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

Bulgaria

30 August 2020

European Environment Agency

Reference: 340201/2019/814628/SER/CLIMA.C.2

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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 Bulgaria, pursuant to:

- Article 4(3) of Regulation (EU) No 2018/842 (the 'Effort Sharing Regulation', ESR), for the purpose of setting out Bulgaria's annual emission allocations (AEAs) for the years from 2021 to 2030 in terms of tonnes of CO_2 equivalent, and
- Article 3 of Decision No 406/2009/EC (the 'Effort Sharing Decision', ESD), for the purpose of verifying Bulgaria'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 Bulgaria 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.

Bulgaria did not provide a resubmission to the Commission.

Step 1 and 2 conclusions

1. The reviewers raised 60 issues with Bulgaria during the first and the second step of the 2020 comprehensive ESD review (see Table 1). The TERT provided recommendations for 10 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. Bulgaria provided 7 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 did not deem necessary any technical corrections in the meaning of Article 19(3)(c) of Regulation (EU) No 525/2013.

5. The TERT identified non-binding recommendations in order to improve the national inventory data of Bulgaria (see Table 6).

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

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

	Issues raised step 1[1]	Issues raised step 2	Recommendations	Revised estimates[2]	Technical corrections[3]
Total	**37**	**23**	**10**	**7**	**-**
Energy	11	7	5	3	-
IPPU	7	11	2	1	-
Agriculture	14	1	1	1	-
Waste	5	4	2	2	-
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 Bulgaria pursuant to Article 7(4) of Regulation (EU) No 525/2013, taking into account any resubmission to the Commission	BGR_2020_1_12042020	57 815.589
CO_2 emissions from 1A3a Domestic Aviation	BGR_2020_1_12042020	52.616
Difference between original estimates and revised estimates provided by Bulgaria and accepted by the TERT[2]		
1A5b Other - Mobile, CO_2, CH_4, N_2O[4]	BG-1A3-2020-0001	31.143
1A3a Domestic Aviation, CH_4, N_2O[4]	BG-1A3-2020-0001	-0.263
1A3a Domestic Aviation, CO_2[4]	BG-1A3-2020-0001	-30.881
1B2a Fugitive Emissions from Oil, CO_2	BG-1B2a-2020-0001	-0.104
1B2b Fugitive Emissions from Natural Gas, CO_2, CH_4	BG-1B2b-2020-0001	2.234
2F1 Refrigeration and Air Conditioning, HFCs	BG-2F1-2020-0003	54.587
3 Agriculture, CH_4, N_2O	BG-3B-2020-0003	12.363
5A Solid Waste Disposal, CH_4	BG-5A-2020-0002	-172.284
5D Wastewater Treatment and Discharge, CH_4	BG-5D-2020-0003	-323.753
Total greenhouse gas emissions including revised estimates and technical corrections		57 388.633
CO_2 emissions from 1A3a Domestic Aviation[3]	BGR_2020_1_12042020 taking into account BG-1A3-2020-0001	21.735
NF_3 emissions[3]	BGR_2020_1_12042020	-

[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. NF_3 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.

[4] This revised estimate is a reallocation of emissions from category 1A3a to category 1A5b and so there is no net impact on the total greenhouse gas emissions.

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 Bulgaria pursuant to Article 7(4) of Regulation (EU) No 525/2013, taking into account any resubmission to the Commission	BGR_2020_1_12042020	64 117.727	59 345.035	61 682.758	57 815.589
CO_2 emissions from 1A3a Domestic Aviation	BGR_2020_1_12042020	40.205	60.953	61.841	52.616
Difference between original estimates and revised estimates provided by Bulgaria and accepted by the TERT[2]					
1A5b Other - Mobile, CO_2, CH_4, N_2O[4]	BG-1A3-2020-0001	23.453	42.911	40.686	31.143
1A3a Domestic Aviation, CH_4, N_2O[4]	BG-1A3-2020-0001	-0.198	-0.362	-0.343	-0.263
1A3a Domestic Aviation, CO_2[4]	BG-1A3-2020-0001	-23.255	-42.549	-40.343	-30.881
1B2a Fugitive Emissions from Oil, CO_2	BG-1B2a-2020-0001	-0.138	-0.111	-0.110	-0.104
1B2b Fugitive Emissions from Natural Gas, CO_2, CH_4	BG-1B2b-2020-0001	0.963	2.050	2.584	2.234
2F1 Refrigeration and Air Conditioning, HFCs	BG-2F1-2020-0003	13.617	50.061	51.708	54.587
3 Agriculture, CH_4, N_2O	BG-3B-2020-0003	-1.829	10.707	11.247	12.363
5A Solid Waste Disposal, CH_4	BG-5A-2020-0002	-1 425.378	-365.634	-269.076	-172.284
5D Wastewater Treatment and Discharge, CH_4	BG-5D-2020-0003	-343.865	-293.235	-286.375	-323.753
Total greenhouse gas emissions including revised estimates and technical corrections		62 361.097	58 748.873	61 192.735	57 388.633
CO_2 emissions from 1A3a Domestic Aviation[3]	BGR_2020_1_12042020 taking into account BG-1A3-2020-0001	16.949	18.403	21.498	21.735

[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.

