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Report on the individual review of the annual submission of Latvia submitted in 2020*

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 2020 annual submission of Latvia, 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 October 2020 remotely.

* In the symbol for this document, 2020 refers to the year in which the inventory was submitted, not to the year of publication.



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Abbreviations and acronyms

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”
C	carbon
CER	certified emission reduction
CH ₄	methane
CLRTAP	Convention on Long-Range Transboundary Air Pollution
CM	cropland management
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”
CO ₂	carbon dioxide
CO ₂ eq	carbon dioxide equivalent
CPR	commitment period reserve
CRF	common reporting format
CSB	Central Statistical Bureau of Latvia
CSC	carbon stock change
DE	digestible energy
DOC	degradable organic carbon
EF	emission factor
ERT	expert review team
ERU	emission reduction unit
Eurostat	statistical office of the European Union
FM	forest management
FMRL	forest management reference level
Frac _{LEACH-(H)}	fraction of nitrogen input to managed soils that is lost through leaching and run-off
Frac _{leachMS}	fraction of managed manure nitrogen losses due to run-off and leaching during solid and liquid storage of manure
Frac _{Remove}	fraction of crops that is removed from the fields
FRL	forest reference level
GE	gross energy intake
GHG	greenhouse gas
GM	grazing land management
HFC	hydrofluorocarbon
IE	included elsewhere
IEF	implied emission factor
IPCC	Intergovernmental Panel on Climate Change
IPPU	industrial processes and product use
JSC	joint stock company
KP-LULUCF	activities under Article 3, paragraphs 3–4, of the Kyoto Protocol
KP reporting adherence	adherence to the reporting guidelines under Article 7, paragraph 1, of the Kyoto Protocol
LULUCF	land use, land-use change and forestry
MCF	methane conversion factor

MMS	manure management system(s)
MSW	municipal solid waste
N	nitrogen
NA	not applicable
NCV	net calorific value
NE	not estimated
NEU	non-energy use
NFI	national forest inventory
NF ₃	nitrogen trifluoride
NH ₃	ammonia
NIR	national inventory report
NO	not occurring
N ₂ O	nitrous oxide
PFC	perfluorocarbon
QA/QC	quality assurance/quality control
R _{AG}	ratio of above-ground residues dry matter to harvested yield for a crop
RMU	removal unit
RV	revegetation
SF ₆	sulfur hexafluoride
SWDS	solid waste disposal site(s)
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	<i>2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands</i>
2006 IPCC Guidelines	<i>2006 IPCC Guidelines for National Greenhouse Gas Inventories</i>

I. Introduction

1. This report covers the review of the 2020 annual submission of Latvia, 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 October 2020 remotely¹ and was coordinated by Javier Hanna Figueroa, Pedro Torres, Claudia do Valle and Luca Birigazzi (secretariat). Table 1 provides information on the composition of the ERT that conducted the review for Latvia.

Table 1

Composition of the expert review team that conducted the review for Latvia

<i>Area of expertise</i>	<i>Name</i>	<i>Party</i>
Generalist	Mausami Desai	United States
	David Glen Thistlethwaite	United Kingdom
Energy	Brooke Elizabeth Perkins	Australia
	Regine Röthlisberger	Switzerland
	Aynur Tokel	Turkey
IPPU	Jacek Skośkiewicz	Poland
	Erhan Ünal	Turkey
Agriculture	Kingsley Kwako Amoako	Ghana
	Ole-Kenneth Nielsen	Denmark
LULUCF and KP-LULUCF	Rehab Ahmed Hassan	Sudan
	Inge G.C. Jonckheere	Belgium
	Nele Inge Gabrielle Rogiers	Switzerland
Waste	Phindile Mangwana	South Africa
	Sirinthornthep Towprayoon	Thailand
Lead reviewers	David Glen Thistlethwaite	
	Sirinthornthep Towprayoon	

2. The basis of the findings in this report is the assessment by the ERT of the Party’s 2020 annual submission in accordance with the UNFCCC review guidelines and the Article 8 review guidelines.

3. The ERT has made recommendations that Latvia resolve identified findings, including issues² designated as problems.³ Other findings, and, if applicable, the encouragements of the ERT to Latvia to resolve related issues, are also included.

4. A draft version of this report was communicated to the Government of Latvia, which provided no comments.

5. Annex I presents the annual GHG emissions of Latvia, including totals excluding and including LULUCF, indirect CO₂ 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.

¹ Owing to the circumstances related to the coronavirus disease 2019, the review had to be conducted remotely.

² Issues are defined in decision 13/CP.20, annex, para. 81.

³ Problems are defined in decision 22/CMP.1, annex, paras. 68–69, as revised by decision 4/CMP.11.

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 2020 annual submission

7. Table 2 provides the assessment by the ERT of the Party's 2020 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 2020 annual submission of Latvia

<i>Assessment</i>	<i>Issue/problem ID#(s) in table 3 or 5^a</i>		
Dates of submission	Original submission: NIR, 14 April 2020; CRF tables (version 2), 14 April 2020; standard electronic format tables, 14 April 2020 Revised submission: NIR, 11 May 2020; CRF tables (version 3), 15 October 2020 Unless otherwise specified, values from the most recent submission are included in this report		
Review format	Centralized review conducted remotely		
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?	Yes	G.1
	(b) Selection and use of methodologies and assumptions?	Yes	E.5, L.2, KL.7
	(c) Development and selection of EFs?	Yes	E.7, E.8, A.12
	(d) Collection and selection of AD?	Yes	E.13, W.8, KL.9
	(e) Reporting of recalculations?	Yes	A.14, A.15
	(f) Reporting of a consistent time series?	Yes	I.1
	(g) Reporting of uncertainties, including methodologies?	Yes	G.3, G.7
	(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	Yes	I.7, L.7, L.10, L.11, L.12, W.4, W.5
	(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?	No	
Description of trends	Did the ERT conclude that the description in the NIR of the trends for the different gases and sectors is reasonable?	No	E.18
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?	Yes	G.6
	(b) Performance of the national system functions?	No	

<i>Assessment</i>	<i>Issue/problem ID#(s) in table 3 or 5^a</i>		
	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 standard independent assessment report?	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?	No	
	(b) Demonstration of methodological consistency between the reference level and reporting on FM in accordance with decision 2/CMP.7, annex, paragraph 14?	Yes	KL.8
	(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	Latvia 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	
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 3 April 2019,⁴ and had not been resolved by the time of publication of the review report of the Party's 2018 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. The ERT noted that the individual review of Latvia's 2019 annual submission did not take place in 2019 owing to insufficient funding for the review process.

