

Final Review Report

2020 Comprehensive Review of National Greenhouse Gas Inventory Data

pursuant to Article 4(3) of Regulation (EU) No 2018/842 and to
Article 3 of Decision No 406/2009/EC

Spain

30 August 2020



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Conclusions from the 2020 comprehensive review

This Final Review Report presents the findings from the 2020 review of the greenhouse gas (GHG) emission inventory of Spain, pursuant to:

- Article 4(3) of Regulation (EU) No 2018/842 (the 'Effort Sharing Regulation', ESR), for the purpose of setting out Spain's annual emission allocations (AEAs) for the years from 2021 to 2030 in terms of tonnes of CO₂ equivalent, and
- Article 3 of Decision No 406/2009/EC (the 'Effort Sharing Decision', ESD), for the purpose of verifying Spain's GHG emissions and achievement of its GHG emission limitation target in the year 2018

The review was carried out as a comprehensive review in line with Article 19(1) of Regulation (EU) No 525/2013 (the 'Monitoring Mechanism Regulation', MMR). The global warming potentials applied are those from the IPCC Assessment Report 4.

The reviewers carried out checks to verify the transparency, accuracy, consistency, comparability and completeness of the national GHG inventory for the years 2005, 2016, 2017 and 2018 submitted in 2020 by Spain pursuant to Article 7 of the MMR.

The review consisted of two steps. The initial checks in step 1 were performed by the EU inventory team (European Environment Agency (EEA), European Topic Centre on Climate Change Mitigation and Energy (ETC/CME), Joint Research Centre (JRC) and Eurostat). Step 2 was performed by a Technical Expert Review Team (TERT).

More information on the Effort Sharing legislation and the procedures for the 2020 comprehensive review is presented in the annexes of this review report.

Spain did not provide a resubmission to the Commission.

Step 1 and 2 conclusions

1. The reviewers raised 41 issues with Spain during the first and the second step of the 2020 comprehensive ESD review (see Table 1). The TERT provided recommendations for 3 of these issues. Other issues raised during the comprehensive review were clarified and are considered non-issues for the ESD review 2020.
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 a number of under- or over-estimates exceeding the threshold of significance pursuant to Article 31 of Commission Implementing Regulation (EU) No 749/2014.
3. Spain provided 2 revised estimates that were accepted by the TERT. Table 2 and Table 3 below summarise the revised estimates and further information is provided in the respective chapter of this report.
4. The TERT also deemed necessary a technical correction in the meaning of Article 19(3)(c) of Regulation (EU) No 525/2013 and calculated the technical correction taking into account the consultation with Spain on this issue. The technical correction is presented in Table 2 and Table 3 of the present review report and is accompanied by evidence-based justification. In its response to the draft technical correction, Spain stated that it agrees with the technical correction.
5. The TERT identified non-binding recommendations in order to improve the national inventory data of Spain (see Table 6).

6. The TERT considers that it received a response from Spain that was sufficient in order to undertake the comprehensive review appropriately.

Table 1: Overview of issues raised with Spain during the first and the second step

	Issues raised step 1 ¹	Issues raised step 2	Recommendations	Revised estimates ²	Technical corrections ³
Total	26	15	3	2	1
Energy	7	2	-	-	-
IPPU	7	4	1	1	-
Agriculture	4	6	1	-	1
Waste	8	3	1	1	-
Cross-cutting	-	-	-	-	-

¹ Excluding findings related to Land Use, Land Use Change and Forestry (LULUCF) and Kyoto Protocol (KP) LULUCF.

² Revised estimates: changes in inventory estimates triggered by the review, which were provided by the country and accepted by the TERT.

³ Technical corrections: changes in inventory estimates triggered by the review and provided by the TERT.

