseline

Ammonia

The main ammonia source is agriculture where manure management drives the emissions. Small emissions are generated in transport, waste handling and industrial processes. The emission ceiling of 31 kt under the NECD and the Gothenburg Protocol is based in calculations in the RAINS model (Regional Air Pollution INformation and Simulation). In the revision of the NECD the target was to limit emissions to the level of 2010. For Finland this means a reduction of 20% in ammonia emissions from 2005, while the optimization in the GAINS would have been 15% for 2030. Both targets require the use of additional measures because the emission reduction according to the base line would be only 10% by 2030.

In the base line approach, reductions in agricultural ammonia emissions follow the decrease in animal numbers, impacts from liquid manure systems to become more common in line with the growth of the unit size, as well as the implementation of new regulations for storage and spreading of sludge according to the updated nitrates directive (Government Decree VNa 1250/2014). On the other hand, increased production volumes raise the level of nitrogen excretion, which partly cancel the reduction by the decrease in animal numbers.

Although ammonia emissions from transport already have decreased due to improvements in technology and will further decrease, the emissions in the model are estimated at the level in 2012.

Emissions from energy production were not included in the inventory the time the FRES model was updated. These emissions will be included in the model when the inventory results are finalized.

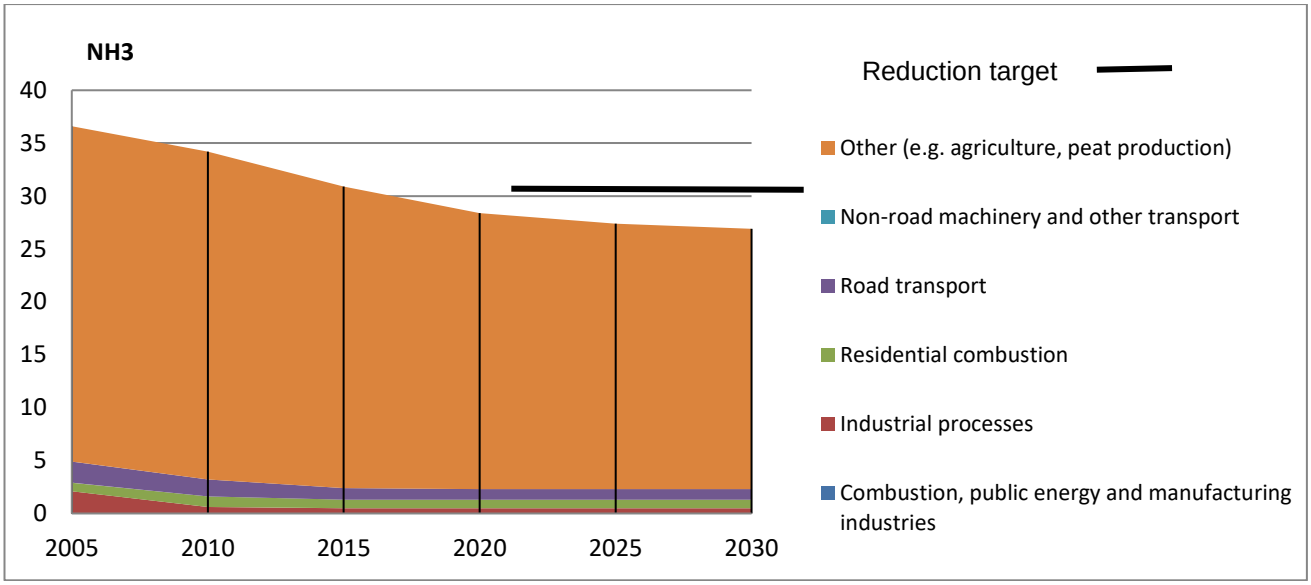


Figure 1.06. Development of ammonia emissions by sectors according to the baseline

NMVOC

NMVOC emissions have been decreased between 2005 - 2010 and further thereafter. The most important source is transport where emission reductions are expected due to EURO5/6 standard vehicles. Half of exhaust gas emissions originate in gasoline vehicles and half from fuel refining, storage and distribution.

FRES model only covers NMVOC emission from transport and small combustion. Projections for emissions from industry and product use are based on national emission inventory values in 2016. These emissions have decreased since the beginning of the 2000s' due to implementation of VOC Directives (1999/13/EC and 2004/42/EC), In Finland also the levels of activities in these sectors have decreased. For oil refineries the emission factor is estimated to decrease by 2030, however, the expected growth of the activity volume keeps the projected emission levels constant.

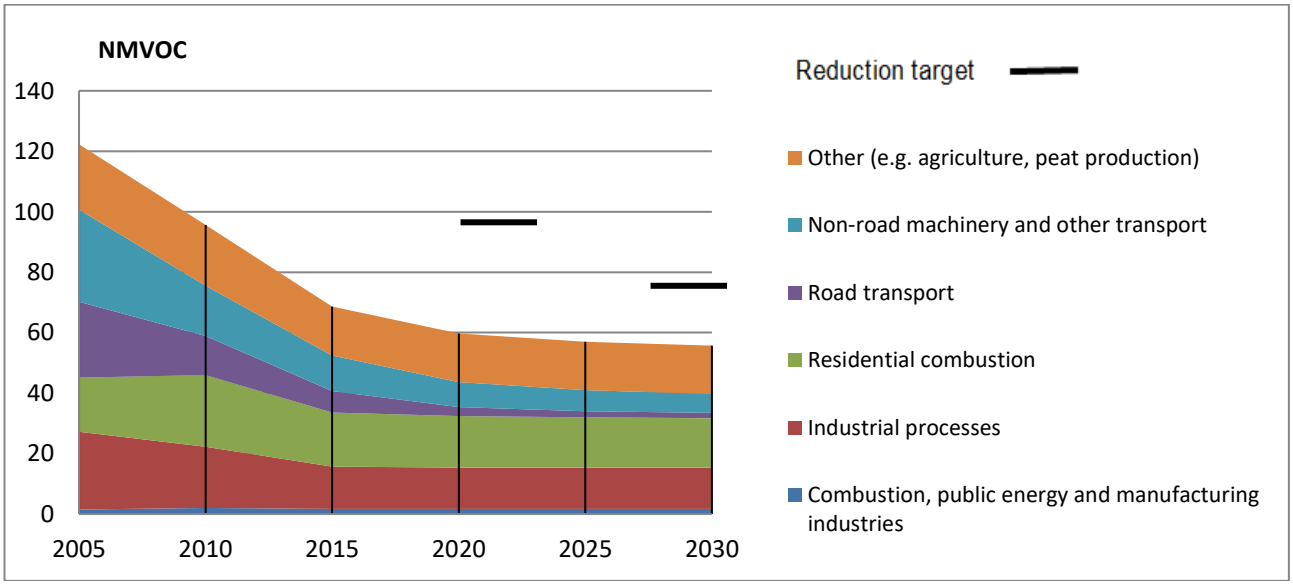


Figure 1.07. Development of NMVOC emissions by sectors according to the baseline

NECD Review on Projections 2019 - Recommendations (Final Review Report)

Table 4-1 Recommendations from the 2019 projections review [1]

Observation	Year	Scenario	KC	Recommendation	Response
FI-1A1-20190001	2020	With Measures (WM)	No	For category 1A1 Energy industries, $PM_{2.5}$ for year 2020, the TRT noted a large increase from 2017 to 2020. In response to a question raised during the review, Finland explained the emission projections in the National Air Pollution Control Programme did not separate emissions from 1A1 and 1A2, only their sum. In the Annex IV this sum was divided 50/50 between those two. Finland corrected this and provided updated data to the TRT. The TRT notes that this issue does not relate to an underestimate and recommends that Finland in future projection submissions use sectoral emissions distribution that is consistent with the historical inventory and the actual distribution between 1A1 and 1A2.	The split has been made to the 2020 submission between 1A1 and 1A2 according to the respective ratio in the inventory.
FI-1A3a,c,d,e2019-0001	2020, 2025, 2030	With Measures (WM)	No	For 1A3a,c,d,e Off-road transport, BC, NMVOC, NO_X and $PM_{2.5}$ for 2020, the TRT noted very big increases in the emissions from 2017 to 2020. In response to a question raised during the review, Finland explained that the emission differences are because the projections have not been updated recently. Updated projections are currently part of the updated LIPASTO model as presented in the revised Annex IV attached by Finland to this observation. The TRT notes that this issue relates to an overestimate and recommends that revised emissions for off road transport from the updated LIPASTO system will be included in the next emission reporting.	LIPASTO scenarios have been included in the 2020 submission.