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

<i>ID#</i>	<i>Issue/problem classification^{a, b}</i>	<i>Recommendation made in previous review report</i>	<i>ERT assessment and rationale</i>
General			
G.1	Key category analysis (G.5, 2018) Transparency	Provide in the NIR a short description of the differences between the categories used for the key category analysis and the categories in the CRF tables that better reflect national circumstances, similar to the description provided during the review.	Not resolved. The Party reported in the NIR (section 1.5.1, p.59) that the key category analysis was performed using a modified list of categories with respect to the IPCC suggested categories that better reflect national circumstances, but did not include an additional description of the differences in the list where modifications were made. During the review, Latvia clarified that it will provide further information in the next annual submission explaining the modifications to the list of categories used in conducting the key category analysis, which are related to types of transport fuel, disaggregation of agriculture categories (by animal species) and further disaggregation of LULUCF categories (e.g. to take into account soil type).
G.2	QA/QC and verification (G.6, 2018) Transparency	Include information on the main elements of the QA/QC plan in the NIR.	Resolved. The Party reported a list of the main elements of the QA/QC plan in its NIR (section 1.2.3, p.46). Hence, the ERT considers that this recommendation has been fully resolved.
G.3	Uncertainty analysis (G.7, 2018) Convention reporting adherence	Include a quantitative uncertainty assessment for the base year in the NIR.	Not resolved. Latvia included in the NIR (section 1.6.1, p.63) the quantitative uncertainty assessment for the latest reported year and the uncertainty assessment in the trend, and provided in the NIR (annex 2) the tables containing the uncertainty analysis for 2018, including and excluding LULUCF. However, the NIR did not include a quantitative assessment of the inventory uncertainty for the base year (1990) in accordance with paragraph 15 of the UNFCCC Annex I inventory reporting guidelines. During the review, the Party clarified that it was in the process of working to develop a quantitative uncertainty assessment for the base year (1990), but provided the ERT with an

⁴ FCCC/ARR/2018/LVA. The ERT notes that the report on the individual inventory review of Latvia's 2019 annual submission has not been published yet. As a result, the latest previously published annual review report reflects the findings of the review of the Party's 2018 annual submission.

<i>ID#</i>	<i>Issue/problem classification^{a, b}</i>	<i>Recommendation made in previous review report</i>	<i>ERT assessment and rationale</i>
			initial estimate of the total inventory uncertainty for 1990, namely 26 per cent including LULUCF and 6 per cent excluding LULUCF.
G.4	National registry (G.4, 2018) (G.13, 2016) (G.13, 2015) Comparability	Establish a previous period surplus reserve account as soon as technically possible.	Resolved. The Party reported in its 2019 NIR (table 10.5) that the previous period surplus reserve account was established in September 2018. During the review, Latvia reconfirmed that the account had been established and stated that the secretariat had been notified thereof in 2018.
Energy			
E.1	1. General (energy sector) (E.1, 2018) (E.10, 2016) (E.10, 2015) Transparency	Provide a reference to documented expert judgment from data providers and transparently explain in the NIR why, although the source of AD remained the same, the AD uncertainty was significantly decreased from 50 to 2 per cent in response to the consultation process with data providers.	Resolved. Latvia reported in the NIR (section 1.6.1, p.62) that the uncertainty analysis was carried out using approach 1 from the 2006 IPCC Guidelines (vol. 1, chap. 3.2.3.1, p.3.27) and presented the AD and EF uncertainty parameters used in its calculations in the NIR (annex 2). Further, the Party transparently described in the NIR (section 3.2.7.3, p.163) that the selected uncertainty parameters were derived from consultations with CSB and surveys addressed to Latvian enterprises. For category 1.A.4 other sectors, CSB estimated AD uncertainty at ± 2 per cent for solid, liquid and gaseous fuels, ± 5 per cent for solid biomass and peat, and ± 15 per cent for the residential subcategory, owing to the fact that consumption data for fuels in this subcategory were only gathered through five-yearly questionnaires. The ERT noted that the 2017 NIR (table 10.8, p.479) provided the rationale for revising the uncertainty parameters for fuel use in the residential subcategory, which remains valid for reporting on uncertainty in the 2020 annual submission.
E.2	Fuel combustion – reference approach – other fossil fuels – CO ₂ (E.5, 2018) (E.12, 2016) (E.12, 2015) Convention reporting adherence	Ensure that CO ₂ emissions from biomass combustion are not included in the estimate of total GHG emissions using the sectoral approach and correct the reference approach calculation for CO ₂ emissions from other fuels.	Resolved. The Party reported in the NIR (section 3.2.5.2, pp.122–123) information on the separation of the biomass and non-biomass fractions of municipal and industrial waste used as fuel. The ERT noted that in the 2019 NIR (table 10.5, p.463) Latvia explained that it recalculated CO ₂ emissions from other fossil fuels under the reference approach to ensure that CO ₂ emissions from the biomass fraction of waste were not included in the reference approach totals and were consistent with the recalculated CO ₂ emissions reported in CRF table 1.A(c). The difference in CO ₂ emissions for other fossil fuels for 2014 between the reference and sectoral approaches has been reduced to –2.3 per cent in the 2020 annual submission from –46.4 per cent reported in the 2015 annual submission.
E.3	Fuel combustion – reference approach – gaseous fuels – CO ₂ (E.17, 2018) Transparency	Investigate the reason for the differences between the sectoral and reference approach for natural gas and, if necessary, revise the explanation for this in the NIR.	Resolved. The ERT noted that Latvia included explanations on the differences in natural gas consumption between the sectoral and reference approaches in its NIR (p.96). The Party explained that differences were mainly due to losses of natural gas occurring annually in the country's natural gas systems which cannot be accounted for under the sectoral approach. The ERT also noted that differences in natural gas consumption between the sectoral and reference approaches were reported in CRF table 1.A(c) as less than 2 per cent in 1990

