

# Final Review Report

## 2022 annual review of national greenhouse gas inventory data

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

Croatia  
30 June 2022

European Environment Agency



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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 Croatia, pursuant to Article 19(2) of Regulation (EU) No 525/2013, with a view to monitoring Croatia'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 Croatia 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 6 significant issues, therefore Croatia 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 42 issues with Croatia during the first and the second step of the 2022 annual ESD review (see Table 1). The TERT provided a recommendation for 2 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 an under- or over-estimate exceeding the threshold of significance pursuant to Article 31 of Commission Implementing Regulation (EU) No 749/2014.
3. Croatia provided no revised estimates.
4. The TERT also deemed necessary a technical correction in the meaning of Article 19(3)(c) of Regulation (EU) No 525/2013 and calculated the technical correction in consultation with Croatia. The technical correction is presented in Table 2 and is accompanied by evidence-based justification. In its response to the draft technical correction, Croatia stated that it agrees with the technical correction.
5. The TERT identified non-binding recommendations in order to improve the national inventory data of Croatia (see Table 4).
6. The TERT considers that it received a response from Croatia that was sufficient in order to undertake the review appropriately.

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

	Issues raised <sup>1</sup>	Recommendations <sup>2</sup>	Revised estimates <sup>3</sup>	Technical corrections <sup>4</sup>
<b>Total</b>	<b>42</b>	<b>2</b>	<b>-</b>	<b>1</b>
Energy	9	-	-	-
IPPU	8	-	-	-
Agriculture	18	2	-	1
Waste	7	-	-	-
Cross-cutting	-	-	-	-

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

<sup>2</sup> The total number of recommendations includes revised estimates and technical corrections.

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

<sup>4</sup> 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 <sub>2</sub> equivalent) <sup>1</sup> 2020
Total greenhouse gas emissions, including indirect CO <sub>2</sub> , without land use, land-use change and forestry as reported by Croatia pursuant to Article 7(4) of Regulation (EU) No 525/2013, taking into account any resubmission to the Commission	HRV_2022_1_24022022	23 758.399
<b>Difference between original estimate and technical correction deemed necessary by the TERT<sup>2</sup></b>		
3A Enteric fermentation, 3B Manure management and 3D Agricultural soils, CH <sub>4</sub> , N <sub>2</sub> O	HR-3A-2022-0001, HR-3A-2022-0002, HR-3B-2022-0006 and HR-3B-2022-0008	100.305
Total greenhouse gas emissions including technical corrections		23 858.704
CO <sub>2</sub> emissions from 1A3a Domestic aviation <sup>3</sup>	HRV_2022_1_24022022	16.650
NF <sub>3</sub> emissions <sup>3</sup>	HRV_2022_1_24022022	-

<sup>1</sup> 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.

<sup>2</sup> A positive difference indicates an increase compared to reported emissions. A negative difference indicates a decrease compared to reported emissions.

<sup>3</sup> CO<sub>2</sub> emissions from 1A3a Domestic aviation and NF<sub>3</sub> 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 <sub>2</sub> equivalent) <sup>1</sup> 2020
Total greenhouse gas emissions including technical correction deemed necessary by the TERT	<i>See Table 2 above</i>	23 858.704
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) <sup>2</sup>	7 323.810
CO <sub>2</sub> emissions from 1A3a Domestic aviation <sup>3</sup>	<i>See Table 2 above</i>	16.650
NF <sub>3</sub> emissions <sup>3</sup>	<i>See Table 2 above</i>	-
<b>Total ESD emissions</b>		<b>16 518.244</b>

<sup>1</sup> 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.

<sup>2</sup> 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.

<sup>3</sup> CO<sub>2</sub> emissions from 1A3a Domestic aviation and NF<sub>3</sub> emissions have been deducted from the national total as they are not included within the scope of total ESD emissions.

