

Final Review Report

2022 annual review of national greenhouse gas inventory data

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

Bulgaria
30 June 2022

European Environment Agency



Reference: 340201/ 2020/838280/SER/CLIMA.C
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Conclusions from the 2022 annual ESD review

This Review Report presents the findings from the 2022 annual review of the greenhouse gas (GHG) emission inventory of Bulgaria, pursuant to Article 19(2) of Regulation (EU) No 525/2013, with a view to monitoring Bulgaria's achievement of its GHG emission reduction or limitation target pursuant to Article 3 of Decision No 406/2009/EC (the 'Effort Sharing Decision', ESD) in 2020.

The reviewers carried out checks to verify the transparency, accuracy, consistency, comparability and completeness of the national GHG inventory for the year 2020 submitted in 2022 by Bulgaria pursuant to Articles 7(1) and 7(3) of Regulation (EU) No 525/2013.

The review consisted of two steps:

1. The EU inventory team (European Environment Agency (EEA), European Topic Centre on Climate Change Mitigation (ETC/CM), 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 2022 annual ESD review.

More information on the ESD legislation and the procedures for the 2022 annual ESD review is presented in the annexes to this review report.

Step 1 conclusions

The checks performed identified 5 significant issues, therefore Bulgaria was subject to a second step of the 2022 annual ESD review. Only significant issues were subject to the second step review checks.

Step 2 conclusions

1. The reviewers raised 38 issues with Bulgaria during the first and the second step of the 2022 annual ESD review (see Table 1). The TERT provided a recommendation for 4 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 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 3 revised estimates. The TERT agreed to all revised estimates. Table 2 below summarises the revised estimates and further information is provided at the end of this report.
4. On that basis, the TERT did not deem necessary any technical corrections within the meaning of Article 19(3)(c) of Regulation (EU) No 525/2013 in consultation with Bulgaria.
5. The TERT identified non-binding recommendations in order to improve the national inventory data of Bulgaria (see Table 4).
6. The TERT considers that it received a response from Bulgaria that was sufficient in order to undertake the review appropriately.

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

| | Issues raised ¹ | Recommendations ² | Revised estimates ³ | Technical corrections ⁴ |
|---------------|----------------------------|------------------------------|--------------------------------|------------------------------------|
| Total | 38 | 4 | 3 | - |
| Energy | 10 | - | - | - |
| IPPU | 10 | 3 | 2 | - |
| Agriculture | 10 | - | - | - |
| Waste | 7 | 1 | 1 | - |
| Cross-cutting | 1 | - | - | - |

¹ Excluding findings related to Land use, land use change and forestry (LULUCF) and Kyoto Protocol (KP) LULUCF.

² The total number of recommendations includes revised estimates and technical corrections.

³ Revised estimates: changes in inventory estimates triggered by the review and provided by the Member State.

⁴ 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

| Data / Source category | Reference | Emission estimates (kt CO ₂ equivalent) ¹ 2020 |
|---|---------------------|--|
| Total greenhouse gas emissions, including indirect CO ₂ , without land use, land-use change and forestry as reported by Bulgaria pursuant to Article 7(4) of Regulation (EU) No 525/2013, taking into account any resubmission to the Commission | BGR_2022_1_08032022 | 49 152.195 |
| Difference between original estimate(s) and revised estimate(s) provided by Bulgaria and accepted by the TERT² | | |
| 2F1 Refrigeration and air conditioning, HFCs | BG-2F1-2022-0001 | 43.000 |
| 2F1 Refrigeration and air conditioning, HFCs | BG-2F1-2022-0002 | 76.795 |
| 5A Solid waste disposal, CH ₄ | BG-5A-2022-0001 | 321.075 |
| Total greenhouse gas emissions including revised estimates | | 49 593.066 |
| CO ₂ emissions from 1A3a Domestic aviation ³ | BGR_2022_1_08032022 | 12.158 |
| NF ₃ emissions ³ | BGR_2022_1_08032022 | - |