ID#	Issue/problem classification ^{a, b}	Recommendation made in previous review report	ERT assessment and rationale
E.4	Comparison with international data (E.2, 2018) (E.3, 2016) (E.3, 2015) (34, 2014) (33, 2013) Accuracy	Use data from both Eurostat and the International Energy Agency to conduct QC of the CRF tables and provide a clear explanation for any differences.	<p>and for 2000 onward (e.g. ranging from 0.74 to 1.31 per cent for 2013–2018) and slightly higher than 2 per cent for 1992–1999, peaking at 3.1 per cent in 1993. The ERT further noted that Latvia transparently reported in the NIR (annex A.3.1) the statistical differences and losses of natural gas for the entire time series, as reported in the national energy balance (see ID# E.13 in table 5).</p> <p>Resolved. The Party provided in the NIR (annex A.3.3) a comparison of the apparent consumption by fuel type reported in the GHG inventory and by Eurostat (data reported by European Union member States in accordance with European Union regulation 1099/2008). The ERT noted that Latvia performed QC checks of these two data sets and clearly explained the differences identified. During the review, Latvia clarified that CSB is the institution that provides data to Eurostat and the International Energy Agency; therefore, the data published by these two international organizations should be the same. The ERT noted that the Party’s clear explanations of the differences identified in the two data sets, and the overall consistency in emission data reported under the reference approach and the sectoral approach, indicated that Latvia conducted rigorous QC checks of the energy statistics used to report national GHG emission data in the CRF tables.</p>
E.5	Feedstocks, reductants and other NEU of fuels – all fuels – CO ₂ (E.6, 2018) (E.13, 2016) (E.13, 2015) Convention reporting adherence	Recalculate excluded carbon under the reference approach in accordance with the 2006 IPCC Guidelines (vol. 2, chap. 6.6, equation 6.4) for the entire time series (the EFs for lubricants and coke were not consistent with the 2006 IPCC Guidelines and the excluded carbon for bitumen and other oil was reported as “NO”).	<p>Addressing. The Party revised and reported in CRF table 1.A(d) the carbon excluded from the reference approach in accordance with the 2006 IPCC Guidelines (vol. 2, chap. 6.6, pp.6.7–6.8) for the entire time series and applied EFs for all fuels (including lubricants, coke, bitumen and other oil) that are consistent with the EF default values from the 2006 IPCC Guidelines (vol. 2, chap. 2, table 2.2, p.2.16) for all fuels (including lubricants, coke, bitumen and other oil). However, the ERT noted that the Party reported “NO” for both carbon stored and fraction of carbon oxidized for other oil in CRF table 1.A(b), which led to incorrect reporting of zero emissions (“NO”) instead of 8.82 kt C calculated from the apparent consumption. During the review, Latvia confirmed that in the calculations it used the EF default values from the 2006 IPCC Guidelines for all fuels (see ID# E.14 in table 5) and that the value for carbon oxidized for other oil will be corrected from “NO” to “1” in the next annual submission. Further, it clarified that other oil was used as a fuel for combustion purposes and represented the sum of data on white spirit, paraffin wax and unspecified other oil products. However, the ERT noted that CO₂ emissions from the NEU of paraffin wax were reported under category 2.D.2 paraffin wax use in CRF table 2(I).A-H (sheet 2), and that excluded carbon from the NEU of other oil (8.82 kt) was reported in CRF table 1.A(d). Therefore, reporting of other oil under the sectoral approach comprised both emissions from NEU and emissions from fuel combustion, but these emissions were not reported consistently in CRF tables 1.A(b) and 1.A(d) (see ID# E.15 in table 5).</p>

<i>ID#</i>	<i>Issue/problem classification^{a, b}</i>	<i>Recommendation made in previous review report</i>	<i>ERT assessment and rationale</i>
E.6	1.A Fuel combustion – sectoral approach – gaseous fuels – CO ₂ (E.10, 2018) (E.17, 2016) (E.17, 2015) Transparency	Transparently report all parameters used for the calculation of the country-specific EFs and provide the rationale for large inter-annual fluctuations in the trend and all recalculations made since the previous annual submission.	Resolved. The Party reported in NIR table 3.17 (p.111) information on the calculation of country-specific CO ₂ EFs for natural gas for the entire time series, including the annual carbon content in the working mass of fuel, natural gas density, oxidation factor, NCV and resulting CO ₂ EF. Further, Latvia explained in the NIR (p.111) that the fluctuation in the CO ₂ EFs for natural gas is due to annual changes in the composition and NCV of the natural gas used in the country. These changes are caused by the different quality of the gas over time due to changes in natural gas suppliers. During the review, the Party indicated that, historically, natural gas was supplied by the Russian Federation, but it has received significant volumes of natural gas from Norway and other countries since the opening of liquefied natural gas terminals in the Baltic States (e.g. the Klaipėda terminal in Lithuania in 2014). In addition, Latvia reported in the relevant NIR chapters detailed information on all recalculations made since the previous annual submission.
E.7	1.A.1 Energy industries – biomass – CO ₂ (E.16, 2018) Accuracy	Provide information on the difference in the CO ₂ EF for landfill gas and sludge gas between the IPCC default value and the value used by Latvia, or use the default CO ₂ EF for these gases.	Not resolved. Latvia stated in its NIR (p.112) that the carbon content, density and NCV of CH ₄ used to calculate the CO ₂ EF for landfill gas and sludge gas were taken from scientific literature and included a reference to the Engineering Toolbox website (Engineering ToolBox, 2003). However, the values presented in the NIR (tables 3.18–3.19) for the NCV and density of CH ₄ differ from those given in the reference provided. During the review, the Party clarified that these values were not country-specific and were taken from scientific literature sources, while the carbon content in the working mass of CH ₄ was calculated on the basis of the relative molecular mass of carbon in CH ₄ . Therefore, the ERT concluded that the CO ₂ EF for landfill gas and sludge gas provided in NIR tables 3.18–3.19 was not country-specific, and that Latvia has not sufficiently justified its use and why it considered that the use of this CO ₂ EF led to a lower level of uncertainty in the emission estimates compared with, for example, the application of the default CO ₂ EF value from the 2006 IPCC Guidelines (vol. 2, chap. 1, table 1.3, p.1.22). Further, the ERT noted that CO ₂ emissions from landfill gas and sludge gas used as fuels are of biogenic and not fossil origin, and therefore the issue of potentially underestimating such emissions is not affecting the national totals and is not relevant under the Kyoto Protocol accounting rules.
E.8	1.A.1.a Public electricity and heat production – solid fuels – CO ₂ (E.18, 2018) Accuracy	Apply country-specific EFs for the whole time series.	Addressing. The Party reported in its 2019 NIR (p.116) that it recalculated CO ₂ emissions from coal for 1990–2015 to take into account the results of a research study “Determination of carbon content and calculation of carbon dioxide emission factors”. These recalculated emissions were reported for subcategory 1.A.1.a public electricity and heat production in CRF table 1.A(a) (sheet 1) for 1990–2015. However, according to the 2020 NIR (table 3.16, p.110), the country-specific CO ₂ EF for coal expressed in energy units for 1990–2002 (85.55 t/TJ) falls significantly short of the lower end of the range of default