[1] Where multiple pollutants are included, the issue is flagged as referring to a key category if relevant for one or more of the pollutants.

Observation	Year	Scenario	KC	Recommendation	Response
FI-1A3a,c,d,e2019-0002	2025,	With Measures (WM)	No	For 1A3a,c,d,e Off-road transport, NH_3 for all projection years, the TRT noted that no NH_3 emissions are reported in the projections. NH_3 emissions are reported for 1A3a,c,d,e Off-road transport in the historical years for Finland. In response to a question raised during the review, Finland explained that emission projections of NH_3 were missing because the old LIPASTO model did not include NH_3. Emissions of NH_3 are now added to the upgraded LIPASTO system and included in the revised data provided by Finland during the review. The TRT notes that this issue relates to an underestimate and recommends that NH_3 emissions for off road transport from the upgraded LIPASTO system will be included in the next submission.	NH3 emissions are included in the 2020 submission.
FI-1A3b-20190001	2025,	With Measures (WM)	No	For 1A3b Road transport, SO_2 for 2020, 2025, 2030, the TRT noted that no SO_2 emissions are reported in the projections. SO_2 emissions are reported for 1A3b in the historical years for Finland. In response to a question raised during the review, Finland explained that the SO_2 emissions are excluded because they were rounded out to 0.0 kt. The decimals will be included in the next submission as provided to the TRT during the review. The TRT notes that this issue relates to an underestimate and recommends that the decimals for the SO_2 emission results are included in the next emission reporting.	The emissions are corrected to the 2020 submission.
FI-1A3bi-20190001 FI-1A3biii2019-0001	2025,	With Measures (WM)	No	For 1A3bi Passenger cars and 1A3biii Heavy Duty Vehicles, SO_2 for 2020, 2025, 2030, the TRT noted that no SO_2 emissions are reported in the projections. SO_2 emissions are reported for these sources in the historical years for Finland. In response to a question raised during the review, Finland explained that the SO_2 emissions are excluded because they were rounded out to 0.0 kt. The decimals will be included in the next submission as presented in the revised projections provided to the TRT. The TRT notes that this issue relates to an underestimate and recommends that the decimals for the SO_2 emission results are included in the next emission reporting.	The emissions are corrected to the 2020 submission.

FI-1A3bii-2019-0001	2020, 2025, 2030	With Measures (WM)	No	For 1A3bii Light duty vehicles, all pollutants for the projections years, the TRT noted that the emissions of BC, NMVOC, NO_X and $PM_{2.5}$ decrease notably from 2017 to 2020 and that no NH_3 and SO_2 emissions are reported in the projections. There is no explanation provided in the IIR. In response to a question raised during the review, an explanation was not given of the level of BC, NMVOC, NO_X and $PM_{2.5}$ emission decreases for light duty vehicles in the projections from 2017 to 2020. The TRT notes that this issue relates to a potential underestimate and recommends that an explanation of the emission trends from 2017 to projection years are given in the next submissions, e.g. accompanied with data for the developments in total mileage and aggregated emission factors for the emission components. In response to a question raised during the review regarding SO_2 and NH_3, Finland explained that the SO_2 emissions are excluded because they were rounded out to 0.0 kt. Finland further explained that NH_3 emissions were not included in the projections because NH_3 has not earlier been estimated in the LIPASTO model. Both SO_2 and NH_3 emissions will be included in the next submission as provided to the TRT during the review. The TRT notes that this issue relates to an underestimate and recommends that the decimals for the SO_2 emission results are included in the next emission reporting as well as totals for NH_3.	The error is corrected as LIPASTO scenarios have been included in the 2020 submission. The emissions have been corrected and NH3 emissions included to the 2020 submission.

FI-1A3biv-2019-0001	2025, 2020, 2030	With Measures (WM)	No	For 1A3biv Mopeds and Motorcycles, NMVOC, $PM_{2.5}$, SO_2 and NH_3 for all projection years, the TRT noted that the emissions of NMVOC and $PM_{2.5}$ decrease notably from 2017 to 2020. No NH_3 and SO_2 emissions are reported in the projections. In response to a question raised during the review, an explanation was not given of the level of NMVOC and $PM_{2.5}$ emission decreases for mopeds and motorcycles in the projections from 2017 to 2020. In response to a question raised during the review regarding SO_2 and NH_3, Finland explained that the SO_2 emissions are excluded because they were rounded out to 0.0 kt. Finland further explained that NH_3 emissions were not included in the projections because NH_3 has not earlier been estimated in the LIPASTO model. Both SO_2 and NH_3 emissions will be included in the next submission as provided to the TRT during the review. The TRT notes that this issue relates to an underestimate and recommends that the decimals for the SO_2 emission results are included in the next emission reporting as well as totals for NH_3. The TRT also recommends that an explanation of the emission trends from 2017 to projection years are given in the next submission, e.g. accompanied with data for the developments in total mileage and aggregated emission factors for the emission components.	The emissions have been corrected and NH3 emissions included to the 2020 submission.
FI-1A3bvii-2019-0001	2025, 2020, 2030	With Measures (WM)	No	For 1A3bvii Automobile road abrasion, $PM_{2.5}$ for 2020, 2025, 2030, the TRT noted that the emissions of $PM_{2.5}$ decrease by around 15 % from 2017 to 2020. $PM_{2.5}$ emissions are kept constant in the projection years. In response to a question raised during the review, Finland explained that no projections have earlier been made for this category (automobile road abrasion). The emissions will be revised as part of the upgraded LIPASTO system and will be included in the next reporting round. The TRT notes that this issue relates to an underestimate and recommends that revised emissions from the upgraded LIPASTO system will be included in the next emission reporting.	It was not possible to include the emissions to the 2020 submission due to need to improve the inventory methodology and changes in the organization of the inventory (all transport sector calculations were moved to VTT/Tremo). The emissions will be included when the calculation is established in LIPASTO in the next submissions.