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 would be 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 CO₂ emissions from 1A3a Domestic aviation and NF₃ emissions have been deducted from the national total as they are not included within the scope of total ESD 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 ₂ equivalent) ¹ 2020 |
|--|---|--|
| Total greenhouse gas emissions including accepted revised estimates provided by Bulgaria | <i>See Table 2 above</i> | 49 593.066 |
| Total verified emissions from stationary installations under Directive 2003/87/EC | Extracted by the European Commission from EUTL on 8 March 2022 (as agreed at the Working Group I of the Climate Change Committee on 18 May 2015) ² | 23 845.295 |
| CO ₂ emissions from 1A3a Domestic aviation ³ | <i>See Table 2 above</i> | 12.158 |
| NF ₃ emissions ³ | <i>See Table 2 above</i> | - |
| Total ESD emissions | | 25 735.613 |

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 would be 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. Emissions of ETS stationary installations have been deducted from the national total as they are not included within the scope of total ESD emissions.

³ CO₂ emissions from 1A3a Domestic aviation and NF₃ emissions have been deducted from the national total as they are not included within the scope of total ESD emissions.

Statement from Bulgaria on the conclusions presented by the TERT

Bulgaria agrees with the aggregated GHG emission inventory estimates presented in Table 3.

Recommendations from the TERT including revised estimates

Table 4: Recommendations from the TERT (RE = Revised estimate¹; TC = Technical correction²)

| EMRT - ID | Key category | Category, gas, year | Recommendation | RE or TC in 2022 |
|------------------|--------------|---|--|------------------|
| BG-2F1-2022-0001 | Yes | 2F1 Refrigeration and Air Conditioning, 1990-2020, HFCs | For category 2F1a Commercial and Industrial Refrigeration and HFC emissions the TERT noted that product life factors varied largely over the time series, and were set to 15 % in 2020. In response to a question raised during the review, Bulgaria explained that preliminary data had been used and provided the TERT with the calculation files. The TERT noted some inconsistencies, found potential under-estimates exceeding the threshold of significance and proposed a technical correction. In response, Bulgaria provided a revised estimate for the year 2020 and the whole time series. The TERT agreed with the revised estimate provided by Bulgaria and attached to the annex of the review report. The TERT recommends that Bulgaria include the revised estimate in its next submission, and use final reported activity data once they are available, and make sure that the correct activity data is reported in the CRF table (using modelled stock data from which emissions are calculated in line 6 and below of the calculation sheet). | RE |
| BG-2F1-2022-0002 | Yes | 2F1 Refrigeration and Air Conditioning, 2017-2020, HFCs | For category 2F1f Stationary Air Conditioning and HFC emissions the TERT noted that the disposal loss factor for some years was higher than 100 % and that disposal emissions thus reached values almost as high as emissions from stock, and dropped significantly in 2019 and 2020, without any reason provided. In response to a question raised during the review, Bulgaria explained that the calculations were based on preliminary data, and provided calculation sheets, where the TERT detected some inconsistencies and provided a Technical Correction. In response, Bulgaria provided a Revised Estimate for year 2020 and stated that it will be included in the next submission. The TERT agreed with the revised estimate provided by Bulgaria and attached to the annex of the review report, as it is the best estimate based on the data available. The TERT recommends that Bulgaria include the revised estimate in its next submission, and recommends Bulgaria to validate activity data throughout the time series, and based on this, re-evaluate its methodology for this sector. | RE |