National totals for the purpose of Article 3 of Decision No 406/2009/EC (ESD)

Table 2: National totals for the purpose of Article 3 of Decision No 406/2009/EC

Emission source category	Reference	Emission estimates (kt CO ₂ equivalent) ¹ 2018
Total greenhouse gas emissions, including indirect CO ₂ , without Land Use, Land Use Change and Forestry, without international aviation, as reported by Spain pursuant to Article 7(4) of Regulation (EU) No 525/2013, taking into account any resubmission to the Commission	ESP_2020_1_06032020	334 255.164
Difference between original estimates and revised estimates provided by Spain and accepted by the TERT²		
2F1 Refrigeration and Air Conditioning, HFCs	ES-2F1-2020-0004	195.787
5D Wastewater Treatment and Discharge, CH ₄	ES-5D-2020-0003	427.139
Difference between original estimates and technical corrections deemed necessary by the TERT²		
3A Enteric Fermentation, CH ₄	ES-3A-2020-0002	-1 444.279
Total greenhouse gas emissions including revised estimates and technical corrections		333 433.811
CO ₂ emissions from 1A3a Domestic Aviation ³	ESP_2020_1_06032020	3 030.149
NF ₃ emissions ³	ESP_2020_1_06032020	-

¹ 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 are taken into account.

² A positive difference indicates an increase compared to reported emissions. A negative difference indicates a decrease compared to reported emissions.

³ Included in the totals. NF₃ was included in the comprehensive review (see Table A-1) for the purpose of the ESR, but has to be deducted for the purpose of ESD.

National totals for the purpose of Article 4(3) of Regulation (EU) No 2018/842 (ESR)

Table 3: National totals for the purpose of Article 4(3) of Regulation (EU) No 2018/842

Emission source category	Reference	Emission estimates (kt CO ₂ equivalent) ¹			
		2005	2016	2017	2018
Total greenhouse gas emissions, including indirect CO ₂ , without Land Use, Land Use Change and Forestry, without international aviation, as reported by Spain pursuant to Article 7(4) of Regulation (EU) No 525/2013, taking into account any resubmission to the Commission	ESP_2020_1_06032020	443 439.521	326 890.379	340 298.289	334 255.164
Difference between original estimates and revised estimates provided by Spain and accepted by the TERT²					
2F1 Refrigeration and Air Conditioning, HFCs	ES-2F1-2020-0004	0	186.694	184.944	195.787
5D Wastewater Treatment and Discharge, CH ₄	ES-5D-2020-0003	615.443	473.683	431.237	427.139
Difference between original estimates and technical corrections deemed necessary by the TERT²					
3A Enteric Fermentation, CH ₄	ES-3A-2020-0002	-1 615.687	-1 340.735	-1 382.943	-1 444.279
Total greenhouse gas emissions including revised estimates and technical corrections		442 439.276	326 210.022	339 531.526	333 433.811
CO ₂ emissions from 1A3a Domestic Aviation ³	ESP_2020_1_06032020	3 997.108	2 675.024	2 804.809	3 030.149

¹ 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 ESR emissions), all available decimal places were used. Therefore, the totals shown may slightly differ from calculation results where only three decimals are taken into account.

² A positive difference indicates an increase compared to reported emissions. A negative difference indicates a decrease compared to reported emissions.

³ Included in the totals.

Statement from Spain on the conclusions presented by the TERT

Spain agrees with the aggregated GHG emission inventory estimates presented in Table 2 and Table 3.

Spain has no additional comments on the draft review report.

Greenhouse gas emissions covered by Decision 406/2009/EC (ESD)

Table 4: Greenhouse gas emissions for the purpose of Article 3 of Decision No 406/2009/EC

Emission source category	Reference	Emission estimates (kt CO ₂ equivalent) ¹ 2018
Total greenhouse gas emissions including any accepted revised estimates provided by Spain and any technical corrections deemed necessary by the TERT	See Table 2 above	333 433.811
Total verified emissions from stationary installations under Directive 2003/87/EC	Extracted by the European Commission from EUTL on 9 March 2020 (as agreed at the Working Group I of the Climate Change Committee on 18 May 2015) ²	127 373.884
CO ₂ emissions from 1A3a Domestic Aviation	See Table 2 above	3 030.149
NF ₃ emissions	See Table 2 above	-
Total ESD emissions		203 029.778

¹ 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 are taken into account.

