United Nations

FCCC/ARR/2022/EST

Framework Convention on Climate Change

Distr.: General
20 April 2023

English only

Report on the individual review of the annual submission of Estonia submitted in 2022*

Note by the expert review team

Summary

Each Party included in Annex I to the Convention must submit an annual inventory of emissions and removals of greenhouse gases for all years from the base year (or period) to two years before the inventory due date (decision 24/CP.19). Parties included in Annex I to the Convention that are Parties to the Kyoto Protocol are also required to report supplementary information under Article 7, paragraph 1, of the Kyoto Protocol with the inventory submission due under the Convention. This report presents the results of the individual review of the 2022 annual submission of Estonia, conducted by an expert review team in accordance with the "Guidelines for review under Article 8 of the Kyoto Protocol". The review took place from 12 to 17 September 2022 in Bonn.

* In the symbol for this document, 2022 refers to the year in which the inventory was submitted, not to the year of publication.

Contents

Abbreviations and acronyms

2006 IPCC Guidelines	*2006 IPCC Guidelines for National Greenhouse Gas Inventories*
AAU	assigned amount unit
AD	activity data
Annex A source	source category included in Annex A to the Kyoto Protocol
AR	afforestation and reforestation
Article 8 review guidelines	"Guidelines for review under Article 8 of the Kyoto Protocol"
BCEF	biomass conversion and expansion factor
CaO	calcium oxide
CEF	carbon emission factor
CER	certified emission reduction
CH_4	methane
CM	cropland management
CO_2	carbon dioxide
CO_2 eq	carbon dioxide equivalent
Convention reporting adherence	adherence to the "Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual greenhouse gas inventories"
COPERT	software tool for calculating road transport emissions
CPR	commitment period reserve
CRF	common reporting format
CSC	carbon stock change
DOC	degradable organic carbon
DOC_f	fraction of degradable organic carbon that decomposes
DOM	dead organic matter
EF	emission factor
ERT	expert review team
ERU	emission reduction unit
EU	European Union
Eurostat	statistical office of the European Union
FAOSTAT	statistical database of the Food and Agriculture Organization of the United Nations
FM	forest management
FMRL	forest management reference level
GHG	greenhouse gas
GM	grazing land management
HFC	hydrofluorocarbon
HWP	harvested wood products
IEA	International Energy Agency
IFASTAT	repository of statistical information on fertilizers of the International Fertilizer Association
IPCC	Intergovernmental Panel on Climate Change
IPPU	industrial processes and product use
k	methane generation rate
KP reporting adherence	adherence to the reporting guidelines under Article 7, paragraph 1, of the Kyoto Protocol
KP-LULUCF	activities under Article 3, paragraphs 3–4, of the Kyoto Protocol
LPG	liquefied petroleum gas
LULUCF	land use, land-use change and forestry

MgO	magnesium oxide
MSW	municipal solid waste
N	nitrogen
N_2O	nitrous oxide
NA	not applicable
NE	not estimated
NF_3	nitrogen trifluoride
NFI	national forest inventory
NH_3	ammonia
NIR	national inventory report
NO	not occurring
PFC	perfluorocarbon
QA/QC	quality assurance/quality control
RMU	removal unit
RV	revegetation
SEF	standard electronic format
SF_6	sulfur hexafluoride
SIAR	standard independent assessment report
UNFCCC Annex I inventory reporting guidelines	"Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual greenhouse gas inventories"
UNFCCC review guidelines	"Guidelines for the technical review of information reported under the Convention related to greenhouse gas inventories, biennial reports and national communications by Parties included in Annex I to the Convention"
WDR	wetland drainage and rewetting
Wetlands Supplement	*2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands*

I. Introduction

1. This report covers the review of the 2022 annual submission of Estonia, organized by the secretariat in accordance with the Article 8 review guidelines (adopted by decision 22/CMP.1 and revised by decision 4/CMP.11). In accordance with the Article 8 review guidelines, this review process also encompasses the review under the Convention as described in the UNFCCC review guidelines, particularly in part III thereof, namely the "UNFCCC guidelines for the technical review of greenhouse gas inventories from Parties included in Annex I to the Convention" (annex to decision 13/CP.20). The review took place from 12 to 17 September 2022 in Bonn and was coordinated by Emma Salisbury and Roman Payo (secretariat). Table 1 provides information on the composition of the ERT that conducted the review for Estonia.

Table 1
Composition of the expert review team that conducted the review for Estonia

Area of expertise	*Name*	*Party*
Generalist	Olia Glade	New Zealand
	Manfred Ritter	Austria
Energy	Graham Anderson	Germany
	Amir Dillawar	Guyana
	Rianne Dröge	Netherlands
	Awassada Phongphiphat	Thailand
IPPU	Kakhaberi Mdivani	Georgia
	Lorenz Moosmann	EU
	Clemencio Nhamtumbo	Mozambique
Agriculture	Yu'e Li	China
	Mahmoud Medany	Egypt
	Lilian Portillo	Paraguay
	Lilia Taranu	Republic of Moldova
LULUCF and KP-LULUCF	Valentin Bellassen	France
	Dinh Hung Nguyen	Viet Nam
	Nele Rogiers	Switzerland
Waste	Qingxian Gao	China
	Gabor Kis-Kovacs	Hungary
Lead reviewers	Qingxian Gao	
	Olia Glade	

2. The basis of the findings in this report is the assessment by the ERT of the Party's 2022 annual submission in accordance with the UNFCCC review guidelines and the Article 8 review guidelines.

3. The ERT has made recommendations that Estonia resolve identified findings, including issues[1] designated as problems.[2] Other findings, and, if applicable, the encouragements of the ERT to Estonia to resolve related issues, are also included in this report.

[1] Issues are defined in decision 13/CP.20, annex, para. 81.
[2] Problems are defined in decision 22/CMP.1, annex, paras. 68–69, as revised by decision 4/CMP.11.

4. A draft version of this report was communicated to the Government of Estonia, which provided comments that were considered and incorporated, as appropriate, into this final version of the report.

5. Annex I presents the annual GHG emissions of Estonia, including totals excluding and including LULUCF, indirect CO_2 emissions, and emissions by gas and by sector, and contains background data on emissions and removals from KP-LULUCF, if elected by the Party, by gas, sector and activity.

6. Information to be included in the compilation and accounting database can be found in annex II.

II. Summary and general assessment of the Party's 2022 annual submission

7. Table 2 provides the assessment by the ERT of the Party's 2022 annual submission with respect to the tasks undertaken during the review. Further information on the issues identified, as well as additional findings, may be found in tables 3 and 5.

Table 2
Summary of review results and general assessment of the 2022 annual submission of Estonia

Assessment			*Issue/problem ID#(s) in table 3 or 5*[a]
Dates of submission	Original submission: NIR, 12 April 2022; CRF tables (version 1), 12 April 2022; SEF tables, 12 April 2022 Revised submissions: CRF tables (version 4), 17 September 2022; SEF tables, 15 September 2022 Unless otherwise specified, values from the most recent submission are included in this report		
Review format	Centralized		
Application of the requirements of the UNFCCC Annex I inventory reporting guidelines and the Wetlands Supplement (if applicable)	Have any issues been identified in the following areas:		
	(a) Identification of key categories?	No	
	(b) Selection and use of methodologies and assumptions?	Yes	L.15, L.16, L.17
	(c) Development and selection of EFs?	Yes	I.3, I.7, L.13, L.18
	(d) Collection and selection of AD?	Yes	E.11, E.14, E.16, I.3, A.10, L.1, L.12
	(e) Reporting of recalculations?	Yes	KL.5
	(f) Reporting of a consistent time series?	Yes	E.10, E.16, A.10
	(g) Reporting of uncertainties, including methodologies?	Yes	G.2, G.3
	(h) QA/QC?	QA/QC procedures were assessed in the context of the national system (see supplementary information under the Kyoto Protocol below)	
	(i) Missing categories, or completeness?[b]	No	
	(j) Application of corrections to the inventory?	No	
Significance threshold	For categories reported as insignificant, has the Party provided sufficient information showing that the likely level of emissions meets the criteria in paragraph 37(b) of the UNFCCC Annex I inventory reporting guidelines?	Yes	
Description of trends	Did the ERT conclude that the description in the NIR of the trends for the different gases and sectors is reasonable?	Yes	

Assessment			*Issue/problem ID#(s) in table 3 or 5[a]*
Supplementary information under the Kyoto Protocol	Have any issues been identified related to the following aspects of the national system:		
	(a) Overall organization of the national system, including the effectiveness and reliability of the institutional, procedural and legal arrangements?	No	
	(b) Performance of the national system functions?	No	
	Have any issues been identified related to the national registry:		
	(a) Overall functioning of the national registry?	No	
	(b) Performance of the functions of the national registry and the adherence to technical standards for data exchange?	No	
	Have any issues been identified related to the reporting of information on AAUs, CERs, ERUs and RMUs and on discrepancies in accordance with decision 15/CMP.1, annex, chapter I.E, in conjunction with decision 3/CMP.11, taking into consideration any findings or recommendations contained in the SIAR?	No	
	Have any issues been identified in matters related to Article 3, paragraph 14, of the Kyoto Protocol, specifically problems related to the transparency, completeness or timeliness of the reporting on the Party's activities related to the priority actions listed in decision 15/CMP.1, annex, paragraph 24, in conjunction with decision 3/CMP.11, including any changes since the previous annual submission?	No	
	Have any issues been identified related to the following reporting requirements for KP-LULUCF:		
	(a) Reporting requirements of decision 2/CMP.8, annex II, paragraphs 1–5?	Yes	KL.2
	(b) Demonstration of methodological consistency between the reference level and reporting on FM in accordance with decision 2/CMP.7, annex, paragraph 14?	No	
	(c) Reporting requirements of decision 6/CMP.9?	No	
	(d) Country-specific information to support provisions for natural disturbances in accordance with decision 2/CMP.7, annex, paragraphs 33–34?	NA	
CPR	Was the CPR reported in accordance with decision 18/CP.7, annex; decision 11/CMP.1, annex; and decision 1/CMP.8, paragraph 18?	Yes	
Adjustments	Has the ERT applied any adjustments under Article 5, paragraph 2, of the Kyoto Protocol?	No	
	Has the Party submitted a revised estimate to replace a previously applied adjustment?	NA	Estonia does not have a previously applied adjustment
Response from the Party during the review	Has the Party provided the ERT with responses to the questions raised, including the data and information necessary for assessing conformity with the UNFCCC Annex I inventory reporting guidelines and any further guidance adopted by the Conference of the Parties?	Yes	

Assessment		*Issue/problem ID#(s) in table 3 or 5*[a]
Recommendation for an exceptional in-country review	On the basis of the issues identified, does the ERT recommend that the next review be conducted as an in-country review?	No
Questions of implementation	Did the ERT list any questions of implementation?	No

[a] Further information on the issues identified, as well as additional findings, may be found in tables 3 and 5.
[b] Missing categories for which methods are provided in the 2006 IPCC Guidelines may affect completeness and are listed in annex III.

III. Status of implementation of recommendations included in the previous review report

8. Table 3 compiles the recommendations from previous review reports that were included in the most recent previous review report, published on 14 April 2021,[3] and had not been resolved by the time of publication of the report on the review of the Party's 2020 annual submission. The ERT has specified whether it believes the Party had resolved, was addressing or had not resolved each issue or problem by the time of publication of this review report and has provided the rationale for its determination, which takes into consideration the publication date of the most recent previous review report and national circumstances.

Table 3
Status of implementation of recommendations included in the previous review report for Estonia

ID#	*Issue/problem classification*[a, b]	*Recommendation from previous review report*	*ERT assessment and rationale*
General			
G.1	National system (G.3, 2020) KP reporting adherence	Enhance the transparency of reporting by including in the next NIR a clear statement on any changes made to the national system since the previous annual submission.	Resolved. The Party reported in its NIR (section 1.2.1, p.20, and chap. 13, p.468) that no changes to the national system were made. The relevant text in the NIR has been changed from "no major changes" to "no changes" and there is no new information in the relevant sections of the NIR.
G.2	Uncertainty analysis (G.4, 2020) Convention reporting adherence	Report in the NIR on methods and underlying assumptions used for the uncertainty assessment for the purpose of helping to prioritize efforts to improve the accuracy of the national inventory in the future and to guide decisions on methodological choice in accordance with paragraph 42 of the UNFCCC Annex I inventory reporting guidelines.	Addressing. The Party documented in its NIR (section 1.6, pp.44–45) the general method used for the uncertainty analysis. In section 1.2.1, under "Procedural arrangements", Estonia stated that sectoral uncertainty estimates, among other inputs (e.g. recommendations from previous review reports), are used to prioritize its efforts to improve the accuracy of the inventory. On the basis of the sectoral method used, the share in total emissions and the uncertainty (in per cent), Estonia evaluates on a case-by-case basis whether a higher-tier method can be applied. Estonia uses the IPCC tier 1 methodology to estimate the total uncertainty of the inventory by aggregating the uncertainty of AD and EFs for each source category and GHG. During the review, the Party clarified that experts provide information on potential improvements to methods and underlying assumptions used in the uncertainty assessment. This information is discussed in an annual inventory meeting of the experts with the inventory coordinators, who evaluate the possibilities for improvement and forward the evaluation to the Ministry of the Environment to initiate a discussion on funding. The NIR serves as the main means of documentation for the methods and assumptions used in the uncertainty assessment and all sectors follow the same structure in the report except energy, for which information on uncertainty is included in section 3.2.4.3. To enhance transparency, Estonia indicated that it will harmonize the

[3] FCCC/ARR/2020/EST. The ERT notes that the report on the review of Estonia's 2021 annual submission has not been published yet owing to insufficient funding for the review process. As a result, the latest previously published annual review report reflects the findings of the review of the Party's 2020 annual submission.