| EMRT - ID | Key category | Category, gas, year | Recommendation | RE or TC in 2022 |
|------------------|--------------|---|---|------------------|
| BG-5A-2022-0001 | Yes | 5A Solid Waste Disposal, 2018-2020, CH ₄ | The TERT noted for CH ₄ emissions from 5A1 Managed Waste Disposal Sites, that there is an unexpected trend after 2018. Indeed, a smooth increasing trend is observed between 2000 and 2018 and suddenly there is an annual decrease of about 2.5%. In response to a question raised during the review, Bulgaria explained that after conducting a more in-depth review of its activity data, minor discrepancies were found between the reported data and the official data published on the NSI website. In addition, Bulgaria explained that 2019 and 2020 estimates were based on preliminary data only. Final data for 2019 was received on April 1st and although 2020 data remains based on preliminary data, Bulgaria was able to submit a revised estimate for its landfill model and stated that it will be included in the next submission. The TERT analysed the revised estimate and identified a potential outlier of the data for 'fraction of waste to SWDS' in 2014, however the potential under-estimate this outlier might cause to 2020 emissions was found to be below the significance threshold. The TERT therefore agreed with the revised estimate provided by Bulgaria and attached to the annex of the review report. The TERT recommends that Bulgaria include the revised estimate in its next submission. | RE |
| BG-2F1-2022-0003 | Yes | 2F1 Refrigeration and air conditioning, 2018-2020, HFCs | For category 2F1e Mobile Air Conditioning and HFC emissions for years 2018-2020 the TERT noted that Bulgaria reported increasing emissions from Mobile Air Conditioning (MAC), whilst the provisions of the EU MAC Directive led to decreasing emissions in this sector since 2017 in most other Member States. In response to a question raised during the review, Bulgaria explained that this is due to the economic situation of Bulgaria, and the large share of used cars in the country, which explains the trend. The TERT thus notes that this issue does not relate to an over- or under-estimate of emissions. The TERT recommends that Bulgaria provide this information in its next NIR submission and continue to monitor the development of this sector in the future. | No |