² 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.

Greenhouse gas emissions covered by Regulation (EU) No 2018/842 (ESR)

Table 5: Greenhouse gas emissions for the purpose of Article 4(3) of Regulation (EU) No 2018/842 (ESR)

Emission source category	Reference	Emission estimates (kt CO ₂ equivalent) ¹			
		2005 ³	2016	2017	2018
Total greenhouse gas emissions including any accepted revised estimates provided by Spain and any technical corrections deemed necessary by the TERT	See Table 3 above	442 439.276	326 210.022	339 531.526	333 433.811
Total verified emissions from stationary installations under Directive 2003/87/EC	Extracted by the European Commission from EUTL on 9 March 2020 (as agreed at the Working Group I of the Climate Change Committee on 18 May 2015) ²	183 627.216	123 556.983	136 316.842	127 373.884
CO ₂ emissions from 1A3a Domestic Aviation	See Table 3 above	3 997.108	2 675.024	2 804.809	3 030.149
Total ESR emissions		-	199 978.015	200 409.875	203 029.778

¹ 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 ESR emissions), all available decimal places were used. Therefore, the totals shown may slightly differ from calculation results where only three decimals are taken into account.

² 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.

³ Due to changes in ETS scope and country coverage between 2005 and 2013, 'Total ESR emissions' cannot be calculated for 2005 by deducting 'Total verified emissions from stationary installations under Directive 2003/87/EC' and 'CO₂ emissions from 1A3a Domestic Aviation' from 'Total GHG emissions including any revised estimates and any technical corrections'.

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

Table 6: Recommendations from TERT (RE = Revised estimate; TC = Technical correction)

EMRT-ID	Key category	Category, gas, year	Recommendation	Revised estimate or technical correction in 2020
ES-2F1-2020-0004	Yes	2F1 Refrigeration and Air Conditioning, HFCs, 2018	For 2F1 Refrigeration and Air Conditioning the TERT noted that disposal emissions were not estimated except in 2F1e category. In response to a question raised during the review, Spain explained that these emissions were assumed to be under the threshold of significance. Spain provided a file explaining how they concluded that disposal emissions were neglected. The TERT identified a low disposal emission factor that is not justified because no precise reference sources are mentioned by the country. Spain provided a revised estimate for the years 2016 to 2018 and stated that it will be included in the next submission. The TERT agreed with the revised estimate provided by Spain. The TERT recommends that Spain include the revised estimate in its next submission and substantiate its assumptions and include references for the data used in the NIR. The TERT also recommends that Spain improve its estimate of the disposal emissions over the whole time series as well as its allocation to the different subcategories (2F1a to 2F1f).	RE

