

Final Review Report

2022 annual review of national greenhouse gas inventory data

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

Cyprus
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 Cyprus, pursuant to Article 19(2) of Regulation (EU) No 525/2013, with a view to monitoring Cyprus'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 Cyprus 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 EU inventory team could not perform all of the Step 1 checks because Cyprus provided key annexes later than the date set out in Annex XVI of the Commission Implementing Regulation (EU) 749/2014. Therefore Cyprus was directly subject to the second step of the 2022 annual ESD review.

Step 2 conclusions

1. The reviewers raised 27 issues with Cyprus during the first and the second step of the 2022 annual ESD review (see Table 1). The TERT provided a recommendation for 6 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. Cyprus provided 6 revised estimates. The TERT did not agree to 2 of these revised estimates. Table 2 below summarises the revised estimates accepted by the TERT and further information is provided at the end of this report.
4. The TERT also deemed necessary 2 technical corrections in the meaning of Article 19(3)(c) of Regulation (EU) No 525/2013. The technical corrections are presented in Table 2 and are accompanied by evidence-based justification. In its response to the draft technical corrections, Cyprus stated that it agrees with the technical corrections.
5. The TERT identified non-binding recommendations in order to improve the national inventory data of Cyprus (see Table 4).
6. The TERT considers that it received a response from Cyprus that was sufficient in order to undertake the review appropriately.

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

	Issues raised ¹	Recommendations ²	Revised estimates ³	Technical corrections ⁴
Total	27	6	4	2
Energy	4	1	1	-
IPPU	3	-	-	-
Agriculture	12	2	1	1
Waste	8	3	2	1
Cross-cutting	-	-	-	-

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 Cyprus pursuant to Article 7(4) of Regulation (EU) No 525/2013, taking into account any resubmission to the Commission	CYP_2022_5_14032022	8 878.439
Difference between original estimates and revised estimates provided by Cyprus and accepted by the TERT²		
1A2g Other (manufacturing industries and construction), CO ₂	CY-1A2g-2022-0001	-349.207
3B Manure management, CH ₄	CY-3B-2022-0003	7.585
5B Biological treatment of solid waste, CH ₄ , N ₂ O	CY-5B-2022-0001	6.942
5D Wastewater treatment and discharge, CH ₄	CY-5D-2022-0001	7.067
Difference between original estimates and technical corrections deemed necessary by the TERT²		
3B Manure management, N ₂ O	CY-3B-2022-0001	19.052
5A Solid waste disposal, CH ₄	CY-5A-2022-0002	-31.740
Total greenhouse gas emissions including revised estimates and technical corrections		8 538.138
CO ₂ emissions from 1A3a Domestic aviation ³	CYP_2022_5_14032022	0.095
NF ₃ emissions ³	CYP_2022_5_14032022	-

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 Cyprus and technical corrections deemed necessary by the TERT	<i>See Table 2 above</i>	8 538.138
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	4 294.888
CO ₂ emissions from 1A3a Domestic aviation ³	<i>See Table 2 above</i>	0.095
NF ₃ emissions ³	<i>See Table 2 above</i>	-
Total ESD emissions		4 243.155

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 Cyprus on the conclusions presented by the TERT

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

Recommendations from the TERT including revised estimates and technical corrections deemed necessary by the TERT.

