

# Final Review Report

## 2017 annual review of national greenhouse gas inventory data

pursuant to Article 19(2) of Regulation (EU) No 525/2013

### Sweden

30 June 2017

European Environment Agency



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## Conclusions from the 2017 annual ESD review

This Final Review Report presents the findings from the 2017 annual review of the GHG emission inventory of Sweden, pursuant to Article 19(2) of Regulation (EU) No 525/2013, with a view to monitoring Sweden's achievement of its greenhouse gas emission reduction or limitation target pursuant to Article 3 of Decision No 406/2009/EC (the 'Effort Sharing Decision', ESD) in 2015.

The reviewers carried out checks to verify the transparency, accuracy, consistency, comparability and completeness of the national greenhouse gas inventory for the year 2015 submitted in 2017 by Sweden pursuant to Article 7(3) of Regulation (EU) No 525/2013.

The review consisted in two steps:

1. The EU inventory team (European Environment Agency (EEA), European Topic Centre on Air Pollution and Climate Change Mitigation (ETC/ACM), Joint Research Centre (JRC) and Eurostat) performed the initial checks under Step 1.
2. A Technical Expert Review Team (TERT) performed Step 2 of the 2017 annual ESD review.

More information on the Effort Sharing Decision and the procedures for the 2017 annual ESD review is presented in the annexes to this review report.

### Step 1 conclusions

The EU inventory team could not fully perform the Step 1 checks because Sweden provided the inventory on 15 March 2017, which is later than the date set out in Annex XVI of the Commission Implementing Regulation (EU) 749/2014. Therefore Sweden was subject to the second step of the 2017 annual ESD review.

### Step 2 conclusions

1. The reviewers raised 32 issues with Sweden during the first and the second step of the review 2017 (see Table 1). The TERT provided recommendations for five of these issues. Other issues raised during the annual review were clarified and are considered resolved.
2. The TERT identified cases where inventory data were prepared in a manner which is inconsistent with UNFCCC guidance documentation or Union rules. In particular, the TERT identified an underestimate or overestimate exceeding the threshold of significance pursuant to Article 31 of Commission Implementing Regulation (EU) No 749/2014.
3. The TERT deemed necessary one technical correction in the meaning of Article 19(3)(c) of Regulation (EU) No 525/2013 and calculated such technical correction in consultation with Sweden. Table 2 below summarises the technical correction and further information is provided at the end of this review report. In its response to the draft technical correction, Sweden stated that it agreed with the technical correction.
4. The TERT identified non-binding recommendations in order to improve the national inventory data of Sweden (see Table 4).
5. The TERT considers that it received a response from Sweden that was sufficient in order to undertake the annual review appropriately.

**Table 1: Issues raised with Sweden during the first and the second step**

	Issues raised	Recommendations	Revised estimates <sup>1</sup>	Technical corrections <sup>2</sup>
<b>Total</b>	<b>32</b>	<b>5</b>	<b>-</b>	<b>1</b>
Energy	12	3	-	-
IPPU	6	1	-	-
Agriculture	11	1	-	1
Waste	2	-	-	-
Cross-cutting	1	-	-	-

<sup>1</sup> Revised estimates: changes in inventory estimates triggered by the review and provided by the Member State.

<sup>2</sup> Technical corrections: changes in inventory estimates triggered by the review and provided by the TERT.

## National totals

**Table 2: National totals**

Data / Source category	Reference	Emission estimates (kt CO <sub>2</sub> equivalent) <sup>1</sup>
		2015
Total greenhouse gas emissions, including indirect CO <sub>2</sub> , without land use, land-use change and forestry as reported by Sweden pursuant to Article 7(3) of Regulation (EU) No 525/2013.	SWE_2017_14032017	53 690.357
<b>Difference between original estimate and technical correction deemed necessary by the TERT<sup>2</sup></b>		
3.D.1 Direct N <sub>2</sub> O emissions from managed soils, N <sub>2</sub> O	SE-3D1-2017-0005	- 54.062
Total greenhouse gas emissions including technical correction deemed necessary by the TERT		53 636.295
CO <sub>2</sub> emissions from 1.A.3.a Domestic aviation	SWE_2017_14032017	502.888
NF <sub>3</sub> emissions	SWE_2017_14032017	-

<sup>1</sup> The tables presented in this report show numbers rounded to three decimal places, although most numbers are available with greater precision. For all calculations (in particular of total GHG emissions and total ESD emissions), all available decimal places were used. Therefore, the totals shown may slightly differ from calculation results where only three decimals would be taken into account.