ID#	Issue/problem classification[a, b]	Recommendation from previous review report	ERT assessment and rationale
			reporting on uncertainty for the energy sector with that of other sectors in its next annual submission. The ERT considers that the recommendation has not yet been fully addressed because the Party has not yet reported on methods and underlying assumptions used in the uncertainty assessment consistently for all sectors.
G.3	Uncertainty analysis (G.5, 2020) Convention reporting adherence	Perform the quantitative uncertainty assessment for the base year including and excluding LULUCF, following approach 1 from the 2006 IPCC Guidelines (vol. 1, chap. 3), and report the results in the NIR (e.g. using the structure provided in the 2006 IPCC Guidelines (vol. 1, table 3.3)).	Addressing. The Party reported in its NIR (sections 1.6 and 10) that lack of AD is the reason for not being able to estimate specific uncertainty percentages for the base year. During the review, the Party clarified that the availability of base-year information has been affected by the institutional changes that have taken place since the country regained independence in 1991. The Party's next steps to resolve this issue are through GHG inventory development projects currently ongoing in different categories, after which the sectoral experts will update inventory AD and EF values, including associated uncertainty values for the base year. The ERT considers that the recommendation has not yet been fully addressed because the Party has not yet reported base-year uncertainty for the inventory with and without LULUCF.
Energy			
E.1	1. General (energy sector) – other fossil fuels – CO_2 (E.4, 2020) (E.7, 2018) (E.11, 2016) (E.10, 2015) Transparency	Report which categories' non-biogenic waste is included under which fuel types in the reference approach in a more transparent manner.	Addressing. The Party reported in its NIR (table 3.9, p.80) a list of non-biogenic waste types. For the sectoral approach, waste oils are allocated to category 1.A.2.f (non-metallic minerals) and MSW to category 1.A.1.a (public electricity and heat production). However, the ERT noted that the NIR (section 3.2.1) does not include information on which categories' non-biogenic waste is included under which fuel types for the reference approach, which will explain the differences in the carbon EF reported in NIR table 3.9 and CRF table 1.A(b). During the review, the Party clarified that MSW is included in the reference approach under non-biogenic waste used in the production of heat and electricity. The ERT considers that the recommendation has not yet been fully addressed because the Party has not yet reported in its NIR (section 3.2.1) which categories' non-biogenic waste is included under which fuel types for the reference approach, for example whether the fossil part of waste that is reported under categories 1.A.1.a and 1.A.2.f in the sectoral approach is all reported under non-biogenic waste in the reference approach or reported under other fuel categories, as explained during the 2015 review. Such an explanation would help to improve the understanding of the carbon EF reported in CRF table 1.A(b).
E.2	1.A Fuel combustion – sectoral approach – biomass – CO_2, CH_4 and N_2O	Correct the CO_2, CH_4 and N_2O emission estimates using the corrected biogas consumption data for 2016 and report the	Resolved. The Party corrected the biogas consumption data and updated the emission estimates for 2016 in its 2022 submission. CRF table 1.A(b) now reports 722.0 TJ for total gas biomass consumption and the estimates for CO_2, CH_4 and N_2O emissions, as

ID#	Issue/problem classification[a, b]	Recommendation from previous review report	ERT assessment and rationale
	(E.17, 2020) Accuracy	corrected estimates in the NIR and CRF tables 1.A(a) and 1.A(b).	well as AD, have been updated accordingly in the sectoral approach tables (CRF table 1.A(a)).
E.3	1.A.2.d Pulp, paper and print – gaseous fuels – CO_2, CH_4 and N_2O (E.18, 2020) Consistency	Correct the CO_2, CH_4 and N_2O emission estimates under category 1.A.2.d (pulp, paper and print) for 1990–2017 using the updated gaseous fuel consumption values reported by Statistics Estonia and report the corrected estimates in the NIR and CRF table 1.A(a)s2 and, to avoid double counting, correct the CO_2, CH_4 and N_2O emission estimates under category 1.A.1.a (public electricity and heat production) for 1990–2017 and report the corrected estimates in the NIR and CRF table 1.A(a)s1.	Resolved. The Party corrected the AD and the CO_2, CH_4 and N_2O emission estimates for categories 1.A.2.d (pulp, paper and print) and 1.A.1.a (public electricity and heat production) for 1990–2017 in its 2022 submission. Updated consumption values from Statistics Estonia were used. The recalculations are explained in the NIR (section 3.2.4.5, p.88) and revised emission estimates are provided in NIR tables 3.5 and 3.6.
E.4	1.A.3.b Road transportation – biofuels – CO_2 (E.10, 2020) (E.25, 2018) Transparency	Report in the NIR information on (1) the types of biofuel consumed, (2) whether they are 100 per cent biogenic in origin and (3) whether they are consumed as blends with conventional fossil fuels or as pure fuels.	Resolved. The Party reported in its NIR (1) information provided by the Estonian Environment Agency about the types of biofuel consumed (section 3.2.5.3, p.98); (2) information on the biogenic origin of the biofuels consumed (section 3.2.5.3, p.99); and (3) that bioethanol is consumed only as a blend with petrol, while biodiesel is consumed both as a mix with diesel and in its pure form (section 3.2.5.3, p.98). Further, the Party stated that the Estonian Environment Agency assumes a B7 biodiesel blend (7 per cent biodiesel) and an E5 mixed fuel blend (5 per cent bioethanol) (section 3.2.5.3, p.98).
E.5	1.A.3.b Road transportation – biogas – CO_2, CH_4 and N_2O (E.20, 2020) Completeness	Estimate emissions from biogas consumption under road transportation (category 1.A.3.b) for the years in which the consumption occurred and report the AD and estimates in the NIR and CRF table 1.A(a)s3.	Resolved. The Party reported emissions from biogas consumption under road transportation (category 1.A.3.b) for the years in which the consumption occurred (2018–2020) and reported the AD and emission estimates in NIR table 3.24 (p.98) and CRF table 1.A(a)s3.
E.6	1.A.3.b Road transportation – biomass – CO_2, CH_4 and N_2O (E.19, 2020) Accuracy	Select and use the correct value for liquid biomass consumption to estimate emissions for 2016 and explain in the NIR the reasons for selecting the AD used and, if necessary, correct the 2016 emission estimates and report the corrected estimates in the NIR and CRF tables.	Resolved. The emissions from liquid biomass consumption for 2016 were not recalculated in the 2022 submission. The Party reported in its NIR (section 3.2.5.3, pp.98–99) liquid biomass consumption and explained that data on biofuel production and inland consumption are received from the Estonian Environment Agency. During the review, the Party clarified that liquid biomass consumption is provided by the Estonian Environment Agency, which receives the information from the Estonian Tax and Customs Board. The Party also clarified that the correct value for liquid biomass consumption was used to estimate emissions for 2016, and that the IEA value was corrected. IEA reports apparent consumption of 80 TJ for Estonia, while the NIR reports 84.73 TJ; the difference (4.73 TJ) is, according to the Party, due to rounding.

ID#	*Issue/problem classification*[a, b]	*Recommendation from previous review report*	*ERT assessment and rationale*
E.7	1.A.3.b Road transportation – gaseous fuels – CO_2, CH_4 and N_2O (E.21, 2020) Completeness	Estimate emissions from natural gas consumption under road transportation (category 1.A.3.b) for the years in which the consumption occurred and report the AD and estimates in the NIR and CRF tables.	Resolved. The Party reported in NIR table 3.20 (p.91) the consumption of compressed natural gas under road transportation (category 1.A.3.b). The AD and estimated emissions were reported in CRF table 1.A(a)s3 for 2010–2020.
E.8	1.A.3.b Road transportation – liquid fuels – CO_2, CH_4 and N_2O (E.7, 2020) (E.15, 2018) (E.18, 2016) (E.17, 2015) Transparency	Explain how data from different sources (Statistics Estonia and the Estonian Transport Administration) are rearranged in a way that ensures consistency across the three data sets (number of vehicles, annual road traffic mileage and the division used in COPERT).	Addressing. The Party reported in its NIR the number of vehicles in the country (table 3.25, p.99) and road traffic mileage (table 3.26, p.100). However, the ERT noted that the Party did not include in the NIR a transparent explanation of how data from different sources are rearranged to ensure consistency across the three data sets (number of vehicles, annual road traffic mileage and the division used in COPERT). During the review, the Party clarified that emissions from road transport are estimated, using COPERT V, by the Estonian Environment Agency. The Agency collects data on the number of vehicles and annual mileage per vehicle from the Estonian Transport Administration and data on fuel consumption from Statistics Estonia. The statistics on fuel consumption are inputted into COPERT V by distributing them between vehicle categories on the basis of annual mileage per vehicle category from odometer readings taken during annual technical inspections to maintain a balance between calculated and statistical fuel consumption. The Party indicated that this explanation will be included in the next annual submission. The ERT considers that the recommendation has not yet been fully addressed because the Party, while it provided the required explanation during the review, has not yet included it in the NIR.
E.9	1.A.3.b Road transportation – LPG – CO_2, CH_4 and N_2O (E.22, 2020) Transparency	Explain in the NIR that vehicles using LPG are not extracted from the total number of vehicles used in COPERT because diesel or gasoline is used as a second fuel.	Resolved. The Party reported in its NIR (p.99) that because LPG vehicles are bifuel vehicles they are not extracted from the total number of vehicles used in COPERT to ensure that the emissions from the second (non-LPG) fuel are accounted for.
E.10	1.A.3.b.iv Motorcycles – gasoline – CO_2, CH_4 and N_2O (E.23, 2020) Consistency	Work with the national vehicle registry to report the correct number of motorcycles for 1990–2012 by including mopeds under the motorcycles category (e.g. by using a data gap filling technique in accordance with the 2006 IPCC Guidelines (vol. 1, chap. 5, p.5.14)); and revise the estimated emissions under motorcycles (subcategory 1.A.3.b.iv) using the updated AD for 1990–2012, ensuring time-series consistency and documenting the estimates in the NIR.	Addressing. The Party corrected in its NIR the AD for 1990–2012 for the number of motorcycles (table 3.25, p.99) and their mileage (table 3.26, p.100). The estimated emissions for subcategory 1.A.3.b.iv (motorcycles) were revised using the corrected AD. However, the ERT noted that the NIR does not include an explanation of the data gap filling technique that was used to correct the number of motorcycles reported. During the review, the Party explained that an analysis of the high statistical number of motorcycles in use during 1990–1994 was carried out, and as a result, the number of vehicles was corrected to ensure that the data no longer include vehicles that are not in use. The number of mopeds for 1995–2012 was adjusted on the basis of the corrections to the number of motorcycles for 1990–1994. The Party indicated that more

ID#	Issue/problem classification[a, b]	Recommendation from previous review report	ERT assessment and rationale
			information on motorcycles and mopeds will be included in the next annual submission in order to improve its transparency. The ERT considers that the recommendation has not yet been fully addressed because the Party has not yet included in the NIR an explanation of the data gap filling technique and other statistical methods used to correct the number of motorcycles and mopeds.
E.11	1.A.3.b.iv Motorcycles – gasoline – CO_2 (E.11, 2020) (E.26, 2018) Transparency	Report in the NIR the differences between the number of motorcycles reported by the national vehicle registry and the number of motorcycles used for estimating emissions in COPERT, and explain the underlying reasons for the differences, when applicable.	Addressing. The Party reported in its NIR (table 3.25, p.99) the number of motorcycles and mopeds used in COPERT and explained in its NIR (table 10.8, p.430) the method used for calculating the number of motorcycles. During the review, the Party clarified that the number of motorcycles in the national vehicle registry includes motorcycles that have been disposed of, while data used in COPERT have been corrected to exclude such motorcycles. The ERT considers that the recommendation has not yet been fully addressed because the Party has not yet included in the NIR (section 3.2.5.3) the differences between the number of motorcycles reported by the national vehicle registry and the number of motorcycles used in COPERT or the reasons for these differences.
E.12	1.A.3.d Domestic navigation – diesel oil – CO_2, CH_4 and N_2O (E.24, 2020) Accuracy	Correct the CO_2, CH_4 and N_2O emission estimates on the basis of the corrected diesel oil consumption data under domestic navigation for 2017–2018 and report the updated estimates in the NIR and CRF table 1.A(a)s3.	Resolved. The Party reported the correct diesel oil consumption under domestic navigation for 2017–2018 in its NIR (table 3.20, p.91). Emission estimates and AD for this category were updated accordingly and are reported in CRF table 1.A(a)s3.
E.13	1.A.3.d Domestic navigation – liquid fuels – CO_2, CH_4 and N_2O (E.12, 2020) (E.27, 2018) Consistency	Work with Statistics Estonia to review the domestic navigation fuel consumption data over the time series to ensure that a consistent methodology is used, and explain in the NIR the underlying reasons for the significant inter-annual variation, if applicable.	Resolved. The Party corrected the AD for 2014–2016, which resolved the data inconsistency for that period. For example, liquid fuel consumption between 2013 and 2014 increased by 149.4 per cent (from 174.00 to 433.94 TJ) in the 2020 submission but increased by 50.0 per cent (from 169.20 to 253.80 TJ) in the 2022 submission. The Party reviewed the domestic navigation fuel consumption data and explained in its NIR (section 3.2.5.6, p.112) the reason for the inter-annual increases seen in 2006–2008.
E.14	1.A.4 Other sectors – liquid fuels – CO_2, CH_4 and N_2O (E.25, 2020) Accuracy	Work with Statistics Estonia to collect AD on total liquid fuel consumption for the subcategories commercial/institutional (1.A.4.a), residential (1.A.4.b) and agriculture/forestry/fishing (1.A.4.c), ensure the accuracy of the AD and recalculate emissions for all years (1990–2018).	Not resolved. The Party reported in its NIR (section 3.2.6.2, p.117) that Statistics Estonia collects AD on total liquid fuel consumption for the subcategories 1.A.4.a, 1.A.4.b and 1.A.4.c by sending questionnaires to all companies with at least 50 employees and by sending questionnaires to a random selection of smaller companies. The ERT noted that this may lead to an overestimation or underestimation of the AD and emissions if only the smallest or largest fuel users are covered by each questionnaire. During the review, the Party clarified that Statistics Estonia has been notified of the issue and is looking into improving the accuracy of the data.

