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

Czechia

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 Czechia, pursuant to:

- Article 4(3) of Regulation (EU) No 2018/842 (the 'Effort Sharing Regulation', ESR), for the purpose of setting out Czechia'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 Czechia'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 Czechia 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.

Czechia did not provide a resubmission to the Commission.

Step 1 and 2 conclusions

1. The reviewers raised 63 issues with Czechia during the first and the second step of the 2020 comprehensive ESD review (see Table 1). The TERT provided recommendations for 11 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. Czechia 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 Czechia (see Table 6).

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

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

	Issues raised step 1[1]	Issues raised step 2	Recommendations	Revised estimates[2]	Technical corrections[3]
Total	**34**	**29**	**11**	**7**	**-**
Energy	7	14	3	2	-
IPPU	13	4	2	1	-
Agriculture	11	5	4	3	-
Waste	3	6	2	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 Czechia pursuant to Article 7(4) of Regulation (EU) No 525/2013, taking into account any resubmission to the Commission	CZE_2020_1_30032020	128 139.420
Difference between original estimates and revised estimates provided by Czechia and accepted by the TERT[2]		
1B1 Fugitive Emissions from Solid Fuels, CH_4	CZ-1B1-2020-0003	-33.426
3B Manure Management, CH_4	CZ-3B-2020-0003	-1.390
3D Agricultural Soils, N_2O	CZ-3D-2020-0002	-244.508
3H Urea Application, CO_2	CZ-3H-2020-0001	59.544
5A Solid Waste Disposal, CH_4	CZ-5A-2020-0001	-376.699
Total greenhouse gas emissions including revised estimates		127 542.941
CO_2 emissions from 1A3a Domestic Aviation[3]	CZE_2020_1_30032020	9.964
NF_3 emissions[3]	CZE_2020_1_30032020	3.111

[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.

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 Czechia pursuant to Article 7(4) of Regulation (EU) No 525/2013, taking into account any resubmission to the Commission	CZE_2020_1_30032020	148 972.363	130 895.417	129 777.011	128 139.420
Difference between original estimates and revised estimates provided by Czechia and accepted by the TERT[2]					
1B1 Fugitive Emissions from Solid Fuels, CH_4	CZ-1B1-2020-0003	-	-30.150	-30.150	-33.426
1B1 Fugitive Emissions from Solid Fuels, CH_4	CZ-1B1-2020-0005	139.119	16.532	-	-
2B8 Petrochemical and Carbon Black Production, CO_2, CH_4	CZ-2B8-2020-0001	-37.032	-	-	-
3B Manure Management, CH_4	CZ-3B-2020-0003	3.452	-1.383	-0.847	-1.390
3D Agricultural Soils, N_2O	CZ-3D-2020-0002	-49.647	-237.446	-233.091	-244.508
3H Urea Application, CO_2	CZ-3H-2020-0001	72.253	78.775	100.887	59.544
5A Solid Waste Disposal, CH_4	CZ-5A-2020-0001	-314.822	-377.298	-376.541	-376.699
Total greenhouse gas emissions including revised estimates		148 785.686	130 344.448	129 237.269	127 542.941
CO_2 emissions from 1A3a Domestic Aviation[3]	CZE_2020_1_30032020	8.777	10.003	9.837	9.964

[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 Czechia on the conclusions presented by the TERT

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

Czechia comments on CZ-1-2020-0001, that we do not agree with this recommendation. The work TERT is proposing in the paragraph is already done. By including additional level of details, the inventory team would bring high level of uncertainty in the reported data. The MMR Annex V is already completed in the details available and if there are allocating issues, the comments are provided. The total verified ETS emissions are always inserted by the official authority responsible for the ETS reporting.

Czechia comments on CZ-3D-2020-0002, that the solution as recommended by TERT would require a continual record keeping of agricultural residues treated in anaerobic digesters. However, there is no such information available in the country. There is only one statistical survey realized in 2016 by Institute of Agricultural Economics and Information that estimated agricultural residues. This survey has not been repeated since then. It should be noted that amount of agricultural residues presumably varies from year to year in relation to growth conditions, species composition, farmers preferences, prices of final products etc. Therefore, we need to retain our methodological approach. The consistency between CRF category 3Da4 crop residues and 3Da2c Other Organic Fertilizers Applied to soils is maintained by procedures in use – e.g. crop residues are estimated in the 3Da4. The amount of digestate from manure estimated by expert is applied to the soil under 3Da2c.