EMRT-ID	Key category	Category, gas, year	Recommendation	Revised estimate or technical correction in 2020
ES-3A-2020-0002	Yes	3A Enteric Fermentation, CH ₄ , 1990-2018	<p>For category 3A Enteric Fermentation, CH₄ for years 2005, 2016, 2017 and 2018 the TERT noted that for dairy cattle there was a large decrease in the methane conversion rate (Y_m) value from 6.42% to 5.65% and for non-dairy cattle the Y_m values used (7.77 % to 7.29%) are above the range presented in the 2006 IPCC Guidelines (default Y_m which is 6.5% (+/- 1.0%)). In response to a question raised during the review, Spain explained that they use a peer-reviewed model based on Dry Matter Intake (DMI), Neutral Detergent Fibre (NDF) and Digestibility (DE) of the feed by Jaurena et al. (2015). The TERT has tried to analyse the model, however Jaurena et al. (2015) has elaborated a model based on "published literature" but the paper does not contain references to the original data. Therefore, it is not possible to verify the background data used in the model. Jaurena et al. (2015) refers to: "hence the original database included 179 inputs of which 39 corresponded to treatments with additives used to mitigate methane emissions." In Europe, the use of e.g. ionophores (a CH₄ suppressor) is not allowed. As it is not possible for the TERT to verify that the model does not include data from CH₄ suppressing compounds the TERT cannot - based on the current knowledge - accept the use of the model by Jaurena et al. (2015) for the estimation of CH₄ emissions from enteric fermentation in Spain. The model by Jaurena et al. (2015) also includes NDF as a determining factor. Large amounts of fibre in the feed limit CH₄ emissions from enteric fermentation as the fibre does not degrade easily. In the Spanish approach to estimate feeding plans for cattle published feed analysis from FEDNA (http://www.fundacionfedna.org/tablas-fedna-composicion-alimentos-valor-nutritivo) is used which provides official Spanish data on the nutrition values of animal feed. In Spain grazing is common and in the inventory submission it is reported that in 2018 64% of the manure management for non-dairy cattle is from grazing. The nutritional value of this grass presented in the feeding plans is equal to that of second cut hay which has a high NDF of 59.1 % (Table 100 in https://www.mapa.gob.es/es/ganaderia/temas/ganaderia-y-medio-ambiente/baseszootecnicasparaelcalculodelbalancealimentariodenitrogenoyfosforoenvovino_tcm30-537001.pdf) compared to fresh grass. The combination of the positive slope for NDF in the model by Jaurena et al. (2015) and a likely too high NDF in the feeding plan for grazed grass will further challenge the use of the model. The TERT is of the view that there is a need for a comparison of the model by Jaurena et al. (2015) with other published models and other data sets for estimating the CH₄ emissions from enteric fermentation and to verify that the data used in the feeding plans described are in line with the actual feeding practices in Spain and that this should be undertaken before a decision is made on the correct Y_m value applicable to Spain. Spain did not provide a clear response to questions from the TERT. After a discussion with Spain on the outcome from the model, the TERT decided to calculate a technical correction for the years 2005, 2016, 2017 and 2018 based on the default Y_m value from the 2006 IPCC Guidelines which was accepted by Spain. The estimates demonstrate that the issue is above the threshold of significance. The TERT recommends that Spain include a revised estimate in its next submission.</p>	TC

EMRT-ID	Key category	Category, gas, year	Recommendation	Revised estimate or technical correction in 2020
ES-5D-2020-0003	Yes	5D Wastewater Treatment and Discharge, CH ₄ , 2005-2018	For 5D Wastewater Treatment and Discharge, CH ₄ for years 2005-2018, the TERT noted that in the NIR (chapter 7.4), Spain did not include emissions due to treatment and discharge of uncollected wastewater in the inventory. In response to a question raised during the review, Spain agreed to this and proposed two changes to their calculation: (i) for the most recent years, Spain updated its estimate of the share of the population whose waste water is collected and treated; (ii) untreated waste water is assumed to be either treated in septic tanks or alike or infiltrated directly in the soil. The 2006 IPCC Guidelines (Vol 5, Chapter 6, Table 6.1) do not contain a default Methane Conversion Factor (MCF) for direct discharge of untreated wastewater and Spain proposed an MCF for this discharge pathway of 0.05, based on expert judgment. This value was accepted by the TERT. Spain provided a revised estimate for the years 2005, 2016, 2017 and 2018 and stated that it will be included in the next submission.	RE

Revised estimates provided by Spain and accepted by the TERT

1

ESD Review Tool ID:	ES-2F1-2020-0004
ESD Review Tool URL:	https://emrt-esd.eionet.europa.eu/2020/ES-2F1-2020-0004
Country:	Spain
Sector:	2F1 Refrigeration and Air Conditioning
Gases:	HFC
Fuel	N/A
Completed by Sector Expert:	Stéphanie Barrault
Reviewed by Counterpart:	Barbara Gschrey
Reviewed by Lead Reviewer:	Ralph Harthan
Reviewed by Quality Controller:	Bernd Guegle