[4] This revised estimate is a reallocation of emissions from category 1A3a to category 1A5b and so there is no net impact on the total greenhouse gas emissions.

Statement from Bulgaria on the conclusions presented by the TERT

Bulgaria agrees with the technical corrections and with the aggregated GHG emission estimates presented in Table 3.

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 Bulgaria and any technical corrections deemed necessary by the TERT	See Table 2 above	57 388.633
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]	31 027.667
CO_2 emissions from 1A3a Domestic Aviation	See Table 2 above	21.735
NF_3 emissions	See Table 2 above	-
Total ESD emissions		**26 339.231**

[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 Bulgaria and any technical corrections deemed necessary by the TERT	See Table 3 above	62 361.097	58 748.873	61 192.735	57 388.633
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]	-	33 410.834	34 908.095	31 027.667
CO_2 emissions from 1A3a Domestic Aviation	See Table 3 above	16.949	18.403	21.498	21.735
Total ESR emissions		-	**25 319.636**	**26 263.142**	**26 339.231**

[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 'CO_2 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
BG-1A3-2020-0001	No	1A5b Other - Mobile, CH_4, CO_2, N_2O, 2005, 2016, 2017, 2018	For 1A5b Other - Mobile, Military Aviation, jet kerosene, CO_2, CH_4, N_2O in 2005, 2016, 2017 and 2018 the TERT noted that there was no information in the NIR regarding where the emissions are included. In response to a question raised during the review, Bulgaria explained that emissions arising from military aviation were included in 1A3a Domestic Aviation. The TERT noted that this allocation issue does not have an impact on national total emissions, but has an impact on emissions under ESD, because 1A3a emissions are excluded from ESD emissions while military aviation emissions should be included. Bulgaria provided a revised estimate for 2005, 2016, 2017 and 2018 for 1A5b. The TERT agreed with the revised estimate provided by Bulgaria. The TERT recommends that Bulgaria include the revised estimate in its next submission.	RE
BG-1B2a-2020-0001	No	1B2a Fugitive Emissions from Oil, CO_2, 2005-2018	For 1B2a Fugitive Emissions from Oil, CO_2, years 2005, 2016-2018 the TERT noted that there is an over-estimate of emissions. Bulgaria reported in the NIR (pages 148-149) that CO_2 emissions from oil exploration were reported by applying the Tier 1 methodology and EFs from the 2019 Refinement to the 2006 IPCC Guidelines. The TERT notes that the reason of the over-estimation was because Bulgaria used a CO_2 emission factor (EF) of 0.0044 Gg/thousand m^3 instead of 0.00044 Gg/thousand m^3, which is the EF for "Onshore Conventional oil exploration" from Table 4.2.4 of the 2019 Refinement. In response to a question raised during the review, Bulgaria confirmed the error with the EF. Bulgaria provided revised estimates for years 2005, 2016, 2017 and 2018 and stated that they will be included in the next submission. The TERT agreed with the revised estimates provided by Bulgaria. The TERT recommends that Bulgaria include the revised estimates in its next submission.	RE

EMRT-ID	Key category	Category, gas, year	Recommendation	Revised estimate or technical correction in 2020
BG-1B2b-2020-0001	No	1B2b Fugitive Emissions from Natural Gas, CH_4, CO_2, 2005-2018	For 1B2b Fugitive Emissions from Natural Gas, CO_2 and CH_4, years 2005, 2016-2018 the TERT noted that there is an under-estimate of emissions. Bulgaria applied the Tier 1 methodology from the 2019 Refinement to the 2006 IPCC Guidelines to estimate emissions from this source. However, the TERT notes that Bulgaria did not report emissions from the sub-segment "gas-production / gathering", although an EF is available in Table 4.2.4g of the 2019 Refinement. According to page 4.68 of the 2019 Refinement: "Countries with onshore gas production should apply a factor for onshore production and the factor for gathering to the quantity of onshore gas produced in each year." Given that Bulgaria applied the Tier 1 method from the 2019 Refinement to estimate emissions for category 1B2b2, the TERT is of the view that Bulgaria should also estimate, and report emissions related to gathering. The partial application of a Tier 1 method is an indication of a potential under-estimation. In response to a question raised during the review, Bulgaria provided revised estimates for years 2005, 2016, 2017 and 2018 and stated that it will be included in the next submission. In the revised estimate, CO_2 and CH_4 emissions associated with the sub-segment gas gathering of onshore gas production were estimated by applying the EF from Table 4.2.4g of the 2019 Refinement. The TERT agreed with the revised estimate provided by Bulgaria. The TERT recommends that Bulgaria include the revised estimate in its next submission. In addition, Bulgaria indicated that it intends to estimate N_2O emissions associated with gas production based on the Tier 1 methodology from the 2019 Refinement. Given that CRF Table 1B2 does not allow the inclusion of N_2O emissions for category 1B2b2 Natural Gas Production, Bulgaria stated it will report these emissions under 1B2c2ii in the next submission. The TERT agreed with Bulgaria. The N_2O emissions were not included in the revised estimate because of their minor magnitude (less than 0.0001 kt CO_2 eq for the years 2005 and 2016-2018).	RE
BG-2F1-2020-0003	Yes	2F1 Refrigeration and Air Conditioning, HFCs, 1990-2018	For 2F1 Refrigeration and Air Conditioning and HFC emissions throughout the time series the TERT noted that a low product life factor was used. In response to a question raised during the review, Bulgaria provided a revised estimate. The TERT agreed to the revised estimate and recommends that Bulgaria include the revised estimate in its next submission.	RE