<sup>2</sup> A positive difference indicates an increase compared to reported emissions. A negative difference indicates a decrease compared to reported emissions.

## Greenhouse gas emissions covered by Decision 406/2009/EC

**Table 3: Greenhouse gas emissions covered by Decision 406/2009/EC**

Data	Reference	Emissions (kt CO <sub>2</sub> equivalent) <sup>1</sup>
		2015
Total greenhouse gas emissions including technical correction deemed necessary by the TERT	<i>See Table 2 above</i>	53 636.295
Total verified emissions from stationary installations under Directive 2003/87/EC	Extracted by the European Commission from EUTL on 8 March 2017 (as agreed at the Working Group I of the Climate Change Committee on 18 May 2015) <sup>2</sup>	19 236.229
CO <sub>2</sub> emissions from 1.A.3.a Domestic aviation	<i>See Table 2 above</i>	502.888
NF <sub>3</sub> emissions	<i>See Table 2 above</i>	-
<b>Total ESD emissions</b>		<b>33 897.178</b>

<sup>1</sup> The tables presented in this report show numbers rounded to three decimal places, although most numbers are available with greater precision. For all calculations (in particular of total GHG emissions and total ESD emissions), all available decimal places were used. Therefore, the totals shown may slightly differ from calculation results where only three decimals would be taken into account.

<sup>2</sup> The emissions of ETS stationary installations were independently verified and recorded in the EU Transaction Log (EUTL). These emissions do not derive from the national greenhouse gas emission inventory data and therefore the TERT was not tasked to review them.

## Statement from Sweden on the conclusions presented by the TERT

Sweden agrees with the aggregated GHG emission inventory estimates presented in Table 2.

## Technical corrections deemed necessary by the TERT

1	ESD Review Tool ID:	SE-3D1-2017-0005
	ESD Review Tool URL:	<a href="https://emrt.eea.europa.eu/2017/SE-3D1-2017-0005">https://emrt.eea.europa.eu/2017/SE-3D1-2017-0005</a>
	Member State:	Sweden
	Sector:	3.D Agricultural soils
	Gases:	N <sub>2</sub> O
	Fuel	
	Completed by (SE):	Steen Gyldenkaerne
	Reviewed by (Counterpart):	Katalin Lovas
	Reviewed by (LR):	Suvi Monni
	The underlying problem:	The estimated amount of N from animal manure entering category 3.D.a.2.a should be the total nitrogen excretion (N <sub>ex</sub> ) minus N losses during manure storage. In the estimation of nitrogen in animal manure applied to soils in 3.D.a.2.a, Sweden has estimated the amount of nitrogen as nitrogen excretion minus loss of ammonia during storage.
The rationale for the corrected estimate:	During storage, there may be losses of NO <sub>x</sub> and N <sub>2</sub> which have not been taken into account by Sweden. The missing NO <sub>x</sub> emission creates an underestimation under 3.B and the missing loss of N <sub>2</sub> creates and overestimation of the N <sub>2</sub> O emission under 3.D.	
Summarise the methodology used:	The TERT has estimated indirect emissions of N <sub>2</sub> O from the missing NO <sub>x</sub> emission with the EMEP/EEA Guidebook, 2016 ( <a href="https://www.eea.europa.eu/publications/emep-eea-guidebook-2016">https://www.eea.europa.eu/publications/emep-eea-guidebook-2016</a> ). N <sub>2</sub> losses during storage have also been estimated with the EMEP/EEA Guidebook. Losses taking place during storage of the manure have been subtracted from the total excreted N and taken into account in the N transferred to 3.D.a.2.a. Using the revised amount of N transferred to 3.D.a.2.a, direct and indirect N <sub>2</sub> O from animal manure applied to soils have been calculated. For calculating the indirect emissions in 3.D the reported loss fractions for volatilized N and FracLEACH-(H) as reported by Sweden have been used.	
References to other workbooks:		

2	<b>Details of the corrected estimate</b>								
			Original estimate (Gg CO <sub>2</sub> eq)						Notes
		Year	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	HFCs	PFCs	SF <sub>6</sub>	
	SE-3D1-2017-0005-OE	2015			3 122.930				
	<b>Was a Revised Estimate received from the MS?</b>		<b>no</b>						
			Revised Estimate received from MS (Gg CO <sub>2</sub> eq)						Notes
		Year	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	HFCs	PFCs	SF <sub>6</sub>	
	SE-3D1-2017-0005-RE	2015							
	<b>Was the Revised Estimate accepted by the TERT?</b>		<b>-</b>						
			Technical Correction calculated by TERT (Gg CO <sub>2</sub> e)						Notes
	Year	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	HFCs	PFCs	SF <sub>6</sub>		
SE-3D1-2017-0005-TC	2015			3 068.867					
<b>Was the Technical Correction accepted by the MS?</b>		<b>yes</b>							