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 Czechia and any technical corrections deemed necessary by the TERT	See Table 2 above	127 542.941
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]	66 913.386
CO_2 emissions from 1A3a Domestic Aviation	See Table 2 above	9.964
NF_3 emissions	See Table 2 above	3.111
Total ESD emissions		**60 616.480**

[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 Czechia and any technical corrections deemed necessary by the TERT	See Table 3 above	148 785.686	130 344.448	129 237.269	127 542.941
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]	82 454.636	67 530.907	66 975.758	66 913.386
CO_2 emissions from 1A3a Domestic Aviation	See Table 3 above	8.777	10.003	9.837	9.964
Total ESR emissions		**-**	**62 803.539**	**62 251.674**	**60 619.591**

[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
CZ-1B1-2020-0005	Yes	1B1 Fugitive Emissions from Solid Fuels, CH_4, 2005-2016	For category 1B1a Coal Mining and Handling, CH_4, years 2005 and 2016, the TERT noted that there is an under-estimate of emissions. Czechia estimated CH_4 emissions from brown coal underground mining in Northern Bohemia by applying a Tier 1 emission factor (EF) for surface mines from the 2006 IPCC Guidelines. The TERT notes that the average Tier 1 CH_4 EF for underground mines from 2006 IPCC Guidelines is significantly higher than the applied EF. In response to a question raised during the review, Czechia explained that the single brown coal underground mine in Northern Bohemia was closed in March 2016, therefore the emissions were under-estimated up to the year 2016. Czechia provided revised estimates for years 2005 and 2016 and stated that it will be included in the next submission. The TERT agreed with the revised estimate. The TERT recommends that Czechia include the revised estimate in its next submission.	RE
CZ-1B1-2020-0003	Yes	1B1 Fugitive Emissions from Solid Fuels, CH_4, CO_2, 2016-2018	For category 1B1ai3 Abandoned Underground Mines, CH_4, years 2016-2018 the TERT noted that there is an over-estimate of emissions. Czechia applied the Tier 1 methodology from the 2006 IPCC Guidelines to estimate CH_4 emissions from abandoned mines. The TERT notes that the over-estimation was due to an incorrect emission factor being used for the interval 1976-2000 (0.769 instead of 0.469 Mm^3 CH_4 per mine). In response to a question raised during the review, Czechia provided revised estimates for years 2016, 2017 and 2018 and stated that it will be included in the next submission. The TERT agreed with the revised estimate. The TERT recommends that Czechia include the revised estimate in its next submission.	RE
CZ-2B8-2020-0001	Yes	2B8 Petrochemical and Carbon Black Production, CO_2 and CH_4, 2005	For category 2B8 Petrochemical and Carbon Black Production, CO_2 and CH_4, and the year 2005, the TERT noted that the activity data (AD) for 2005 was the same as the AD for 2004. In response to a question raised during the review, Czechia explained that AD for 2005 was not available during the compilation of the submission but that it is now available. Czechia provided a revised estimate for year 2005. The TERT agreed with the revised estimate provided by Czechia. The TERT recommends that Czechia include the revised estimate in its next submission.	RE