EMRT-ID	Key category	Category, gas, year	Recommendation	Revised estimate or technical correction in 2020
BG-3B-2020-0003	Yes	3 Agriculture, CH_4, N_2O, 1990-2018	For 3B Manure Management, CH_4 and N_2O, the TERT identified a potential underestimate in CH_4 emissions and an overestimate in N_2O emissions which exceeds the threshold of significance for the years 2005, 2016, 2017 and 2018. This potential underestimate of CH_4 emissions and overestimate of N_2O emissions arises as a result of the use of the animal waste management system "dry lot" in the estimation of emissions from the animal categories cattle, sheep, swine, poultry and other in this category. The TERT also noted that this issue also affects category 3D. The TERT is of the view that this animal waste management system is unlikely to exist in Bulgaria. In response to a question raised during the review, Bulgaria provided a revised estimate for the years 2005, 2016, 2017 and 2018 for both gases, CH_4 and N_2O, including the effect on category 3D. Bulgaria stated that it will be included in the next submission. The revised estimate was made for cattle and swine. The TERT noted that the impact of the assumption on dry lot for other animal categories is likely to be below threshold of significance. The TERT therefore agreed with the revised estimate provided by Bulgaria. The TERT recommends that Bulgaria include the revised estimate in its next annual submission and that the country revise its assumption on the use of dry lot for other animal types than cattle and swine as well.	RE

EMRT-ID	Key category	Category, gas, year	Recommendation	Revised estimate or technical correction in 2020
BG-5A-2020-0002	Yes	5A Solid Waste Disposal, CH_4, 2005-2018	The TERT noted with reference to 5A Solid Waste Disposal, CH_4 and years 2005-2018 and the NIR, page 380, table 241, that Bulgaria makes different assumptions on amount and composition of the municipal solid waste (MSW) landfilled before 1998-2001, compared to the monitored values in the period after 1998-2001. As a result, Bulgaria appears to achieve a reduction of 50% of methane potential (L0), landfilled in solid waste disposal sites (SWDS) which contributes significantly to the observed trend in methane emissions from SWDS. According to the 2006 IPCC Guidelines (Vol 1, Ch 5), a consistent time-series needs to be ensured. In addition, the TERT noted that emissions from assimilated municipal solid waste (AMSW) and sludge were not included in the inventory. Bulgaria provided a revised estimate for the years 2005, 2016-2018 addressing the issues explained above for MSW. In the revised estimate for MSW, Bulgaria improved the assumptions for 1950-1999 regarding the amount of DOC in waste, waste generation and collection, and the share of waste to landfills. When reviewing the revised estimate, the TERT noted small changes in the shares and amount of waste landfilled in managed and unmanaged landfills in 2000-2018 compared to the original estimate. These changes were not explained, but the TERT noted that their impact is below the threshold of significance. Therefore, the TERT agreed with the revised estimate. Regarding AMSW and sludge, Bulgaria agreed with the calculations made by the TERT for the purposes of a technical correction, that was sent to Bulgaria as part of the draft review report. These estimates are based on calculations made with two IPCC waste models (one for managed and another one for unmanaged landfills) and are included in the revised estimate values in this report. The TERT recommends that Bulgaria include revised estimates in its next submission for MSW, AMSW and sludge (both managed and unmanaged landfills). The TERT further recommends that Bulgaria ensure the consistency in the amounts of MSW landfilled, as included in the waste model, and reported in the NIR (Table 241, page 380).	RE