FI-1A4-20190001	2020	With Measures (WM)	No	For category 1A4 Other sectors, NO_X for 2020, the TRT noted a large decrease from 2017 to 2020. In response to a question raised during the review, Finland explained that, in the projections, the emissions were not distributed using the same NFR codes as in Annex I. Finland corrected this and provided updated data to the TRT. The TRT observe that the national total emissions differ between the projection submission and the revised estimates provided for all NO_X, NMVOC, SO_2, NH_3, $PM_{2.5}$ and BC. Finland informed the TRT that emissions have been corrected for NMVOC, NH_3, $PM_{2.5}$ and SO_2 for 1B (refer to observation FI-1B-2019-0003 and FI-1B-2019-0002), but these emission changes do not correspond to the changes of neither the national total emissions nor the emissions from the Energy sector. The TRT notes that this issue relates to an over and/or underestimate and recommends that Finland in future projection submissions use sectoral emissions distribution that is consistent with the historical inventory, and to extend the documentation of the projection in the IIR to improve transparency.	The emissions have been corrected to the 2020 submission.
FI-1A5-2019-0001 FI-1A5-20190002	2025, 2030	With Measures (WM)	No	For category 1A5 Other, NO_X for years 2025 and 2030, the TRT noted that no emissions were reported in the WM projection, but emissions are reported for 2020. For $PM_{2.5}$ projections in 2020 there is a large decrease from 2017 to 2020. In response to a question raised during the review, Finland explained that, in the projections, the emissions were not distributed using the same NFR codes as in Annex I. Finland corrected this and provided updated data to the TRT. The TRT observe that the national total emissions differ between the projection submission and the revised estimates provided for all NO_X, NMVOC, SO_2, NH_3, $PM_{2.5}$ and BC. Finland informed the TRT that emissions have been corrected for NMVOC, NH_3, $PM_{2.5}$ and SO_2 for 1B (refer to observation FI-1B-2019-0003 and FI-1B-2019-0002), but these emission changes does not correspond to the changes of neither the national total emissions nor the emissions from the Energy sector. The TRT notes that this issue relates to an over and/or underestimate and recommends that Finland in future projection submissions use sectoral emissions distribution that is consistent with the historical inventory, and to extend the documentation of the projection in the IIR to improve transparency.	The emissions have been corrected to the 2020 submission

FI-1B-20190002	2020, 2025, 2030	With Measures (WM)	No	For category 1B Fugitive emissions, NH_3, $PM_{2.5}$ and SO_2, for all projection years, the TRT noted that no emissions were reported in the WM projection, which would be expected, because emissions are reported in the historical inventory. In response to a question raised during the review, Finland explained that, “in the projections, NFR 1B was not included in the NMVOC projections and thus the projections for NFR 1B have now been corrected as frozen to the 2017 emission levels”. The TRT observe that emissions of NH_3, $PM_{2.5}$ and SO_2 have been included in the revised estimates provided during the review, and expect that the answer from Finland refer to these pollutants and not NMVOC as written in the answer. The TRT notes that this issue relates to an underestimate and recommends that Finland include emissions from 1B in future projection submissions and provide a methodological description in the IIR.	The emissions have been corrected to the 2020 submission
FI-1B-20190003	2020	With Measures (WM)	No	For category 1B Fugitive emissions, NMVOC for 2020, the TRT noted a large increase from 2017 to 2020. In response to a question raised during the review, Finland explained that, the NMVOC emission is an old expert estimate and is likely overestimated. Finland corrected this and provided updated data to the TRT. The updated estimate is an expert estimate based on recent years’ data. The TRT notes that this issue relates to an overestimate and recommends that Finland use updated emissions estimates in future projection submissions.	The emissions have been corrected to the 2020 submission
FI-2A,B,C,H,I,J,K,L-2019-0002	2020, 2025, 2030	With Measures (WM)	No	For category 2A,B,C,H,I,J,K,L Industrial processes, NMVOC, for 2020,2025 and 2030, the TRT noted that the projected emission level is almost double (13.70 kt) compared to any of the historically reported emissions (reference year, 2017, is 7.13 kt). In response to a question raised during the review, Finland corrected the projected emissions for the sector by excluding (wrongly included) NFR categories 2D and 2G. The TRT recommends that Finland corrects the error in future submissions and ensures that the projections are consistent with the inventory to the extent possible.	The emissions have been corrected to the 2020 submission

FI-2D, 2G-2019-0001	2025, 2030	With Measures (WM)	No	For 2D, 2G Solvent and other product use, SO_2 for years 2025 and 2030, the TRT noted that Finland reported IE, while a projected emission of 0.05 kt are reported for 2020 and for the historical years a reduction form 0.05 kt in 2010 to 0.009 kt in the reference year 2017 is reported. In response to a question raised during the review, Finland explained that the SO_2 projection for 2020 was based on an old estimate that was not updated. Finland further explained that the estimates have been revised and held constant at the 2017 level in the porjected emissions as provided to the TRT during the review. The TRT recommends that Finland in future submissions ensure consistency between the projections and the inventory to the extent possible and describe any differences in the IIR.	The emissions have been corrected to the 2020 submission
FI-2D, 2G-2019-0004	2020, 2025, 2030	With Measures (WM)	No	For 2D, 2G Solvent and Other Product Use, NO_X for years 2020, 2025, 2030, the TRT noted that emissions are reported as NA, while historical emissions are reported (0,006 kt for the reference year 2017). In response to a question raised during the review, Finland explained that the emissions in the inventory are allocated through a boiler/process specific inventory and the projections are made on a more aggregated level, thus the emissions are included under the energy sector NFRs 1A1/1A2. The TRT recommends that Finland explains such differences in allocation according to differences in aggregation level in its next submission.	Estimates in the projections have been included for these sources to the 2020 submission
FI-2D, 2G-2019-0005	2020, 2025, 2030	With Measures (WM)	No	For category 2D, 2G Solvent and other product use, $PM_{2.5}$ for years 2020, 2025 and 2030, the TRT noted that zero emissions have been reported while historical $PM_{2.5}$ emissions are reported (0.24 kt PM2,5 for the reference year 2017). In response to a question raised during the review, Finland explained that the $PM_{2.5}$ emissions from NFRs 2D and 2G were not included in the projections but have now been estimated based on an expert view of the last 10 years emission levels and provided to the TRT during the review. The TRT recommends that Finland reports correctly in the next submission and explain any differences in scope between the projections and the inventory in the projections chapter in the IIR.	Estimates in the projections have been included for these sources to the 2020 submission

FI-5-20190001	2020, 2025, 2040	With Measures (WM)	No	For category 5 Waste, $PM_{2.5}$ for years 2020,2025 and 2030, the TRT noted that projected emissions are reported as as factor 50 below the reference year (0,11 kt $PM_{2.5}$ in 2017 and 0,002 kt PM2,5 in 2020,2025 and 2030). In response to a question raised during the review, Finland explained that the $PM_{2.5}$ projection was not updated to reflect inclusion of new sources in the latest inventory. The TRT acknowledges that the corrected $PM_{2.5}$ emissions have been estimated and provided by Finland during the review. The TRT notes that this issue relates to an underestimate and recommends that Finland in the next reporting ensures consistency between the inventory and the projection.	Estimates in the projections have been included for these sources to the 2020 submission
FI-5-20190003	2020, 2025, 2030	With Measures (WM)	No	For category 5 Waste and SO_2, the TRT noted that Finland reported emissions of 0.02 kt in each of the years 2020,2025 and 2030, while historical emissions are reported as NA, NO. Finland explains that projections have not recently been updated to reflect the updates in the inventory, where SO_2 emissions are no more included for the waste sector. In the earlier inventories, emissions were reported due to allocation/division of point source data. The TRT recommends that that Finland explains clearly such changes in allocation in its next submission of projected emissions and ensures that projections are consistent with the emission inventory to the extent possible.	The projections have been aligned with the inventory reporting to the 2020 submission
FI-NATIONAL TOTAL-20190001	2020, 2025, 2030	With Measures (WM)	NA	The TRT noted that the reference year is not given in the submission of emission projections. The TRT noted that as outlined in Annex IV Part 2 (3) of EU Directive 2016/2284, 'National emission projections shall be consistent with the national annual emission inventory for the year x-3'. In response to a question raised during the review, Finland explained that the projections reported in 2019 are not yet fully in line with the principles presented in the new "General Guidance on Estimating and Reporting Air Pollutant Emission Projections" (which currently still is under preparation) but that they are in the process of updating the projections to align with the guidelines and to harmonise the principles throughout the sectors. The projections reported for the energy, industry and domestic sectors are according to the National Air Pollution Control Programme 2030 and are estimated as a relative change to the reported emissions in 2015. For IPPU and waste sector projections assessment against the recent inventories is also made. Transport sector emissions are based on mileage forecasts that are updated on demand by the Finnish Transport Infrastructure Agency, legislation requirements for fuel bio shares and using transport experts' knowledge. The TRT recommends that Finland report on the reference year of the projections in the NFR and IIR.	The projections in the FRES model were not recalculated to the 2020 submission, therefore this information will be included in the IIR after the FRES model projections are updated.