EMRT-ID	Key category	Category, gas, year	Recommendation	Revised estimate or technical correction in 2020
CZ-3B-2020-0003	Yes	3B Manure Management, CH_4, 2005-2018	For category 3B Manure Management, CH_4 and years 2005, 2016, 2017 and 2018, the TERT noted the UNFCCC ARR 2019 and EU UNFCCC review recommendation to consider swine a significant species and apply a Tier 2 method to estimate CH_4 emissions from manure management for swine was not implemented. The TERT further noted that Czechia used a weighted average of the two default emission factors for market swine and breeding swine assuming a 90%:10% split in swine population statistics. The TERT identified that the proportional spilt in population utilised by Czechia was not appropriate for all years. In response to a question raised during the review, Czechia provided a revised estimate for the years 2005, 2016, 2017 and 2018 and stated that it will be included in the next submission. The TERT agreed with the revised estimate provided by Czechia. The TERT recommends that Czechia include the revised estimate in its next submission.	RE
CZ-3D-2020-0002	Yes	3D Agricultural Soils, N_2O, 2016-2018	For category 3Da2c Other Organic Fertilizers Applied to Soils, N_2O and years 2016-2018, the TERT noted that there is an over-estimation of emissions due to the double counting of animal manure and crop residues treated in anaerobic digesters. In response to a question raised during the review, Czechia explained that animal manure and crop residues are treated in digesters and half of the reported digestate is animal manure based on the expert judgement of Dr Klír (Crop Research Institute). Czechia provided revised estimates for years 2016, 2017, 2018 combining with CRF category 3Da2a Animal Manure Applied to Soils. The TERT accepted the revised estimates for the purposes of this review. However, the TERT notes that further improvements in the methodology are necessary. Therefore, the TERT recommends that Czechia (1) calculate the amounts of digested manure Nitrogen in manure management category instead of using expert judgement and revise the total Nitrogen available from anaerobic digested manure applied to soils accordingly, ensuring that the same Nitrogen is not double counted in categories 3Da2a and 3Da2c (see issue CZ-3-2020-0002)t; (2) revise the value of $Frac_{REMOVE}$ used to estimate emissions from crop residues under category 3Da4 (value is currently zero according to NIR table 5-37), so that it takes into account the crop residues removed for the purposes of anaerobic digestion to avoid double counting of crop residues treated in digesters; (3) improve the quality control regarding the anaerobic digestion and cross-check the data reported in the waste sector under CRF category 5B1.	RE

EMRT-ID	Key category	Category, gas, year	Recommendation	Revised estimate or technical correction in 2020
CZ-3H-2020-0001	No	3H Urea Application, CO_2, 2005-2018	For category 3H Urea Application, CO_2 emissions, the TERT noted that there was an under-estimation of emissions because Czechia reported lower use of urea than is reported under FAOSTAT. Additionally, the emissions from 'Urea and ammonium nitrate solutions (UAN)' were omitted from the calculation. However, the UAN fertilizer contains around 33% urea in terms of mass of the product and is therefore also a source of CO_2 emissions. The TERT noted that FAOSTAT reported use of UAN fertilizers for 2016 (316,727 t) and 2017 (260,743 t). In response to a question raised during the review, Czechia indicated that it agreed with the finding of the TERT. Czechia provided revised estimates for years 2005, 2016, 2017 and 2018. The TERT agreed with the revised estimate provided by Czechia. The TERT recommends that Czechia include the revised estimate in its next submission.	RE
CZ-5A-2020-0001	Yes	5A Solid Waste Disposal, CH_4, 2005-2018	For 5A Solid Waste Disposal, CH_4 and years 2005-2018 the TERT noted that Czechia calculated methane emissions using a country-specific value of fraction of CH_4 in generated landfill gas (F=0.55). The value of 0.55 was based on measurements in collected landfill gas. The 2006 IPCC Guidelines (Vol 5, Chapter 3, page 3.15) indicate that a country-specific value of F might be based on measurements of gas as it is released. However, this measured composition should be corrected for CO_2 absorption. Such correction was not made by the Czechia in the inventory. During the review, Czechia provided a revised estimate for 2005, 2016-2018 using the default value of F=0.5 and stated that it will be included in the next submission. The TERT agreed with the revised estimate. The TERT recommends that Czechia include the revised estimate in its next submission.	RE