EMRT-ID	Key category	Category, gas, year	Recommendation	Revised estimate or technical correction in 2020
BG-5D-2020-0003	Yes	5D Wastewater Treatment and Discharge, CH_4, 2005-2018	The TERT noted with reference to 5D, CH4 and years 2005-2018 and the NIR, page 391/393, that Bulgaria assumes a MCF=0.3 for centralized wastewater treatment plants (WWTP), assuming that all WWTP in Bulgaria are not well managed or are overloaded. Information on the implementation of the Urban Waste Water Directive (UWWTD) however shows, that Bulgarian WWTP for the largest extent are not overloaded. Most of them also comply with legislation on remaining BOD in the effluent. Based on this information, the TERT estimated that 7.5% of Bulgarian WWTP might be considered not well-managed, overloaded. Assuming an MCF of 0.3 for this 7.5% and an MCF=0 for all other WWTP, the TERT calculated an average MCF of 0.0225 for all WWTP. Bulgaria acknowledged that for 2016-2018 this approach might be accurate. However, it is expected that in 2005, there were more WWTP that were overloaded or not well managed, resulting in a higher average MCF in the past. No information exists to estimate the share of such WWTP in 2005 and to derive a consistent times series of average MCF using the method in the 2006 IPCC Guidelines. Bulgaria provided a revised estimate for 2005, 2016-2018, using the methodology available in the 2019 refinement to the 2006 IPCC Guidelines (Vol 5, Ch. 6, Table 6.3). The TERT agreed with the revised estimate provided by Bulgaria. The TERT recommends that Bulgaria include the revised estimate in its next submission. While evaluating the calculation file Bulgaria sent to support the revised estimate, the TERT noted that Bulgaria quantifies methane emissions due to direct discharge of untreated waste water without adding the amount of industrial BOD discharged into sewers (i.e. the correction factor I for additional industrial BOD discharged into sewers is 1). The TERT believes that this wastewater is collected via a sewer system and subsequently discharged to open waters. In this case, a value of I=1.25 should be applied (see 2006 IPCC Guidelines, Vol. 5, page 6.14). However, the impact of the application of this value of I is below the threshold of significance. The TERT recommends that Bulgaria apply I=1.25 in the calculation of emissions due to direct discharge of untreated wastewater, if applicable.	RE

EMRT-ID	Key category	Category, gas, year	Recommendation	Revised estimate or technical correction in 2020
BG-1A1c-2020-0001	Yes	1A1c Manufacture of Solid Fuels and Other Energy Industries, CO_2, 2005-2018	For the MMR Annex V table (Article 10-Reporting on consistency of reported emissions with data from the emissions trading system) the TERT noted that there were a number of issues related to ETS emissions for some subcategories being reported significantly higher than the GHG inventory estimates i.e. 1A1a, 1A1b, 1A2b, 1A2f, and some significantly lower i.e. 1A2g. No verified ETS emissions were reported for 1A1c Manufacture of Solid Fuels and Other Energy Industries whilst inventory emissions were reported. In response to a question raised during the review, Bulgaria explained four key reasons why there is inconsistency between the two data sets, summarised as 1) unclear allocation of ETS plants to CRF categories, 2) for natural gas the ETS data uses emission factors that are one year behind the inventory, 3) the ETS data uses monthly NCVs whilst the inventory uses an annual NCV, 4) some ETS plants report "mixed" solid fuels which are omitted from the national weighted average emission factor calculations for coal types. The TERT recommends that Bulgaria improve the comparison presented in Annex V so it can be a useful tool for improving the GHG inventory, and include a transparent explanation of the discrepancies between the inventory and ETS data in the Annex V table. The TERT further recommends that Bulgaria work to improve the consistency between ETS and inventory data.	No
BG-1B1-2020-0002	Yes	1B1 Fugitive Emissions from Solid Fuels, CH_4, 2005-2018	For category 1B1ai3 Abandoned Underground Mines, CH_4 emissions, the TERT noted that there is a lack of transparency regarding the Tier 2/3 methodology applied. More specifically, Bulgaria did not provide sufficient details in the NIR that would have allowed the TERT to replicate and assess the inventory and the application of the Tier 2/3 method. The TERT notes that this issue does not relate to an over- or under-estimate of emissions. In response to a question raised during the review, Bulgaria provided a detailed spreadsheet to the TERT that contained sufficient details in order to assess the estimation of emissions. The TERT concluded that estimated CH_4 emissions are in line with the 2019 Refinement of the 2006 IPCC Guidelines. However, the TERT recommends that Bulgaria report in the next NIR the detailed information of the 21 mines that was presented during the review (i.e. the coal rank, the year of closure, the current state - flooded or not, the average emissions prior of closure, the mine depth, and the emission factors according to equation 4.1.12 and Table 4.1.9 of the 2019 Refinement to the 2006 IPCC Guidelines), in order facilitate the replication and assessment of the inventory by users of the reported information.	No