The underlying problem:	The Spanish Inventory only estimated disposal emissions in subcategory 2F1e, not in the other subcategories. Spain sent a file explaining why they considered the disposal emissions can be neglected. After analysing the assumptions, it seems that disposal emission factor (EF) assumptions were particularly low without accurate reference sources. A change in these assumptions showed that it was easy to reach the threshold of significance (ToS) and that minor changes to the disposal emission factor would cause a relevant increase of the disposal emissions above the ToS. The TERT suggested a revised estimate which was accepted by the country.
Summarise the methodology used:	The calculation is based on the reported reclaimed and recovered data. The disposal emissions are estimated assuming that the disposal EF was 11% as a first estimate (instead of 8% initially proposed by the country). In this first estimate, the calculation is made in a global way; the decomposition by sector will be proposed in the next submission.

2

	Original estimate (Gg CO ₂ e)								Notes
Year	CO ₂	CH ₄	N ₂ O	HFCs	PFCs	SF ₆	NF ₃	Mixed GHG	
2005				0					(NE) disposal emissions
2016				0					(NE) disposal emissions
2017				0					(NE) disposal emissions
2018				0					(NE) disposal emissions

	Revised Estimate received from country (Gg CO ₂ e)								Notes
Year	CO ₂	CH ₄	N ₂ O	HFCs	PFCs	SF ₆	NF ₃	Mixed GHG	
2005				NE					
2016				186.694					
2017				184.944					
2018				195.787					

	Difference between RE and OE (Gg CO ₂ e)							
Year	CO ₂	CH ₄	N ₂ O	HFCs	PFCs	SF ₆	NF ₃	Mixed GHG
2005								
2016				186.694				
2017				184.944				
2018				195.787				

1

ESD Review Tool ID:	ES-5D-2020-0003
ESD Review Tool URL:	https://emrt-esd.eionet.europa.eu/2020/ES-5D-2020-0003
Country:	Spain
Sector:	5D Wastewater Treatment and Discharge
Gases:	CH ₄
Fuel	N/A
Completed by Sector Expert:	Hans Oonk
Reviewed by Counterpart:	Céline Gueguen
Reviewed by Lead Reviewer:	Ralph Harthan
Reviewed by Quality Controller:	Bernd Guegle

The underlying problem:	The TERT noted with reference to 5D, CH ₄ , for years 2005-2018 and the NIR (chapter 7.4), that emissions due to treatment and discharge of uncollected wastewater seemed not to be included in the inventory. During the review, Spain agreed to this and made two changes to their calculation.
Summarise the methodology used:	Emissions are calculated by Spain using the calculation sheet as provided on 17 June 2020: (i) for the most recent years, Spain updated its estimate of the share of the population whose wastewater is collected and treated. (ii) Untreated wastewater is assumed to be either treated in septic tanks or alike or infiltrated directly in the soil. Direct infiltration of untreated wastewater is practically phased out in 2016-2018. However, in 2005 it still was often applied. The 2006 IPCC Guidelines do not provide a default Methane Conversion Factor (MCF) for direct infiltration of untreated wastewater in the soil and an MCF of 0.05 was proposed by Spain and accepted by the TERT.

2

	Original estimate (Gg CO ₂ e)								Notes
Year	CO ₂	CH ₄	N ₂ O	HFCs	PFCs	SF ₆	NF ₃	Mixed GHG	
2005		395.881							5D1 Domestic Wastewater
2016		240.311							5D1 Domestic Wastewater
2017		240.729							5D1 Domestic Wastewater
2018		241.681							5D1 Domestic Wastewater

	Revised Estimate received from country (Gg CO ₂ e)								Notes
Year	CO ₂	CH ₄	N ₂ O	HFCs	PFCs	SF ₆	NF ₃	Mixed GHG	
2005		1 011.323							5D1 Domestic Wastewater
2016		713.993							5D1 Domestic Wastewater
2017		671.966							5D1 Domestic Wastewater
2018		668.820							5D1 Domestic Wastewater