ID#	Issue/problem classification ^{a, b}	Recommendation made in previous review report	ERT assessment and rationale
E.9	1.B.2.b Natural gas – gaseous fuels – CH ₄ (E.12, 2018) (E.19, 2016) (E.19, 2015) Comparability	Revise the AD for this category and report the relevant AD for gas volumes in CRF table 1.B.2 in accordance with the 2006 IPCC Guidelines so that the AD values in this table are consistent with the natural gas volumes reported for the reference approach.	<p>values for solid fuels presented in the 2006 IPCC Guidelines (vol. 2, chap. 2, table 2.2, p.2.16), whereas the CO₂ EFs for recent years (e.g. 102.65 t/TJ in 2016) are higher than or at the higher end of the range of IPCC default values for coal (94.60–101.00 t/TJ), with the exception of lignite (90.90–115.00 t/TJ). This observed trend in the values of the country-specific CO₂ EFs was not explained in the NIR. In addition, NIR table 3.16 showed that a single value of 66.45 per cent carbon in mass of coal was applied for all years in the time series with a separate time series of NCVs for coal, obtained from CSB (ranging from 28.46 GJ/t for 1990–2002 to around 24 GJ/t for 2013 onward) to calculate the CO₂ EFs in energy units. During the review, Latvia clarified that the country-specific CO₂ EF for coal expressed in mass units was derived from sampling and analysis for 2016 only and that solid fuel reported as coal referred only to other bituminous coal. The ERT noted that the single value of carbon content (as a percentage of mass) from the 2016 analysis was applied to a wide range of NCVs dating back to 1990, leading to a wide range of CO₂ EFs in energy units for coal, which is not plausible given the relationship between the carbon content for coal and its energy content. Therefore, the ERT considered that the country-specific CO₂ EFs for coal used in the estimates were not calculated using consistent carbon content values and corresponding NCVs, thus impacting the accuracy of the emission estimates. The varying NCVs indicate that the carbon content of coal should also vary over time. The ERT considered that it would be more accurate to derive the CO₂ EF in energy units from the 2016 analysis and apply that CO₂ EF consistently across the time series. Therefore, while the Party has sought to address the recommendation by applying country-specific CO₂ EFs for the whole time series, the method used is not in accordance with the 2006 IPCC Guidelines, and continued to represent an issue of accuracy in the emission estimates.</p> <p>Resolved. The Party reported AD for fugitive emissions from natural gas as 12,236 m³ under subcategory 1.B.2.b.4 transmission and storage and as 731,446 m³ under subcategory 1.B.2.b.5 distribution for 2018. The ERT noted that in NIR table 3.59 (p.176) the Party reported that these AD correspond to the actual annual volumes of natural gas leaked for each of the subcategories: transmission and storage, distribution, other and venting of natural gas. These volumes correspond to the AD reported in CRF table 1.B.2, while for the reference approach Latvia reported in CRF table 1.A(b) the total apparent consumption in energy terms (TJ). The ERT noted that Latvia's reporting of actual volumes of gas leaked as AD in the CRF tables differs from the approach applied by other Parties, which reported AD on marketable gas or utility gas sales through national transmission and distribution networks. While applying a different approach may limit comparability of Latvia's data, the ERT noted that the reporting of AD in CRF table 1.B.2 is not prescriptive, and as such</p>

ID#	Issue/problem classification ^{a, b}	Recommendation made in previous review report	ERT assessment and rationale
E.10	1.B.2.b Natural gas – gaseous fuels – CH ₄ (E.13, 2018) (E.19, 2016) (E.19, 2015) Transparency	Aggregate detailed individual data and present them in the NIR so as to highlight the information that is important for the transparency of the inventory without disclosing individual data that would compromise confidentiality.	reporting estimates of actual volumes of gas leaked as AD did not represent an issue; the ERT therefore considered this issue to be resolved. Not resolved. Latvia presented NIR table 3.58 (pp.174–175) the length of its transport and distribution gas pipelines. It also reported in NIR table 3.59 (p.176) estimates of actual annual volumes of natural gas leaked during the transmission and storage, distribution, other and venting of natural gas. However, the Party did not provide further information in the NIR on the AD (individual or aggregate) used for calculating the emissions or, in particular, on the country-specific EFs used in the estimates. During the review, Latvia also did not provide further information on the AD or the country-specific EFs used in the calculations.
E.11	1.B.2.b Natural gas – gaseous fuels – CH ₄ (E.14, 2018) (E.8, 2016) (E.8, 2015) (41, 2014) (41, 2013) Transparency	Describe methods and data used in the NIR, including more detailed background information, such as on the length of the pipeline and the materials used for the distribution network, on the pressure conditions of the different parts of the network, on flow rates and on annual reconstruction rates to explain the improvements made to the network.	Addressing. The Party reported on the length of its transport and distribution gas pipelines in NIR table 3.58 (pp.174–175) and on the amount of natural gas leakage in NIR table 3.59 (p.176). The ERT noted that information on some relevant natural gas characteristics (i.e. carbon content, density and NCV) was provided in NIR table 3.17 (p.111). However, Latvia did not describe the method used by gas companies to estimate CH ₄ emissions for subcategory 1.B.2.b natural gas nor provide any information on relevant parameters used in the calculations, such as the materials used for the distribution network; the pressure conditions of the different parts of the network; gas flow rates; and annual network reconstruction/renewal rates to improve network performance. During the review, Latvia explained that emissions from natural gas systems were estimated using confidential methodologies developed by the gas companies. The Party stated that in cooperation with the gas companies, a clear description of the methodologies will be provided without disclosing confidential information, in the next annual submission.
E.12	1.B.2.b Natural gas – gaseous fuels – CH ₄ (E.22, 2018) Transparency	Obtain information on how the data provider generated the AD and CH ₄ emissions and if necessary, conduct QA/QC procedures as described in the 2006 IPCC Guidelines (vol. 2, chap. 4.2.3).	Not resolved. The Party explained in the NIR (section 3.3.2.2, p.175) that gas companies calculate CH ₄ emissions using natural gas density and other physical parameters and measurements of the content of CH ₄ and other chemical compounds in natural gas. However, additional information was not provided on the collection or generation of AD by the data provider, on the methodology for estimating emissions, in particular for the CH ₄ emission estimates for subcategory 1.B.2.b.5 distribution, or on QA/QC procedures conducted. During the review, Latvia explained that gas companies prepare regular reports on operation and maintenance works and use this information to calculate annual gas leakages. It also explained that emissions from natural gas systems were estimated using confidential methodologies developed by the gas companies. The Party stated that in cooperation with the gas companies, a description of the methodologies and AD used will be provided without disclosing confidential information, in the next annual submission.