EMRT-ID	Key category	Category, gas, year	Recommendation	Revised estimate or technical correction in 2020
BG-2D-2020-0003	No	2D Non-Energy Products from Fuels and Solvent Use, CO_2, 2005-2018	For 2D3 Solvent Use, CO_2, all years, the TERT noted that there is an inconsistency between the NMVOC emissions reported under the NECD and CLRTAP and the NMVOC emissions used to calculate indirect CO_2 emissions in the CRF. In response to a question raised during the review Bulgaria did not explain the reasons for the differences, i.e. why the per capita coefficient based on 7-8 countries has been applied when estimating indirect CO_2 emissions from this category while the NMVOC emissions reported under the NECD and CLRTAP are based on officially submitted activity data from the NSI. The TERT recommends that Bulgaria improve its methodology in the future, focusing on the use of country-specific data, where available, and consider aligning emission estimates with the NECD and CLRTAP submissions whilst ensuring completeness of the estimates.	No

Revised estimates provided by Bulgaria and accepted by the TERT

1

ESD Review Tool ID:	BG-1A3-2020-0001
ESD Review Tool URL:	https://emrt-esd.eionet.europa.eu/2020/BG-1A3-2020-0001
Country:	Bulgaria
Sector:	1A5b Other - Mobile
Gases:	CO_2, CH_4 and N_2O
Fuel	Liquid fuels
Completed by Sector Expert:	Melanie Hobson
Reviewed by Counterpart:	Jean-Marc Andre
Reviewed by Lead Reviewer:	Suvi Monni
Reviewed by Quality Controller:	Justin Goodwin

The underlying problem:	Bulgaria included emissions from military aviation under 1A3a Domestic Aviation, even though they should be included under 1A5b Other - Mobile. This allocation issue does not have an impact on national total emissions, but has an impact on emissions under ESD, because 1A3a emissions are excluded from ESD emissions while military aviation emissions should be included.
Summarise the methodology used:	Jet kerosene consumption for military aviation was estimated based on the difference between jet kerosene consumption data in the energy balance and that reported as domestic aviation fuel consumption by Eurocontrol. A Tier 1 methodology and default emission factors were used.

2

	Original estimate (Gg CO_2e)								Notes
Year	CO_2	CH_4	N_2O	HFCs	PFCs	SF_6	NF_3	Mixed GHG	
2005	0	0	0						Estimates for military aviation under 1A5b
2016	0	0	0						Estimates for military aviation under 1A5b
2017	0	0	0						Estimates for military aviation under 1A5b
2018	0	0	0						Estimates for military aviation under 1A5b

	Revised Estimate received from country (Gg CO_2e)								Notes
Year	CO_2	CH_4	N_2O	HFCs	PFCs	SF_6	NF_3	Mixed GHG	
2005	23.255	0.004	0.194						Estimates for military aviation under 1A5b
2016	42.549	0.007	0.355						Estimates for military aviation under 1A5b
2017	40.343	0.007	0.336						Estimates for military aviation under 1A5b
2018	30.881	0.005	0.257						Estimates for military aviation under 1A5b

	Difference between RE and OE (Gg CO_2e)							
Year	CO_2	CH_4	N_2O	HFCs	PFCs	SF_6	NF_3	Mixed GHG
2005	23.255	0.004	0.194					
2016	42.549	0.007	0.355					
2017	40.343	0.007	0.336					
2018	30.881	0.005	0.257					

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ESD Review Tool ID:	BG-1B2a-2020-0001
ESD Review Tool URL:	https://emrt-esd.eionet.europa.eu/2020/BG-1B2a-2020-0001#tab-qa
Country:	Bulgaria
Sector:	1B2a Fugitive Emissions from Oil
Gases:	CO_2
Fuel	Liquid fuels
Completed by Sector Expert:	Ioannis Sempos
Reviewed by Counterpart:	Marion Pinterits
Reviewed by Lead Reviewer:	Suvi Monni
Reviewed by Quality Controller:	Justin Goodwin

The underlying problem:	For 1B2a1 Oil Exploration, CO_2, years 2005, 2016-2018 the TERT noted that there is an over-estimate of emissions. Bulgaria reported in the NIR (pages 148-149) that CO_2 emissions from oil exploration were reported by applying the Tier 1 methodology and EFs from the 2019 Refinement to the 2006 IPCC Guidelines. The TERT notes that the reason of the over-estimation was because Bulgaria used a CO_2 emission factor (EF) of 0.0044 Gg/thousand m^3 instead of 0.00044 Gg/thousand m^3 , which is the EF for "Onshore Conventional oil exploration" from Table 4.2.4 of the 2019 Refinement.
Summarise the methodology used:	In the revised estimate, CO_2emissions associated to oil exploration (category 1B2a1) were estimated by applying the EF 0.00044 Gg/thousand m^3, in line with Table 4.2.4 of the 2019 Refinement to the 2006 IPCC GLs.