## Statement from Croatia on the conclusions presented by the TERT

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

## Recommendations from the TERT including technical corrections deemed necessary by the TERT.

**Table 4: Recommendations from the TERT (RE = Revised estimate<sup>1</sup>; TC = Technical correction<sup>2</sup>)**

EMRT - ID	Key category	Category, gas, year	Recommendation	RE or TC in 2022
HR-3A-2022-0001, HR-3A-2022-0002, HR-3B-2022-0006 and HR-3B-2022-0008	Yes	3A Enteric fermentation, 3B Manure management and 3D Agricultural soils, 1990-2020, CH <sub>4</sub> , N <sub>2</sub> O	This issue combines the findings raised under issues HR-3A-2022-0001, HR-3A-2022-0002, HR-3B-2022-0006 and HR-3B-2022-0008. For 3A Enteric Fermentation and 3B Manure Management for CH <sub>4</sub> from cattle for 2020, the TERT noted that Croatia was using the implied emission factors from the technical correction calculated by the TERT for 2018 in the 2020 ESD review. For N <sub>2</sub> O from cattle for 3B, Croatia was using the N excretion rates from the technical correction calculated by the TERT for 2018 in the 2020 ESD review. This also had an impact on the emissions from 3D. The TERT noted that this is not in accordance with good practice, because Tier 2 methods should be used for the key categories 3A and 3B. In response to a question raised during the review, Croatia explained that it is in the process of developing Tier 2 methods to be used in the next submission. The TERT decided to calculate a technical correction for the year 2020 which was accepted by Croatia. The estimates demonstrate that the issue is above the threshold of significance. The TERT recommends that Croatia include a revised estimate in its next submission.	TC
HR-3B-2022-0002	Yes	3B Manure Management, 1990-2020, CH <sub>4</sub> , N <sub>2</sub> O	For category 3B Manure Management, CH <sub>4</sub> and N <sub>2</sub> O for all years the TERT noted that Croatia is reporting anaerobic lagoons as one of their manure management systems (MMS). As noted by the TERT also in the previous ESD reviews, anaerobic lagoons generally produce very large amounts of CH <sub>4</sub> and they are very seldom used in Europe as this MMS only works at environments with higher temperatures year-round. In response to a question raised during the ESD review in 2020, Croatia explained that 'Usage of uncovered anaerobic lagoons, as specified in table 10.18, Chapter 10, Volume 4 of the 2006 IPCC guidelines, is still in place in some of the older (Yugoslavia-era) farms.' During the 2020 ESD review, Croatia also reiterated planned improvements for the category 3B including the collection of new manure management system data through environmental permits and questionnaires. In the latest submission (2022) Croatia continues to report use of anaerobic lagoons (CRF Table3.B(a)s2), but with a Methane Conversion Factor (MCF) of 22%. This is the same as for liquid manure management systems. The used MCF is substantially lower than the MCF for anaerobic lagoons as given in the 2006 IPCC Guidelines, vol. 4, Chapter 10, table 10.17 (approximately 70%) and therefore, the likely over-estimation of the CH <sub>4</sub> emissions due to a potential misclassification of the MMS is low. Regarding N <sub>2</sub> O, the emissions from both anaerobic lagoons and liquid systems are negligible according to 2006 IPCC Guidelines vol. 4, Chapter 10, table 10.21. The TERT agreed that the current estimate provided by Croatia is appropriate considering the information available. However, the TERT recommends that Croatia further investigate the use of MMS and use the updated information in its inventory.	No

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

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



## Technical corrections deemed necessary by the TERT

1

ESD Review Tool ID:	HR-3A-2022-0001
ESD Review Tool URL:	<a href="https://emrt-esd.eionet.europa.eu/2022/HR-3A-2022-0001">https://emrt-esd.eionet.europa.eu/2022/HR-3A-2022-0001</a> , <a href="https://emrt-esd.eionet.europa.eu/2022/HR-3A-2022-0002">https://emrt-esd.eionet.europa.eu/2022/HR-3A-2022-0002</a> , <a href="https://emrt-esd.eionet.europa.eu/2022/HR-3B-2022-0006">https://emrt-esd.eionet.europa.eu/2022/HR-3B-2022-0006</a> , <a href="https://emrt-esd.eionet.europa.eu/2022/HR-3B-2022-0008">https://emrt-esd.eionet.europa.eu/2022/HR-3B-2022-0008</a>
Country:	Croatia
Sector:	3A Enteric Fermentation, 3B Manure Management and 3D Agricultural Soils
Gases:	CH <sub>4</sub> and N <sub>2</sub> O
Fuel	N/A
Completed by Sector Expert:	Steen Gyldenkaerne
Reviewed by Counterpart:	Etienne Mathias
Reviewed by Lead Reviewer:	Suvi Monni
Reviewed by Quality Controller:	Bernd Guele

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The underlying problem:	For 3A Enteric Fermentation and 3B Manure Management for CH <sub>4</sub> from cattle for 2020, the TERT noted that Croatia was using the implied emission factors from the technical correction calculated by the TERT for 2018 in 2020. For N <sub>2</sub> O from cattle for 3B, Croatia was using the N excretion rates from the technical correction calculated by the TERT for 2018 in 2020. This also had an impact on the emissions from 3D Agricultural Soils. The TERT noted that this is not in accordance with good practice, because tier 2 methods should be used for the key categories 3A and 3B.
Summarise the methodology used:	The TERT has estimated the emissions based on the methods in the 2006 IPCC Guidelines, vol. 4, ch. 10 for 3A and 3B and methods in vol. 4, ch. 11 for 3D. Specifically, equations 10.2-10.16 applicable for cattle were used for enteric fermentation. Nitrogen excretion was calculated using equations 10.32-10.33 and CH <sub>4</sub> emissions from manure management using equations 10.22-10.24. Activity data has been taken from the CRF tables for 2020 in the 2022 submission, including animal numbers and information on weight and productivity. Where data was missing in the 2006 IPCC Guidelines to apply the methods (namely fat and protein content in milk, average protein content in feed), data was taken from the 2019 Refinement, vol. 4, ch. 10, Table 10A.1, Western Europe for dairy and Eastern Europe for other cattle.

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Original estimate (Gg CO <sub>2</sub> e)								Notes
Year	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	HFCs	PFCs	SF <sub>6</sub>	Mixed GHG	
2020		964.928	171.448					
3A, 3B and 3D for cattle								
Technical Correction calculated by TERT (Gg CO <sub>2</sub> e)								Notes
Year	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	HFCs	PFCs	SF <sub>6</sub>	Mixed GHG	
2020		1 007.768	228.912					
3A, 3B and 3D for cattle								
Difference between TC and original estimate (Gg CO <sub>2</sub> e)								
Year	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	HFCs	PFCs	SF <sub>6</sub>	Mixed GHG	
2020		42.840	57.464					

## 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 Sempos
- 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 over- or under-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 <sub>2</sub> , CH <sub>4</sub> , N <sub>2</sub> O, HFCs, PFCs, SF <sub>6</sub>	NF <sub>3</sub> 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 <sub>2</sub> 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.