ID#	Issue/problem classification ^{a, b}	Recommendation made in previous review report	ERT assessment and rationale
IPPU			
I.1	2. General (IPPU) (I.1, 2018) (I.1, 2016) (I.1, 2015) (46, 2014) Consistency	Implement the planned improvement to undertake capacity-building projects to achieve better time-series consistency for several categories in the early years of the time series.	Addressing. The ERT noted that the NIR did not contain information on implementation of the planned improvement to undertake capacity-building projects to achieve better time-series consistency within the programme “European Economic Area Financial Mechanism 2009–2014 – National Climate Policy”. However, Latvia provided information in relevant sections of the IPPU chapter of the NIR on some activities undertaken to improve time-series consistency in the early years of the time series (e.g. within the research implemented under the above-mentioned programme for category 2.F.1 refrigeration and air conditioning). During the review, the Party explained that it is implementing an integrated database on the basis of the databases of different institutions to achieve better time-series consistency and is still testing the resulting integrated database to ensure that all its functions work properly. At the time of the 2020 annual submission it had established linkages between the integrated database, the GHG calculation Excel files and CRF Reporter. So far, the use of the database has enabled Latvia to identify some errors in previous calculations, leading to some improvements in time-series consistency.
I.2	2.A.1 Cement production – CO ₂ (I.3, 2018) (I.10, 2016) (I.10, 2015) Transparency	Transparently report how the amount of clinker production has been estimated by providing a clear methodological description and the sources of data used in the annual submission.	Resolved. The Party reported in the NIR (p.186) that clinker production data were estimated using the data on final amount of cement produced taken from the reports under the European Union Emissions Trading System of the only cement plant in Latvia, because the amount of clinker produced is not weighed directly in the plant owing to the uninterrupted production process in the kilns. As the plant produces many types of cement, clinker AD were estimated taking into account the different cement types produced and multiplying their production data by the appropriate cement/clinker ratio and considering the mass balance of cement, clinker and used additives in cement production. Latvia also reported the formula used to estimate the amount of clinker produced from the cement production data and the clinker/cement ratio. During the review, the Party clarified that this calculation was performed by the cement plant on the basis of data reported under the European Union Emissions Trading System.
I.3	2.A.2 Lime production – CO ₂ (I.5, 2018) (I.12, 2016) (I.12, 2015) Transparency	Update the text in the NIR to reflect the revised EF calculation and AD for CO ₂ emissions from lime production.	Addressing. The ERT noted that Latvia provided information in the NIR (section 4.2.3.2, pp.191–193) on the EF calculation and AD used for estimating CO ₂ emissions from lime production. The ERT also noted that lime production ceased in the country in 2016 and CO ₂ emissions for this category were reported using the notation key “NO”. During the review, Latvia reported that, in the 2019 annual submission, the AD and EFs were revised and emissions were recalculated using a production output-based method. The ERT further noted that the information in the NIR (section 4.2.3.2, p.191) needs to be

<i>ID#</i>	<i>Issue/problem classification^{a, b}</i>	<i>Recommendation made in previous review report</i>	<i>ERT assessment and rationale</i>
			updated to reflect the values of different types of lime used as AD instead of the values of dolomite and limestone used.
I.4	2.A.2 Lime production – CO ₂ (I.10, 2018) Accuracy	Shift from raw material input based on a country-specific method to the correct application of a production output-based method using the 2006 IPCC Guidelines tier 2 method for lime production (vol. 3, chap. 2, p.2.21), providing AD on lime production by type and a country- or plant-specific CO ₂ EF/t lime production. If country- or plant-specific EFs are not available, the output lime production and input raw material listed in the NIR (p.185, table 4.10) may be used to derive plant-specific EFs.	Resolved. The ERT noted that Latvia provided information in the NIR (section 4.2.3.2, pp.191–193) on the method, EF calculation and AD used for estimating CO ₂ emissions from lime production. The ERT also noted that the Party shifted from the previous raw material input based on a country-specific method to the correct application of a production output-based method using the tier 2 method from the 2006 IPCC Guidelines (vol. 3, chap. 2, p.2.21). The ERT further noted that the information in the NIR (section 4.2.3.2, p.191, and table 4.9, p.192) needs to be updated to indicate that values of different types of lime were used as AD instead of values of raw material used.
I.5	2.A.2 Lime production – CO ₂ (I.11, 2018) Transparency	Describe in the NIR the reason(s) for the fluctuation in AD, particularly the reporting of “NO” for 2011 and 2016.	Resolved. Latvia reported in its NIR (pp.190–191) that lime production ceased in the country in 2016 and provided explanations for the fluctuations in AD in different periods of the time series. The ERT noted that the NIR (pp.190–191) described lime production activities in 2011 and that CO ₂ emissions were reported in the CRF tables for that year (0.09 kt).
I.6	2.F Product uses as substitutes for ozone-depleting substances – HFCs (I.8, 2018) (I.15, 2016) (I.15, 2015) Consistency	Ensure the proper use of notation keys in accordance with decision 24/CP.19, annex I, paragraph 37, and, if appropriate, ensure that a complete and consistent time series is reported for this gas.	Resolved. The Party reported the correct notation keys (“NO”) and HFC emissions for various subcategories under category 2.F product uses as substitutes for ozone-depleting substances for different years of the time series. However, Latvia used the notation key “NE” for some subcategories for 1990–2003, and in particular for HFC emissions from disposal for 2013–2018. During the review, Latvia indicated that it did not have sufficient information on HFC consumption prior to 1998 that could be used for estimating HFC emissions for 1995–1997, and that the latest available data did not provide evidence of HFC consumption in this period. Nevertheless, during the review, under the guidance of the ERT, Latvia provided revised HFC emission estimates across the time series for relevant subcategories under category 2.F product uses as substitutes for ozone-depleting substances, subsequently revised the use of notation keys and resubmitted updated CRF tables with this information, thus ensuring reporting of a complete and consistent time series of HFC emission estimates. The ERT agreed with the revised estimates, methodologies and assumptions used and the notation keys reported (see ID# I.8 in table 5).
I.7	2.F.1 Refrigeration and air conditioning – HFCs (I.12, 2018) Completeness	Provide an estimation of HFC emissions related to the management of refrigerant containers.	Addressing. The Party reported in its NIR (p.245) that HFC emissions related to the management of refrigerant containers were not estimated owing to lack of AD and evidence of these emissions occurring in the country. During the review, Latvia provided estimates of HFC emissions from the management of refrigerant containers for 2013–2018 based on equation 7.11 from the 2006 IPCC Guidelines (vol. 3, chap. 7, p.7.49), using an EF of 2 per cent of the HFC