2

	Original estimate (Gg CO_2e)								Notes
Year	CO_2	CH_4	N_2O	HFCs	PFCs	SF_6	NF_3	Mixed GHG	
2005	0.154								
2016	0.123								
2017	0.123								
2018	0.115								

	Revised Estimate received from country (Gg CO_2e)								Notes
Year	CO_2	CH_4	N_2O	HFCs	PFCs	SF_6	NF_3	Mixed GHG	
2005	0.015								
2016	0.012								
2017	0.012								
2018	0.012								

	Difference between RE and OE (Gg CO_2e)							
Year	CO_2	CH_4	N_2O	HFCs	PFCs	SF_6	NF_3	Mixed GHG
2005	-0.138							
2016	-0.111							
2017	-0.110							
2018	-0.104							

ESD Review Tool ID:	BG-1B2b-2020-0001
ESD Review Tool URL:	https://emrt-esd.eionet.europa.eu/2020/BG-1B2b-2020-0001/
Country:	Bulgaria
Sector:	1B2b Fugitive Emissions from Natural Gas
Gases:	CO_2, CH_4
Fuel	Gaseous fuels
Completed by Sector Expert:	Ioannis Sempos
Reviewed by Counterpart:	Marlene Plejdrup
Reviewed by Lead Reviewer:	Suvi Monni
Reviewed by Quality Controller:	Justin Goodwin

1

The underlying problem:	For 1B2b2 Natural Gas Production, CO_2 and CH_4, years 2005, 2016-2018 the TERT noted that there is an under-estimate of emissions. Bulgaria applied the Tier 1 methodology from the 2019 Refinement to the 2006 IPCC Guidelines to estimate emissions from this source. However, the TERT notes that Bulgaria did not report emissions from the sub-segment "gas-production / gathering", although an EF is available in Table 4.2.4g of the 2019 Refinement. According to page 4.68 of the 2019 Refinement: "Countries with onshore gas production should apply a factor for onshore production and the factor for gathering to the quantity of onshore gas produced in each year." Given that Bulgaria applied the Tier 1 method for the 2019 Refinement to estimate emissions for category 1B2b2, the TERT is of the view that Bulgaria should also estimate and report emissions related to gathering. The partial application of a Tier 1 method is an indication of a potential under-estimation.
Summarise the methodology used:	In the revised estimate, CO_2 and CH_4 emissions associated to the sub-segment gas gathering of onshore gas production were estimated by applying the EF from Table 4.2.4g of the 2019 Refinement to the 2006 IPCC Guidelines.

2

	Original estimate (Gg CO_2e)								Notes
Year	CO_2	CH_4	N_2O	HFCs	PFCs	SF_6	NF_3	Mixed GHG	
2005	1.894	33.401							
2016	0.335	5.906							
2017	0.288	5.086							
2018	0.119	2.092							

	Revised Estimate received from country (Gg CO_2e)								Notes
Year	CO_2	CH_4	N_2O	HFCs	PFCs	SF_6	NF_3	Mixed GHG	
2005	1.898	34.360							
2016	0.344	7.947							
2017	0.300	7.659							
2018	0.128	4.316							

	Difference between RE and OE (Gg CO_2e)							
Year	CO_2	CH_4	N_2O	HFCs	PFCs	SF_6	NF_3	Mixed GHG
2005	0.004	0.959						
2016	0.009	2.041						
2017	0.011	2.573						
2018	0.010	2.225						

1

ESD Review Tool ID:	BG-2F1-2020-0003
ESD Review Tool URL:	https://emrt-esd.eionet.europa.eu/2020/BG-2F1-2020-0003
Country:	Bulgaria
Sector:	2F1 Refrigeration and Air Conditioning
Gases:	HFCs
Fuel	N/A
Completed by Sector Expert:	Barbara Gschrey
Reviewed by Counterpart:	Jacek Soszkiewics
Reviewed by Lead Reviewer:	Suvi Monni
Reviewed by Quality Controller:	Justin Goodwin

The underlying problem:	For 2F1a Refrigeration and Air Conditioning, which includes commercial and industrial refrigeration equipment, for HFC emissions a product life factor of 10% is used for the entire time series. This issue has been raised also earlier: BG-2F1-2017-0001. Given that large centralized systems as well as industrial installations are included in this category (2F1c is not reported separately) and that refrigerant management (2-10% of the refrigerant market) is also accounted in this product life factor, this factor seems to be very low compared to other countries that use a similar approach for their emission estimates.
Summarise the methodology used:	A higher product life factor of 15% has been used for emission estimates from 2F1a (including 2F1c and also accounting for refrigerant management). This product life factor is in line with the factors applied by other countries.