## Recommendations from the TERT, considering revised estimates and technical corrections deemed necessary by the TERT

**Table 4: Recommendations from the TERT**

EMRT - ID	Key category	Category, gas, year	Conclusion step 2 note	Revised estimate	Technical correction
SE-1A1-2017-0001	Yes	1.A.1 Energy industries, CO <sub>2</sub> , 2015	For category 1.A.1.b petroleum refining for 2015, the TERT noted from the confidential data provided by Sweden during the review, that CO <sub>2</sub> IEF for gaseous fuels is low and outside the range in the 2006 IPCC Guidelines. In response to a question raised during the review, Sweden explained that for one facility using LNG, CO <sub>2</sub> emissions are based on verified EU ETS data, while AD and CO <sub>2</sub> emission allocations between stationary combustion and fugitive emissions are based on other information sources, causing the low IEF. The TERT notes that this issue does not relate to an over or underestimate and recommends that Sweden clarify in its next submission the data reported by the site such as the calorific values used (NCV vs. GCV) and the split of LNG consumption and CO <sub>2</sub> emissions between stationary combustion and fugitive emissions and revise its reporting, if appropriate.	No	No
SE-1AB-2017-0001	No	1.AB Reference approach, CO <sub>2</sub> , 1990-2015	For the reference approach and all fuels, the TERT noted that CRF Table 1.A(c) shows very high differences between energy consumptions and CO <sub>2</sub> emissions from the Reference Approach (RA) and the Sectoral Approach (SA). Recommendations on closing the gaps between both approaches were already made several times during ESD review (SE-1AB-2016-0001) and UNFCCC review (UNFCCC in-country review of submission 2013). With a focus on natural gas, the TERT also noted in Eurostat Energy balance, for gaseous fuels in 2015, that statistical differences represent 18.8 % of the Gross Inland consumption, this one being lower than the energy consumption reported under 1.A in the Energy balance. The TERT concluded that it is not possible to compare the RA and the SA. The TERT also noted that the SA based on Eurostat data and on the CRF are consistent (1.37 % difference for gaseous fuels) and therefore there is more confidence in the Sectoral Approach. In response to a question raised during the review, Sweden explained that in the Swedish GHG reporting program, there is an on-going development project with the goal to harmonize the national statistics including the Energy Balances (major source to Eurostat) and the GHG inventories (which uses other sources). Based on these elements and the previous recommendations made, the TERT strongly recommends that Sweden reconcile the different data sources as soon as possible, to close the gaps between the RA and the SA and clearly identify the progress made in the next NIR submission.	No	No
SE-1B2-2017-0001	Yes	1.B.2 Fugitive emissions from oil and natural gas and other emissions from	For category 1.B.2.a.1 Exploration for 2015, the TERT noted, from the confidential data provided by Sweden during the review, a very low CO <sub>2</sub> IEF compared to the previous years. This sector corresponds to the production of H <sub>2</sub> in the Swedish inventory. The NIR states that LNG and butane are used as feedstock in this process. In response to a question raised during the review, Sweden explained that this decrease in CO <sub>2</sub> IEF is due to the feedstock mix evolution. In the previous years, PSA (pressure	No	No