ID#	Issue/problem classification ^{a, b}	Recommendation made in previous review report	ERT assessment and rationale
Agriculture			
A.1	3.A.1 Cattle – CH ₄ (A.9, 2018) Transparency	Provide information in the NIR to justify the low CH ₄ IEF (30.00 kg/head/year) to improve the transparency and comparability of the documentation.	market for new equipment and servicing of all refrigeration applications. The provided HFC estimates for 2013–2018 amounted to 1.67–5.50 kt CO ₂ eq, thus below the threshold of significance for Latvia (5.86 kt CO ₂ eq, which corresponds to 0.05 per cent of the total national emissions in 2018, and not exceeding 500 kt CO ₂ eq) in accordance with paragraph 37(b) of the UNFCCC Annex I inventory reporting guidelines. The ERT considered that the recommendation has not yet been fully addressed because the Party has not yet included this information in the NIR or the recommended HFC emission estimates.
A.2	3.A.4 Other livestock – CH ₄ (A.5, 2018) (A.9, 2016) (A.9, 2015) Accuracy	Report in the NIR on the possibility of obtaining separate EFs for deer and reindeer on the basis of data from the Agricultural Data Centre, and use the latest research results related to emissions from deer and reindeer in Nordic countries.	Resolved. The Party reported in its NIR (p.292) that according to consultations with the Organic Farmers and Wildlife Breeders Association and the Agricultural Data Centre there is no reindeer farming in Latvia. There is therefore no need to obtain a separate EF for reindeer and the EF value for deer can continue to be used.
A.3	3.B Manure management – CH ₄ (A.11, 2018) Comparability	In CRF table 3.B(a) (sheet 2), replace the notation key “NA” with numerical values for the MCFs for sheep, goats, rabbits, reindeer, fur-bearing animals, horses and poultry, to improve comparability across Parties.	Resolved. In CRF table 3.B(a) (sheet 2), Latvia reported “NA” for the MCF values for sheep, goats, horses, poultry, rabbit, fur-bearing animals and reindeer (other). During the review, Latvia stated that reporting MCF values is relevant only when using the tier 2 methodology for estimating CH ₄ emissions from manure management. For the animal categories mentioned in the recommendation, Latvia used the tier 1 methodology (NIR, p.301); thus, there is no requirement to report MCFs. The ERT agreed with the explanation provided and noted that reporting MCFs would not enhance the transparency of the tier 1 estimate.
A.4	3.B.5 Indirect N ₂ O emissions – N ₂ O (A.10, 2018) Transparency	Provide in the NIR specific NH ₃ EFs by livestock category and by MMS to improve the transparency of the documentation.	Resolved. Latvia reported the requested information on specific NH ₃ EFs in NIR table 5.27 (p.314).
A.5	3.B.5 Indirect N ₂ O emissions – N ₂ O (A.12, 2018) Transparency	Provide more information on the choice of Frac _{leachMMS} for various MMS for the entire time series in the NIR.	Resolved. Latvia reported additional information on the choice of leaching rates from different MMS (known as Frac _{leachMMS}) for the entire time series in its NIR (pp.315–316).

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A.6	3.D.a.4 Crop residues – N ₂ O (A.13, 2018) Transparency	Provide more information on the choice of Frac _{Remove} for the entire time series in the NIR.	Resolved. Latvia provided the requested information in its NIR (p.325) on the assumptions made in relation to Frac _{Remove} , including the source reference and trend across the time series.
A.7	3.D.a.5 Mineralization/immobilization associated with loss/gain of soil organic matter – N ₂ O (A.14, 2018) Completeness	Report N ₂ O emissions from mineralization/immobilization associated with gain/loss of soil organic matter, or provide in the NIR the justification for reporting “NO”.	Resolved. Latvia justified in its NIR (pp.325–326) the use of the notation key “NO” for reporting N ₂ O emissions for this subcategory, stating that there is no loss of soil organic matter in mineral soils in cropland remaining cropland, which was confirmed by the ERT.
A.8	3.D.b.2 N leaching and run-off – N ₂ O (A.15, 2018) Transparency	Provide in the NIR more information on the choice of a country-specific Frac _{LEACH-(H)} based on the results of agricultural run-off monitoring by Sudars et al. (2016).	Addressing. Latvia included a link to a paper by Sudars et al. (2016) in the NIR (p.328). The ERT analysed the paper and noted that the results obtained by the study on national Frac _{LEACH-(H)} values were based on one monitoring station (Mellupīte) with 16 plots covering an area of 2 ha. During the review, Latvia provided more information and explanations, including references to other documents indicating that measurement plots from other monitoring stations (Bērze and Vienziemīte) were also included in the analysis. The ERT considered that this additional information and explanations provided to the ERT should be included in the NIR to substantiate the country-specific value of Frac _{LEACH-(H)} .
LULUCF			
L.1	4. General (LULUCF) – (L.11, 2018) Convention reporting adherence	Eliminate the inconsistencies between NIR tables 6.8–6.9 and CRF table 4.A for 1990, the inconsistent reporting of the area of organic soils for cropland and grassland within the CRF tables, and the errors in the EF used for estimating emissions from organic soils on grassland converted to cropland and the CO ₂ emissions from biomass burning, and strengthen the QA/QC procedures to avoid such errors.	Addressing. The Party eliminated the inconsistencies previously noted between NIR tables 6.8–6.9 (pp.345–352) and CRF table 4.A for 1990 and corrected some of the inconsistencies of the area of organic soils reported in CRF tables 4.B–4.C and the area of cultivated organic soils reported under the agriculture sector in CRF table 3.D; however, for most of the years of the time series minor inconsistencies were still not corrected. In addition, the Party eliminated the errors in the EF used for estimating emissions from organic soils on grassland converted to cropland and in the CO ₂ emissions from biomass burning reported for forest land converted to forest land and FM. The ERT noted that Latvia strengthened and implemented QA/QC procedures, introducing manual data checks to compare figures imported into CRF Reporter with the calculated values. The Party indicated in the NIR (p.368) that mathematical errors identified during the previous review were corrected in the Emissions Projections and Inventory Model (known as EPIM) used for calculating GHG emissions for the LULUCF sector.
L.2	4. General (LULUCF) – CO ₂	Implement the model in a consistent manner for the mineral soils pool for the forest land, cropland and	Not resolved. Latvia did not implement the Yasso model in a consistent manner for the mineral soils pool for the forest land, cropland and grassland categories.