	Difference between RE and OE (Gg CO ₂ e)							
Year	CO ₂	CH ₄	N ₂ O	HFCs	PFCs	SF ₆	NF ₃	Mixed GHG
2005		615.443						
2016		473.683						
2017		431.237						
2018		427.139						

Technical corrections deemed necessary by the TERT

ESD Review Tool ID:

ES-3A-2020-0002

ESD Review Tool URL:

https://emrt-esd.eionet.europa.eu/2020/ES-3A-2020-0002

Country:

Spain

Sector:

3A Enteric Fermentation

Gases:

CH₄

Fuel

N/A

Completed by Sector Expert:

Steen Gyldenkaerne

Reviewed by Counterpart:

Bernard Hyde

Reviewed by Lead Reviewer:

Ralph Harthan

Reviewed by Quality Controller:

Bernd Guegle

The underlying problem:

The TERT identified a large unexpected decrease in the implied Y_m factor for CH₄ from dairy cattle from enteric fermentation and a large Y_m for other cattle outside the range of the 2006 IPCC Guidelines default value (6.5 ± 1.0).

Summarise the methodology used:

The default Y_m factor of the 2006 IPCC Guidelines is used.

Year

CO₂

CH₄

N₂O

HFCs

PFCs

SF₆

NF₃

Mixed GHG

Notes

2005

12 745.363

3A1 Cattle

2016

12 547.861

3A1 Cattle

2017

12 781.435

3A1 Cattle

2018

12 983.154

3A1 Cattle

Year

CO₂

CH₄

N₂O

HFCs

PFCs

SF₆

NF₃

Mixed GHG

Notes

2005

11 129.675

3A1 Cattle

2016

11 207.126

3A1 Cattle

2017

11 398.493

3A1 Cattle

2018

11 538.875

3A1 Cattle

Year

CO₂

CH₄

N₂O

HFCs

PFCs

SF₆

NF₃

Mixed GHG

2005

-1 615.687

2016

-1 340.735

2017

-1 382.943

2018

-1 444.279

Annex I: Legal background and procedures of the 2020 comprehensive 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 countries 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 Regulation (EU) No 749/2014.

The Effort Sharing Regulation (EU) 2018/842 (ESR) sets national emission limits for greenhouse gas emissions in the sectors outside the EU's ETS for the period 2021-2030. In Article 4(3) of the ESR, the Commission is required to adopt implementing acts setting out annual emission allocations (AEAs) for the period 2021-2030 in terms of CO₂ equivalents, for which it shall carry out a comprehensive review.

The 2020 Union review was thus held as a comprehensive review in line with MMR Article 19 (1) in concert with the Union review required by the ESR.

Objectives

The objectives of the comprehensive review of countries' GHG emission inventories in 2020 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 years 2018 in a credible, consistent, transparent and timely manner, and for
 - setting out countries' annual emission allocations (AEAs) for the years from 2021 to 2030 in terms of tonnes of CO₂ equivalent, according to Article 4(3) of the ESR.
- b) to assist countries in improving the quality of their GHG inventories.

Procedures

The scope of the 2020 comprehensive review is presented in Table A-1. The checks carried out during the 2020 comprehensive review are presented in Annex II. The review consisted of two steps.

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

The EU inventory team consisted of the following experts:

- ETC/CME task manager: Nicole Mandl, Marion Pinterits (ETC/CME)
- Energy: Julien Vincent, Coralie Jeannot, Eva Krtková, Marion Pinterits, Matina Kastori, Giorgos Mellios, Markéta Müllerová, Bernd Gugele (ETC/CME), Michael Goll (Eurostat)
- IPPU: Barbara Gschrey, Lorenz Moosmann, Kristina Kaar, Lukas Emele, Maria Purzner, Ils Moorkens (ETC/CME)
- Agriculture: Adrian Leip, Janka Szemesová, Alexander De-Meij (JRC)
- Waste: Céline Gueguen (ETC/CME)
- LULUCF: Raúl Abad-Viñas (JRC)