EMRT-ID	Key category	Category, gas, year	Recommendation	Revised estimate or technical correction in 2020
CZ-1-2020-0001	Yes	1A Fuel Combustion Activities, CO_2, 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 Czechia reports 'IE' for all of sector 1A (Fuel Combustion Activities). No other explanation is provided for any of the subcategories under 1A than "disagregated information not available, sum value presented under 1A". The TERT notes that this issue does not directly relate to an under- or over-estimate of emissions but that lack of sufficient reporting transparency inhibits an efficient and thorough review. In response to a question raised during the review, Czechia explained that the disaggregated data was not available from the ETS reporting due to unreliable category reporting from a high number of plants, because there is no obligation to submit in the EU ETS questionnaire the information on the CRF category. Furthermore, the TERT noted that the sum of the verified CO2 emissions under Directive 2003/87/EC according to the different CRF categories (1A, 2A, 2B, 2C) (61 981 kt CO2 in 2018) reported in Annex V table is lower than the total verified emissions reported at the top of the same Annex (66 801 kt CO2 in 2018). This is also an issue for years 2017 and 2016. The TERT requested the country to provide an explanation for the differences during the review but did not receive any response. The TERT recommends that Czechia work to complete the MMR Annex V table in as much detail as possible, providing comments in the file where there are known allocation issues, as well as ensuring the sum of reported ETS data by CRF category matches the total verified ETS emissions.	No
CZ-2B1-2020-0001	Yes	2B1 Ammonia Production, CO_2, 1990-2018	For category 2B1 Ammonia Production, CO_2, all years, the TERT noted that Czechia continues to use a Tier 1 method for this key category. Czechia explained that it plans to estimate emissions using Tier 3 in the next submission. The TERT recommends that Czechia uses a Tier 2 methodology or above for 2B1 in the next submission.	No

EMRT-ID	Key category	Category, gas, year	Recommendation	Revised estimate or technical correction in 2020
CZ-3-2020-0002	Yes	3D Agricultural Soils, N_2O, 1990-2018	For category 3Da2a Animal Manure Applied to Soils, during Step 1 of the review the TERT noted that there is a discrepancy between the CRF Tables 3.D and 3.B(b). The amount of Nitrogen (N) applied with animal manure in 3Da2a is too large compared to the amount managed in manure management systems minus N lost as NH_3+NO_x or leaching (inverse ratio range: 1-1.1). In response to the question raised during Step 1 of the review, Czechia explained that did not understand the problem identified and provided the calculation sheet used in the estimate. The TERT's thorough examination of the Excel sheet provided by Czechia revealed several calculation errors and methodological problems during Step 2 of the review. Namely, inappropriate use of default figures on total nitrogen losses from manure management systems (FracLossMS) given in Table 10.23 of the 2006 IPCC Guidelines and the double counting of straw used for bedding. During Step 2 of the review, Czechia provided revised estimates for years 2005, 2016, 2017 and 2018. The TERT accepted the revised estimates for the purposes of this review, included under CZ-3D-2020-0002. However, the TERT notes that further improvements in the methodology are necessary. Therefore, the TERT recommends that (1) Czechia use the default figures of FracGasMS and FracLossMS provided in the Table 10.22 and Table 10.23 of the 2006 IPCC Guidelines consistently; (2) as the 2006 IPCC Guidelines do not provide default figures of FracGasMS and FracLossMS for anaerobic digested manure, and the share of the animal manure treated in digesters in Czechia is the highest in the EU, Czechia develop a Tier 2 Nitrogen-flow approach to calculate the animal manure N applied to soils; (3) Czechia ensure consistency between CRF categories 3Da2a and 3Da4 to avoid double counting of straw used for bedding; (4) Czechia ensure the consistency between the CRF category 3Da2a and 3Da2c to avoid double counting of N from anaerobic digested animal manure applied to soils (see issue CZ-3D-2020-0002); (5) Czechia enhance the quality control of the emission estimate for the Agriculture Sector to avoid calculation errors in the Excel spreadsheet.	No

EMRT-ID	Key category	Category, gas, year	Recommendation	Revised estimate or technical correction in 2020
CZ-5D-2020-0002	Yes	5D Wastewater Treatment and Discharge, CH_4, 2005-2018	For category 5D Wastewater Treatment and Discharge, CH_4 and the years 2005-2018, the TERT noted that the methane correction factors (MCFs) for uncollected wastewater and wastewater treated in centralised wastewater treatment plants are not well justified. The TERT could not evaluate whether this results in an over- or under-estimate of emissions. In response to a question raised during the review, Czechia explained that for well managed aerobic treatment plants the high end of the IPCC range 0-0.1 was selected, arguing that the IPCC default of 0 would result in an under-estimation of emissions. The TERT notes, that the 2006 IPCC Guidelines does not contain a clear definition of well-managed and not well-managed wastewater treatment plants. The country explained that MCF for uncollected wastewater is based on expert judgement, based on the share of each treatment method and their MCFs. However, Czechia was not able to provide quantitative information to support this expert judgement. The TERT recommends that Czechia improve the justification of the expert judgement for the MCFs and report them in the next NIR. The TERT notes that the country may consider using the methodology suggested by TERT during the review to quantify the ratio of well-managed and not well-managed wastewater treatment plants, should it decide to revise its estimates.	No