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

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

Revised estimates provided by Bulgaria and accepted by the TERT

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|---------------------------------|---|--|--|--|--|-----------------|-----------------|-----------|-------------------------------|--|-------|-------|-----------------|-----------------|------------------|------------------|------|-----------------|-----------------|-----------|------|--|--|---------|---------|--|--|-------------------------------|--|
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ESD Review Tool ID: | BG-2F1-2022-0001 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ESD Review Tool URL: | https://emrt-esd.eionet.europa.eu/2022/BG-2F1-2022-0001 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Country: | Bulgaria | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Sector: | 2F1 Refrigeration and Air Conditioning | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Gases: | HFCs | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Fuel | N/A | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Completed by Sector Expert: | Maria Purzner | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Reviewed by Counterpart: | Kristina Kaar | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Reviewed by Lead Reviewer: | Ralph Harthan | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Reviewed by Quality Controller: | Emma Salisbury | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| 1 | The underlying problem: | During the initial phase of the review, the TERT found that for 2F1a Commercial Refrigeration and HFC emissions, Bulgaria applied product life factors that varied largely between recent years, and the agreed PLF that was applied during last year’s technical correction of 15 % was applied only to the calculation for 2020. This resulted in Bulgaria providing a revised estimate, which contained the calculation sheet that had previously not been available to the TERT. The TERT found an inconsistency in the calculation sheet, because stock data reported in the CRF was based on what the TERT considers reported data, but emission estimates were based on modelled stock from last year’s TC. The TERT thus did not accept the revised estimate provided by Bulgaria, and calculated a technical correction based on what is assumed to be reported data from the RIEW database mentioned in the NIR. Bulgaria then submitted a Revised Estimate based on the TERT calculation, which was accepted by the TERT. | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Summarise the methodology used: | Bulgaria provided a revised estimate based on last year’s TC including a new set of data previously unavailable to the TERT, consisting of stock data which the TERT presumes to be taken from the RIEW database described in their NIR. Stock data from the database was reported as stock, but emissions were estimated from a modelled stock (based on last year’s TC). The TERT then applied a consistent methodology, and the emission factors selected by Bulgaria. This methodology was accepted by Bulgaria, and they brought forward a Revised Estimate with new activity data for 2020, which is based on an average of the last 5 years or trends, rather than preliminary and incompletely reported data. This resulted in an increase of emissions above the threshold of significance. The TERT recommends Bulgaria to re-evaluate the 58 % emission factor for disposal, which refers to the amount of refrigerants remaining in equipment at decommissioning, or provide additional information to the rationale behind this emission factor in their NIR. | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | | <table><tr><td></td><td colspan="7">Original estimate (Gg CO₂e)</td><td rowspan="2">Notes</td></tr><tr><td>Year</td><td>CO₂</td><td>CH₄</td><td>N₂O</td><td>HFCs</td><td>PFCs</td><td>SF₆</td><td>Mixed GHG</td></tr><tr><td>2020</td><td></td><td></td><td></td><td>157.965</td><td></td><td></td><td></td><td>2F1a Commercial Refrigeration</td></tr></table> | | Original estimate (Gg CO ₂ e) | | | | | | | Notes | Year | CO ₂ | CH ₄ | N ₂ O | HFCs | PFCs | SF ₆ | Mixed GHG | 2020 | | | | 157.965 | | | | 2F1a Commercial Refrigeration | |
| | | Original estimate (Gg CO ₂ e) | | | | | | | Notes | | | | | | | | | | | | | | | | | | | | |
| | Year | CO ₂ | CH ₄ | N ₂ O | HFCs | PFCs | SF ₆ | Mixed GHG | | | | | | | | | | | | | | | | | | | | | |
| | 2020 | | | | 157.965 | | | | 2F1a Commercial Refrigeration | | | | | | | | | | | | | | | | | | | | |
| | | | <table><tr><td></td><td colspan="7">Revised Estimate received from country (Gg CO₂e)</td><td rowspan="2">Notes</td></tr><tr><td>Year</td><td>CO₂</td><td>CH₄</td><td>N₂O</td><td>HFCs</td><td>PFCs</td><td>SF₆</td><td>Mixed GHG</td></tr><tr><td>2020</td><td></td><td></td><td></td><td>200.965</td><td></td><td></td><td></td><td></td></tr></table> | | Revised Estimate received from country (Gg CO ₂ e) | | | | | | | Notes | Year | CO ₂ | CH ₄ | N ₂ O | HFCs | PFCs | SF ₆ | Mixed GHG | 2020 | | | | 200.965 | | | | |
| | | Revised Estimate received from country (Gg CO ₂ e) | | | | | | | Notes | | | | | | | | | | | | | | | | | | | | |
| | Year | CO ₂ | CH ₄ | N ₂ O | HFCs | PFCs | SF ₆ | Mixed GHG | | | | | | | | | | | | | | | | | | | | | |