ID#	*Issue/problem classification[a, b]*	*Recommendation from previous review report*	*ERT assessment and rationale*
			The ERT considers that the recommendation has not yet been addressed because the Party has not yet updated the data-collection methodology but concludes that any possible underestimation, if occurring, will be below the significance threshold for application of an adjustment in accordance with decision 22/CMP.1, annex, paragraph 80(b), in conjunction with decision 4/CMP.11 (5.78–10.97 kt CO_2 eq for 2013–2020), and therefore the issue will not be included in the list of potential problems and further questions raised.
E.15	1.B.2.a Oil – CH_4 (E.16, 2020) (E.19, 2018) (E.21, 2016) (E.20, 2015) Transparency	Fill in AD in the columns "Unit" and "Value" of the row "Distribution of oil products" in CRF table 1.B.2 instead of reporting these values as "NA", and change the notation keys in the other cells to "NA".	Resolved. The Party has reported "NE" in CRF table 1.B.2 and provided an explanation in CRF table 9 in line with paragraph 37(b) of the UNFCCC Annex I inventory reporting guidelines.
E.16	International navigation – liquid fuels – CO_2, CH_4 and N_2O (E.1, 2020) (E.20, 2018) Consistency	Revise fuel consumption estimates for international navigation and ensure their time-series consistency.	Not resolved. The Party reported recalculations for 1990–2019 in NIR table 3.4 (p.65), which were made owing to the use of the updated Joint Questionnaire data set from Statistics Estonia. However, the Party continued to report in its NIR (section 3.2.2, p.64) that the almost 200 per cent increase in emissions between 2011 and 2012 was caused by an AD-related change in the methodology used by Statistics Estonia. During the review, the Party clarified that Statistics Estonia has been notified of the issue and is looking into improving the time-series consistency of the data on fuel consumption for international navigation. The ERT considers that the recommendation has not yet been addressed because the AD-related change in methodology results in a time series that is not consistent, as described in section 3.2.2 of the NIR and as shown by the reported sharp increase in emissions between 2011 and 2012.
IPPU			
I.1	2.A.1 Cement production – CO_2 (I.1, 2020) (I.8, 2018) Transparency	Provide in the NIR information on how the overall uncertainty for the clinker EF was calculated and how possible errors in the chemical analysis affect the final uncertainty value.	Resolved. The Party reported in its NIR (p.133) that the overall uncertainty of the EF was determined by adding the uncertainties of the EFs for clinker and kiln dust and that the uncertainties of these EFs were derived from the uncertainties associated with the chemical analysis of CaO and MgO. Estonia explained that the company operating the only cement plant in the country uses the World Business Council for Sustainable Development methodology for its calculations and that the methodology has been approved by the Environment Minister of Estonia.
I.2	2.F.1 Refrigeration and air conditioning – PFCs, HFCs and SF_6 (I.6, 2020) (I.13, 2018) Transparency	Provide further information to justify the use of German statistics on the share of new vehicles still charged with HFC-134a to estimate emissions from mobile air conditioning by including quantitative data	Resolved. The Party provided in its NIR (p.184) a justification for the use of German statistics on the share of new vehicles still charged with HFC-134a to estimate emissions from mobile air conditioning; that is, the congruence of the Estonian and German car fleets in terms of new car makes and models.

ID#	Issue/problem classification[a, b]	Recommendation from previous review report	ERT assessment and rationale
		showing the comparison between Estonian and German new vehicles in 2016.	
I.3	2.F.1 Refrigeration and air conditioning – HFCs (I.7, 2020) (I.7, 2018) (I.10, 2016) (I.9, 2015) Accuracy	Continue to seek to collect more complete, accurate AD and EF data in order to improve the database and improve the accuracy and completeness of the estimates, and report on progress.	Addressing. The Party reported in its NIR (p.173) the issue with the completeness of AD and EFs for commercial and industrial refrigeration, which leads to high uncertainties. Inventory compilers and environmental inspectors collect AD in the commercial and industrial refrigeration sectors. The uncertainty of AD has decreased since the 2020 submission, while the uncertainty of EFs has not improved. The database for fluorinated gas equipment and servicing was overhauled in 2021, but still needs further improvement because the use of the database by service companies is low. During the review, the Party clarified that discussions on and development of the method to calculate emissions for the commercial and industrial refrigeration sectors are ongoing. The ERT does not have any data that might lead to lower uncertainties in the AD and EFs used to calculate emissions and that would allow it to evaluate potential underestimations thereof, but it compared the per capita emissions of Estonia with those of neighbouring countries with similar climatic, economic and urban planning conditions and found that Estonia's were not significantly lower. The ERT concludes that any possible underestimation would be below the threshold for application of an adjustment in accordance with decision 22/CMP.1, annex, paragraph 80(b), in conjunction with decision 4/CMP.11 (5.78–10.97 kt CO_2 eq for 2013–2020) and therefore the issue is not included in the list of potential problems and further questions raised. The ERT considers that the recommendation has not yet been fully addressed because, while the Party has improved the uncertainty of the AD, it has not yet improved the uncertainty of the EFs in comparison with those used for the previous annual submissions.
I.4	2.F.1 Refrigeration and air conditioning – HFC-143a (I.8, 2020) Transparency	Ensure that CRF table 2(II)B-Hs2 includes the correct AD for HFC-143a filled into new manufactured products for industrial refrigeration for 2016 and include an explanation of significant inter-annual changes in AD in the next annual submission.	Addressing. The Party reported in the NIR (pp.176–178) of its 2021 submission recalculations of HFC-143a for industrial refrigeration for 2016, but the inter-annual change between 2010 and 2011 noted by the previous ERT is still reported in the 2022 submission. During the review, the Party clarified that the AD for HFC-143a filled into new manufactured products for 2016 were corrected and that an explanation of these recalculations is included in the 2021 NIR (section 4.6.1.3.5). The ERT considers that the recommendation has not yet been fully addressed because the Party did not include in the NIR an explanation of the significant inter-annual changes for HFC-143a filled into new manufactured products for industrial refrigeration (e.g. a 261.3 per cent increase between 2010 and 2011).

ID#	*Issue/problem classification*[a, b]	*Recommendation from previous review report*	*ERT assessment and rationale*
I.5	2.F.1 Refrigeration and air conditioning – HFC-143a (I.9, 2020) Transparency	Clarify in the NIR the significant changes in the HFC-143a remaining in products at decommissioning for industrial refrigeration between 2015 and 2017.	Resolved. The Party reported in NIR table 10.8 that the reason for the significant inter-annual change in HFC-143a remaining in decommissioned equipment between 2014 and 2015 is that most of the R507 refrigerant in stock was decommissioned in 2015, while the reason for the significant inter-annual change between 2017 and 2018 is an error. For 2016 and 2017, errors were found arising from the double counting of some equipment decommissioned in 2015. These errors were corrected in the 2021 submission recalculations. During the review, the Party confirmed that the corrected values were included in the 2021 NIR (table 4.15).
Agriculture			
A.1	3.A.1 Cattle – CH_4 (A.10, 2020) Convention reporting adherence	Use 40 per cent as the uncertainty of the EFs for enteric fermentation as an average of the uncertainties provided in the 2006 IPCC Guidelines (vol. 4, chap. 10, p.10.33).	Resolved. The Party reported in NIR table 5.15 (p.244) that the uncertainty of CH_4 EFs for enteric fermentation in cattle, swine, sheep, goats, horses and fur animals is 40 per cent, in accordance with the 2006 IPCC Guidelines (vol. 4, chap. 10, p.10.33).
A.2	3.B.4 Other livestock – CH_4 and N_2O (A.5, 2020) (A.7, 2018) Accuracy	Correct the allocation of poultry manure, taking into account the findings from the new study by the Estonian University of Life Sciences or, if the study does not provide the necessary information, change the allocation from pasture/range/paddock to dry lot.	Addressing. The Party reported in NIR table 5.33 (p.258) that the allocation of poultry manure is 99.41 per cent solid waste and 0.59 per cent pasture, range and paddock. In CRF table 3.B(a)s2, 100 per cent solid storage and dry lot is reported. The ERT considers that the recommendation has not yet been addressed because the Party has not yet reported N_2O emissions in CRF table 3.B(b) that are consistent with NIR table 5.33 and that the allocation of poultry manure is 99.41 per cent solid waste and 0.51 per cent pasture, range and paddock.
A.3	3.D.a.2 Organic N fertilizers – N_2O (A.11, 2020) Consistency	Provide strong evidence that the information on the amount of sewage sludge applied to soils provided by the two sources and used for the estimates is consistent, or ensure time-series consistency by using any of the methods provided in the 2006 IPCC Guidelines (vol. 1, chap. 5).	Resolved. The Party reported in its NIR (p.283) evidence that the information on the amount of sewage sludge applied to soils provided by the two sources and used for the estimates is consistent.
A.4	3.D.a.2 Organic N fertilizers – N_2O (A.11, 2020) Transparency	Include information in the NIR explaining the fluctuations in the time series of sewage sludge applied to soils.	Resolved. The Party included in its NIR (p.283) a transparent explanation for the large fluctuations (up to 582.4 per cent inter-annual variation) of the data in NIR table 5.56 (p.283) and the CRF tables.
A.5	3.G Liming – CO_2 (A.12, 2020) Transparency	Clearly state in the next NIR the source of the liming application data used for 2004.	Resolved. The Party reported in its NIR (p.299) that liming application data for 2004 have been interpolated in the time series from Ministry of Rural Affairs data for 2003 and from Statistics Estonia data for 2005.

ID#	Issue/problem classification[a, b]	Recommendation from previous review report	ERT assessment and rationale
LULUCF			
L.1	4. General (LULUCF) – CO_2, CH_4 and N_2O (L.2, 2020) (L.3, 2018) Accuracy	Acquire land-use change data for 1970–1990 and recalculate N_2O emissions for the entire reporting period.	Addressing. Land-use change assumptions or data for 1970–1990 are not documented in the NIR (see also ID# L.12 in table 5). The N_2O emissions have been recalculated for the entire reporting period, but on the basis of updated and corrected land-use change data for 1991–2020 rather than by acquiring data for 1970–1990. During the review, the Party clarified that the Estonian Land Board has started digitalizing old orthophotos and that as these data become available Estonia will use them to report on 1970–1990 land-use changes in NFI plots. The ERT, while noting that the information provided during the review demonstrates that the Party has made progress in addressing this recommendation, considers that it should describe its progress in future NIRs. The ERT also notes that this recommendation is relevant to all GHGs, not only N_2O.
L.2	Land representation (L.12, 2020) Convention reporting adherence	Where emissions from land converted to "unmanaged wetlands" are reported in the NIR and where these areas are identified as "managed wetlands" in CRF tables 4.1 and 4.D, do not use the term "unmanaged" to describe these lands in the NIR and provide more transparent descriptions in the NIR (section 6.1) to identify these lands as managed lands.	Resolved. The Party transparently reported in its NIR (p.311) what it considers as managed and unmanaged wetlands and clarified that land converted to wetlands was reported as managed, and also clarified the reporting in CRF tables 4.1 and 4.D.
L.3	Land representation (L.13, 2020) Convention reporting adherence	Improve QC procedures and ensure that the final areas reported for each year under wetlands and other land are equal to the initial areas reported for the following year in CRF table 4.1, that CRF table 4.D reports the correct area of wetlands remaining wetlands, and that CRF table 4.F reports the area of wetlands converted to other land as "NO".	Resolved. The areas reported in CRF table 4.1 are consistent from one year to the next, and CRF table 4.D is consistent with CRF table 4.1. The area of wetlands converted to other land has not been reported as "NO" from 2006 onward in CRF table 4.F, which is consistent with the corresponding land-use transition matrices.
L.4	4.A Forest land – CO_2 (L.4, 2020) (L.5, 2018) Transparency	Provide in the NIR relevant data and evidence showing that CSCs in DOM are increasing constantly every year, such as references to the scientific literature or the annual change in the stock of DOM in the country, as determined by the NFI.	Resolved. The Party included in its NIR (p.319) a link to a web page containing relevant information on the decadal age classes of Estonian forests. Moreover, the reported stable increase in deadwood is supported by the NFI insofar as the forest age structure shows that Estonia has a substantial share of non-mature forests.
L.5	4.A Forest land – CO_2 (L.15, 2020) Transparency	Provide additional information in the NIR on time-series management of NFI data to allocate AD to individual years with a view to	Addressing. The ERT noted that NIR figure 6.11 still shows large inter-annual CSC for living biomass in forest land remaining forest land. As noted by the previous ERT, this seems to be in contradiction with a stock difference method, which usually smooths

ID#	Issue/problem classification[a, b]	Recommendation from previous review report	ERT assessment and rationale
		ensuring that estimates remain accurate and reliable as recalculations occur.	inter-annual variation as it gives only one value for an entire inventory cycle for any given plot. The NIR (p.439) points to sections 6.1.3 and 6.2 as addressing this issue by clarifying how plot data are aggregated to determine the national total. The ERT considers that these sections are not yet fully transparent. On p.321 (section 6.2), the Party mentions summing estimates for "each given area" but does not specify what these areas are. On p.314 (section 6.1.3), it states that "the average standing volume is calculated for every year based on the 15-year trend". During the review, the Party clarified that the procedure applied for estimating CSC in living biomass involves (1) estimating the standing volume on each plot; (2) summing all plots to obtain the total national standing volume for each year; (3) regressing the standing volume against time over a 15-year window centred on each year; (4) estimating a "smoothed standing volume" for each year as 75 per cent of the regressed value for the year plus 25 per cent of the actual value for the year; and (5) computing the difference with the standing volume in year y – 1 to obtain the reported CSC in living biomass for year y. The ERT considers that the recommendation has not yet been fully addressed because the Party has not yet provided in its NIR a fully transparent explanation of how it estimates CSC for living biomass in forest land remaining forest land. The ERT considers that the issue could be resolved by detailing in the NIR the procedure outlined during the review, including, ideally, providing equations that allow the ERT to track how Estonia goes from standing stock in each NFI plot to reported CSC in living biomass for a specific year.
L.6	4.B Cropland – CO_2 (L.17, 2020) Transparency	Ensure that historical pre-1990 cropland activity in Estonia is described consistently throughout the NIR.	Resolved. Land-use change assumptions or data for 1970–1990 are not documented in the NIR (see also ID# L.12 in table 5). Therefore, there is no inconsistency in the description of historical pre-1990 cropland activity because it is no longer described. The ERT considers that the issue of inconsistency is therefore resolved, but replaced with ID# L.12 in table 5 regarding the absence of such information (see also ID# L.1 above).
L.7	4.B.1 Cropland remaining cropland – CO_2, CH_4 and N_2O (L.5, 2020) (L.7, 2018) Completeness	Seek additional sources of information, such as agricultural statistics or criminal records about biomass burning in cropland, to verify the data on the areas and locations of the fires and confirm that no fires occur in cropland.	Resolved. The Party stated in its NIR (p.365) that GHG emissions from biomass burning in cropland were reported as "NE" as a disproportionate amount of effort would be required to collect the AD and estimate the emissions. The Party justified the notation key on the basis that the level of emissions is below the significance threshold in line with paragraph 37(b) of the UNFCCC Annex I inventory reporting guidelines.
L.8	4.B.1 Cropland remaining cropland – CO_2 (L.18, 2020) Completeness	Either identify an EF and estimate CSCs from DOM resulting from changes in orchard area, or report "NE" in CRF table 4.B and justify use of this notation key on the basis of negligible emissions in the NIR and in CRF table 9.	Resolved. The Party stated in its NIR (section 6.3.2.2, p.335) that CSCs in the DOM pool were reported as "NE" as they are considered as insignificant in terms of the overall level and trend in national emissions.