2

	Original estimate (Gg CO_2e)								Notes
Year	CO_2	CH_4	N_2O	HFCs	PFCs	SF_6	NF_3	Mixed GHG	
2005				27.233					2F1a Product life factor 10%
2016				100.122					
2017				103.416					
2018				109.174					

	Revised Estimate received from country (Gg CO_2e)								Notes
Year	CO_2	CH_4	N_2O	HFCs	PFCs	SF_6	NF_3	Mixed GHG	
2005				40.850					2F1a Product life factor 15%
2016				150.182					
2017				155.124					
2018				163.761					

	Difference between RE and OE (Gg CO_2e)							
Year	CO_2	CH_4	N_2O	HFCs	PFCs	SF_6	NF_3	Mixed GHG
2005				13.617				
2016				50.061				
2017				51.708				
2018				54.587				

ESD Review Tool ID:	BG-3B-2020-0003
ESD Review Tool URL:	https://emrt-esd.eionet.europa.eu/2020/BG-3B-2020-0003
Country:	Bulgaria
Sector:	3 Agriculture
Gases:	CH_4 and N_2O
Fuel	N/A
Completed by Sector Expert:	Bernard Hyde
Reviewed by Counterpart:	Chris Dore
Reviewed by Lead Reviewer:	Suvi Monni
Reviewed by Quality Controller:	Justin Goodwin

1

The underlying problem:	Bulgaria reports the use of the manure management system (MMS) dry lot. The TERT considered that this MMS is unlikely to occur in Bulgaria. Bulgaria agreed with the TERT and explained that there had been a misunderstanding regarding the definitions of the MMS.
Summarise the methodology used:	Bulgaria recalculated emissions from manure management category (direct and indirect) for cattle and swine due to revised assumptions on MMS used. For cattle: The MMS dry lot was changed to Liquid/Slurry based on the description of the system - manure is stored as excreted usually for periods less than one year, i.e. period of no longer than 6 months. MCF used is 13% based on Table 10.17 from the 2006 IPCC Guidelines and the average temperature in Bulgaria. This change in the cattle MMS, also led to recalculation in the indirect emission from manure management category as well as in the category 3D Direct and Indirect N_2O emissions from agricultural soils, due to recalculation in N input from manure applied to soils. The fractions for nitrogen loss are based on Tables 10.22 and 10.23 (2006 IPCC Guidelines). For swine: in Bulgaria, all farms with more than 50 sows store the manure in liquid systems. The small and the private farms store the manure in semi solid form on cement floors. Manure stays there for months and then is used as fertilizer. Bulgaria had considered that a part of this solid storage is dry lot, but this is now changed to solid storage. Poultry it is not a key category, and Bulgaria used a default emission factor and parameters for estimation of CH_4 emission – methane conversion factor (MCF) for layers and broilers is equal to 1.5 %, which is derivation of 50%/50% of Dry lot and Solid storage.

2

	Original estimate (Gg CO_2e)								Notes
Year	CO_2	CH_4	N_2O	HFCs	PFCs	SF_6	NF_3	Mixed GHG	
2005		146.795	3 074.408						CRF Table Summary 2 values and CRF Table 3D
2016		119.652	4 767.359						CRF Table Summary 2 values and CRF Table 3D
2017		118.665	4 762.079						CRF Table Summary 2 values and CRF Table 3D
2018		119.829	4 637.232						CRF Table Summary 2 values and CRF Table 3D

	Revised Estimate received from country (Gg CO_2e)								Notes
Year	CO_2	CH_4	N_2O	HFCs	PFCs	SF_6	NF_3	Mixed GHG	
2005		306.459	2 912.915						
2016		326.492	4 571.225						
2017		324.082	4 567.910						
2018		319.605	4 449.819						

	Difference between RE and OE (Gg CO_2e)							
Year	CO_2	CH_4	N_2O	HFCs	PFCs	SF_6	NF_3	Mixed GHG
2005		159.664	-161.492					

2016		206.840	-196.134					
2017		205.416	-194.169					
2018		199.777	-187.413					

1

ESD Review Tool ID:	BG-5A-2020-0002
ESD Review Tool URL:	https://emrt-esd.eionet.europa.eu/2020/BG-5A-2020-0002
Country:	Bulgaria
Sector:	5A Solid Waste Disposal
Gases:	CH_4
Fuel	N/A
Completed by Sector Expert:	Hans Oonk
Reviewed by Counterpart:	Céline Gueguen
Reviewed by Lead Reviewer:	Suvi Monni
Reviewed by Quality Controller:	Justin Goodwin