Revised estimates provided by Czechia and accepted by the TERT

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ESD Review Tool ID:	CZ-1B1-2020-0003
ESD Review Tool URL:	https://emrt-esd.eionet.europa.eu/2020/CZ-1B1-2020-0003/
Country:	Czechia
Sector:	1B1 Fugitive Emissions from Solid Fuels
Gases:	CH_4
Fuel	Solid 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 category 1B1ai3 Abandoned Underground Mines, CH_4, years 2016-2018 the TERT noted that there is an over-estimate of emissions. Czechia applied a Tier 1 methodology from the 2006 IPCC Guidelines to estimate CH_4 emissions from abandoned mines. The TERT notes that the over-estimation was due to a wrong emission factor applied for the interval 1976-2000 (0.769 instead of 0.469 Mm^3 CH_4 per mine).
Summarise the methodology used:	In the revised estimate, CH_4 emissions associated to abandoned mines (category 1B1ai3) were estimated by applying the EF 0.469 Mm^3 CH_4 per mine for the interval 1976-2000, in line with Table 4.1.6 of the 2006 IPCC Guidelines, Volume 2.

2

	Original estimate (Gg CO_2e)								Notes
Year	CO_2	CH_4	N_2O	HFCs	PFCs	SF_6	NF_3	Mixed GHG	
2005									
2016		106.007							
2017		106.007							
2018		109.284							

	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									
2016		75.857							
2017		75.857							
2018		75.857							

	Difference between RE and OE (Gg CO_2e)							
Year	CO_2	CH_4	N_2O	HFCs	PFCs	SF_6	NF_3	Mixed GHG
2005								
2016		-30.150						
2017		-30.150						
2018		-33.426						

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ESD Review Tool ID:	CZ-1B1-2020-0005
ESD Review Tool URL:	https://emrt-esd.eionet.europa.eu/2020/CZ-1B1-2020-0005/
Country:	Czechia
Sector:	1B1 Fugitive Emissions from Solid Fuels
Gases:	CH_4
Fuel	Solid 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 category 1B1a Coal Mining and Handling, CH_4, and the years 2005 and 2016, the TERT noted that there is an under-estimate of emissions. Czechia estimated CH_4 emissions from brown coal underground mining in Northern Bohemia by applying a Tier 1 emission factor for surface mines from the 2006 IPCC Guidelines (the upper limit of the proposed range for surface mines). The TERT notes that the average Tier 1 CH_4 EF for underground mines from 2006 IPCC Guidelines is several times higher than the applied EF. During the review, Czechia explained that the single brown coal underground mine in Northern Bohemia was closed in March 2016, therefore the emissions were under-estimated up to the year 2016.
Summarise the methodology used:	In the revised estimate, CH_4 emissions associated to coal mining and handling (category 1B1a) of brown coal in the underground mine in Northern Bohemia were estimated by applying the average Tier 1 CH_4 EF for underground mines from 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		16.321							
2016		1.940							
2017									
2018									

	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		155.440							
2016		18.472							
2017									
2018									

	Difference between RE and OE (Gg CO_2e)							
Year	CO_2	CH_4	N_2O	HFCs	PFCs	SF_6	NF_3	Mixed GHG
2005		139.119						
2016		16.532						
2017								
2018								

1

ESD Review Tool ID:	CZ-2B8-2020-0001
ESD Review Tool URL:	https://emrt-esd.eionet.europa.eu/2020/CZ-2B8-2020-0001
Country:	Czechia
Sector:	2B8 Petrochemical and Carbon Black Production
Gases:	CO_2, CH_4
Fuel	N/A
Completed by Sector Expert:	Emma Salisbury
Reviewed by Counterpart:	Kristina Kaar
Reviewed by Lead Reviewer:	Suvi Monni
Reviewed by Quality Controller:	Justin Goodwin

The underlying problem:	Activity data for the year 2005 for ethylene production was not available to Czechia whilst preparing the inventory submission. The AD value for 2004 was used.
Summarise the methodology used:	AD obtained from Czech Statistical office for the year 2005 and used in the calculations of CO_2 and CH_4 emissions by Czechia.