ID#	*Issue/problem classification[a, b]*	*Recommendation from previous review report*	*ERT assessment and rationale*
L.9	4.E.2 Land converted to settlements – CO_2 (L.10, 2020) (L.12, 2018) Accuracy	Revise the CSC factors for organic soils used in forest land and cropland to settlement conversions.	Resolved. The Party reported in CRF table 4.E specific EFs for mineral soils and for organic soils for forest land converted to settlements. The CSC factors for organic soils used in cropland to settlement conversions had already been revised, as acknowledged by the previous ERT.
L.10	4.G HWP – CO_2 (L.19, 2020) Accuracy	Include in the tier 2 methods and reporting for HWP under the Convention the accumulation and decay of wood products in use arising from activities that would be defined as deforestation under the Kyoto Protocol.	Resolved. The Party described in the NIR (pp.369–370) that HWP originating from deforestation are now treated similarly to all HWP under Convention reporting.
L.11	4.G HWP – CO_2 (L.20, 2020) Transparency	Correct the reference to the tier used in the description of the methodology for estimating emissions from semi-chemical wood pulp.	Resolved. The Party corrected the reference to the tier in CRF table 4.G and added a definition of semi-chemical wood pulp to the NIR (section 6.10, p.370).
Waste			
W.1	5. General (waste) – CH_4 (W.6, 2020) Transparency	Correct the information in the NIR and make sure that each category appears only once in the key category analysis.	Resolved. The Party updated the NIR (p.43) so that each category and gas appear only once in the key category analysis in table 1.3. The key categories and gases for the waste sector are 5.A (solid waste disposal on land) (CH_4), 5.D.1 (domestic wastewater) (CH_4) and 5.D.1 (domestic wastewater) (N_2O).
W.2	5. General (waste) – CO_2 (W.7, 2020) Convention reporting adherence	Improve QC procedures and report consistent information in the NIR and the CRF tables.	Addressing. The Party reported in CRF table 5.C and NIR annex 4 (p.92) consistent information for subcategories 5.C.1.1 (waste incineration – biogenic) and 5.C.2.1 (open burning of waste – biogenic). However, for subcategory 5.A.1.a (managed waste disposal sites – anaerobic), the Party reported the CO_2 emissions as "NA" in annex 4 (p.92) to the NIR but as "NO" in CRF table 5.A. The ERT considers that the recommendation has not yet been fully addressed.
W.3	5.D Wastewater treatment and discharge – N_2O (W.8, 2020) Accuracy	Correct the protein consumption data (kg/person/year) on the basis of the new data from the Food and Agriculture Organization of the United Nations and revise the N_2O estimates for 2018 for its next annual submission.	Resolved. The Party reported in CRF table 5.D under additional information that the protein consumption value of 37.36 kg/person/year was used for the 2020 calculation. The ERT notes that this is consistent with the latest data from the Food and Agriculture Organization of the United Nations. The Party used this value to estimate N_2O emissions. In the NIR (p.412), the Party reported that the annual protein consumption per capita value was obtained from FAOSTAT.
KP-LULUCF			
KL.1	General (KP-LULUCF) – CO_2 (KL.3, 2020) (KL.5, 2018) (KL.6, 2016) (KL.6, 2015) Consistency	Use a technical correction to exclude the effect of past disturbances in the FMRL in order to incorporate the background level of natural disturbances without double counting.	Resolved. During the review, Estonia clarified that it will not apply the natural disturbances provision during the commitment period.

ID#	*Issue/problem classification[a, b]*	*Recommendation from previous review report*	*ERT assessment and rationale*
KL.2	FM – CO_2 (KL.4, 2020) (KL.6, 2018) (KL.7, 2016) (KL.7, 2015) Accuracy	Obtain necessary data and apply a tier 2 method for estimating CSCs under the litter pool.	Addressing. The Party reported "NA" for the pool, indicating that it is assumed to be in equilibrium, and reported in its NIR (p.331) that it has developed a country-specific litter model; however, the model requires testing before being used for the GHG inventory. The ERT notes that this model could be seen as a tier 3 approach, which would accordingly require validation against ground data at the national level. The ERT concludes that any possible underestimation, if occurring, will not impact the accounting for FM because net removals for FM for the entire commitment period (–19,812.38 kt CO_2 eq) are in absolute value terms higher than the FM cap (11,199.08 kt CO_2 eq) and therefore the issue will not be included in the list of potential problems and further questions raised.
KL.3	FM – CO_2 (KL.5, 2020) (KL.8, 2018) (KL.10, 2016) (KL.10, 2015) Accuracy	Follow the recommendation made in document FCCC/TAR/2011/EST when making technical corrections during the second commitment period of the Kyoto Protocol (i.e. make a technical correction to the FMRL when agreement on HWP estimation has been reached because of the high inter-annual variability of the estimates for forest land in the 2011 GHG inventory, unless causes of such variability were detected and estimates consequently reassessed, and exclude CO_2 emissions from forest fires reported in CRF table 5(V)).	Resolved. Estonia performed a technical correction of the FMRL and included the information in the NIR (p.458). NIR table 11.8 shows that the recommendation made in document FCCC/TAR/2011/EST was followed when making technical corrections during the second commitment period of the Kyoto Protocol. During the review, the Party clarified that HWP calculations have been stabilized.
KL.4	FM – CO_2 (KL.9, 2020) KP reporting adherence	Ensure that the methodology relating to the natural disturbances provision avoids the expectation of net debits or net credits during the commitment period, and transparently describe in the NIR how this requirement is satisfied in accordance with decision 2/CMP.7, annex, paragraph 33.	Resolved. The Party reported in its NIR (p.442) that the background level and margin were recalculated using data from 1990–2012 and included this information in the NIR. In the NIR and during the review, Estonia clarified that it will not apply the natural disturbances provision during the commitment period.
KL.5	FM – CO_2 (KL.10, 2020) Transparency	Transparently explain the significant recalculations made for FM since the 2019 submission, including how updates to time-series management led to a revision that changed the 2013 estimate for FM sequestrations by over 50 per cent, and make a technical correction to the FMRL in accordance with the recalculations.	Addressing. The Party reported in its NIR (section 11.5.2.3) that it made a technical correction to the FMRL to ensure that the projections remain consistent with the historical average over 2000–2009, as recalculated for the 2022 submission. The ERT therefore considers that the "accuracy" component of the issue is resolved. However, the ERT considers that the explanation of the recalculations, and more generally of the "smoothing procedure" used for estimating CSC in living biomass, is not fully transparent in the NIR (see ID# L.5 above). Accordingly, the "transparency" component of the issue is not yet resolved.

ID#	*Issue/problem classification*[a, b]	*Recommendation from previous review report*	*ERT assessment and rationale*
KL.6	CH_4 and N_2O emissions from drained and rewetted organic soils – CH_4 and N_2O (KL.7, 2020) (KL.10, 2018) (KL.11, 2016) (KL.11, 2015) Completeness	Report CH_4 and N_2O emissions from organic soils associated with drainage and rewetting under those activities, in accordance with the good practice guidance provided in section 2.12.4 (WDR) of the *2013 Revised Supplementary Methods and Good Practice Guidance Arising from the Kyoto Protocol* and in the Wetlands Supplement.	Resolved. The Party reported in CRF table 4(KP-II).2 and in its NIR (sections 6.2.2.6 and 11.3.1.1.6) CH_4 and N_2O emissions for AR and FM activities, but not for deforestation, which was reported as "NA". During the review, the Party clarified that the 2006 IPCC Guidelines do not provide a method for estimating these emissions for the relevant subcategories under the Convention (e.g. land converted to cropland or land converted to settlements) and that it is therefore not mandatory to estimate them. The ERT agrees with the assessment by the Party and therefore considers that the recommendation has been addressed.

[a] References in parentheses are to the paragraph(s) and the year(s) of the previous review report(s) in which the issue or problem was raised. Issues are identified in accordance with paras. 80–83 of the UNFCCC review guidelines and classified as per para. 81 of the same guidelines. Problems are identified and classified as problems of transparency, accuracy, consistency, completeness or comparability in accordance with para. 69 of the Article 8 review guidelines in conjunction with decision 4/CMP.11.

[b] The report on the review of the 2021 annual submission of Estonia was not available at the time of this review. Therefore, the recommendations reflected in this table are taken from the 2020 annual review report. For the same reason, 2021, 2019 and 2017 are excluded from the list of review years in which issues could have been identified.

IV. Issues and problems identified in three or more successive reviews and not addressed by the Party

9. In accordance with paragraph 83 of the UNFCCC review guidelines, the ERT noted that the issues and/or problems included in table 4 have been identified in three or more successive reviews, including the review of the 2022 annual submission of Estonia, and had not been addressed by the Party by the time of publication of this review report.

Table 4
Issues and/or problems identified in three or more successive reviews and not addressed by Estonia

ID#	*Previous recommendation for issue*	*Number of successive reviews issue not addressed*[a]
General	No issues identified.	
Energy		
E.1	Report which categories' non-biogenic waste is included under which fuel types in the reference approach in a more transparent manner.	4 (2015/2016–2022)
E.8	Explain how data from different sources (Statistics Estonia and the Estonian Transport Administration) are rearranged in a way that ensures consistency across the three data sets (number of vehicles, annual road traffic mileage and the division used in COPERT).	4 (2015/2016–2022)
E.11	Report in the NIR the differences between the number of motorcycles reported by the national vehicle registry and the number of motorcycles used for estimating emissions in COPERT, and explain the underlying reasons for the differences, when applicable.	3 (2018–2022)

ID#	*Previous recommendation for issue*	*Number of successive reviews issue not addressed*[a]
E.16	Revise fuel consumption estimates for international navigation and ensure their time-series consistency.	3 (2018–2022)
IPPU		
I.3	Continue to seek to collect more complete, accurate AD and EF data in order to improve the database and improve the accuracy and completeness of the estimates, and report on progress.	4 (2015/2016–2022)
Agriculture		
A.2	Correct the allocation of poultry manure, taking into account the findings from the new study by the Estonian University of Life Sciences or, if the study does not provide the necessary information, change the allocation from pasture/range/paddock to dry lot.	3 (2018–2022)
LULUCF		
L.1	Acquire land-use change data for 1970–1990 and recalculate N_2O emissions for the entire reporting period.	3 (2018–2022)
Waste	No issues identified.	
KP-LULUCF		
KL.2	Obtain necessary data and apply a tier 2 method for estimating CSCs under the litter pool.	4 (2015/2016–2022)

[a] Reports on the reviews of the 2017, 2019 and 2021 annual submissions of Estonia have not yet been published. Therefore, 2017, 2019 and 2021 were not included when counting the number of successive years for this table. In addition, as the reviews of the Party's 2015 and 2016 annual submissions were conducted together, they are not considered successive reviews and 2015/2016 is counted as one year.

V. Additional findings made during the individual review of the Party's 2022 annual submission

10. Table 5 presents findings made by the ERT during the individual review of the 2022 annual submission of Estonia that are additional to those identified in table 3.

Table 5
Additional findings made during the individual review of the 2022 annual submission of Estonia

ID#	*Finding classification*	*Description of finding with recommendation or encouragement*	*Is finding an issue/problem?*[a]
General		No general findings additional to those included in table 3 were made by the ERT during the review.	
Energy			
E.17	Fuel combustion – reference approach – all fuels – CO_2	The Party reported in its NIR (section 3.2.1, p.64) that the difference in total CO_2 emissions between the reference approach and the sectoral approach is 29.6 per cent. However, CRF table 1.A(c) lists this difference as 41.99 per cent. The ERT noted that the difference in CO_2 emissions between the two approaches is largest	Yes. Transparency

ID#	Finding classification	Description of finding with recommendation or encouragement	Is finding an issue/problem?[a]
		for solid fuels (72.08 per cent for 2020) and other fuels (56.12 per cent for 2020). In the NIR (section 3.2.1, p.64), the Party explained that in the case of solid fuels, the amount of emitted CO_2 is different, as the sectoral approach considers that some of the oil shale is turned into shale oil, and this process has a smaller CEF than the combustion of oil shale (some of the carbon is transferred into shale oil), while in the reference approach calculations all the carbon in oil shale is combusted. The ERT noted that a quantitative analysis of the differences is not included in the NIR. The ERT noted that these differences are due to an overestimation in the reference approach and no issues related to the sectoral approach were identified. During the review, the Party clarified there is an error in the NIR (section 3.2.1, p.64) and that the difference in emissions between the approaches is 41.99 per cent, as reported in CRF table 1.A(c). The ERT recommends that the Party report in the NIR the correct difference in total CO_2 emissions from fuel combustion (per cent) between the reference approach and the sectoral approach and expand the explanation for the difference between the two approaches by including a quantitative explanation of the CO_2 calculations of oil shale and shale oil in the reference approach and the sectoral approach, as described in NIR section 3.2.1.	
E.18	Comparison with international data – liquid fuels – CO_2, CH_4 and N_2O	The Party reported in CRF table 1.A(b) a total liquid fuel consumption of 44,790 TJ for 2019 and 43,970 TJ for 2020. However, the IEA values for consumption of the same fuels are –526 TJ for 2019 and –1,663 TJ for 2020. The ERT noted that the Party did not provide the energy balance for the most recent year in the NIR as annex 4 as required by the UNFCCC Annex I inventory reporting guidelines. The ERT also noted that the Estonian energy balance is available online (https://andmed.stat.ee/en/stat/majandus__energeetika__energia-tarbimine-ja-tootmine__aastastatistika/KE0240).There is a large difference between the stock change of shale oil for 2019 and 2020 reported in these statistics and in CRF table 1.A(b): the energy statistics include a stock change for oil shale of 0 TJ for 2019 and 2020, while CRF table 1.A(b) contains a stock change for shale oil of –1,132.00 kt (–44,464.96 TJ) for 2019 and –1,114.48 kt (–44,121.56 TJ) for 2020. During the review, the Party clarified that the fuel consumption data reported in CRF table 1.A(b) are provided by Statistics Estonia, which also provides data to IEA. The Party indicated that Statistics Estonia has confirmed that the data used for the inventory and the data provided to IEA are the same. The ERT recommends that the Party (1) include the national energy balance for the most recent year in the NIR as annex 4 and (2) compare the national energy statistics with the AD reported in CRF table 1.A(b) and either correct the AD so that the values are consistent or describe transparently in the NIR any differences between them. The ERT encourages the Party to explore the differences between the data used for the annual inventory submission and the data submitted to IEA and report on them in the NIR.	Yes. Transparency
E.19	1.A.1.a Public electricity and heat production – other fossil fuels – CO_2, CH_4 and N_2O	The Party reported, as an information item in CRF table 1.A(a)s4, the total emissions from waste incineration, with energy recovery divided into biogenic and fossil fuel emissions (with the same value of 1,198.37 TJ and the same emissions for both portions). However, no further explanation of which fuel types these emissions are included under was provided in the documentation box of CRF table 1.A(a)s4 or in the NIR.	Yes. Transparency