FI-NATIONAL TOTAL-20190004	2025, 2020, 2030	With Measures (WM)	NA	Related to the overall projection information, the TRT noted that limited information is available in the IIR on the methodologies, assumptions and data sources. In response to a question raised during the review, Finland explained the information provided in the IIR and the NAPCP and provided information on a sensitivity analysis carried out for the fuel combustion sector. Furthermore, Finland indicated that the information included in the IIR will be expanded in future reporting. The TRT notes that this issue does not relate to an over or underestimate and recommends that Finland includes more information in the IIR on the methodologies, assumptions and data sources used in the projection.	The requested information will be included when the FRES projections are updated.

Encouragements

Table 4-2 Encouragements from the 2019 projections review

Scenario	KC			Encouragement	Response
FI-2A,B,C,H,I,J,K,L-2019-0001	2025, 2030, 2040	With Measures (WM)	No	For 2A,B,C,H,I,J,K,L Industrial processes, Black Carbon for years 2020, 2025, 2030, the TRT noted that zero emissions are reported, while historical emissions are reported. Furthermore, in methodology sections of different sub-categories in the IIR, Black Carbon is estimated as a percentage of PM_{10} and $PM_{2.5}$ respectively. The NECD refers to Black Carbon projections reporting "if available". In response to a question raised during the review, Finland explained that black carbon emissions have not been projected for industrial processes. During the review, Finland provided a BC projection that included emissions as the 2017 value for all future years. The TRT encourages Finland to provide projections of black carbon in future submissions for these sources if the data are available.	Projections for these setors were estimated and included in the 2020 submission.

FI-5-20190004	2020, 2025, 2030	With Measures (WM)	No	For category 5 Waste, NO_X for years 2020, 2025, 2030, the TRT noted that historical emissions are reported as "NA,NO,IE" while projections are reported as 0. NO_X emissions are expected to occur from incineration in Finland. In response to a question raised during the review, Finland explained that all waste is combusted with energy recovery and therefore included in the energy sector. The TRT is satisfied with the explanation provided by Finland. The TRT encourages Finland to report correct notation keys in the next submission.	The notation key was corrected.

10 GRIDDED EMISSIONS AND LPS

Changes in chapter	
March 2018	KS
Change in methodology	New grid 2015

10.1 Gridded data

The new EMEP grid of 0.1 degrees introduced in the 2014 Reporting Guidelines was implemented in the inventory system in 2015. Finland lies between the northern latitudes of 60^{o} and 70^{o}, where one degree corresponds to approximately to a 7 km *7 km area.

The presentation of gridded data in the 1^{o} * 1^{o} format has at the moment been implemented for the land cover of activities only in 2005. It is planned to prepare datasets also for the earlier years as well as for future years when resources are available for this kind of work.

Gridded data in the resolution of 50 km * 50 km according to the earlier versions of the Reporting Guidelines is available also for the earlier reporting years.

Submissions of gridded data are presented in Table 1.07 in Chapter x.

Figure 1.08. Geographical location of Finland (Maps of the World 2016)

Developments in land use

In comparison to other European countries, Finland is still a sparcely populated country with a small urban zone in the Southern part of the country. Only the capital region is a highly urbanized area according to the classifiactions of EuroStat and OECD.

In addition to the low population density, a specific feature of Finland is the share of rural areas and long distances between inhabitant centres. An exceptional feature compared to other low density countries is that almost all of Finland is populated and the most distant rural areas are rather vital. In an European comparison Finland was one of the top 5 countries in the share of rural areas of total area.

During the last decades more people have moved to the population centres, rural centres of in their vicinity and especially in the Southern part of Finland. Inside municipalities, population is more and more moving from sparcely populated areas to villages. Largest growth can be seen in population centres exceeding 100 000 inhabitants and secondly in 1000 - 100 000 population centres. Growth rate has been high also in centres less than 1000 inhabitants, while the sparcely populated areas continue to loose their inhabitants.

10.2 LPS data, sources, geographical coordinates and emissions

Changes in chapter	
March 2018	KS
Change in method	none

The definition of the set of Finnish Large Point Sources (LPS) was revised in the 2012 submission under the UNECE CLRTAP to correspond to the definition of E-PRTR installations, as defined in the revised UNECE Reporting Guidelines (ECE/EB.AIR/97)**.**

Emission data from LPS installations are reported by plants according to the environmental monitoring requirements in their environmental permits, as well as their reporting requirements under the E-PRTR Regulation. As described in Chapter 2.3.3 of the IIR, these data are available for the use in inventories from the regional environmentral authorities' VAHTI database.

Data on Finnish LPSs has been submitted annually under the CLRTAP and since 2002 under the NECD.

During the preparation of the 2012 submission, it was observed that the conversion of nationally used coordinates into the coordinates in the CLRTAP reporting did not work as believed. A new method to convert the coordinates was introduced. The geographical coordinates used in national reporting for point sources is EUREF-FIN and there was a need to carry out a conversion between the level and geographical coordinates. In the 2017 submission, additional functionality challenges were met, and were solved by the following submissions

ADJUSTMENTS

11.1 Adjustment Application 2015

Finland applied for adjustments for the ammonia emissions inventories in Manure Management (NFR 3B), Small Scale Combustion (NFR 1A4) and Road transport, Railways, Navigation (NFRs 1A3b, 1A3c, 1A3d). The application was due to the fact that the 2010 emission ceiling for ammonia emissions set for Finland in the 1999 Gothenburg Protocol is 31 kilotonnes and according to the best science inventories, ammonia emissions in Finland were 38.2 kt in 2010, 37.4 kt in 2011, 37.3 kt in 2012 and 37.1 kt in 2013. The application of adjustments is presented as Annex 3 to Finnish IIR 2015.

The Adjustments Expert Review Team in 2015 accepted two of the applied adjustments the sums of which are presented in Table ES2 below. The Adjustments ERT Review Report is in Appendix 2 of this IIR.

Table ES2 Aggregated Sum of Recommended Inventory Adjustments (ktonnes), Finland 2010-2013

Pollutant		2010	2011	2012	2013
NH_3	kt	-2.05	-1.85	-1.85	-1.72

11.2 Reporting of Approved Adjustments

Documentation of the adjusted Small Scale Combustion NH3 inventory and the adjusted Road Transport NH3 inventory is provided in files:

- FI IIR 2019 Appendix 3B REVISED 15032019 Documentation Small Combustion.xls
  Saved in reporting folder C. Adjustment – Revised 2019 Approved Adjustments Reporting

- FI IIR 2019 Appendix 3B Documentation of Road Transport February 2019.xls
  Saved in reporting folder C. Adjustments – Approved Adjustments Reporting 2019

- Approved Adjustments FI Reporting year 2019 RESUBMISSION 15032019.docx
  Saved in reporting folder C. Adjustments - Revised 2019 Approved Adjustments Reporting

Finland has submitted the approved adjustments reporting (Annex VII) in 2016, 2017, 2018 and 2019 and included the in the submission the Declaration of consistency in the methods used (file name "Approved Adjustments Reporting"). Information on changes in activity data or new information to correct EFs has been included in these reports.