<i>ID#</i>	<i>Issue/problem classification^{a, b}</i>	<i>Recommendation made in previous review report</i>	<i>ERT assessment and rationale</i>
	(L.12, 2018) Accuracy	grassland categories, paying particular attention to the balanced estimation of CSC during conversion.	During the review, the Party clarified that implementation of the Yasso model is in progress and that its use was delayed owing to insufficient availability of data on carbon input, which hindered its implementation for obtaining accurate results. The Party indicated that a recent study demonstrated that insufficient data on litter input in forest land has resulted in CSCs in mineral soils being underestimated, and that it considers the implementation of research results on carbon input data an essential requirement for correctly calculating CSCs using Yasso or any other model. The Party also indicated that an ongoing national study (to be completed by the end of 2020) will provide additional information on carbon input and biomass expansion factors to be used for implementing the Yasso model for mineral soils and performing estimates of CSCs for different agricultural crops. Other studies related to collection of carbon input through litter data in forest land will be finished in 2022–2023. The results of these studies will be used by the Party for its GHG inventory calculations once they have been analysed and published in scientific papers (provisionally expected for 2022–2025).
L.3	4.A Forest land – CO ₂ (L.14, 2018) Transparency	Report in the NIR a list of the publications that provide the basis for the values reported in NIR table 6.17 and add them to the list of references.	Resolved. The Party reported in its NIR (p.362) a list of the publications that provide the scientific basis for the values reported in NIR table 6.17, which were also added to the list of references.
L.4	4.A.1 Forest land remaining forest land – N ₂ O (L.13, 2018) Transparency	Include in its NIR the justification for why its country-specific value (0.52 t C/ha) is much lower than that in the Wetlands Supplement (2.6 t C/ha).	Addressing. Latvia reported in its NIR (p.341) that it used a country-specific value much lower than that in the Wetlands Supplement to take into account the results of a nationally conducted study (Lupiķis and Lazdiņš, 2017), which showed that carbon losses in forests with organic soils are within the range of 0.23–0.96 t C/ha depending on the soil moisture regime, but did not provide sufficient justification for this. During the review, the Party clarified that studies on CSCs in organic soils are ongoing within the scope of a national project, and that future inventories will be based on a tier 3 modelling approach with country-specific parameters and assumptions.
L.5	4.A.2 Land converted to forest land – CO ₂ (L.3, 2018) (L.15, 2016) (L.14, 2015) Transparency	Provide in the NIR the following information to support the use of a 150-year transition period: the reason why two generations of trees (150 years) was considered appropriate to properly encompass carbon stock in harvesting residues, stumps and the above-ground fraction of dead trees.	Resolved. The Party provided information in its NIR (pp.366–367) supporting the use of a 150-year transition period. The assumption used by the Party, based on NFI data from field measurements and expert judgment, considered that the average stock of deadwood, and consequently in litter, becomes equal at a certain stand age in forest land remaining forest land and land converted to forest land. The Party also assumed that the increment of the deadwood stock in afforested areas will follow a linear regression path and reach the values characteristic for forest land within 150 years, which corresponds to two generations of trees. During the review, Latvia clarified that it carried out further investigations within the scope of elaborating the FRL for the country using the Yasso model, which showed that CSCs in soils and litter due to

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			conversion to forest land continue for more than 60 years, and that the calculation of CSCs in soils and litter will be improved further after gathering country-specific data on litter carbon input, and that research in this field has already started.
L.6	4.A.2 Land converted to forest land – CO ₂ (L.3, 2018) (L.15, 2016) (L.14, 2015) Transparency	Provide in the NIR the following information to support the use of a 150-year transition period: progress on, or results of, the implementation of the Yasso model for afforestation to evaluate actual CSC in deadwood and soils on afforested land (the model has already been implemented for cropland, grassland and forest land).	Not resolved. The Party reported in its NIR (pp.366–367) the use of a 150-year transition period. The Party also reported in the NIR (section 6.4.6, p.370) that it plans to implement the Yasso model to calculate CSCs in soil, deadwood and litter following afforestation, deforestation and FM as an improvement for 2021. During the review, Latvia clarified that it has conducted several studies, employing field measurements and modelling approaches, related to estimating carbon input to above-ground and below-ground litter of trees and ground vegetation. In addition, two studies that include research on carbon input to above- and below-ground litter are being conducted for conclusion in 2022–2023, the results of which will be used in the GHG inventory as soon as they are published.
L.7	4.A.2 Land converted to forest land – CO ₂ (L.4, 2018) (L.16, 2016) (L.15, 2015) Completeness	Continue the methodological work for estimating CSC in living biomass, deadwood and litter for cropland converted to forest land, wetlands converted to forest land and settlements converted to forest land as well as in mineral soils (cropland converted to forest land and settlements converted to forest land) and organic soils (wetlands converted to forest land), and report the estimates in the annual submission.	Not resolved. Latvia did not report the estimates in CRF table 4.A or provide information in the NIR on the ongoing methodological work for estimating CSC in living biomass, deadwood and litter (for cropland converted to forest land, wetlands converted to forest land and settlements converted to forest land), in mineral soils (for cropland converted to forest land and settlements converted to forest land) and in organic soils (for wetlands converted to forest land). During the review, the Party clarified that only the preliminary results of a study on recalculating forest increment, mortality and harvest rate have been published in a peer-reviewed publication (Krumsteds et al., 2019a). The forest parameters estimated in the above-mentioned study will be included in the 2021 annual submission in order to reduce the high uncertainty of the current CSC estimates.
L.8	4.B Cropland – CO ₂ and CH ₄ (L.15, 2018) Transparency	Include in the NIR an explanation for the specific area reported in CRF table 4(II).	Addressing. The Party referenced a scientific peer-reviewed paper (Krumsteds et al., 2019b) in the NIR (p.377) to explain the specific area of organic soils reported in CRF table 4(II), but did not include specific details such as the AD tables presented in the paper. During the review, Latvia indicated that this information will be transparently provided in the NIR of the 2021 annual submission, noting that there are a significant number of inventory improvements for which transparent reporting is planned.
L.9	4.B.2.2 Grassland converted to cropland – CO ₂ (L.5, 2018) (L.18, 2016) (L.17, 2015)	Ensure consistency in reporting between the NIR and CRF table 4.B regarding CO ₂ emissions and removals from the conversion of grassland to cropland.	Resolved. Latvia reported consistent values of CO ₂ emissions and removals from the conversion of grassland to cropland in the NIR (pp.372–376) and CRF table 4.B, including explanations for use of the notation key “IE” for the living biomass and dead organic matter pools.