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	Original estimate (Gg CO_2e)								Notes
Year	CO_2	CH_4	N_2O	HFCs	PFCs	SF_6	NF_3	Mixed GHG	
2005	958.846	37.789							
2016									
2017									
2018									

	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	923.218	36.385							
2016									
2017									
2018									

	Difference between RE and OE (Gg CO_2e)							
Year	CO_2	CH_4	N_2O	HFCs	PFCs	SF_6	NF_3	Mixed GHG
2005	-35.628	-1.404						
2016								
2017								
2018								

1

ESD Review Tool ID:	CZ-3B-2020-0003
ESD Review Tool URL:	https://emrt-esd.eionet.europa.eu/2020/CZ-3B-2020-0003
Country:	Czechia
Sector:	3B Manure Management
Gases:	CH_4
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

The underlying problem:	Czechia assumed a 90%:10% split between market swine and breeding swine which was fixed across the time series. However, the proportion differs annually based on the number of swine in each category.
Summarise the methodology used:	Czechia provided revised proportion values and emission estimates for market swine and breeding swine for each of the years 2005, 2016, 2017 and 2018.

2

	Original estimate (Gg CO_2e)								Notes
Year	CO_2	CH_4	N_2O	HFCs	PFCs	SF_6	NF_3	Mixed GHG	
2005		964.150							
2016		516.525							
2017		501.988							
2018		532.907							

	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		967.602							Revised spilt for the proportion of market swine and breeding swine
2016		515.143							Revised spilt for the proportion of market swine and breeding swine
2017		501.141							Revised spilt for the proportion of market swine and breeding swine
2018		531.517							Revised spilt for the proportion of market swine and breeding swine

	Difference between RE and OE (Gg CO_2e)							
Year	CO_2	CH_4	N_2O	HFCs	PFCs	SF_6	NF_3	Mixed GHG
2005		3.452						
2016		-1.383						
2017		-0.847						
2018		-1.390						

ESD Review Tool ID:	CZ-3D-2020-0002
ESD Review Tool URL:	https://emrt-esd.eionet.europa.eu/2020/CZ-3D-2020-0002
Country:	Czechia
Sector:	3D Agricultural Soils
Gases:	N_2O
Fuel	N/A
Completed by Sector Expert:	Katalin Lovas
Reviewed by Counterpart:	Etienne Mathias
Reviewed by Lead Reviewer:	Suvi Monni
Reviewed by Quality Controller:	Bernd Gugele

1

The underlying problem:	During Step 1 of the review the animal manure applied to soils reported in CRF category 3Da2a was compared with the nitrogen (N) managed in manure management systems (MMS) minus 'Nvol' plus 'Nleach' in category 3B. The amount of N applied with animal manure in 3Da2a was too large as compared to N managed in MMS minus N lost as NH_3+NO_x or leaching (inverse ratio range: 1-1.1). The thorough examination of the Excel sheet provided by Czechia revealed several calculation errors and methodological problems. Namely, inappropriate use of default values on total nitrogen losses from manure management systems, FracLossMS provided in Table 10.23 of the 2006 IPCC Guidelines and double counting of straw used for bedding. Additionally, there was double counting of animal manure treated in anaerobic digester. The reported amount of digestate N includes the animal manure. However, in CRF category 3Da2a Animal Manure Applied to Soils the animal manure treated in digesters is also reported.
Summarise the methodology used:	The amount of animal manure applied to soils (FAM) reported in CRF category 3Da2a was revised by Czechia. Additionally, the amount of the animal manure digestate was subtracted from the digestate N by expert judgement of Dr Klír (Crop Research Institute). The related direct and indirect N_2O emissions were calculated according to the 2006 IPCC Guidelines. Czechia provided revised emissions for the overall changes in category 3D.