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
CY-1A2g-2022-0001	Yes	1A2g Other (Manufacturing Industries and Construction), 2020, CO ₂	For category 1A2giii Other (Mining (Excluding Fuels) and Quarrying) and gas CO ₂ for year 2020, the TERT noted that the CO ₂ emission factor in CRF Table1.A(a)s2 is very high. In response to a question raised during the review, Cyprus explained that there was a mistake in the CO ₂ emissions from Other Kerosene and that the emission was a factor 1000 too high. Cyprus provided a revised estimate for the year 2020 and stated that it will be included in the next submission. The TERT agreed with the revised estimate provided by Cyprus and attached to the annex of the review report. The TERT recommends that Cyprus include the revised estimate in its next submission.	RE
CY-3B-2022-0003	Yes	3B Manure Management, 1990-2020, CH ₄ , N ₂ O	For category 3B Manure Management, CH ₄ , all years, the TERT noted that in the NIR (page 156) Tier 2 is used for swine, but some values are not clearly referenced, and it appeared that some calculations for swine were incorrect. (1) A mistake was done in the calculation of methane from market swine due to a wrong link in the calculation file on solid manure (MCF used =22 % instead of 4 %). (2) A mistake was done in the calculation of breeding swine due to a wrong link in the calculation file. (3) Cyprus reported a large part of its swine manure as aerobic treatment without any liquid manure, but the TERT considers that there was no sufficient information in the NIR to justify the reporting of aerobic treatment (forced) as defined by the 2006 IPCC Guidelines, this manure should be considered as liquid. In response to a question raised during the review, Cyprus provided a revised estimate for 2020 and stated that it will be included in the next submission. The TERT agreed with the revised estimate provided by Cyprus and attached to the annex of the review report. The TERT recommends that Cyprus include the revised estimate in its next submission.	RE
CY-3B-2022-0001	Yes	3B Manure Management, 1990-2020, N ₂ O	For category 3B Manure Management for all years, the TERT noted in the NIR, page 159, that nitrogen excretion rates are estimated by a Tier 1 method but the application of Tier 1 for N ₂ O from livestock presents a few mistakes. (1) The weights used in the calculation of nitrogen rates are different from default values of the 2006 IPCC Guidelines for some animals (sheep, horses, mules) and not referenced. (2) N ₂ O emission factors from liquid manure were irrelevant regarding crust (liquid without crust for cattle and with crust for swine). In response to a question raised during the review, Cyprus provided a revised estimate for 2020 and stated that it will be included in the next submission. The TERT disagreed with the revised estimate provided by Cyprus. The revised estimate proposed by Cyprus did not include impact on indirect emissions from 3B Manure Management and 3D Direct and Indirect N ₂ O Emissions from Agricultural Soils. It also did not correct N ₂ O emission factors on liquid manure. The TERT decided to calculate a technical correction for the year 2020 which was accepted by Cyprus. The estimates demonstrate that the issue is above the threshold of significance. The TERT recommends that Cyprus include a revised estimate in its next submission.	TC

EMRT - ID	Key category	Category, gas, year	Recommendation	RE or TC in 2022
CY-5A-2022-0002	Yes	5A Solid Waste Disposal, 1990-2020, CH ₄	For 5A Solid Waste Disposal, CH ₄ and the year 2020 the TERT noted that in response to a question raised during the review Cyprus provided a revised estimate that the TERT disagreed with. The TERT decided to calculate a technical correction for the year 2020 which was accepted by Cyprus. The estimates demonstrate that the issue is above the threshold of significance. The TERT recommends that Cyprus include a revised estimate in its next submission.	TC
CY-5B-2022-0001	Yes	5B Biological Treatment of Solid Waste, 2010-2020, CH ₄ , N ₂ O	For category 5B Biological Treatment of Solid Waste, CH ₄ and N ₂ O and 2020 the TERT noted that Cyprus operates two plants for mechanical separation and/or mechanical biological treatment of waste. Such a plant often includes a biological treatment step, of which emissions need to be included in the emission inventory. In response to a question raised during the review, Cyprus explained that IWMF Koshie does include a composting step and IWMF Pentakomo does not. Cyprus provided a revised estimate for year 2020. The TERT agreed with the revised estimate provided by Cyprus and attached to the annex of the review report. The TERT recommends that Cyprus include the revised estimate in its next submission.	RE
CY-5D-2022-0001	Yes	5D Wastewater Treatment and Discharge, 1990-2020, CH ₄	For category 5D Wastewater Treatment and Discharge, CH ₄ and 2020 the TERT noted that part of the generated waste water might be discharged without treatment. In response to a question raised during the review, Cyprus requested additional expert judgement of the Water Pollution Control Permit & Inspections Unit of the Cypriot Department of Environment. Based on this expert judgement Cyprus provided a revised estimate for the year 2020 and stated that it will be included in the next submission. The TERT agreed with the revised estimate provided by Cyprus and attached to the annex of the review report. The TERT recommends that Cyprus include the revised estimate in its next submission.	RE