| | 2020 | | | | 200.965 | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | <table><tr><td></td><td colspan="7">Difference between RE and original estimate (Gg CO₂e)</td></tr><tr><td>Year</td><td>CO₂</td><td>CH₄</td><td>N₂O</td><td>HFCs</td><td>PFCs</td><td>SF₆</td><td>Mixed GHG</td></tr><tr><td>2020</td><td></td><td></td><td></td><td>43.000</td><td></td><td></td><td></td></tr></table> | | Difference between RE and original estimate (Gg CO ₂ e) | | | | | | | Year | CO ₂ | CH ₄ | N ₂ O | HFCs | PFCs | SF ₆ | Mixed GHG | 2020 | | | | 43.000 | | | | | |
| | | Difference between RE and original estimate (Gg CO ₂ e) | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Year | CO ₂ | CH ₄ | N ₂ O | HFCs | PFCs | SF ₆ | Mixed GHG | | | | | | | | | | | | | | | | | | | | | | |
| 2020 | | | | 43.000 | | | | | | | | | | | | | | | | | | | | | | | | | |
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| ESD Review Tool ID: | | BG-2F1-2022-0002 | | | | | | | |
| ESD Review Tool URL: | | https://emrt-esd.eionet.europa.eu/2022/BG-2F1-2022-0002 | | | | | | | |
| Country: | | Bulgaria | | | | | | | |
| Sector: | | 2F1 Refrigeration and Air Conditioning | | | | | | | |
| Gases: | | HFCs | | | | | | | |
| Fuel | | N/A | | | | | | | |
| Completed by Sector Expert: | | Maria Purzner | | | | | | | |
| Reviewed by Counterpart: | | Kristina Kaar | | | | | | | |
| Reviewed by Lead Reviewer: | | Ralph Harthan | | | | | | | |
| Reviewed by Quality Controller: | | Justin Goodwin | | | | | | | |
| | | | | | | | | | |
| 1 | The underlying problem: | In the March 2022 submission, Bulgaria reported disposal emissions that were unrealistically high due to a disposal loss factor greater than 100 % throughout the time series, which resulted in a strong drop of emissions in 2019 and especially in 2020. In response to the question of the TERT, Bulgaria provided a revised estimate based on last year's Technical Correction. The TERT found a discrepancy between the results of the approach in the calculation sheets and last year's TC, and found some other unexplained discrepancies. The TERT thus did not accept the revised estimate provided by Bulgaria, and provided a technical correction, which Bulgaria then adapted and submitted as a Revised Estimate, which was accepted by the TERT. | | | | | | | |
| | Summarise the methodology used: | Bulgaria provided a revised estimate which was supposed to be based on last year's TC, however the TERT found some unexplained differences. In the revised estimate, Bulgaria provided two calculation sheets, one for Domestic Air Conditioning and one for Commercial AC. For Domestic AC disposal emissions were found to equal initial charge, which is an overestimation, because this type of equipment is usually not refilled during lifetime, so emissions during lifetime have to be taken into account and subtracted from the initial charge. At the same time this resulted in an increase of stock, because lower disposed amounts were subtracted from stock. Thus, emissions from disposal decreased, whilst emissions from stock slightly increased, which resulted in an overall decrease of emissions from this subcategory. In the revised estimate Bulgaria extrapolated the 2020 value for new equipment as a mean value of the five years before as only preliminary reported data for 2020 was available. For Commercial AC for HFC-134a and HFC-143a the new quantities of HFCs had not been calculated correctly for the year 2020 (problem with the applied formula in Excel), they were set to zero as the stock is decreasing. For disposal emissions the methodology was found to not consider refilling of equipment, which is an underestimation of disposed amounts as commercial AC installations are usually filled on-site and refilled regularly during service. Bulgaria might want to re-evaluate the use of its emission factor for disposal emissions trying to reflect the actual disposal routine in Bulgaria and, among other things consider the fact that installations might not be refilled at the last year(s) of their lifetime. As stock data for 2020 is preliminary and is possibly incomplete, and the time series for R143a strongly increased in 2019, final reported data might not depict a decrease in banks, thus the TERT agrees not to consider this decrease as disposal for the year 2020, but strongly recommends Bulgaria to reconsider this approach after final reported data have become available. | | | | | | | |
| | | | | | | | | | |
| 2 | Original estimate (Gg CO ₂ e) | | | | | | | Notes | |
| | Year | CO ₂ | CH ₄ | N ₂ O | HFCs | PFCs | SF ₆ | | Mixed GHG |
| | 2020 | | | | 1 015.657 | | | | |
| | Revised Estimate received from country (Gg CO ₂ e) | | | | | | | Notes | |
| | Year | CO ₂ | CH ₄ | N ₂ O | HFCs | PFCs | SF ₆ | | Mixed GHG |
| | 2020 | | | | 1 092.452 | | | | |
| | Difference between RE and original estimate (Gg CO ₂ e) | | | | | | | | |
| | Year | CO ₂ | CH ₄ | N ₂ O | HFCs | PFCs | SF ₆ | | Mixed GHG |
| | 2020 | | | | 76.795 | | | | |
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| ESD Review Tool ID: | BG-5A-2022-0001 |
| ESD Review Tool URL: | https://emrt-esd.eionet.europa.eu/2022/BG-5A-2022-0001 |
| Country: | Bulgaria |
| Sector: | 5A Solid Waste Disposal |
| Gases: | CH ₄ |
| Fuel | N/A |
| Completed by Sector Expert: | Richard Claxton |
| Reviewed by Counterpart: | Hans Oonk |
| Reviewed by Lead Reviewer: | Ralph Harthan |
| Reviewed by Quality Controller: | Emma Salisbury |