Adjustment for Small Scale Wood Combustion, submission 2019

In the 2019 submission, for small scale combustion of wood, Finland used the revised official wood use statistics, which is based on a survey conducted in 2017-2018. This traditional survey also includes use of wood in the different combustion equipment, which means that both the wood consumption data and the allocation of wood between the 14 techniques was revised. The new category for modern sauna stoves was added in the inventory due to the improved data.

In addition, the technique specific EFs were corrected according to new information from various national studies. The new EFs are higher for conventional devices and lower for modern devices, compared to the earlier used EFs. As a result of the revision, the emissions for 2017 increased by 0.344 kt compared to those calculated with the earlier used EF. The national total NH3 emissions in 2017 were 31.083 kt, which is 0.083 kt above the ceiling of 31 kt. As the share of wood combusted in modern sauna stoves, modern masonry ovens and modern iron stoves is continuously growing, the change in the EFs follows more closely the real world emissions than the earlier used EFs .

Detailed information on the changes is provided in the file "Approved Adjustments FI Reporting year 2019 RESUBMISSION 15032019".

Adjustment for Road Transport

A revision of the kilometrage in the national road transport emissions model LIISA was carried out and four EFs were corrected (see file Approved Adjustments FI Reporting year 2019 RESUBMISSION 15032019).

11.3. Adjustment ERT's review report 2015

(the following page)

Convention on Long-range Transboundary Air Pollution

emep Co - operative programme for monitoring and evaluation of the long-range transmissions of air pollutants in Europe

First Joint session of the EMEP SB and the Working Group on Effects
Geneva, 14–18 September 2015
CEIP/Adjustment RR/2015/Finland
1 September 2015
English ONLY

Review of the 2015 Adjustment Application by Finland

Expert Review Team Report for the EMEP Steering Body

Report title	Review of the 2015 Adjustment Application by Finland
Country	Finland
Report reference	CEIP/Adjustment RR/2015/ Finland
Date	20/07/2015
Version no	Final

Expert Review Team

Role	Sectors	Name	Country
Adjustment lead reviewer	All	Chris Dore	United Kingdom
Primary expert reviewer	Stationary combustion (1A2gviii, 1A4ai, 1A4bi, 1A4ci)	Stephan Poupa	Austria
Secondary expert reviewer	Stationary combustion (1A2gviii, 1A4ai, 1A4bi, 1A4ci)	Tomas Gustafson	Sweden
Primary expert reviewer	Road transport (1A3bi-iv)	Melanie Hobson	European Union
Secondary expert reviewer	Road transport (1A3bi-iv)	Michael Kotzulla	Germany
Primary expert reviewer	Manure management (3B)	Jim Webb	United Kingdom
Secondary expert reviewer	Manure management (3B)	Michael Anderl	European Union
Basic checks (Step 1 and 2)	N/A	Katarina Mareckova	CEIP

Executive Summary

1. As mandated by Decision 2012/3 (ECE/EB.AIR/111/Add.1) of the Executive Body to the Convention on Long-range Transboundary Air Pollution (CLRTAP) the nominated expert review team (ERT) undertook a detailed review of the adjustment application submitted by Finland. The review was undertaken on behalf of the EMEP EMEP[2] Steering Body (SB) and following the guidance published in the Annex to decision 2012/12 (ECE/EB.AIR/113/Add.1) and 2014/1 (ECE/EB.Air/130).

2. Each sector of the application was reviewed by two independent sectoral experts during May and June 2015. The findings were discussed at the meeting held from 22-26 June 2015 in Copenhagen at the EEA. The conclusions and recommendations for the EMEP SB are documented in this country report.

Table ES1 Summary Information on the Submitted Application, Finland 2015

Reasons for adjustment application (Decision 2012/3, para 6 as amended by decision 2014/1, annex, para 3)	Stationary combustion 1A2gviii, 1A4ai, 1A4bi, 1A4ci: New Source Road transport 1A3bi-iv: Significantly different EFs Manure management 3B: Significantly different EFs
Pollutant for which adjustment is applied for	NH_3
Year(s) for which inventory adjustment is applied	2010, 2011, 2012, 2013
Date of notification of adjustment to the Secretariat	20 February 2015
Date of submission of supporting documentation	13 March 2015

3. The expert review team (ERT) reviewed and evaluated the documents submitted by Finland.

4. **NH_3 emissions from stationary combustion (1A2gviii, 1A4ai, 1A4bi, 1A4ci):** Finland provided information that transparently presented "extraordinary" revisions to emission factors for NH_3, and also clearly quantified the impact of the revisions to the EFs. The Expert Review Team has concluded that the application does meet all of the requirements laid out in Decision 2012/12 of the Executive Body of the CLRTAP, and therefore recommends that the EMEP Steering Body **ACCEPT** this adjustment application.

5. **NH_3 emissions from road transport (1A3bi-iv):** Finland provided information that transparently presented "extraordinary" revisions to emission factors for NH_3, and also clearly quantified the impact of the revisions to the EFs alone. The Expert Review Team has concluded that the application does meet all of the requirements laid out in Decision 2012/12 of the Executive Body of the CLRTAP, and therefore recommends that the EMEP Steering Body **ACCEPT** this adjustment application.

6. **NH_3 emissions from manure management (3B):** Finland provided information that transparently presented revisions to N excretion rates for livestock, and the resulting impact on NH_3 emissions. The ERT reviewed the information provided and concluded that the application regarding NH_3 from Manure Management[3] (3B) does not meet the requirements laid out in Decision 2012/12 of the Executive Body of the CLRTAP. The ERT noted that revisions of N excretion estimates are regarded as revisions to activity data, and that the application was therefore not based on one of the three circumstances listed in paragraph 6 of

[2] Cooperative Programme for Monitoring and Evaluation of the Long-range Transmission of Air Pollutants in Europe
[3] NFR 3B1a, 3B1b, 3B2, 3B3, 3B4d, 3B4e, 3B4gi-iv and 3B4h henceforth referred as 3B

decision 2012/3, as amended by Decision 2014/1. The ERT therefore recommends that the EMEP Steering Body **REJECT** the adjustment submitted for NH_3 from Manure Management 3B.

7. The quantity and impact of the adjustments recommended for acceptance is summarized in tables ES2 and ES3 below.

Table ES2 Aggregated Sum of Recommended Inventory Adjustments (ktonnes), Finland 2010-2013

Pollutant		2010	2011	2012	2013
NH_3	kt	-2.05	-1.85	-1.85	-1.72

Table ES3 Impact of the Recommended Inventory Adjustments on National Emissions, Finland 2010 and 2013

Poll.	GP Emission Commitment (kt)	2010 Emission reported in 2015 (kt)	2010 Emission (adjusted) (kt)	Difference (%)	2013 Emission reported in 2015 (kt)	2013 Emissions (adjusted) (kt)	Difference (%)
NH3	31	38.25	36.20	5%	37.28	35.56	5%

8. Finland's national total emissions will remain above the 1999 Gothenburg Protocol ceilings if the EMEP SB follow the recommendations of the ERT.