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 Cyprus and accepted by the TERT

1

ESD Review Tool ID:	CY-1A2g-2022-0001						
ESD Review Tool URL:	https://emrt-esd.eionet.europa.eu/2022/CY-1A2g-2022-0001						
Country:	Cyprus						
Sector:	1A2g Other (Manufacturing Industries and Construction)						
Gases:	CO ₂						
Fuel	Liquid fuels						
Completed by Sector Expert:	Marlene Plejdrup						
Reviewed by Counterpart:	Ioannis Sempos						
Reviewed by Lead Reviewer:	Ralph Harthan						
Reviewed by Quality Controller:	Emma Salisbury						
The underlying problem:	The CO ₂ IEF and CO ₂ emission for 1A2giii (mining and quarrying) for liquid fuels is unexpectedly high and deviates largely from the default IPCC EFs that are used for the emission calculation. This was because emissions from other kerosene were 1000 times too high.						
Summarise the methodology used:	The CO ₂ emissions are estimated based on Cyprus' activity data and IPCC default EFs.						

2

	Original estimate (Gg CO ₂ e)							Notes
Year	CO ₂	CH ₄	N ₂ O	HFCs	PFCs	SF ₆	Mixed GHG	
2020	365.329							
								Notes
	Revised Estimate received from country (Gg CO ₂ e)							
Year	CO ₂	CH ₄	N ₂ O	HFCs	PFCs	SF ₆	Mixed GHG	
2020	16.122							
	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	-349.207							

ESD Review Tool ID:

CY-3B-2022-0003

ESD Review Tool URL:

https://emrt-esd.eionet.europa.eu/2022/CY-3B-2022-0003

Country:

Cyprus

Sector:

3B Manure Management

Gases:

CH₄

Fuel

N/A

Completed by Sector Expert:

Etienne Mathias

Reviewed by Counterpart:

Steen Gyldenkaerne

Reviewed by Lead Reviewer:

Ralph Harthan

Reviewed by Quality Controller:

Justin Goodwin

1

The underlying problem:

(1) A mistake was done in the calculation of methane from market swine due to a wrong link on solid manure (MCF used =22 % instead of 4 %).

(2) A mistake was found in the calculation of breeding swine (unexplained).

(3) Cyprus reported a large part of its swine manure as aerobic treatment without any liquid manure. In the 2006 IPCC Guidelines aerobic treatment can lead to negligible emissions (MCF=0 %). After additional investigation, the TERT considers that there is no sufficient information in the NIR to justify the reporting of aerobic treatment (forced) as defined by the 2006 IPCC Guidelines and recommends to apply the 2006 IPCC Guidelines as if it was a liquid system. For liquid without crust swine manure, MCF should be 35 % (with 18°C as average temperature and no crust, crust is unlikely for swine).

(4) Small differences appeared in the IEF for sheep and goats and breeding swine compared to IPCC Tier 1 EF.

Cyprus submitted a revised estimate and this resolves the issue.

Summarise the methodology used:

Cyprus submitted a revised estimate and this resolves the issue.

(1) Correction of calculation for market swine (mistake in solid manure MCF 22 % instead of 4 %).

(2) There was a mistake in the formula for breeding swine in the national file. It is now corrected.

(3) Change of MCF for swine which are finally not considered as aerobic but more like liquid and consequently without crust for swine (MCF changed from 22 % to 35 % for aerobic treatment of swine).

(4) Differences due to rounding of activities were noted for sheep and goats and breeding swine. Not an issue on emissions.