The underlying problem:	The TERT noted with reference to 5A, CH_4 and years 2005-2018 and the NIR, page 380, table 241, that Bulgaria makes different assumptions on amount and composition of the waste landfilled before 1998-2001, compared to the monitored values in the period after 1998-2001. As a result, Bulgaria appears to achieve a reduction of 50% of methane potential (L0), landfilled in solid waste disposal sites (SWDS) which contributes significantly to the observed trend in methane emissions from SWDS. According to the 2006 IPCC Guidelines (Vol 1, Ch 5), a consistent time-series needs to be ensured. In addition, emissions from assimilated municipal solid waste (AMSW) and sludge are not included in the inventory.
Summarise the methodology used:	Emissions from landfilling of municipal solid waste are calculated using the same waste model which was used in the original estimate, but using revised data for the period 1950 to 1999 for the amount of DOC in waste, waste generation and collection, and the share of waste to landfills. Emissions due to disposal of AMSW (industrial waste) and sludge are also calculated using the IPCC Waste Model.

2

	Original estimate (Gg CO_2e)								Notes
Year	CO_2	CH_4	N_2O	HFCs	PFCs	SF_6	NF_3	Mixed GHG	
2005		4 107.816							
2016		3 010.379							
2017		2 829.466							
2018		2 741.324							

	Revised Estimate received from country (Gg CO_2e)								Notes
Year	CO_2	CH_4	N_2O	HFCs	PFCs	SF_6	NF_3	Mixed GHG	
2005		2 682.438							
2016		2 644.745							
2017		2 560.390							
2018		2 569.040							

	Difference between RE and OE (Gg CO_2e)							
Year	CO_2	CH_4	N_2O	HFCs	PFCs	SF_6	NF_3	Mixed GHG
2005		-1 425.378						
2016		-365.634						
2017		-269.076						
2018		-172.284						

ESD Review Tool ID:	BG-5D-2020-0003
ESD Review Tool URL:	https://emrt-esd.eionet.europa.eu/2020/BG-5D-2020-0003
Country:	Bulgaria
Sector:	5D Wastewater Treatment and Discharge
Gases:	CH_4
Fuel	N/A
Completed by Sector Expert:	Hans Oonk
Reviewed by Counterpart:	Celine Gueguen
Reviewed by Lead Reviewer:	Suvi Monni
Reviewed by Quality Controller:	Justin Goodwin

1

The underlying problem:	The TERT noted with reference to 5D, CH_4 and years 2005-2018 and the NIR, page 391/393, that Bulgaria assumes a MCF=0.3 for centralized waste water treatment plants (WWTP), assuming that all WWTP in Bulgaria are not well managed or are overloaded. Information on the implementation of the Urban Waste Water Directive (UWWTD) however shows, that Bulgarian WWTP for the largest extent are not overloaded. Most of them also comply with legislation on remaining BOD in the effluent. Based on this information, the TERT estimated that 7.5% of Bulgarian WWTP might be considered not well-managed, overloaded. Assuming an MCF of 0.3 for this 7.5% and an MCF=0 for all other WWTP, the TERT calculated an average MCF of 0.0225 for all WWTP. Bulgaria acknowledged that for 2016-2018 this approach might be accurate. However, it is expected that in 2005, there were more WWTP that were overloaded or not well managed, resulting in a higher average MCF in the past. No information exists to estimate the share of such WWTP and to derive a consistent times series of average MCF using the method in the 2006 IPCC Guidelines.
Summarise the methodology used:	Emissions are calculated by Bulgaria, using activity data from the Bulgarian NIR, along with information from the NIR regarding how waste water is divided over the various discharge pathways and assuming an MCF for WWTP of 0.03 from 2019 refinement to the 2006 IPCC Guidelines (Vol 5, Ch. 6, Table 6.3).

2

	Original estimate (Gg CO_2e)								Notes
Year	CO_2	CH_4	N_2O	HFCs	PFCs	SF_6	NF_3	Mixed GHG	
2005		697.698							Refers only to 5D1
2016		564.689							Refers only to 5D1
2017		531.410							Refers only to 5D1
2018		562.012							Refers only to 5D1

	Revised Estimate received from country (Gg CO_2e)								Notes
Year	CO_2	CH_4	N_2O	HFCs	PFCs	SF_6	NF_3	Mixed GHG	
2005		353.833							Refers only to 5D1
2016		271.455							Refers only to 5D1
2017		245.034							Refers only to 5D1
2018		238.259							Refers only to 5D1

	Difference between RE and OE (Gg CO_2e)							
Year	CO_2	CH_4	N_2O	HFCs	PFCs	SF_6	NF_3	Mixed GHG
2005		-343.865						
2016		-293.235						
2017		-286.375						
2018		-323.753						

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 CO_2 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 CO_2 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 CO_2 Transport and Storage: Ioannis Sempos, 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 Gyldenkærne 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_2O, 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.