Content

11 INTRODUCTION AND CONTEXT

9. Parties may apply to adjust their inventory data or emission reduction commitments if they are (or expect to be) in non-compliance with their emission reduction targets[4]. However, in making an adjustment application, they must demonstrate that extraordinary circumstances have given rise to revisions to their emissions estimates. These extraordinary circumstances fall into three broad categories:

a) Emission source categories are identified that were not accounted for at the time when the emission reduction commitments were set; or

b) For a particular source, the emission factors used to estimate emissions for the year in which emissions reduction commitments are to be attained are significantly different to those used when the emission reduction commitments were set; or

c) The methodologies used for determining emissions from specific source categories have undergone significant changes between the time when emission reduction commitments were set and the year they are to be attained.

10. Any Party submitting an application for an adjustment to its inventory is required to notify the Convention Secretariat through the Executive Secretary by 15 February at the latest. The supporting information detailed in Decision 2012/12 must be provided (either as part of the Informative Inventory Report, or in a separate report) by 15 March of the same year.

11. As mandated by Decision 2012/12 as amended by the Decision 2014/1 of the Executive Body of the CLRTAP, applications for adjustments that are submitted by Parties are subject to an expert review[5]. Technical coordination and support to the review is provided by EMEP's Centre on Emission Inventories and Projections (CEIP). The members of the review team are selected from the available review experts[6] that Parties have nominated to the CEIP roster of experts.

12. The expert review team (ERT) undertakes a detailed technical review of the adjustment application in cooperation with the EMEP technical bodies and makes a recommendation to the EMEP Steering Body on the acceptance or rejection of the application. The EMEP Steering Body then takes its decision on any adjustment application based on the outcome of the technical assessment completed by ERT.

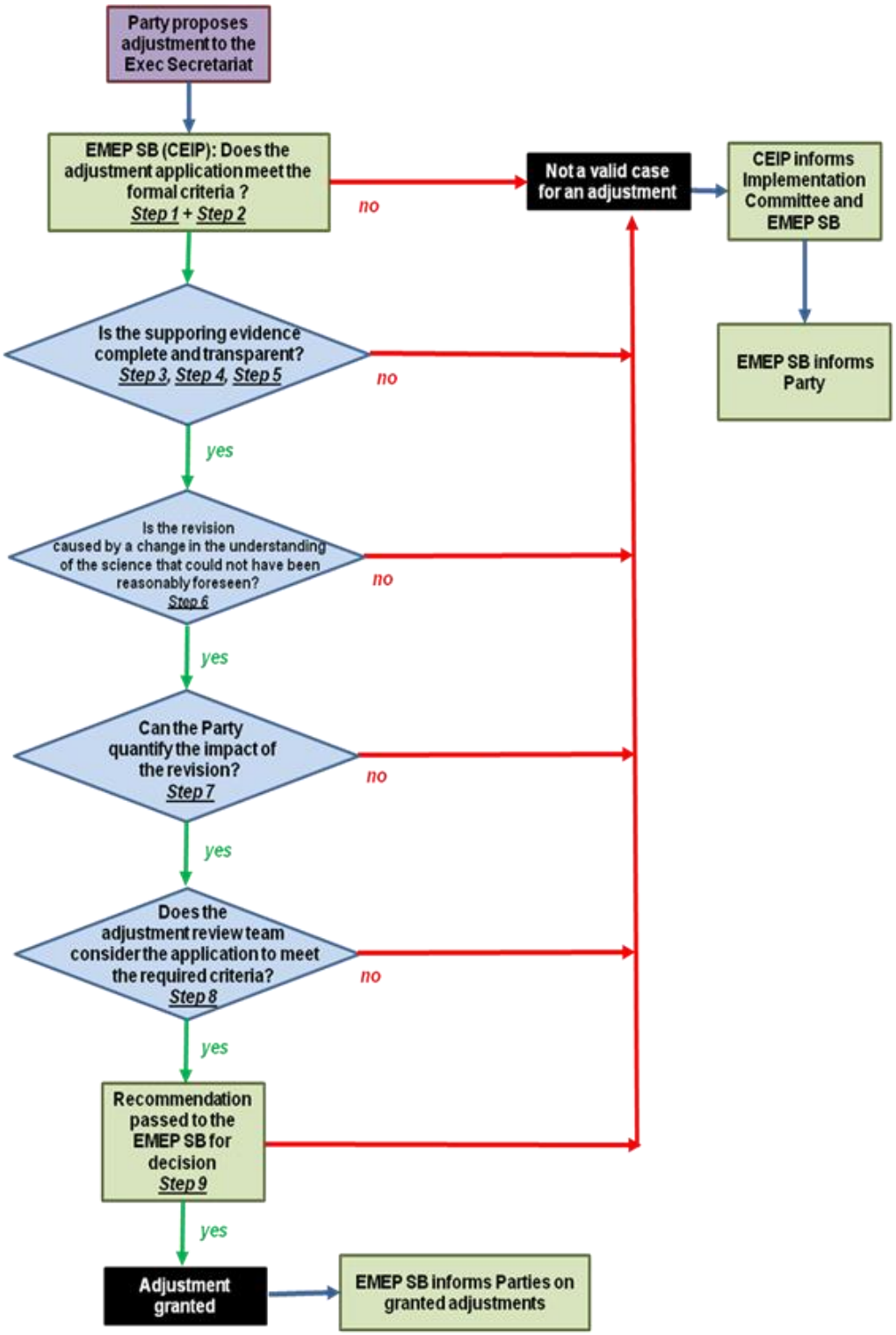
13. The flow diagram below outlines the different stages of the technical review. The following sections of this report are structured in the same way, and describe in detail the findings of the ERT at each of the decision gates in the process.

[4] Throughout this report the term "emission reduction commitments" is used. However, the term "emission ceilings" is equally applicable.

[5] The EMEP Steering Body, in conjunction with other appropriate technical bodies under EMEP, shall review the supporting documentation and assess whether the adjustment is consistent with the circumstances described in paragraph 6 of EB decision 2012/3 and the further guidance in EB decision 2012/12 as amended by EB decision 2014/1 and Technical guidance document ECE/AB.Air/130 ..

[6] http://www.ceip.at/fileadmin/inhalte/emep/pdf/2015/0_Roster_2015.pdf

Figure 1.010: Flow Diagram/Decision Tree for the Review of Adjustment Applications



1 Review of Submitted Adjustments

1.1 Assessment of Formal Criteria

14. Finland notified the Convention Secretariat through the Executive Secretary of its intention to apply for an adjustment on 20/02/2015 and thus after the legal deadline of 15 February. All supporting information requested by Decision 2012/12 amended by Decision 2014/1 was provided as part of the Informative Inventory Report before the legal deadline of the 15 March of the same year that it is being submitted for review by the EMEP Steering Body(Decision 2012/12, annex, para 1). Additional documentation was provided during the review in response to requests from the CEIP and ERT. Section 4 lists the documentation provided by the Party.

15. Finland submitted an application for emissions adjustments to NH_3 for 2010-2013 for the following sectors:

a) NH_3 Stationary combustion 1A2gviii, 1A4ai, 1A4bi, 1A4ci

b) NH_3 Road transport 1A3bi-iv

c) NH_3 Manure management 3B1a, 3B1b, 3B2, 3B3, 3B4d, 3B4e, 3B4gi-iv and 3B4h (henceforth referred as 3B).

16. Finland does not comply with its emission reduction commitments listed in Annex II of the Gothenburg Protocol (paragraph 1 of Decision 2012/3).

17. Finland provided information on the impact of the adjustment to its emission inventory, and the extent to which it would reduce the current exceedance and possibly bring the Party in compliance with emission reduction commitments.