2

Original estimate (Gg CO₂e)

Year

CO₂

CH₄

N₂O

HFCs

PFCs

SF₆

Mixed GHG

2020

34.031

Revised Estimate received from country (Gg CO₂e)

Year

CO₂

CH₄

N₂O

HFCs

PFCs

SF₆

Mixed GHG

2020

41.616

Difference between RE and original estimate (Gg CO₂e)

Year

CO₂

CH₄

N₂O

HFCs

PFCs

SF₆

Mixed GHG

2020

7.585

1	ESD Review Tool ID:	CY-5B-2022-0001							
	ESD Review Tool URL:	https://emrt-esd.eionet.europa.eu/2022/CY-5B-2022-0001							
	Country:	Cyprus							
	Sector:	5B Biological Treatment of Solid Waste							
	Gases:	CH ₄ , N ₂ O							
	Fuel	N/A							
	Completed by Sector Expert:	Hans Oonk							
	Reviewed by Counterpart:	Richard Claxton							
	Reviewed by Lead Reviewer:	Ralph Harthan							
Reviewed by Quality Controller:	Emma Salisbury								
1	The underlying problem:	<p>The TERT noted that Cyprus most likely operates multiple mechanical-biological pre-treatment plants. These plants often include a composting step. During the review Cyprus indicated there are two MBT-plants operational (IWMF-Koshie and IWMF-Pentakomo) and provided plant data and their original interpretation of these data. The TERT did not agree with this interpretation, because the products of composting (referred to as 'production of compost for backfilling' in worksheet 'IWMF Koshie') was used as activity data for the amount of waste composted. This resulted in an under-estimation of emissions. In response, Cyprus provided a new emission estimate, using the amount of 'organic material sent to composting unit at Koshi' (row 4 in worksheet 'IWMF Koshi') as activity data. Waste at Pentakomo (calculated as row 2 minus row 4 in worksheet 'IWMF Koshi') is not composted after mechanical separation and does not result in methane emissions.</p>							
	Summarise the methodology used:	Emissions are calculated, based on an interpretation of plant data and the default emission factors from the 2006 IPCC Guidelines.							
2	Original estimate (Gg CO ₂ e)								
	Year	CO ₂	CH ₄	N ₂ O	HFCs	PFCs	SF ₆	Mixed GHG	Notes
	2020		5.861	4.192					
	Revised Estimate received from country (Gg CO ₂ e)								
	Year	CO ₂	CH ₄	N ₂ O	HFCs	PFCs	SF ₆	Mixed GHG	Notes
	2020		9.908	7.086					
	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		4.047	2.895					

ESD Review Tool ID:	CY-5D-2022-0001																										
ESD Review Tool URL:	https://emrt-esd.eionet.europa.eu/2022/CY-5D-2022-0001																										
Country:	Cyprus																										
Sector:	5D Wastewater Treatment and Discharge																										
Gases:	CH ₄																										
Fuel	N/A																										
Completed by Sector Expert:	Hans Oonk																										
Reviewed by Counterpart:	Richard Claxton																										
Reviewed by Lead Reviewer:	Ralph Harthan																										
Reviewed by Quality Controller:	Emma Salisbury																										
1	<div><div>The underlying problem:</div><div><p>The TERT noted that according to the UWWTD-website (which monitors the progress of the Urban Waste Water Treatment Directive in EU member states), part of the Cypriot waste water is discharged without treatment. In response to questions raised during review, Cyprus revised its distribution of waste water over the various treatment and distribution pathways. Based on documented expert judgement of the Water Pollution Control Permit & Inspections Unit of the Cypriot Department of Environment, Cyprus now assumed that:</p><ul style="list-style-type: none">- 82.65 % of the total generated load of all agglomerations ≥ 2,000 p.e. is collected via a collecting system and is compliant with the treatment requirements of the Directive.- 2.38 % of the total generated load of all agglomerations ≥ 2,000 p.e. is addressed through IAS (Individual and other Appropriate Systems). The generated load of agglomerations treated by IAS is the generated load treated in situ and the generated load transported to central urban waste water treatment plants (UWWTPs) by trucks.- 14.97 % of the generated load of all agglomerations ≥ 2,000 p.e is not collected in collecting systems/UWWTPs but is served by individual housing sanitary facilities (septic tanks and absorption pits).<p>Cyprus provided a revised estimate of its emissions from 5D Wastewater Treatment and Discharge, based on the assumption that only the last 14.97 % is treated in septic tanks.</p><p>According to the TERT, the 2.38 % seems to be treated in septic tanks as well (note that IAS is UWWTD-language for septic tanks and similar), after which its effluent is transported to a waste water treatment plant for further treatment. So this waste water might also generate methane emissions. However, quantifying potential emissions from this amount of waste water, assuming it is treated in a septic tank, results in the conclusion that the effect is below the threshold of significance for Cyprus. The TERT therefore accepts the revised estimate of Cyprus.</p></div></div>																										
	<div><div>Summarise the methodology used:</div><div><p>Emissions from waste water treatment and discharge are calculated for the year 2020, using eq. 6.1 (Vol 5, Ch 6) in the 2006 IPCC Guidelines and assuming default values for BOD generated per capita (0.06 kg/cap/day), I (1 -/-) and MCF (0.5 -/- for septic tanks) and the distribution of waste water over treatment and discharge pathways, as describe above in the box 'the underlying problem'.</p></div></div>																										
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>46.541</td><td></td><td></td><td></td><td></td><td></td><td></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		46.541						
		Original estimate (Gg CO ₂ e)							Notes																		
	Year	CO ₂	CH ₄	N ₂ O	HFCs	PFCs	SF ₆	Mixed GHG																			
	2020		46.541																								
	<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>53.608</td><td></td><td></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		53.608						
		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		53.608																								
<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>7.067</td><td></td><td></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		7.067								
	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		7.067																									