- Quality coordinators: Adrian Leip, Giacomo Grassi (JRC), Bernd Gugele, Nicole Mandl, Marion Pinterits, Maria Purzner, Julien Vincent, Giorgos Mellios, Ils Moorkens, Kaat Jespers (ETC/CME)
- Cross-cutting: Nicole Mandl (ETC/CME)

Step 2 of the comprehensive review 2020 was performed by a Technical Expert Review Team (TERT) under service contract **340201/2019/814628/SER/CLIMA.C.2** of the Directorate General for Climate Action of the European Commission. The lead reviewers and sector review experts did not review emission inventories of countries 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 country whose inventory is concerned, did not take part in the review of that inventory.

The TERT consisted of the following experts:

- CRF categories 1A1, 1A2, 1A4, 1A5 (Stationary Combustion) + Reference Approach: Katrina Young, Julien Vincent and Stephan Poupa;
- CRF categories 1A3 Transport + 1D International Bunkers: Melanie Hobson, Jean-Marc André and Matina Kastori;
- CRF categories 1B Fugitive + 1C CO₂ Transport and Storage: Ioannis Sempas, Marlene Plejdrup and Marion Pinterits;
- CRF categories IPPU Fluorinated Gases: Barbara Gschrey, Jacek Skoskiewicz and Stephanie Barrault;
- CRF categories IPPU Other Gases than Fluorinated Gases: Emma Salisbury, Kristina Kaar and Wolfram Jörß;
- CRF categories 3A Enteric Fermentation and 3B Manure Management: Chris Dore, Steen Gyldenkerne and Bernard Hyde;
- CRF categories 3C-3J: Katalin Lovas, Etienne Mathias and Michael Anderl;
- CRF sector 5 Waste: Céline Gueguen, Elisabeth Kampel and Hans Oonk;
- Lead reviewers: Karin Kindbom, Suvi Monni, Ole-Kenneth Nielsen and Ralph Harthan;
- The following experts supported the team on request of the TERT: Tomas Gustafson (IPPU), Maria Purzner (F-gases), Beatriz Sanchez (Agriculture), Katja Pazdernik (Waste).

The second step of the review was coordinated by Bernd Gugele and Justin Goodwin.

The EEA review secretariat consisting of Melanie Sporer, Claire Qoul, Kirsten May, Justine Raoult and Henry Irvine prepared and coordinated the Union comprehensive review as foreseen in Article 28 of Commission Implementing regulations (EU) No 749/2014 and Article 42 of the Governance Regulation (EU) 2018/1999.

The step 2 of the review was performed on the basis of the 15 April submissions of GHG emission data and the national inventory report (NIR) under the Monitoring Mechanism. Resubmissions reported by countries were taken into account until 8 May 2020.

Where relevant, the TERT calculated technical corrections for over- or under-estimates identified in a mandatory category in the countries' GHG inventories that exceed the threshold of significance. Technical corrections have been calculated only for the years 2005 and 2016-2018. If the technical correction exceeds the threshold of significance for at least one year of the inventory under review (2005, and 2016-2018) but not for all the years the technical correction was calculated for all years under review in order to ensure time series consistency.

Table A-1: Scope of the comprehensive review 2020

Element	Scope	Further information
Countries	EU geographical coverage of the Member States, the United Kingdom, Norway and Iceland	
Years	2005, 2016, 2017, 2018	According to MMR Article 27(2); According to MMR Article 19(1); According to ESR Article 4(3)
Gases	CO ₂ , CH ₄ , N ₂ O, HFCs, PFCs, SF ₆ , NF ₃	
Sectors	All emission source sectors excluding LULUCF	National totals exclude emissions from LULUCF and emissions reported under memo items
Indirect CO ₂ emissions	Included in national total	

Annex II: Checks carried out during the 2020 comprehensive review in line with Art. 29, 32 and 33 of the Commission Implementing Regulation (EU) No 749/2014

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 over-estimations or under-estimations 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.