18. Finland did include information on when it will meet its emission ceiling for NH_3 in the supporting documentation.

1.2 Stationary Combustion 1A2gviii, 1A4ai, 1A4bi, 1A4ci (NH_3)

1.2.1 Assessment of Consistency with Requirements of EB Decision 2012/3 as amended by EB Decision 2014/1

19. Finland initially made an adjustment application based on new sources. However following some discussion with the ERT, elected to amend this to an application based on significant revisions to emission factors (EFs).

20. The adjustment application requires the provision of specific supporting information to demonstrate compliance with specific criteria (Decision 2012/3, para. 6a-c as amended by decision 2014/1, annex, para 3). The ERT reviewed the supporting documentation (see section 4) with regard to these criteria and concluded that NH_3 emission factors used to determine emission levels for the source categories 1A2gviii, 1A4ai, 1A4bi and 1A4ci for the year in which emissions reduction commitments are to be attained are significantly different than the emission factors applied to these categories when emission reduction commitments were set.

21. The biomass NH_3 EFs used for calculation of the 2015 submission are significantly higher than those which were available in the Second Edition of the EMEP/CORINAR Emissions Inventory Guidebook 1999. However, NH_3 EFs used for coal are lower than those in the second edition of the EMEP/CORINAR Emissions Inventory Guidebook 1999.

22. The ERT therefore concludes that the provided supporting evidence does comply with the criteria presented in Decision 2012/3, and that the circumstances on which the adjustment is based could not have been reasonably foreseen by Finland when the emission ceilings were established for 2010.

1.2.2 Assessment of the Quantification of the Impact of the Revision

23. The adjustment application process requires that the Party submit a quantification of the impact of the adjustment for which an application has been submitted. Table 1 provides an overview of the NH_3 adjustment applications of Finland in Stationary combustion. The Adjustments for categories 1A2gviii, 1A4ci and 1A4ai are positive because the selected EFs for coal are lower than those in the Second Edition of the EMEP/CORINAR Emissions Inventory Guidebook 1999.

Table 1: Finland's NH_3 Adjustment Applications for the Stationary Combustion, 2010-2013

Reference number	Pollutant	NFR14	unit	2010	2011	2012	2013
11a-11b	NH3	1A2gviii	kt	0.015	0.014	0.017	0.015
12a-12b	NH3	1A4ai	kt	0.023	0.022	0.026	0.024
13a-13af	NH3	1A4bi	kt	-0.610	-0.485	-0.594	-0.542
14a-14c	NH3	1A4ci	kt	0.042	0.036	0.044	0.041
	NH3	**Total**	**kt**	**-0.531**	**-0.413**	**-0.507**	**-0.462**

1.3 Road Transport 1A3bi-iv (NH_3)

1.3.1 Assessment of Consistency with Requirements of EB Decision 2012/3 as amended by EB Decision 2014/1

24. Finland initially made an adjustment application based on new sources. However following some discussion with the ERT, elected to amend this to an application based on significant revisions to the NH_3 road transport emission factors (EFs).

25. The adjustment application requires the provision of specific supporting information to demonstrate compliance with specific criteria (Decision 2012/3, para. 6a-c as amended by decision 2014/1, annex, para 3). The ERT reviewed the supporting documentation (see section 4) with regard to these criteria and concluded that emission factors used to determine emission levels for the road transport source categories 1A3bi-iv for the year in which emissions reduction commitments are to be attained are significantly different than the emission factors applied to these categories when emission reduction commitments were set.

26. Finland provided information to support its application for an adjustment, which was based on NH_3 emission factors for the transport sector being significantly different. This was on the basis that the NH_3 emission factors in the 1999 EMEP/EEA Guidebook are significantly different to that provided in the 2013 EMEP / EEA Guidebook.

27. Finland did not include NH_3 emissions from the transport sector in their inventory until their 2005 submission. However, for the basis of determining whether the emission factor has significantly changed, a comparison of the 1999 and 2013 EMEP/EEA Guidebooks has been undertaken.

28. The changes in EFs highlighted in the adjustment application could not have been foreseen at the time of setting 2010 emission ceilings, and result from NH_3 emissions being higher from vehicles fitted with catalysts than originally accounted for.

29. The ERT therefore concludes that the provided supporting evidence does comply with the criteria presented in Decision 2012/3, and that the circumstances on which the adjustment is based could not have been reasonably foreseen by the Party when the emission ceilings were established for 2010.

30. The supporting information provided by the Party on the revisions made to emission factors was considered to be complete. A spreadsheet outlining the NH_3 emission factors contained in the 1999 and 2013 versions of the Emissions Inventory Guidebook and the emission factors used in the Finland emissions inventory was provided.

1.3.2 Assessment of the Quantification of the Impact of the Revision

31. The adjustment application process requires that the Party submit a quantification of the impact of the adjustment for which an application has been submitted. Table 2 provides an overview of the NH_3 adjustment applications of Finland in the Road transport sector.

Table 2: Finland's NH_3 Adjustment Applications for Road Transport, 2010-2013

Reference number	Pollutant	NFR14	unit	2010	2011	2012	2013
FI/2014/1a	NH3	1A3bi-iv	kt	-1.52	-1.44	-1.34	-1.26

1.4 Manure Management 3B (NH_3)

1.4.1 Assessment of Consistency with Requirements EB Decision 2012/3 as amended by EB Decision 2014/1

32. The Party made an application based on revised EFs for Manure management (3B1a, 3B1b, 3B2, 3B3, 3B4d, 3B4e, 3B4gi-iv and 3B4h - referred to as "3B").

33. The adjustment application requires the provision of specific supporting information to demonstrate compliance with specific criteria (Decision 2012/3, para. 6a-c as amended by decision 2014/1, annex, para 3). The ERT reviewed the supporting documentation (see section 4) with regard to these criteria.

34. The ERT noted that the basis of the application was that N excretion from livestock had increased since the ceilings were set in 1999. However the ERT consider N excretion to be activity data, and not a component of an EF. In addition, the ERT considered that applying year-specific N excretion values (rather than a fixed value) did not represent a change in methodology. The ERT recognized that it was good practice to revise input data when productivity and farming practices changed, but considered this particular revision to constitute routine emissions inventory development.

35. Consequently the ERT concluded that the application for an NH_3 adjustment from Manure management 3B did not comply with the criteria presented in Decision 2012/3. In particular, the ERT noted that the application was not based on one of the three circumstances listed in paragraph 6 of decision 2012/3, as amended by decision 2014/1.

1.4.2 Assessment of the Quantification of the Impact of the Revision

36. The adjustment application process requires that the Party submit a quantification of the impact of the adjustment for which an application has been submitted. Table 3 provides an overview of the NH_3 adjustment applications of Finland from Manure management.