2

	Original estimate (Gg CO_2e)								Notes
Year	CO_2	CH_4	N_2O	HFCs	PFCs	SF_6	NF_3	Mixed GHG	
2005			3 553.285						
2016			4 577.574						
2017			4 573.806						
2018			4 229.329						

	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			3 503.637						
2016			4 340.128						
2017			4 340.715						
2018			3 984.821						

	Difference between RE and OE (Gg CO_2e)							
Year	CO_2	CH_4	N_2O	HFCs	PFCs	SF_6	NF_3	Mixed GHG
2005			-49.647					
2016			-237.446					
2017			-233.091					
2018			-244.508					

1

ESD Review Tool ID:	CZ-3H-2020-0001
ESD Review Tool URL:	https://emrt-esd.eionet.europa.eu/2020/CZ-3H-2020-0001
Country:	Czechia
Sector:	3H Urea Application
Gases:	CO_2
Fuel	N/A
Completed by Sector Expert:	Katalin Lovas
Reviewed by Counterpart:	Etienne Mathias
Reviewed by Lead Reviewer:	Suvi Monni
Reviewed by Quality Controller:	Justin Goodwin

The underlying problem:	The TERT noted that FAOSTAT reports higher use of urea than Czechia reports under 3H. Additionally, Czechia did not include CO_2 emissions from Urea and ammonium nitrate solutions (UAN) in its estimates under 3H. However, according to the data held by FAOSTAT, agriculture use of UAN fertilizer occurred in 2016 (316,727 t) and 2017 (260,743 t). The use of UAN fertilizers is a source of CO_2 emissions.
Summarise the methodology used:	The Ministry of Agriculture provided data on the use of urea and 'DAM 390', which is a product reported under 'Urea and ammonium nitrate solution' in the FAOSTAT. For the revised estimate, activity data was calculated as the sum of the 'Urea use' and the urea content of the UAN fertilizer 'DAM 390'. The urea content of the UAN fertilizers was estimated as 32.6% in terms of mass of product. To calculate the CO_2 emissions the UAN the default emission factor from the 2006 IPCC Guidelines (0.02 tC/t urea) was applied.

2

	Original estimate (Gg CO_2e)								Notes
Year	CO_2	CH_4	N_2O	HFCs	PFCs	SF_6	NF_3	Mixed GHG	
2005	74.170								
2016	210.760								
2017	124.284								
2018	125.923								

	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	146.423								
2016	289.535								
2017	225.172								
2018	185.468								

	Difference between RE and OE (Gg CO_2e)							
Year	CO_2	CH_4	N_2O	HFCs	PFCs	SF_6	NF_3	Mixed GHG
2005	72.253							
2016	78.775							
2017	100.887							
2018	59.544							

1

ESD Review Tool ID:	CZ-5A-2020-0001
ESD Review Tool URL:	https://emrt-esd.eionet.europa.eu/2020/CZ-5A-2020-0001
Country:	Czechia
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:	For 5A Solid Waste Disposal, CH_4 and years 2005-2018 the TERT noted that Czechia calculated methane emissions using a country-specific value of fraction of CH_4 in generated landfill gas (F=0.55). The value of F seems to be based on the composition of collected landfill gas, as reported to MIT. According to the 2006 IPCC Guidelines (Volume 5, chapter 3, page 3.15), the fraction of CH_4 in generated landfill gas (F) should not be confused with measured CH_4 in gas emitted from the solid waste disposal sites (SWDS), because CO_2 is absorbed in seepage water and the composition of the gas is shifted towards higher concentration of CH_4. It is good practice to adjust for CO_2 absorption in seepage water if F is based on measured concentrations of CH_4 in landfill gas, emitted from the SWDS. During the review, the country was not able to sufficiently justify the country-specific value of F.
Summarise the methodology used:	Czechia calculated the revised estimate using the same IPCC waste model as used in the inventory but changed the value of F to the default (F=0.5).

2

	Original estimate (Gg CO_2e)								Notes
Year	CO_2	CH_4	N_2O	HFCs	PFCs	SF_6	NF_3	Mixed GHG	
2005		3 058.112							
2016		3 671.111							
2017		3 705.912							
2018		3 742.721							

	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		2 743.290							
2016		3 293.813							
2017		3 329.372							
2018		3 366.022							

	Difference between RE and OE (Gg CO_2e)							
Year	CO_2	CH_4	N_2O	HFCs	PFCs	SF_6	NF_3	Mixed GHG
2005		-314.822						
2016		-377.298						
2017		-376.541						
2018		-376.699						

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.