ID#	*Finding classification*	*Description of finding with recommendation or encouragement*	*Is finding an issue/problem?*[a]
		Additionally, the Party reported in its NIR (section 3.2.4.1, p.67) that emissions from the Iru waste-to-energy plant are included under "Other fossil fuels" under category 1.A.1.a in CRF table 1.A(a)s1. The ERT noted, upon comparing the consumption of "Other fossil fuels" under category 1.A.1.a in CRF table 1.A(a)s1 with the information item in CRF table 1.A(a)s4 (total emissions from waste incineration with energy recovery), that the Party included the biogenic portion of the waste under "Other fossil fuels" under category 1.A.1.a in CRF table 1.A(a)s1. The ERT also noted that the plant-specific CEF for MSW, as reported in NIR table 3.9, is 17.94 GJ/t, but it is not clear from the NIR whether this value includes only the fossil portion of the MSW or both the fossil and the biogenic portions. During the review, the Party clarified that the emissions from waste incineration with energy recovery reported in CRF table 1.A(a)s4 are included under category 1.A.1.a (public electricity and heat production) in CRF table 1.A(a)s1. The ERT recommends that the Party allocate the biogenic portion of the waste incinerated with energy recovery to "Biomass" under category 1.A.1.a (public electricity and heat production) in CRF table 1.A(a)s1 and transparently report in the NIR on the derivation of the EFs for MSW for "Other fossil fuels" and "Biomass" of the same category.	
E.20	1.A.2.g Other (manufacturing industries and construction) – biomass – CO_2, CH_4 and N_2O	The ERT noted a significant decrease in biomass consumption, from 4,022 TJ for 2015 to 341 TJ for 2016, was reported in CRF table 1.A(a)s2 for category 1.A.2.g (other (manufacturing industries and construction)). During the review, the Party clarified that Statistics Estonia explained that this decrease results from the introduction of new technologies and the switch to a different fuel in the wood and wood products industry. The ERT recommends that the Party explain in the NIR the drivers of the trend in biomass consumption by manufacturing industries and construction and the reasons for any significant inter-annual variation.	Yes. Transparency
IPPU			
I.6	2.A.2 Lime production – CO_2	The Party reported in its NIR (p.134) that EFs based on actual CaO and MgO content measured by one of the bigger lime plants in the country have been available since 2005. As the EFs from that lime plant differ significantly from the default EFs available in the 2006 IPCC Guidelines (vol. 3, table 2.4), EFs for 1990–2004 were established as mean values from the EFs for 2005–2008. The ERT noted that the significant differences between country- or plant-specific EFs and default EFs from the 2006 IPCC Guidelines should be explained in line with the 2006 IPCC Guidelines (vol. 1, chap. 6, p.6.13). During the review, the Party clarified that the percentage of CaO and MgO in lime differs from year to year because of differences in the quality of the raw material. The EFs for CaO and MgO were calculated on the basis of the ratio of the molecular weight of CO_2 to CaO or MgO. The Party explained that the recalculations made for the 2010 submission (2010 NIR section 4.2.2.5, on source-specific recalculations) following a recommendation in a previous review report (FCCC/ARR/2009/EST, para. 93) showed differences in the emissions estimated using plant-specific EFs and those estimated using default EFs.	Yes. Transparency

ID#	*Finding classification*	*Description of finding with recommendation or encouragement*	*Is finding an issue/problem?*[a]
		The ERT recommends that the Party improve the explanation in the NIR of the differences for different years in the values of its plant-specific CaO and MgO EFs used for estimating CO_2 emissions from lime production and compare these EFs with the default EFs from the 2006 IPCC Guidelines (vol. 3, table 2.4).	
I.7	2.A.2 Lime production – CO_2	The Party reported in its NIR (p.134) that its method for calculating emissions from lime production is consistent with the tier 2 methodology and that four different EFs were used in the calculations. The ERT noted that in the NIR (section 4.2.2.3, on uncertainties and time-series consistency), no description is included of how the use of different EFs affects time-series consistency. During the review, the Party clarified that for 1990–1996, production data from Statistics Estonia and the IPCC default EF were used to calculate emissions for those plants for which it did not receive company-specific information and that emissions for 1990–1996 were recalculated by applying plant-specific EFs from two production plants. Emissions for 1997–2007 were recalculated owing to better AD and plant-specific EFs becoming available. The ERT noted that the 1990–1996 plant-specific EFs from the two production plants could be used to calculate an implied EF for those plants for which company-specific information was not received. The ERT recommends that the Party improve the justification in the NIR for using IPCC default EFs for some plants for 1990–1996 and for why it considers them more appropriate than a country-specific implied EF for 1990–1996.	Yes. Transparency
I.8	2.B.1 NH_3 production – CO_2	The Party reported in its NIR (p.147) that it used plant-specific EFs for calculating CO_2 emissions from NH_3 production throughout the time series and that these NH_3 production EFs varied between 1.276 and 1.516 t CO_2/t NH_3 produced. The ERT noted that the EFs reported by Estonia are outside the range of default EF values in the 2006 IPCC Guidelines (vol. 3, table 3.1); that is, 1.694–3.273 t CO_2/t NH_3. During the review, the Party clarified that the difference is attributable to the fact that the default EFs in table 3.1 of the 2006 IPCC Guidelines take into account natural gas used as both fuel and feedstock. The Party noted that it explained in the NIR (section 4.3.1.2) that under the IPPU sector, Estonia accounts only for emissions from the natural gas used as feedstock for primary steam reforming. The amount of natural gas combusted is reported under the energy sector (category 1.A.2.c) as it is possible to obtain separate data on natural gas that is used for non-fuel and fuel purposes from Statistics Estonia. Thus, the plant-specific EFs are lower than the default EFs in table 3.1 of the 2006 IPCC Guidelines. The ERT noted that this is not in line with the 2006 IPCC Guidelines (vol. 3, chap. 3.2.2, p.3.11), which state that "in the case of NH_3 production no distinction is made between fuel and feedstock emissions with all emissions accounted for in the IPPU Sector". The ERT recommends that the Party report all CO_2 emissions from NH_3 production (category 2.B.1) under the IPPU sector in accordance with the 2006 IPCC Guidelines (vol. 3, chap. 3.2.2, p.3.11) and ensure that the related fuel consumption is excluded from the emissions reported under the energy sector in order to avoid double counting.	Yes. Comparability

ID#	*Finding classification*	*Description of finding with recommendation or encouragement*	*Is finding an issue/problem?*[a]
I.9	2.D.1 Lubricant use – CO_2	The Party reported in NIR figure 4.4 (p.155) the emissions from lubricant use. The ERT noted that the emissions decreased from about 16 kt CO_2 eq for 1990 to about 3 kt CO_2 eq for 2020 and no explanation for this decrease was provided. During the review, the Party clarified that AD on lubricants are obtained from Statistics Estonia and Eurostat; both data sources have similar information on imports and exports. Import numbers declined steadily from 1990 to 2006, which has made the biggest impact on the overall trend. The ERT recommends that the Party include the description of the trend in lubricant use and associated emissions in the NIR (section 4.5.1.4). The ERT encourages the Party to conduct category-specific QA/QC and verification for this category and to explain the significant decrease in lubricant imports over the time series.	Yes. Transparency
I.10	2.F.1 Refrigeration and air conditioning – HFC-134a	The Party reported in NIR table 4.17 (under section 4.6.1.3.5, on category-specific recalculations) that the HFC-134a filled into new equipment for industrial refrigeration amounts to 1.2 kt and the quantity in stock is 4.98 kt for 2019. However, the ERT noted that in CRF table 2(II)B-Hs2, HFC-134a filled into new equipment for industrial refrigeration is reported as 1.31 t and the average annual stock as 10.66 t for the same year. During the review, the Party clarified that the data in NIR table 4.17 are on recalculations of HFC-134a that were not in different blends of HFCs but in a pure form. The amount of HFC-134a in different blends stayed the same. In contrast, the amounts reported in the CRF table are calculated as the sum of HFC-134a in pure form and in blends. The ERT recommends that the Party provide in the NIR, in the AD section for category 2.F.1, in tabular format, if appropriate, information on how the values for HFC-134a filled into new equipment and in stock for industrial refrigeration reported in CRF table 2(II)B-Hs2 were calculated, including an indication of whether they are based on individual HFCs or blends thereof that are used in the country.	Yes. Transparency
Agriculture			
A.6	3.B Manure management – CH_4	The Party reported in its NIR (pp.219 and 250, table 5.26 and figure 5.12) that the total CH_4 emissions from livestock manure management were 5.97 kt for 2014, decreasing to 5.25 kt for 2016 and increasing to 6.52 kt for 2020. The Party indicated that the main reason for this trend is "the recovering pork production in Estonia during the recent years after the outbreak of African swine fever in 2015" (NIR p.250). The ERT noted that no supporting documentation was provided to justify the reasons for the trend in the swine and dairy cattle annual population. During the review, the Party clarified that the dairy cattle and swine populations started to decrease from 2014 owing to the economic sanctions imposed by the Russian Federation on the EU and because of the African swine fever outbreak in the country in 2015, which reiterated the explanation included in the NIR (p.219): "Economic sanctions imposed by Russia on the EU starting from August 2014 have had an impact on the dairy industry resulting with a decline in production. Consequently, the number of dairy cattle in 2020 had fallen by 11.8% in comparison with 2014. The number of swine has fallen by 11.5% in 2020 compared to 2014 because of African swine fever outbreak in the region in 2015".	Yes. Transparency

ID#	*Finding classification*	*Description of finding with recommendation or encouragement*	*Is finding an issue/problem?*[a]
		The ERT recommends that the Party include in the NIR the reasons for the trend in livestock populations between 2014 and 2020, which led to a reduction and then increase in CH_4 emissions from manure management, for example by providing more information on the impacts of and recovery from the 2015 outbreak of African swine fever in the country (in the case of swine) and on the economic sanctions imposed by the Russian Federation on the EU from 2014 onward (in the case of dairy cattle).	
A.7	3.D.a.2.b Sewage sludge applied to soils – N_2O	The Party reported in its NIR (p.283, including table 5.56) that the methodology for treating sewage sludge according to the R10 category (which is one of the country-specific categories under which sludge is treated) for 1990–1998 was developed by the Tallinn University of Technology, which compiled the GHG inventory until 2012. During 1990–1998, limited waste-related data were gathered by the predecessor of the Estonian Environment Agency (the Estonian Environment Information Centre) and, therefore, an assumption was made that 50 per cent of the total amount of sewage sludge generated was applied to agricultural land. The ERT noted that no justification for the assumption that 50 per cent of the total amount of sewage sludge generated was applied to agricultural land is included in the NIR.	Yes. Transparency
		During the review, the Party clarified that the assumption is based on historical data on the use of sewage sludge and was originally made by the Tallinn University of Technology.	
		The ERT recommends that the Party include in the NIR supporting documentation to justify the assumption that, for 1990–1998, 50 per cent of the total amount of sewage sludge generated was applied to agricultural land.	
A.8	3.F Field burning of agricultural residues – CH_4 and N_2O	The Party reported in its NIR (p.298) that CH_4 and N_2O emissions from the field burning of agricultural residues were reported as "NO" for the whole time series. It also reported that it is feasible that it has been overestimating emissions for 1990–2006 by applying the IPCC default value for the fraction of residues burned in the field for previous submissions.	Yes. Transparency
		During the review, the Party acknowledged that the text in the NIR may be confusing and indicated that it will improve the description for this category in the next NIR. Since the 2015 submission, Estonia has applied the notation key "NO" for the entire time series for this category because in 2004 the burning of crop residues was prohibited by Estonian law and, prior to this, the Estonian Ministry of Rural Affairs does not consider that there was widespread burning of crop residues.	
		The ERT recommends that the Party investigate the probability that some field burning of agricultural residues does occur (because there may not be 100 per cent compliance with the law prohibiting the burning of crop residues) and include in the NIR the findings, which may take the form of expert judgment or a relevant document, in order to justify the reporting of CH_4 and N_2O emissions for this category as "NO".	
A.9	3.G Liming – CO_2	The Party reported in its NIR (p.299) that the emissions from limestone application were calculated using sales records for clinker dust, chalk and powdered limestone. The fraction of calcium carbonate in cement clinker dust (49.48 per cent) was obtained from the only cement plant operating in Estonia. The ERT noted that the method used to calculate this fraction was not clearly reported in the NIR.	Yes. Transparency
		During the review, the Party clarified that it received a calculation sheet from the cement plant in which different components of clinker dust and their proportions were shown. Therefore, using the burning residue percentage (80.92 per cent) and the CaO percentage in burning residue (51.92 per cent), which were both	