		energy production, CO <sub>2</sub> , 2015	swing adsorption) gas with very low net calorific value was consumed but in 2015, one facility also consumed LNG (with higher net calorific value) which explains the CO <sub>2</sub> IEF decrease. Sweden also mentioned that CO <sub>2</sub> emissions are based on EU ETS reports. The TERT notes that this issue does not relate to an over or underestimate and recommends that Sweden clarify the description of this category in its next NIR, regarding the feedstocks used.		
SE-2F2-2017-0001	No	2.F.2 Foam blowing agents, HFCs, 2015	For HFC emissions from foam blowing agents (2.F.2), all years, the TERT noted that in response to a question raised during the review, Sweden explained that it has not been able to establish statistical information sources to make estimations on imported products containing foam, and that it will consider investigating this emission source in the ongoing national development project on f-gases. The TERT noted that the issue is below the threshold of significance for a technical correction. The TERT recommends that Sweden investigate this emission source, identify possible activity data concerning the amount of HFCs included in imported foams and include the relevant emissions in the next submission.	No	No
SE-3D1-2017-0005	Yes	3.D.1 Direct N <sub>2</sub> O emissions from managed soils, N <sub>2</sub> O, 1990-2015	<p>For N<sub>2</sub>O from categories 3.B Manure Management and 3.D Direct and Indirect N<sub>2</sub>O Emissions from Agricultural Soils, for all years, the TERT noted that the amount of N in manure management systems (MMS) (reported in CRF table 3.B(b)) minus losses of N volatilized as NH<sub>3</sub> (CRF Table 3.B(b)) is equal to what is reported as nitrogen in Animal Manure Applied to Soils (category 3.D.a.2.a, CRF Table 3.D). The TERT noted that this indicates that the current methodology for estimating indirect N<sub>2</sub>O from manure management only takes into account ammonia losses and not NO<sub>x</sub> losses. In response to a question raised during the review, Sweden confirmed that this is the case. As a consequence, Sweden is underestimating the indirect N<sub>2</sub>O emission from manure management.</p> <p>In addition, omission of NO<sub>x</sub> losses from Manure Management leads to an overestimation of the amount of N in category 3.D.a.2.a, Animal Manure Applied to Soils. The TERT also noted that Sweden is not taking into account that during storage, manure may lose nitrogen as N<sub>2</sub> (EMEP/CORINAIR Atmospheric Inventory Guidebook, Chapter 1009 (European Environmental Agency, 2002) cited by the 2006 IPCC Guidelines, page 10.61). This omission of the N<sub>2</sub> losses in manure management leads to a further overestimation of the amount of N in animal manure applied to soils, and thus an overestimation of direct and indirect N<sub>2</sub>O emissions from agricultural soils.</p> <p>Furthermore, Sweden explained that it did not include nitrogen from bedding material in the estimates for manure management, but also explained that the amount of crop residues used as bedding material have not been subtracted from the amount of N reported under Crop Residues (3.D.a.4). The TERT concluded that therefore there are no omitted N<sub>2</sub>O emission from straw used as bedding material. During the review, Sweden explained that it plans to either clarify the current approach in the NIR or investigate whether the bedding material could be included as input to Manure Management category.</p> <p>The TERT decided to calculate a technical correction for the year 2015, taking into account both underestimation of indirect N<sub>2</sub>O from manure management and overestimation of direct and indirect N<sub>2</sub>O emissions from animal manure applied to soils. Sweden accepted the technical correction (presented above). The estimates demonstrate that the issue is above the threshold of significance. The TERT recommends that Sweden include a revised estimate in its next submission.</p>	No	Yes

## Annex I: Legal background and procedures of the 2017 annual ESD review

The Effort Sharing Decision No 406/2009/EC (ESD) sets national emission limits for greenhouse gas (GHG) emissions in the sectors outside the EU's Emission Trading System (ETS) for the period 2013-2020. The ESD and the Monitoring Mechanism Regulation (EU) 525/2013 (MMR) lay down annual reporting obligations, compliance checks and a Union review process to ensure that the compliance with annual GHG emission limits is assessed in a credible, consistent, transparent and timely manner. The requirements for the Union review of the national inventory data submitted by Member States are set out in Article 19 of the MMR.

The details concerning the review process, such as the timing and steps of conducting the annual and comprehensive reviews are set out in Chapter III and Annex XVI of the Commission Implementing regulations (EU) No 749/2014.

The objectives of the 2017 annual ESD review of Member States' GHG emission inventories are:

- a) to support the European Commission by ensuring it has accurate, reliable and verified information on annual GHG emissions for determining compliance with ESD targets for the year 2015 in a credible, consistent, transparent and timely manner, according to Article 19 (2) of the MMR;
- b) to assist Member States in improving the quality of their GHG inventories.

The 2017 annual ESD review of national greenhouse gas (GHG) inventory data was carried out for the compliance year 2015 pursuant to Article 19 of the MMR. The EEA review secretariat (consisting of Melanie Sporer, John van Aardenne and Emma Salisbury) coordinated the 2017 annual ESD review as foreseen in Article 28 of the Commission Implementing Regulation (EU) No 749/2014.

The scope of the 2017 annual ESD review is presented in Table A.1.1. The checks carried out during the 2017 annual ESD review are presented in Annex II.

The review consisted of 2 steps. Step 1 was combined with the 'EU QA/QC procedures' (i.e. initial checks) and was carried out by the EU inventory team (ETC/ACM, JRC, Eurostat). All findings from the initial checks that were relevant for the ESD and that were not resolved within the initial check phase were followed up in the second step of the annual review.