Technical corrections deemed necessary by the TERT

1

ESD Review Tool ID:	CY-3B-2022-0001
ESD Review Tool URL:	https://emrt-esd.eionet.europa.eu/2022/CY-3B-2022-0001
Country:	Cyprus
Sector:	3B Manure Management
Gases:	N ₂ O
Fuel	N/A
Completed by Sector Expert:	Etienne Mathias
Reviewed by Counterpart:	Steen Gyldenkaerne
Reviewed by Lead Reviewer:	Ralph Harthan
Reviewed by Quality Controller:	Justin Goodwin
The underlying problem:	(1) The weights used in the calculation of nitrogen excretion rates are different from default values of the 2006 IPCC Guidelines for some animals (sheep, horses, mules) and not referenced. (2) N ₂ O emission factors were irrelevant (liquid without crust for cattle, with crust for swine). (3) Changes on nitrogen excretion rates have impact on direct and indirect emissions. The revised estimate proposed by Cyprus does not include impacts on indirect emissions from 3B and 3D Direct and Indirect N ₂ O Emissions from Agricultural Soils. It also does not correct N ₂ O emission factors on liquid manure. It was thus not accepted.
Summarise the methodology used:	(1) The weights from sheep, horses and mules were revised. (2) N ₂ O emission factors were changed (liquid with crust for cattle, without for swine). (3) Indirect N ₂ O from category 3B and direct and indirect N ₂ O from soils (category 3D) are estimated.

2

Original estimate (Gg CO ₂ e)								Notes
Year	CO ₂	CH ₄	N ₂ O	HFCs	PFCs	SF ₆	Mixed GHG	
2020			152.399					
Technical Correction calculated by TERT (Gg CO ₂ e)								Notes
Year	CO ₂	CH ₄	N ₂ O	HFCs	PFCs	SF ₆	Mixed GHG	
2020			171.451					
Difference between TC and original estimate (Gg CO ₂ e)								
Year	CO ₂	CH ₄	N ₂ O	HFCs	PFCs	SF ₆	Mixed GHG	
2020			19.052					