ID#	*Finding classification*	*Description of finding with recommendation or encouragement*	*Is finding an issue/problem?*[a]
		calculated by the cement plant, it was possible to calculate the fraction of calcium carbonate in the cement clinker dust. The Party indicated that it will add this clarification to the next NIR. The ERT recommends that the Party include in the NIR an explanation of how the value of the calcium carbonate content of cement clinker dust used in estimating CO_2 emissions from liming was derived, along with supporting documentation to justify the value used.	
A.10	3.H Urea application – CO_2	The Party reported in its NIR (p.302) that as the Agriculture and Food Board has not collected data on the amounts of marketed urea fertilizers since 2019, the CO_2 emissions from urea application for 2018 were also used as the 2019 and 2020 values. During the review, the Party clarified that the study referred to in the NIR included conducting a comparison of the data on urea fertilizers used in Estonia from IFASTAT and the data used in the inventory from Statistics Estonia and Nitrofert (a urea fertilizer producer). The Party noted that, unfortunately, highly significant discrepancies were found in the historical time series of data from IFASTAT that were not explained by the manager of IFASTAT. Therefore, using IFASTAT data to update Estonia's fertilizer time series was considered not possible. Estonia has contacted mineral fertilizer manufacturers and resellers to obtain data on the amount of urea fertilizers sold in Estonian markets each year. The Party will evaluate the possibility of using the manufacturers' data for reporting urea fertilizer use in the 2023 submission. The ERT noted that based on the AD time series, there is no underestimation of emissions in 2019 and 2020. The ERT recommends that the Party ensure reliable and consistent AD across the time series, include information on its activities to obtain urea fertilizer use data and report on the results of its evaluation of the manufacturers' data in the next annual submission.	Yes. Accuracy
LULUCF			
L.12	4. General (LULUCF) – CO_2, CH_4 and N_2O	The Party reported in its NIR (pp.318–319) and showed in NIR figures 6.9 and 6.10 that the area of land converted to forest land is very small for the 1990s and is associated with a decreasing area in forest land remaining forest land. The ERT noted that this pattern could be the result of an implicit assumption that there was no conversion to forest land prior to 1990; however, this assumption is neither stated nor justified in the NIR. More generally, assumptions made on land-use changes between 1970 and 1990 are not explicitly described in the NIR. During the review, Estonia declared that it was still in the process of collecting data on pre-1990 areas and practices. Because Estonia has chosen the default transition period of 20 years for conversions between land categories, data or assumptions on land-use changes necessarily start in 1970 to estimate areas of land categories in 1990 (in line with the 2006 IPCC Guidelines, vol. 4, p.4.33), even if Estonia has not yet acquired data for 1970–1990 (see also ID# L.1 in table 3). The ERT recommends that the Party transparently describe in the NIR the assumptions made on land-use changes between 1970 and 1990, possibly by including a representative land-transition matrix for that period, and, if the area subject to land-use changes is not nil, recalculate all estimates accordingly for 1990–2009.	Yes. Accuracy

ID#	*Finding classification*	*Description of finding with recommendation or encouragement*	*Is finding an issue/problem?*[a]
L.13	4. General (LULUCF) – CO_2	The Party reported in its NIR (p.326) that it uses EFs from the 2020 Swedish NIR for estimating CO_2 emissions from the drainage of organic soils. The ERT noted that the Swedish EFs are weighted averages of IPCC default EFs from the Wetlands Supplement (p.2.11); for forest land, they are weighted by the shares of boreal/poor, boreal/rich and temperate forest soils in Sweden. Similar weightings are applied for other land uses. The ERT considers that the application of these Swedish EFs by Estonia is not justified as Estonia lies entirely in the temperate zone according to the maps in the 2006 IPCC Guidelines (p.3.47). During the review, the Party clarified that its experts considered that using the default EFs from the 2006 IPCC Guidelines (vol. 4, chap. 4, p.4.53) for the temperate zone would be appropriate. The ERT agrees that this is in line with the UNFCCC Annex I inventory reporting guidelines, noting that using the more recent and more detailed default EFs from the Wetlands Supplement would likely improve the accuracy of the emission estimates. The ERT recommends that the Party use EFs that are better suited to Estonia's national soils and climate than the EFs currently in use (from the Swedish NIR) for estimating CO_2 emissions from the drainage of organic soils; for example, the ERT considers that the IPCC default EFs from the Wetlands Supplement (p.2.11) would be appropriate.	Yes. Accuracy
L.14	4.A Forest land – CO_2	The Party reported in its NIR (p.321) country-specific values for BCEFs. The ERT noted that these BCEFs present a counter-intuitive pattern because they are approximately stable per growing stock level, whereas BCEFs normally tend to decrease substantially with increasing growing stock level. For example, the changes in the BCEFs from the <20 m^3 class to the 21–50 m^3 class are very small (the <20 m^3 value is even lower than the 21–50 m^3 value for pine), whereas this change is commonly around –50 per cent (e.g. default values from the 2006 IPCC Guidelines (vol. 4, pp.4.50–4.51)). During the review, the Party clarified that the stable trend is the result of a fitted regression (BCEF as a function of stand volume) based on 165 pine, 127 spruce and 117 birch sample trees. The ERT recommends that the Party demonstrate in its NIR that the regression performed (BCEF as a function of stand volume) is accurate by providing the equation and parameters used together with graphical or numerical evidence that residuals are evenly distributed around zero along a representative range of growing stock levels. The ERT notes that, for example, a graph showing the regression curve for each tree type (i.e. pine, spruce and birch) together with points for each measured tree and an indicator of the fit (e.g. adjusted R-squared) would address the issue.	Yes. Transparency
L.15	4.A Forest land – CO_2	The Party reported in its NIR (p.321) weighted averages for BCEFs for each subcategory of forest land, as well as BCEF values per tree species and growing stock level. However, the NIR does not clearly state which of these two sets of values are used in the calculations. During the review, the Party clarified that it applied each weighted average to all the plots for a subcategory rather than applying different BCEFs corresponding to the growing stock level of each plot. The ERT notes that by doing so, the Party risks overestimating emissions from harvest, as the average is higher than the value for plots with a high growing stock level.	Yes. Accuracy

ID#	*Finding classification*	*Description of finding with recommendation or encouragement*	*Is finding an issue/problem?*[a]
		The ERT recommends that the Party either demonstrate that the risk of overestimating emissions from harvest is negligible when using a weighted average BCEF value for each subcategory of forest land or apply a set of BCEFs adapted to the variation in BCEF values per growing stock level.	
L.16	4.A.1 Forest land remaining forest land – CO_2	The Party reported in its NIR (p.319) that annual felling is generally the first-order driver of CSCs in forest land remaining forest land in the short to medium term (one to five years). The ERT noted that the time series for harvesting was not provided in the NIR. Comparing a time series of harvest values downloaded from FAOSTAT with overall removals in forest land (NIR figure 6.10 (p.119)), the ERT noted three major concerns: (a) Consistently with the narrative in the NIR (p.312), the comparison indicates that the end of the planned economy led to a substantial increase in harvested amounts in the 1990s (500 per cent between 1992 and 2001). One would therefore expect removals to have fallen steadily over that period, which is, however, not the case in the reported time series; (b) The maximum in removals occurred in 2003 and corresponded to a local maximum in harvest statistics. In general, a peak in harvest corresponds to lower removals. A similar feature, although less pronounced, occurred in 2018, when removals increased whereas harvest reached its all-time maximum. Usually, local maximums in removals correspond to local minimums in harvest and vice versa; (c) Since 2010, harvest statistics and removals have been broadly correlated at the 10-year timescale by an overall increasing trend in harvest and an overall decreasing trend in removals. However, at the five-year timescale, this is not the case: harvest rose sharply between 2008 and 2012, whereas removals also increased over that period, and, after a short plateau, harvest rose again sharply between 2014 and 2018, whereas removals were broadly stable. During the review, the Party offered three explanations for these concerns: (1) harvest is not the only factor affecting CSC in forest biomass, which depends also on the forest age structure and change in forest land area, as well as on the relative impact of changes in these factors over time; (2) the smoothing procedure cuts off the peaks in 2003 and 2018; and (3) the unfinished NFI cycles generate uncertainties in the most recent years of the time series. The ERT understands that because the NFI cycle is five years long, unfinished NFI cycles can blur the estimates for the last four reported years (2017–2020 in the case of the 2022 submission). However, a harvest lower than the increment justifies net removals, not a flat trend in removals, and smoothing justifies lower peaks than expected, but not opposite local extremes in harvest and CSCs. In addition, the Party clarified that it was using both permanent and temporary plots to estimate CSCs via the stock difference method. The ERT notes that using temporary plots together with the stock difference method could introduce a substantial random component in the estimates of CSCs. Indeed, when the stock difference method is applied to permanent plots, the estimate only reflects the change in stock, whereas when it is applied to temporary plots, the estimate also reflects the random change in sampled plots. Therefore, the ERT notes that the inconsistencies between the reported CSCs and the harvested volumes might be the result of an inaccurate smoothing procedure (see also ID# L.5 in table 3). The ERT recommends that the Party (1) provide in the NIR a transparent description of the counteracting forces that prevail over harvest as the main drivers of inter-annual (or short-term) changes in harvest levels or	Yes. Accuracy

ID#	*Finding classification*	*Description of finding with recommendation or encouragement*	*Is finding an issue/problem?*[a]
		reconsider its smoothing procedure so that it better reflects short-term (at least on a five-year timescale) changes in harvest levels and (2) report in the NIR harvest statistics for the entire reporting period, possibly in the same figure (graph) as the one displaying total emissions/removals for the category (figure 6.10 (p.319) in the 2022 NIR).	
L.17	4.A.2 Land converted to forest land – CO_2	The Party reported in its NIR (p.325) that its EFs for CSCs in mineral soils in cropland converted to forest land and grassland converted to forest land were derived from a published article (Kõlli et al., 2010). During the review, the Party provided the ERT with the article together with the calculation sheet describing how the figures from the articles were combined into the reported EFs. The ERT noted that the calculation method is in line with the 2006 IPCC Guidelines (vol. 4, chap. 2, p.2.38). However, the ERT also noted that the soil types for which no data were available were misrepresented as "no change in soil carbon" rather than being noted as "no data" and that the shares of forest per soil type did not add up to 100 per cent. The ERT recommends that the Party correct the estimates for CSCs in mineral soils in cropland converted to forest land and grassland converted to forest land by correcting the errors in the calculation sheet used to estimate the EFs for CSCs in mineral soils in cropland converted to forest land and grassland converted to forest land (by noting "no data" rather than "0" for soil types for which no data are available and ensuring that the shares of forest per soil type add up to 100 per cent) and report on the associated recalculations of emissions in the NIR.	Yes. Accuracy
L.18	4.E.2 Land converted to settlements – CO_2	The Party reported in its NIR (p.357) that it uses EFs from the 2020 Swedish NIR for CSCs in mineral soils for all subcategories of land converted to settlements, with the exception of forest land converted to settlements. The ERT noted that this is in principle reasonable, provided that Estonia has assessed that (1) the neighbouring country (in this case Sweden) is likely to be comparable for the given EFs and (2) the neighbouring country's EFs were obtained in line with the 2006 IPCC Guidelines. In this case, at least the first condition might not apply, as reported soil carbon stocks in Estonia and Sweden are very different in several categories (e.g. cropland and forest land). The ERT also noted that the reported EFs are very counter-intuitive: the EF for cropland converted to settlements is substantially lower than those for forest land converted to settlements and grassland converted to settlements despite soil carbon stocks being substantially higher in forest land and grassland compared with cropland. Similarly, the EF for forest land converted to settlements is three times lower than the EF for grassland converted to settlements despite the fact that Estonia considers that the transition from forest land to grassland results in negligible soil carbon changes in mineral soils. During the review, the Party noted that it has not validated the assumptions that the proportions of land-use groups within the different subcategories and the effects of land-use changes on soil carbon stocks in Estonia and Sweden are similar. The ERT recommends that the Party verify that the Swedish and Estonian situations are similar for the EFs in the land converted to settlements categories and that the Swedish EFs were obtained in line with the 2006 IPCC Guidelines, and if either of these conditions is violated, use a different set of EFs, possibly in conjunction with a tier 1 method for estimating emissions until an accurate higher-tier method can be properly justified.	Yes. Accuracy

ID#	*Finding classification*	*Description of finding with recommendation or encouragement*	*Is finding an issue/problem?*[a]
L.19	4.G HWP – CO_2	The Party reported in its NIR (p.370) several sources of data used in equations 2.8.1–2.8.6 from the *2013 Revised Supplementary Methods and Good Practice Guidance Arising from the Kyoto Protocol*, but did not provide the numerical values of a few key variables (e.g. total stock in HWP, share of industrial roundwood for the domestic production of HWP originating from domestic forests and share of domestically produced pulp for the domestic production of paper and paperboard). During the review, the Party clarified the description in the NIR by providing the source of data for each variable in the IPCC equations as well as the numerical values of a few key variables (e.g. total stock in HWP, share of industrial roundwood for the domestic production of HWP originating from domestic forests and share of domestically produced pulp for the domestic production of paper and paperboard) for a selection of years, including 1990. The ERT recommends that the Party provide in the NIR the source of the data as well as numerical values for each key variable in the equations used for estimating CO_2 emissions for this category (equations 2.8.1–2.8.6 from the *2013 Revised Supplementary Methods and Good Practice Guidance Arising from the Kyoto Protocol*).	Yes. Transparency
Waste			
W.4	5.A Solid waste disposal on land – CH_4	The Party reported in its NIR (pp.380 and 397) that its waste stream includes imported and exported waste and clarified that all waste data have been considered in the emission calculations. However, no details on the two streams are provided in the NIR. During the review, the Party clarified that when preparing the inventory, the entire waste stream, including waste that is generated, imported, exported, recycled and landfilled, is checked. The majority of the imported waste types (e.g. different metals) are reported by Estonian recycling companies. Historically, only a small part of the imported waste has been landfilled; this waste, while it is included in the waste model calculation, is inert waste for which CH_4 emissions are not calculated. The ERT recommends that the Party provide in the NIR a thorough description of imported waste, including its amount, characteristics and how it is accounted for in the calculations of CH_4 emissions for this category.	Yes. Transparency
W.5	5.A Solid waste disposal on land – CH_4	The Party reported in NIR table 7.7 that the IPCC default value of DOC_f was used and in CRF table 5.A the DOC_f for anaerobic managed waste disposal sites was reported as 13.84. The ERT noted that this is not in accordance with the 2006 IPCC Guidelines (vol. 5, chap. 3, p.3.13), which provide a default value of 0.5 for DOC_f. During the review, the Party clarified that an error occurred in reporting, namely that the MSW DOC was reported as DOC_f in CRF table 5.A. The default fraction of 0.5 from the 2006 IPCC Guidelines was, however, used in the calculations. The ERT recommends that the Party correct the DOC_f value for anaerobic managed waste disposal sites reported in CRF table 5.A (i.e. to the default value from the 2006 IPCC Guidelines) in the next annual submission.	Yes. Convention reporting adherence