Step 2 of the 2017 annual ESD review was performed by a Technical Expert Review Team (TERT) under service contract 34.0201/2016/743206/SER/CLIMA.C2 of the Directorate General for Climate Action of the European Commission. The TERT consisted of the following experts:

- Lead Reviewers: Anke Herold, Suvi Monni, Klaus Radunsky
- Energy: Julien Vincent, Ralph Harthan, Graham Anderson
- IPPU F-gases: Barbara Gschrey, Domenico Gaudioso
- IPPU excluding F-gases: Daniela Romano, Eva Krtkova
- Agriculture: Steen Gyldenkaerne, Rocio Condor, Chris Dore, Katalin Lovas
- Waste: Hans Oonk, Kaat Jespers, Juraj Farkas
- Quality controller: Justin Goodwin
- Co-ordinator: Bernd Gugele

The lead reviewers and sector review experts did not review emission inventories of Member States where these individuals have themselves contributed to the compilation of that inventory, or presently are or have been any part of the decision-making process related to the compilation of that inventory. Reviewers who are nationals of the Member State whose inventory is concerned, did not take part in the review of that inventory.

Step 2 of the review was performed on the basis of GHG emission data and the national inventory report (NIR) officially reported by Member States by 15 March 2017 under the MMR. Where relevant, the TERT calculated technical corrections for over- or underestimates identified in a mandatory category in the Member States' GHG inventories that exceed the threshold of significance. Technical corrections were calculated for the year 2015.

**Table A.1.1: Scope of the 2017 annual ESD review**

Element	Scope	Further information
Member States	EU geographical coverage of the Member States	
Years	2015	
Gases	CO <sub>2</sub> , CH <sub>4</sub> , N <sub>2</sub> O, HFCs, PFCs, SF <sub>6</sub>	NF <sub>3</sub> is not covered by the ESD
Sectors	All emission source sectors excluding LULUCF	National totals exclude emissions from LULUCF and emissions reported under memo items
Indirect CO <sub>2</sub> emissions	Included in national total	
Inventory Submission	Submissions received by 15 March, 2017	

## Annex II: Checks carried out during the 2017 annual ESD review in line with Art.29 and 32 of the Commission Implementing Regulation (EU) No 749/2014

**As part of the EU's effort to assist Member States in improving the quality of the GHG inventories, the checks to verify the transparency, accuracy, consistency, comparability and completeness of the greenhouse gas inventory included:**

### **First step review checks:**

1. Assessment whether all emission source categories and gases required under Regulation (EU) No 525/2013 are reported;
2. Assessment whether emissions data time series are consistent;
3. Assessment whether implied emission factors across Member States are comparable taking the IPCC default emission factors for different national circumstances into account;
4. Assessment of the use of 'Not Estimated' notation keys where IPCC tier 1 methodologies exist and where the use of the notation key is not justified in accordance with paragraph 37 of the UNFCCC reporting guidelines on annual greenhouse gas inventories as included in Annex I to Decision 24/CP.19;
5. Analysis of recalculations performed for the inventory submission, in particular if the recalculations are based on methodological changes;
6. Comparison of the verified emissions reported under the Union's Emissions Trading System with the greenhouse gas emissions reported pursuant to Article 7 of Regulation (EU) No 525/2013 with a view of identifying areas where the emission data and trends as submitted by the Member State under review deviate considerably from those of other Member States;
7. Comparison of the results of Eurostat's reference approach with the Member States' reference approach;
8. Comparison of the results of Eurostat's sectoral approach with the Member States' sectoral approach;
9. Assessment whether recommendations from earlier Union or UNFCCC reviews, not implemented by the Member State could lead to a technical correction;
10. Assessment whether there are potential overestimations or underestimations relating to a key category in a Member State's inventory.

### **Second step review checks:**

1. Detailed examination of the inventory estimates including methodologies used by the Member State in the preparation of inventories;
2. Detailed analysis of the Member State's implementation of recommendations related to improving inventory estimates as listed in its most recent UNFCCC annual review report made available to that Member State before the submission under review or in the final review report pursuant to Article 35(2) of this Regulation; where recommendations have not been implemented a detailed analysis of the justification provided by the Member State for not implementing them;
3. Detailed assessment of the time series consistency of the greenhouse gas emissions estimates;
4. Detailed assessment whether the recalculations made by a Member State in the given inventory submission as compared to the previous one are transparently reported and made in accordance with the 2006 IPCC Guidelines for National Greenhouse Gas Inventories;
5. Follow-up on the results of the checks referred to in Article 29 of the Commission Implementing Regulation (EU) No 749/2014 and on any additional information submitted by the Member State under review in response to questions from the technical experts review team and other relevant checks.