1	ESD Review Tool ID:	CY-5A-2022-0002
	ESD Review Tool URL:	https://emrt-esd.eionet.europa.eu/2022/CY-5A-2022-0002
	Country:	Cyprus
	Sector:	5A Solid Waste Disposal
	Gases:	CH ₄
	Fuel	N/A
	Completed by Sector Expert:	Hans Oonk
	Reviewed by Counterpart:	Richard Claxton
	Reviewed by Lead Reviewer:	Ralph Harthan
	Reviewed by Quality Controller:	Emma Salisbury
The underlying problem:	This is a combined Corrected Estimate for issues CY-5A-2022-0002 and CY-5A-2022-0004:	
	<p>In CY-5A-2022-0002 the TERT noted in the 2022-NIR, that activity data on disposal of non-MSW have significantly changed, compared to previous inventories (for example, table 7.12 on page 226 in the 2021-NIR). However the justification of the amount of non-MSW disposed has remained identical. In response to a question during the review, Cyprus indicated that there is a mistake on the total amount of non-MSW. Values in the NIR refer to generated waste and not the amount disposed to landfills. So actual amounts of non-MSW disposed are lower than previously assumed.</p> <p>Cyprus re-evaluated the activity data and proposed a revised estimate. Upon review of the revised estimate, the TERT noticed that amounts of non-MSW disposed since 2008 are reduced to levels comparable to levels assumed in the 2021-NIR. However, the amount of wood and sludge in the non-MSW disposed before 2006 are significantly increased, both compared to the 2021-NIR and the 2022-NIR. This increase cannot be explained by the mistake mentioned during the review (generated waste instead of disposed waste) and Cyprus did not provide additional justification for this increase. The TERT therefore did not accept the changes in disposal of non-MSW prior to 2008 that result in an increase in disposed non-MSW (in the revised estimate, compared to the 2022-NIR).</p>	
	<p>In CY-5A-2022-0004 the TERT noted that Cyprus has two mechanical biological treatment (MBT) plants for MSW: IWMF in Koshie since 2010; IWMF-Pentakomo since 2017. MBT-plants produce a residue, that is often disposed in SWDS. Although methane potential is significantly reduced, disposal of MSW-residues might result in additional methane emissions.</p> <p>During the review, Cyprus provided data on the amount of residues generated at mechanical-separation in Pentakomo and mechanical-biological treated at Koshie and provided a quantification of emissions upon disposal in a managed SWDS. This quantification was accepted by the TERT.</p>	
	The TERT decided to calculate the effect of both issues on methane emissions from solid waste disposal as part of a new technical correction.	

	<p>Methane emissions from managed SWDS are calculated, using the IPCC-waste models (provided as attachments in the EMRT).</p> <p>For CY-5A-2022-0002 Cyprus recalculated the emissions for managed and unmanaged SWDS separately, using the IPCC Waste Model. Cyprus provided the TERT both Waste Models as a part of the revised estimate. As mentioned under 'the underlying problem', the TERT did not accept increases in disposal of specific fractions in non-MSW in the revised estimate, compared to the values used in the 2022-NIR. For these types of waste and years (wood in 2006 and before; sludge in 2004 and before), the values from the 2022-NIR are assumed. Emissions are recalculated by the TERT, by correcting the values for amount of wood (2006 and before) and sludge (2004 and before) disposed in the IPCC Waste Models, as provided by Cyprus.</p> <p>For CY-5A-2022-0004 Cyprus provided a revised estimate of methane emissions from disposal of MBT-residues in SWDS. This is also done, using the IPCC Waste Model. The amount of MBT-residue disposed at Koshie and mechanically separated MSW (at Pentakomo) disposed annually is based on plant-specific data from both installations. Assumptions on DOC content in mechanically-pretreated waste and mechanic-biologic-treated waste comes from literature and a GHG inventory by another EU Member State. This revised estimate by Cyprus was accepted by the TERT.</p>							
	Summarise the methodology used:							
2	Original estimate (Gg CO ₂ e)							
	Year	CO ₂	CH ₄	N ₂ O	HFCs	PFCs	SF ₆	Mixed GHG
	2020		541.458					
	Technical Correction calculated by TERT (Gg CO ₂ e)							
	Year	CO ₂	CH ₄	N ₂ O	HFCs	PFCs	SF ₆	Mixed GHG
	2020		509.718					
	Difference between TC and original estimate (Gg CO ₂ e)							
	Year	CO ₂	CH ₄	N ₂ O	HFCs	PFCs	SF ₆	Mixed GHG
	2020		-31.740					
	Notes							

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, Efisio 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 overestimations or underestimations relating to a key category in a Member State's inventory.

Second step review checks:

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