ID#	*Finding classification*	*Description of finding with recommendation or encouragement*	*Is finding an issue/problem?*[a]
W.6	5.A Solid waste disposal on land – CH_4	The Party reported in NIR table 7.7 (p.385) that k values are 0.06, 0.03, 0.1, 0.185 and 0.09 for paper/textile, wood, organic/garden and park, food and sewage, and industrial waste respectively. However, the NIR provides no justification on the choice of the values used from table 3.3 of the 2006 IPCC Guidelines (vol. 5, chap. 3, p.3.17). The ERT noted that the k values are those from the boreal and temperate climate zone for wet waste. During the review, the Party clarified that it plans to include climate zone information in the methodological section of the waste sector chapter in the next NIR and noted that according to the Estonian Environment Agency, the mean annual temperature in Estonia (1991–2020) was 6.4 °C and precipitation is almost twice as much as evaporation, so the climate is wet. The ERT recommends that the Party provide in its NIR an explanation of the reason for its choice of climate zone when selecting k values for waste.	Yes. Transparency
W.7	5.A Solid waste disposal on land – CH_4	The Party reported in its NIR (p.385) that default DOC content factors from the 2006 IPCC Guidelines were used in emission calculations. The ERT noted that NIR table 7.11 (p.386) includes country-specific DOC content factors for mixed MSW divided into five periods. The ERT also noted that NIR table 7.1 (p.373) states that default EFs were used. During the review, the Party clarified that NIR table 7.1 should include both country-specific and default EFs for estimating CH_4 emissions because the DOC values are calculated using data from national MSW studies that take place periodically. The ERT recommends that the Party include in NIR table 7.1 that country-specific EFs are used for estimating CH_4 emissions from MSW disposal on land and provide in the NIR information about the way in which these country-specific DOC content factors in MSW have been calculated.	Yes. Transparency
W.8	5.B.1 Composting – CH_4	The Party reported in NIR table 7.15 (p.391) the quantities of MSW composted in 2003, 2014 and 2017. For the other years of the time series, the notation key NO was used for composted MSW. During the review, the Party clarified that for 2003, 2014 and 2017, a waste management company reported composted waste with an MSW code, which is not common practice, and therefore switched to reporting the quantities of waste under the respective waste groups in future years. The ERT recommends that the Party include information on the composting of MSW across the time series. The ERT encourages the Party to provide a description of composted waste practices in its next annual submission.	Yes. Transparency
KP-LULUCF			
KL.7	General (KP-LULUCF) – CO_2	The Party reported in its NIR (p.326) that it uses EFs from the 2020 Swedish NIR for estimating CO_2 emissions from the drainage of organic soils. The ERT noted that the Swedish EFs are weighted averages of IPCC default EFs from the Wetlands Supplement (p.2.11); for forest land, they are weighted by the shares of boreal/poor, boreal/rich and temperate forest soils in Sweden. Similar weightings are applied for other land uses. The ERT considers that the application of these Swedish EFs by Estonia is not justified because Estonia lies entirely in the temperate zone according to the maps in the 2006 IPCC Guidelines (p.3.47).	Not a problem

ID#	*Finding classification*	*Description of finding with recommendation or encouragement*	*Is finding an issue/problem?*[a]
		During the review, the Party clarified that its experts considered that using the default EFs from the 2006 IPCC Guidelines for the temperate zone would be appropriate. The ERT agrees that this is indeed reasonable, although using the more recent and more detailed default EFs from the Wetlands Supplement (p.2.11) would be likely to improve the accuracy of the emission estimates. During the review, the Party resubmitted its CRF tables, which report emissions that were estimated using the default EFs from the 2006 IPCC Guidelines for the temperate zone for all drained organic soils, which resulted in: for AR, net removals decreased by 108.77 kt CO_2 eq; for deforestation, net emissions increased by 64.62 kt CO_2 eq; for FM, net removals decreased by 2 741.37 kt CO_2 eq. The ERT agrees with the Party that the revised submission complies with the Kyoto Protocol accounting rules. (See also ID# L.13 in table 5, which is related to this issue under the Convention.)	

[a] Recommendations made by the ERT during the review are related to issues as defined in para. 81 of the UNFCCC review guidelines or problems as defined in para. 69 of the Article 8 review guidelines.

VI. Application of adjustments

11. The ERT did not identify the need to apply any adjustments for the 2022 annual submission of Estonia.

VII. Accounting quantities for activities under Article 3, paragraph 3, and, if any, activities under Article 3, paragraph 4, of the Kyoto Protocol

12. Table I.5 presents the accounting quantities for KP-LULUCF reported by Estonia and the final values agreed by the ERT. The final quantities of units to be issued and cancelled are presented in table I.6.

VIII. Questions of implementation

13. No questions of implementation were identified by the ERT during the individual review of the Party's 2022 annual submission.

Annex I

Overview of greenhouse gas emissions and removals and data and information on activities under Article 3, paragraphs 3–4, of the Kyoto Protocol, as submitted by Estonia in its 2022 annual submission

1. Tables I.1–I.4 provide an overview of the total GHG emissions and removals as submitted by Estonia.

Table I.1
Total greenhouse gas emissions and removals for Estonia, base year–2020
(kt CO_2 eq)

	Total GHG emissions excluding indirect CO_2 emissions		*Total GHG emissions and removals including indirect CO_2 emissions*[a]		*Land-use change (Article 3.7 bis as contained in the Doha Amendment)*[b]	*KP-LULUCF (Article 3.3 of the Kyoto Protocol)*[c]	*KP-LULUCF (Article 3.4 of the Kyoto Protocol)*	
	Total including LULUCF	*Total excluding LULUCF*	*Total including LULUCF*	*Total excluding LULUCF*			*CM, GM, RV, WDR*	*FM*
FMRL								–2 741.00
Base year[d]	37 046.80	40 206.70	NA	NA	NA		NA	
1990	37 015.28	40 175.17	NA	NA				
1995	17 281.14	20 080.53	NA	NA				
2000	13 274.54	17 479.52	NA	NA				
2010	16 345.42	21 180.81	NA	NA				
2011	16 311.88	21 134.14	NA	NA				
2012	16 476.44	20 023.45	NA	NA				
2013	19 769.32	21 931.18	NA	NA		268.56	NA	–3 141.01
2014	19 420.86	21 104.45	NA	NA		312.27	NA	–2 657.84
2015	15 908.67	18 036.69	NA	NA		354.58	NA	–3 316.62
2016	17 627.09	19 721.59	NA	NA		431.73	NA	–3 162.37
2017	19 698.37	20 965.47	NA	NA		448.94	NA	–2 630.57
2018	18 687.44	20 125.74	NA	NA		433.81	NA	–3 088.34
2019	14 301.56	14 636.12	NA	NA		350.01	NA	–1 792.65
2020	12 853.08	11 555.81	NA	NA		295.27	NA	–22.98

Note: Emissions and removals reported for the sector other (sector 6) are not included in the total GHG emissions.

[a] The Party did not report indirect CO_2 emissions in CRF table 6.

[b] The value reported in this column relates to GHG emissions from conversion of forests (deforestation) in 1990 as contained in the report on the review of the Party's report to facilitate the calculation of the assigned amount for the second commitment period of the Kyoto Protocol.

[c] Activities under Article 3, para. 3, of the Kyoto Protocol, namely AR and deforestation.

[d] "Base year" refers to the base year under the Kyoto Protocol, which is 1990 for CO_2, CH_4 and N_2O, and 1995 for HFCs, PFCs, SF_6 and NF_3. Estonia has not elected any activities under Article 3, para. 4, of the Kyoto Protocol. For activities under Article 3, para. 3, of the Kyoto Protocol and FM under Article 3, para. 4, only the inventory years of the commitment period must be reported.

Table I.2

Greenhouse gas emissions and removals by gas for Estonia, excluding land use, land-use change and forestry, 1990–2020

(kt CO_2 eq)

	CO_2[a]	*CH_4*	*N_2O*	*HFCs*	*PFCs*	*Unspecified mix of HFCs and PFCs*	*SF_6*	*NF_3*
1990	36 922.21	1 912.52	1 340.45	NO	NO	NO	NO	NO
1995	18 066.41	1 284.38	698.21	28.45	NO	NO	3.07	NO
2000	15 500.38	1 259.91	637.47	79.15	NO	NO	2.61	NO
2010	19 002.52	1 253.87	746.47	176.11	NO	NO	1.83	NO
2011	18 984.22	1 208.02	756.04	183.98	NO	NO	1.87	NO
2012	17 794.83	1 224.90	807.83	193.91	NO	NO	1.99	NO
2013	19 697.91	1 217.11	805.93	208.11	NO	NO	2.12	NO
2014	18 860.40	1 190.78	832.87	218.20	NO	NO	2.21	NO
2015	15 846.90	1 095.87	868.22	223.35	NO	NO	2.35	NO
2016	17 559.35	1 084.24	841.06	234.30	NO	NO	2.64	NO
2017	18 762.49	1 095.35	873.33	231.76	NO	NO	2.55	NO
2018	17 935.07	1 093.14	862.50	232.36	NO	NO	2.67	NO
2019	12 380.19	1 098.30	928.46	226.33	NO	NO	2.84	NO
2020	9 343.01	1 095.46	929.68	184.74	NO	NO	2.92	NO
Percentage change 1990–2020	**–74.7**	**–42.7**	**–30.6**	**NA**	**NA**	**NA**	**NA**	**NA**

Note: Emissions and removals reported for the sector other (sector 6) are not included in this table.

[a] Estonia did not report indirect CO_2 emissions in CRF table 6.

Table I.3

Greenhouse gas emissions and removals by sector for Estonia, 1990–2020

(kt CO_2 eq)

	Energy	*IPPU*	*Agriculture*	*LULUCF*	*Waste*	*Other*
1990	36 213.16	963.74	2 628.34	–3 159.90	369.93	NO
1995	17 697.15	635.29	1 350.11	–2 799.39	397.97	NO
2000	15 098.87	695.97	1 122.23	–4 204.98	562.45	NO

	Energy	*IPPU*	*Agriculture*	*LULUCF*	*Waste*	*Other*
2010	18 899.50	539.51	1 253.80	–4 835.38	488.00	NO
2011	18 747.17	663.63	1 277.57	–4 822.26	445.77	NO
2012	17 328.20	909.07	1 359.61	–3 547.01	426.58	NO
2013	19 144.02	1 000.03	1 391.84	–2 161.87	395.30	NO
2014	18 593.00	712.45	1 437.90	–1 683.59	361.10	NO
2015	15 773.45	517.03	1 408.52	–2 128.02	337.69	NO
2016	17 519.24	503.67	1 369.13	–2 094.50	329.55	NO
2017	18 585.32	640.57	1 420.76	–1 267.10	318.82	NO
2018	17 770.83	628.54	1 417.62	–1 438.30	308.74	NO
2019	12 210.92	621.35	1 501.48	–334.56	302.38	NO
2020	9 461.45	295.47	1 508.38	1 297.27	290.51	NO
Percentage change 1990–2020	**–73.9**	**–69.3**	**–42.6**	**–141.1**	**–21.5**	**NA**

Notes: (1) Estonia did not report emissions or removals for the sector other (sector 6); (2) Estonia did not report indirect CO_2 emissions in CRF table 6.

Table I.4

Greenhouse gas emissions and removals from activities under Article 3, paragraphs 3–4, of the Kyoto Protocol by activity, base year–2020, for Estonia

(kt CO_2 eq)

	Article 3.7 bis as contained in the Doha Amendment[a]	*Activities under Article 3.3 of the Kyoto Protocol*		*FM and elected activities under Article 3.4 of the Kyoto Protocol*				
	Land-use change	*AR*	*Deforestation*	*FM*	*CM*	*GM*	*RV*	*WDR*
FMRL				–2 741.00				
Technical correction				2 164.10				
Base year[b]	NA				NA	NA	NA	NA
2013		–279.91	548.46	–3 141.01	NA	NA	NA	NA
2014		–269.19	581.46	–2 657.84	NA	NA	NA	NA
2015		–255.35	609.93	–3 316.62	NA	NA	NA	NA
2016		–239.91	671.64	–3 162.37	NA	NA	NA	NA
2017		–222.17	671.10	–2 630.57	NA	NA	NA	NA
2018		–204.92	638.73	–3 088.34	NA	NA	NA	NA
2019		–188.57	538.57	–1 792.65	NA	NA	NA	NA
2020		–172.90	468.17	–22.98	NA	NA	NA	NA
Percentage change base year–2020					**NA**	**NA**	**NA**	**NA**

Note: Values in this table include emissions from land subject to natural disturbances, if applicable.

[a] The value reported in this column relates to 1990.
[b] Estonia has not elected to report on any activities under Article 3, para. 4, of the Kyoto Protocol. For activities under Article 3, para. 3, of the Kyoto Protocol and FM under Article 3, para. 4, only the inventory years of the commitment period must be reported.

2. Table I.5 provides information on the Party's accounting quantities for reporting under Article 3, paragraphs 3–4, of the Kyoto Protocol.