The underlying problem:

The TERT noted for CH₄ emissions from 5A1 Solid Waste Disposal - Managed Waste Disposal Sites that there is an unexpected trend after 2018. Indeed, a smooth increasing trend is observed between 2000 and 2018 and suddenly there is an annual decrease of about 2.5%.

Summarise the methodology used:

During the review, Bulgaria conducted a more in-depth review of its activity data and found minor discrepancies between the reported data and the official data published on the NSI website. In addition, Bulgaria explained that 2019 and 2020 estimates were based on preliminary data only. Final data for 2019 was received on April 1st and although 2020 data remains based on preliminary data, Bulgaria was able to submit a revised estimate for its landfill model in response to questions raised by the TERT. The TERT analysed the revised estimate and identified a potential outlier of the data for "fraction of waste to SWDS" in 2014 (cell BO8 in calculations sheet), however the potential under-estimate this outlier might cause to 2020 emissions was found to be below the significance threshold. The revised estimate was therefore accepted by the TERT.

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| | Original estimate (Gg CO ₂ e) | | | | | | | Notes |
|------|--|-----------------|------------------|------|------|-----------------|-----------|-------|
| Year | CO ₂ | CH ₄ | N ₂ O | HFCs | PFCs | SF ₆ | Mixed GHG | |
| 2020 | | 2 023.279 | | | | | | |
| | Revised Estimate received from country (Gg CO ₂ e) | | | | | | | Notes |
| Year | CO ₂ | CH ₄ | N ₂ O | HFCs | PFCs | SF ₆ | Mixed GHG | |
| 2020 | | 2 344.355 | | | | | | |
| | Difference between RE and original estimate (Gg CO ₂ e) | | | | | | | |
| Year | CO ₂ | CH ₄ | N ₂ O | HFCs | PFCs | SF ₆ | Mixed GHG | |
| 2020 | | 321.075 | | | | | | |

Annex I: Legal background and procedures of the 2022 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.

Therefore, this is the last ESD review that will be performed. 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 Regulation (EU) No 749/2014.

The objectives of the 2022 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 2020 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 2022 annual ESD review of national GHG inventory data was carried out for the compliance year 2020 pursuant to Article 19 of the MMR. The EEA review secretariat (consisting of Melanie Sporer, Claire Qoul and Justine Raoult) coordinated the 2022 annual ESD review as foreseen in Article 28 of the Commission Implementing Regulation (EU) No 749/2014.

The scope of the 2022 annual ESD review is presented in Table A.1.1. The checks carried out during the 2022 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 (EEA, ETC/CM, JRC, Eurostat). The EU inventory team consisted of the following experts:

- ETC/CME task manager: Nicole Mandl, Marion Pinterits (ETC/CM)
- Energy: Julien Vincent, Coralie Jeannot, Marion Pinterits, Zuzana Roskova, Bernd Gugele, Markéta Klusackova, Maria Georgakaki (ETC/CM), Michael Goll (Eurostat)
- IPPU: Barbara Gschrey, Kristina Kaar, Lorenz Moosmann, Lukas Emele, Julien Vincent, Coralie Jeannot (ETC/CM)
- Agriculture: Frank Dentener, Simona Bosco, Efsio Solazzo (JRC)
- Waste: Céline Gueguen (ETC/CM)
- LULUCF: Peter Iversen (EEA), Raúl Abad-Viñas (JRC)
- Quality experts: Frank Dentener, Giacomo Grassi (JRC), Nicole Mandl, Marion Pinterits, Markéta Klusackova, Risto Saarikivi, Maria Purzner, Julien Vincent, Giorgos Mellios, Ils Moorkens, Zuzana Roskova (ETC/CM)
- Cross-cutting: Nicole Mandl (ETC/CM)

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 2022 annual ESD review was performed by a Technical Expert Review Team (TERT) under service contract 340201/2018/790329/SER/CLIMA.C of the Directorate General for Climate Action of the European Commission. The TERT consisted of the following experts:

- Lead Reviewers: Suvi Monni, Ralph Harthan
- Energy: Marlene Plejdrup, Ioannis Sempas
- IPPU: Kristina Kaar, Maria Purzner
- Agriculture: Etienne Mathias, Steen Gyldenkaerne
- Waste: Richard Claxton, Hans Oonk
- Quality controller: Emma Salisbury, Justin Goodwin
- Co-ordinator: Bernd Guegle

The TERT 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 2022 under the MMR. Where relevant, the TERT calculated technical corrections for under- or over-estimates identified in a mandatory category in the Member States' GHG inventories that exceed the threshold of significance. Technical corrections were calculated for the year 2020.

Table A.1.1: Scope of the 2022 annual ESD review

| Element | Scope | Further information |
|------------------------------------|---|---|
| Countries | EU geographical coverage of the 27 Member States and the United Kingdom | |
| Years | 2020 | |
| Gases | CO ₂ , CH ₄ , N ₂ O, HFCs, PFCs, SF ₆ | NF ₃ 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 ₂ emissions | Included in national total | |
| Inventory Submission | Submissions received by 15 March 2022 | |

Annex II: Checks carried out during the 2022 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, 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 under- or over-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.