Table 3: Finland's NH_3 Adjustment Applications for Manure Management, 2010 - 2013

Reference number	Pollutant	NFR14	unit	2010	2011	2012	2013
FI/2015/1	NH_3	3B1a	kt	-1.149	-1.194	-1.260	-1.271
FI/2015/2a-2d	NH_3	3B1b	kt	-3.389	-3.274	-3.093	-3.116
FI/2015/3	NH_3	3B2	kt	0.259	0.261	0.257	0.268
FI/2015/ 4a-4d	NH_3	3B3	kt	-0.111	-0.068	-0.108	-0.169
FI/2015/5	NH_3	3B4d	kt	0.010	0.009	0.009	0.009
FI/2015/6a-6b	NH_3	3B4e	kt	0.261	0.253	0.236	0.237
FI/2015/7a-7b	NH_3	3B4gi	kt	-0.281	-0.259	-0.254	-0.273
FI/2015/8a-8b	NH_3	3B4gii	kt	-0.710	-0.819	-0.894	-1.012
FI/2015/9	NH_3	3B4giii	kt	-0.161	-0.171	-0.163	-0.152
FI/2015/10a-10b	NH_3	3B4giv	kt	-0.307	-0.284	-0.294	-0.326
FI/2015/11a-11c	NH_3	3B4h	kt	1.119	1.157	0.987	1.075
	NH_3	**3B TOTAL**	**kt**	**-4.459**	**-4.387**	**-4.578**	**-4.730**

37. Finland did not inform the ERT when the emission ceilings would be reached. However, Finland noted that it continued implementing measures to abate ammonia emissions and would further develop the inventory to timely reflect impacts of the measures on the emission levels.

2 Conclusions and Recommendations

38. The ERT has undertaken a full and thorough assessment of the application for adjustments of NH_3 emissions inventory that was submitted by Finland for the following source sectors:

a. Stationary combustion- 1A2gviii, 1A4ai, 1A4bi, 1A4ci
b. Road transport - 1A3bi-iv
c. Manure management - 3B.

39. The review of the submitted application followed the guidance provided in the Annex to Decision 2012/12 of the Executive Body of the CLRTAP as amended by Technical Guidance ECE/EB.AIR/130. The findings of the ERT are described in detail in Section 2 of this report.

40. Table 4 below provides a summary of the adjustment applications received from Finland, and the subsequent recommendations made by the ERT to the EMEP SB.

Table 4: Recommendations from the ERT to the EMEP SB, Finland 2015

Country	Sector	NFRs	Pollutant	Years	ERT Recommendation
Finland	Stationary Combustion	1A2gviii, 1A4ai, 1A4bi, 1A4ci	NH_3	2010- 2013	Accept
	Road Transport	1A3bi-iv	NH_3	2010 – 2013	Accept
	Manure Management	3B	NH_3	2010 - 2013	Reject

41. **Stationary combustion (1A2gviii, 1A4ai, 1A4bi, 1A4ci, 1A2gviii) NH_3:** Finland provided information to support their application for an adjustment. During the review, the ERT requested more detailed information from Finland, which they were able to provide, and this is detailed in Table 6. The ERT therefore recommends that the EMEP Steering Body **ACCEPT** the adjustments submitted for these sectors.

42. **Road transport (1A3bi-iv) NH_3**: Finland provided information to support their application for an adjustment. During the review, the ERT requested more detailed information from Finland, which they were able to provide, and this is detailed in Table 6. The ERT therefore recommends that the EMEP Steering Body **ACCEPT** the adjustments submitted for these sectors

43. **Manure management (3B) NH_3:** Finland provided information that transparently presented the quantification of an adjustment for NH_3 Manure management 3B. However, the ERT concluded that the application does not meet the requirements laid out in Decision 2012/12 of the Executive Body of the CLRTAP, and in particular, that the application was not based on one of the three circumstances listed in paragraph 6 of Decision 2012/3, as amended by Decision 2014/1. The ERT therefore recommends that the EMEP Steering Body **REJECT** the adjustment submitted for NH_3 Manure Management 3B. Finland did not provide information on when it will meet its emission ceiling for NH_3 in the supporting documentation. However, Finland noted that it continued implementing measures to abate ammonia emissions and would further develop the inventory to timely reflect the impacts of the measures on the emission levels.

3 Information Provided by the Party

44. Table 5 lists the information provided by the Party in its adjustment application. The information provided by Party can be downloaded from the CEIP website[7].

Table 5: Information Provided by the Finland

Filename	Short description of content
Appendix 3 to FI IIR 2015 DOCUMENTATION ADJUSTMENT APPLICATION 13March2015.docx	Special Appendix to IIR 2015. Includes documentation of adjustments.
FI_IIR2015_22_May2015_revised_Part_1.pdf	IIR 2015. Revised version 22nd May.
FI_IIR2015_13March2015_Part2.pdf	IIR 2015 Annexes. Version 13th March
FI_NotificationTemplate__CLRTAP_EMEP_emission_inventory_status_report_2015_20022014.docx	CLRTAP submission 2015 notification template.
FI_YM12_44_2014.pdf	Official letter from Ministry of Environment to UNECE about adjustment application, 12th Feb 2015.

45. The ERT found it necessary to ask the Party for further information. The information provided is described in Table 6 below.

Table 6: Additional Information Provided by Finland

Filename	Short description of content
Documentation Transport 24 June 2015.xls	Road transport NH3 emission factors provided in the 1999 EMEP/EEA Guidebook and those used in the 2014 Finland emissions inventory and accompanying calculations to assess the difference in emission estimates.
Documentation Small Combustion 23June2015.xlsx	Detailed calculations of NH3 emissions for biomass and coal with EFs from GB 1999 and EFs used for the 2015 submission.

[7] http://www.ceip.at/ms/ceip_home1/ceip_home/adjustments_gp/

4 References

Decision 2012/3 (ECE/EB.AIR/111/Add.1): Adjustments under the Gothenburg Protocol to emission reduction commitments or to inventories for the purposes of comparing total national emissions with them

Decision 2012/12 (ECE/EB.AIR/113/Add.1): Guidance for adjustments under the 1999 Protocol to Abate Acidification, Eutrophication and Ground-level Ozone to emission reduction commitments or to inventories for the purposes of comparing total national emissions with them

Decision 2014/1 (ECE/EB.Air/127/Add.1) Improving the guidance for adjustments under the 1999 Protocol to Abate Acidification, Eutrophication and Ground-level Ozone to emission reduction commitments or to inventories for the purposes of comparing total national emissions with them

Data submitted by Parties applying for an adjustment:
http://www.ceip.at/ms/ceip_home1/ceip_home/adjustments_gp/

EMEP/EEA Air Pollutant Emission Inventory Guidebook 2013
http://www.eea.europa.eu/publications/emep-eea-guidebook-2013

EMEP/CORINAIR Air Pollutant Emission Inventory Guidebook 1999, 2nd edition
http://www.eea.europa.eu//publications/EMEPCORINAIR

2014 Reporting Guidelines (ECE/EB.AIR/125) for Estimating and Reporting Emission Data under CLRTAP
http://www.ceip.at/ms/ceip_home1/ceip_home/reporting_instructions/

ECE/EB.AIR/130: Technical Guidance for Parties Making Adjustment Applications and for the Expert Review of Adjustment Applications, 14 April 2015

The 1999 Gothenburg Protocol to Abate Acidification, Eutrophication and Ground-level Ozone
http://www.unece.org/env/lrtap/multi_h1.htm

12 MEMO ITEMS

Changes in chapter	
Update of text	March 2020 KS
Change in methodology	
Other (e.g. language. layout)	

Overall description and methodologies

1 A 3 ai(ii) International aviation cruise

See IIR Part 2 Energy under Aviation.

1 A 3 aii(ii) Domestic aviation cruise

See IIR Part 2 Energy under Aviation.

1 A 3 dii(i) International maritime navigation

See IIR Part 2 Energy under Navigation.

1 A 5 c Multilaterial operations

Included under 1A5 (IE)

1 A 3 Transport (fuel used)

.Not applicable (NA). The inventory is based on fuels sold.

6 B Other not included in national total of the entire territory

Not occurring (NO) in Finland.

11 A Volcanoes

There are no volcanoes in Finland.

11 B Forest fires

Not estimated (NE).

11 C Other natural emissions

Not applicable (NA).

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