Table I.5
Accounting quantities for activities under Article 3, paragraph 3, and forest management and any elected activities under Article 3, paragraph 4, of the Kyoto Protocol for Estonia
(kt CO_2 eq)

GHG source/sink activity	*Net emissions/removals*										*Accounting parameters*	*Accounting quantities*[a]
	Base year[b]	*2013*	*2014*	*2015*	*2016*	*2017*	*2018*	*2019*	*2020*	*Total*[c]		
A.1. AR		–279.907	–269.187	–255.354	–239.912	–222.165	–204.921	–188.566	–172.899	–1 832.910		–1 832.909
Excluded emissions from natural disturbances		NO	NO	NO	NO	NO	NO	NO	NO	NO		NO
Excluded subsequent removals from land subject to natural disturbances		NA	NA	NA	NA	NA	NA	NA	NA	NA		NA
A.2. Deforestation		548.462	581.461	609.934	671.638	671.103	638.729	538.572	468.173	4 728.072		4 728.072
B.1. FM										–19 812.384		–15 197.202
Net emissions/ removals		–3 141.012	–2 657.839	–3 316.624	–3 162.374	–2 630.575	–3 088.337	–1 792.645	–22.979	–19 812.384		
Excluded emissions from natural disturbances[d]		NO	NO	NO	NO	NO	NO	NO	NO	NO		NO
Excluded subsequent removals from land subject to natural disturbances		NO	NO	NO	NO	NO	NO	NO	NO	NO		NO

GHG source/sink activity	*Net emissions/removals*										*Accounting parameters*	*Accounting quantities*[a]
	Base year[b]	*2013*	*2014*	*2015*	*2016*	*2017*	*2018*	*2019*	*2020*	*Total*[c]		
Any debits from newly established forest		–	–	–	–	–	–	–	–	–		–
FMRL[e]											–2 741.000	
Technical corrections to FMRL											2 164.102	
FM cap											11 199.075	–11 199.075
B.2. CM (if elected)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA
B.3. GM (if elected)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA
B.4. RV (if elected)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA
B.5. WDR (if elected)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA

[a] The accounting quantity is the total quantity of units to be issued or cancelled for a particular activity.
[b] Net emissions and removals from CM, GM, RV and/or WDR, if elected, in the Party's base year as established in decision 9/CP.2.
[c] Cumulative net emissions and removals for all years of the commitment period reported in the annual submission under review.
[d] The Party indicated that it does not intend to exclude emissions from natural disturbances.
[e] As inscribed in the appendix to the annex to decision 2/CMP.7 in kt CO_2 eq per year.

3. Table I.6 provides an overview of key data from Estonia's reporting under Article 3, paragraphs 3–4, of the Kyoto Protocol.

Table I.6
Key data for Estonia under Article 3, paragraphs 3–4, of the Kyoto Protocol from its 2022 annual submission

Parameter	*Data*
Periodicity of accounting	(a) AR: commitment period accounting
	(b) Deforestation: commitment period accounting
	(c) FM: commitment period accounting
	(d) CM: not elected
	(e) GM: not elected
	(f) RV: not elected
	(g) WDR: not elected
Elected activities under Article 3, paragraph 4, of the Kyoto Protocol	None
Election of application of provisions for natural disturbances	Yes, for FM[a]
3.5% of total base-year GHG emissions, excluding LULUCF	1 399.884 kt CO_2 eq (11 199.075 kt CO_2 eq for the duration of the commitment period)
Cancellation of AAUs, CERs and ERUs and/or issuance of RMUs in the national registry for:	
1. AR	Issue 1 832 909 RMUs
2. Deforestation	Cancel 4 728 072 units
3. FM	Issue 11 199 075 RMUs

Note: Values in this table reflect the accounting quantities for activities under Article 3, para. 3, and FM and any elected activities under Article 3, para. 4, of the Kyoto Protocol as reported in table I.5.

[a] The Party decided not to exclude emissions and subsequent removals from natural disturbances in its accounting for the 2022 annual submission.

Annex II

Information to be included in the compilation and accounting database

Tables II.1–II.8 include the information to be included in the compilation and accounting database for Estonia. Data shown are from the Party's annual submission, including the latest revised estimates submitted, adjustments (if applicable) and the final data to be included in the compilation and accounting database.

Table II.1
Information to be included in the compilation and accounting database for 2020, including on the commitment period reserve, for Estonia
(t CO_2 eq)

	Original submission	*Revised submission*	*Adjustment*	*Final value*
CPR	**45 951 279**			**45 951 279**
Annex A emissions				
CO_2	9 343 010	–	–	9 343 010
CH_4	1 095 455	–	–	1 095 455
N_2O	929 681	–	–	929 681
HFCs	184 740	–	–	184 740
PFCs	NO	–	–	NO
Unspecified mix of HFCs and PFCs	NO	–	–	NO
SF_6	2 923	–	–	2 923
NF_3	NO	–	–	NO
Total Annex A sources[a]	**11 555 809**	**–**	**–**	**11 555 809**
Activities under Article 3, paragraph 3, of the Kyoto Protocol				
AR	–187 294	–172 899	–	–172 899
Deforestation	478 197	468 173	–	468 173
FM and elected activities under Article 3, paragraph 4, of the Kyoto Protocol				
FM	–365 381	–22 979	–	–22 979

[a] The sum of the values for the individual gases and groups of gases may not match the total owing to rounding.

Table II.2
Information to be included in the compilation and accounting database for 2019 for Estonia
(t CO_2 eq)

	Original submission	*Revised submission*	*Adjustment*	*Final value*
Annex A emissions				
CO_2	12 380 190	–	–	12 380 190
CH_4	1 098 300	–	–	1 098 300
N_2O	928 457	–	–	928 457
HFCs	226 334	–	–	226 334
PFCs	NO	–	–	NO
Unspecified mix of HFCs and PFCs	NO	–	–	NO
SF_6	2 840	–	–	2 840
NF_3	NO	–	–	NO
Total Annex A sources[a]	**14 636 121**	**–**	**–**	**14 636 121**
Activities under Article 3, paragraph 3, of the Kyoto Protocol				
AR	–202 727	–188 566	–	–188 566
Deforestation	548 158	538 572	–	538 572
FM and elected activities under Article 3, paragraph 4, of the Kyoto Protocol				

	Original submission	*Revised submission*	*Adjustment*	*Final value*
FM	–2 135 124	–1 792 645	–	–1 792 645

[a] The sum of the values for the individual gases and groups of gases may not match the total owing to rounding.

Table II.3
Information to be included in the compilation and accounting database for 2018 for Estonia
(t CO_2 eq)

	Original submission	*Revised submission*	*Adjustment*	*Final value*
Annex A emissions				
CO_2	17 935 074	–	–	17 935 074
CH_4	1 093 135	–	–	1 093 135
N_2O	862 503	–	–	862 503
HFCs	232 355	–	–	232 355
PFCs	NO	–	–	NO
Unspecified mix of HFCs and PFCs	NO	–	–	NO
SF_6	2 669	–	–	2 669
NF_3	NO	–	–	NO
Total Annex A sources[a]	**20 125 737**	**–**	**–**	**20 125 737**
Activities under Article 3, paragraph 3, of the Kyoto Protocol				
AR	–218 847	–204 921	–	–204 921
Deforestation	647 765	638 729	–	638 729
FM and elected activities under Article 3, paragraph 4, of the Kyoto Protocol				
FM	–3 430 893	–3 088 337	–	–3 088 337

[a] The sum of the values for the individual gases and groups of gases may not match the total owing to rounding.

Table II.4
Information to be included in the compilation and accounting database for 2017 for Estonia
(t CO_2 eq)

	Original submission	*Revised submission*	*Adjustment*	*Final value*
Annex A emissions				
CO_2	18 762 487	–	–	18 762 487
CH_4	1 095 349	–	–	1 095 349
N_2O	873 329	–	–	873 329
HFCs	231 757	–	–	231 757
PFCs	NO	–	–	NO
Unspecified mix of HFCs and PFCs	NO	–	–	NO
SF_6	2 549	–	–	2 549
NF_3	NO	–	–	NO
Total Annex A sources[a]	**20 965 471**	**–**	**–**	**20 965 471**
Activities under Article 3, paragraph 3, of the Kyoto Protocol				
AR	–235 857	–222 165	–	–222 165
Deforestation	679 470	671 103	–	671 103
FM and elected activities under Article 3, paragraph 4, of the Kyoto Protocol				
FM	–2 973 207	–2 630 575	–	–2 630 575

[a] The sum of the values for the individual gases and groups of gases may not match the total owing to rounding.

Table II.5
Information to be included in the compilation and accounting database for 2016 for Estonia
(t CO_2 eq)

	Original submission	*Revised submission*	*Adjustment*	*Final value*
Annex A emissions				

	Original submission	*Revised submission*	*Adjustment*	*Final value*
CO_2	17 559 353	–	–	17 559 353
CH_4	1 084 243	–	–	1 084 243
N_2O	841 060	–	–	841 060
HFCs	234 295	–	–	234 295
PFCs	NO	–	–	NO
Unspecified mix of HFCs and PFCs	NO	–	–	NO
SF_6	2 637	–	–	2 637
NF_3	NO	–	–	NO
Total Annex A sources[a]	**19 721 588**	–	–	**19 721 588**
Activities under Article 3, paragraph 3, of the Kyoto Protocol				
AR	–253 369	–239 912	–	–239 912
Deforestation	679 234	671 638	–	671 638
FM and elected activities under Article 3, paragraph 4, of the Kyoto Protocol				
FM	–3 505 083	–3 162 374	–	–3 162 374

[a] The sum of the values for the individual gases and groups of gases may not match the total owing to rounding.

Table II.6
Information to be included in the compilation and accounting database for 2015 for Estonia
(t CO_2 eq)

	Original submission	*Revised submission*	*Adjustment*	*Final value*
Annex A emissions				
CO_2	15 846 900	–	–	15 846 900
CH_4	1 095 872	–	–	1 095 872
N_2O	868 218	–	–	868 218
HFCs	223 353	–	–	223 353
PFCs	NO	–	–	NO
Unspecified mix of HFCs and PFCs	NO	–	–	NO
SF_6	2 351	–	–	2 351
NF_3	NO	–	–	NO
Total Annex A sources[a]	**18 036 694**	–	–	**18 036 694**
Activities under Article 3, paragraph 3, of the Kyoto Protocol				
AR	–268 574	–255 354	–	–255 354
Deforestation	617 034	609 934	–	609 934
FM and elected activities under Article 3, paragraph 4, of the Kyoto Protocol				
FM	–3 659 371	–3 316 624	–	–3 316 624

[a] The sum of the values for the individual gases and groups of gases may not match the total owing to rounding.

Table II.7
Information to be included in the compilation and accounting database for 2014 for Estonia
(t CO_2 eq)

	Original submission	*Revised submission*	*Adjustment*	*Final value*
Annex A emissions				
CO_2	18 860 397	–	–	18 860 397
CH_4	1 190 775	–	–	1 190 775
N_2O	832 869	–	–	832 869
HFCs	218 205	–	–	218 205
PFCs	NO	–	–	NO
Unspecified mix of HFCs and PFCs	NO	–	–	NO
SF_6	2 206	–	–	2 206
NF_3	NO	–	–	NO

	Original submission	*Revised submission*	*Adjustment*	*Final value*
Total Annex A sources[a]	**21 104 453**	–	–	**21 104 453**
Activities under Article 3, paragraph 3, of the Kyoto Protocol				
AR	–282 279	–269 187	–	–269 187
Deforestation	588 094	581 461	–	581 461
FM and elected activities under Article 3, paragraph 4, of the Kyoto Protocol				
FM	–3 000 672	–2 657 839	–	–2 657 839

[a] The sum of the values for the individual gases and groups of gases may not match the total owing to rounding.

Table II.8
Information to be included in the compilation and accounting database for 2013 for Estonia
(t CO_2 eq)

	Original submission	*Revised submission*	*Adjustment*	*Final value*
Annex A emissions				
CO_2	19 697 905	–	–	19 697 905
CH_4	1 217 110	–	–	1 217 110
N_2O	805 933	–	–	805 933
HFCs	208 113	–	–	208 113
PFCs	NO	–	–	NO
Unspecified mix of HFCs and PFCs	NO	–	–	NO
SF_6	2 123	–	–	2 123
NF_3	NO	–	–	NO
Total Annex A sources[a]	**21 931 185**	–	–	**21 931 185**
Activities under Article 3, paragraph 3, of the Kyoto Protocol				
AR	–292 728	–279 907	–	–279 907
Deforestation	554 740	548 462	–	548 462
FM and elected activities under Article 3, paragraph 4, of the Kyoto Protocol				
FM	–3 484 026	–3 141 012	–	–3 141 012

[a] The sum of the values for the individual gases and groups of gases may not match the total owing to rounding.

Annex III

Additional information to support findings in table 2

Missing categories that may affect completeness

No mandatory categories from the 2006 IPCC Guidelines were identified as missing.

Annex IV

Reference documents

A. Reports of the Intergovernmental Panel on Climate Change

IPCC. 2006. *2006 IPCC Guidelines for National Greenhouse Gas Inventories*. S Eggleston, L Buendia, K Miwa, et al. (eds.). Hayama, Japan: Institute for Global Environmental Strategies. Available at http://www.ipcc-nggip.iges.or.jp/public/2006gl.

IPCC. 2014. *2013 Revised Supplementary Methods and Good Practice Guidance Arising from the Kyoto Protocol*. T Hiraishi, T Krug, K Tanabe, et al. (eds.). Hayama, Japan: Institute for Global Environmental Strategies. Available at https://www.ipcc.ch/publication/2013-revised-supplementary-methods-and-good-practice-guidance-arising-from-the-kyoto-protocol/.

IPCC. 2014. *2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands*. T Hiraishi, T Krug, K Tanabe, et al. (eds.). Geneva: IPCC. Available at https://www.ipcc.ch/publication/2013-supplement-to-the-2006-ipcc-guidelines-for-national-greenhouse-gas-inventories-wetlands/.

B. UNFCCC documents

Annual review reports

Reports on the individual reviews of the 2015, 2016, 2018 and 2020 annual submissions of Estonia, contained in documents FCCC/ARR/2015/EST, FCCC/ARR/2016/EST, FCCC/ARR/2018/EST and FCCC/ARR/2020/EST respectively.

Other

Aggregate information on greenhouse gas emissions by sources and removals by sinks for Parties included in Annex I to the Convention. Note by the secretariat. Available at https://unfccc.int/documents/510888.

Annual status report for Estonia for 2022. Available at https://unfccc.int/sites/default/files/resource/asr2022_EST.pdf.

C. Other documents used during the review

Responses to questions during the review were received from Cris-Tiina Pärn and Hanna-Lii Kupri (Estonian Environmental Research Centre), including additional material on the methodology and assumptions used. The following reference may not conform to UNFCCC editorial style as it has been reproduced as received:

Kõlli, R., Köster, T., Kauer, K., Lemetti, I. (2010). Pedoecological regularities of organic carbon retention in Estonian mineral soils. International Journal of Geosciences, 1, 139–148.