<i>ID#</i>	<i>Issue/problem classification^{a, b}</i>	<i>Recommendation made in previous review report</i>	<i>ERT assessment and rationale</i>
	Convention reporting adherence		
L.10	4.B.2.2 Grassland converted to cropland – CO ₂ (L.16, 2018) Completeness	Use the country-specific factors for the GHG inventory to estimate CSC in the living biomass pool for this category as soon as they are available and provide detailed information on this in the NIR.	Not resolved. The Party did not use country-specific biomass expansion factors to estimate CSC in the living biomass pool for this subcategory or elaborate in its NIR on any related future improvements in this area. During the review, Latvia clarified that improving the use of country-specific factors was proposed as part of its improvement plan for the next annual submission. Resources have been allocated for this activity and initial results on the estimation of country-specific biomass expansion factors have been published in a scientific peer-reviewed publication (Krumsteds et al., 2019a).
L.11	4.C.2 Land converted to grassland – CO ₂ (L.7, 2018) (L.20, 2016) (L.19, 2015) Completeness	Continue the methodological work for estimating CSC in living biomass, deadwood and litter for forest land converted to grassland, wetlands converted to grassland and settlements converted to grassland as well as in mineral soils (forest land converted to grassland and settlements converted to grassland) and organic soils (wetlands converted to grassland), and report the estimates in the annual submission.	Not resolved. The ERT noted that the NIR did not include information on the methodological work for estimating CSC in living biomass, deadwood and litter, or in mineral and organic soils, for the relevant different land conversions to grassland. The ERT also noted that Latvia did not report the corresponding CSC estimates in its 2020 annual submission. During the review, the Party clarified that the preliminary results of a research study on this topic had been published in a scientific peer-reviewed paper (Krumsteds et al., 2019a), but that research continues with the aim of reducing the uncertainty of the current CSC estimates by including data from three complete NFI cycles. Considering the high uncertainty of the current CSC estimates, the Party plans to implement the study results in the next annual submission.
L.12	4.E.2 Land converted to settlements – CO ₂ (L.10, 2018) (L.23, 2016) (L.22, 2015) Completeness	Continue the methodological work for estimating CSC in living biomass and dead organic matter for cropland converted to settlements and grassland converted to settlements and report the estimates in the annual submission.	Not resolved. The Party did not include information in the NIR on the methodological work for estimating CSC in living biomass and dead organic matter for relevant land conversions to settlements, or report the corresponding CSC estimates in its 2020 annual submission. During the review, the Party clarified that it will update the methodology used and document this improvement in the NIR of the 2021 annual submission, drawing on research published in Krumsteds et al. (2019a).
L.13	4(V) Biomass burning – CO ₂ , CH ₄ and N ₂ O (L.17, 2018) Transparency	Include information in the NIR justifying the basis for the reported ratios of harvesting residues affected by burning.	Addressing. The Party referenced a national publication (Lazdiņš and Lazdiņa, 2013) in the NIR (p.403) to justify the basis for the reported ratios of harvesting residues affected by burning being the results of surveys addressed to forest owners, but did not provide an explanation justifying the data selected. During the review, the Party clarified that it will update the explanation in the NIR of its 2021 annual submission regarding its justification on the reported ratios of harvesting residues affected by burning.
Waste			
W.1	5.A Solid waste disposal – CH ₄ (W.1, 2018) (W.9, 2016)	Provide justification in the NIR and the CRF tables for reporting that there is no significant underestimation of emissions resulting from Latvia's	Addressing. The Party did not provide in its NIR or CRF tables a justification that there is no significant underestimation of emissions resulting from its use of solid waste disposal data for 1970 onward. In addition, the ERT did not find

<i>ID#</i>	<i>Issue/problem classification^{a, b}</i>	<i>Recommendation made in previous review report</i>	<i>ERT assessment and rationale</i>
	(W.9, 2015) Transparency	use of solid waste disposal data from 1970, using as a proxy for this significance determination the values contained in decision 24/CP.19, annex I, paragraph 37(b).	information in the NIR on any planned improvements for category 5.A solid waste disposal. However, Latvia reported time-series data for waste disposal for 1965 onward in the NIR (pp.420–421), which the Party used in its calculations. The Party assumed that data on solid waste disposal for 1965–1974 were the same as for 1975, which was established by using data from research surveys. The time series covered the 50-year period required for the first-order decay estimation of emissions. During the review, the Party clarified that, during the 2020 review of the GHG inventory within the scope of the European Union effort-sharing decision, emissions for this category were recalculated to address this issue using a time series of waste disposal data starting in 1950, and that it will include this information and the estimates in the 2021 annual submission.
W.2	5.A Solid waste disposal – CH ₄ (W.6, 2018) Transparency	Clarify in the NIR whether or not the CH ₄ recovery factor (50 per cent) has been applied in the estimation.	Resolved. The Party reported in its NIR (pp.423–424) detailed information on CH ₄ recovery in new and old landfills, including information reported by CH ₄ collection enterprises on measured quantities of CH ₄ recovery in unmanaged and managed SWDS starting from 2002. The ERT noted that the reference to a CH ₄ recovery factor of 50 per cent has been removed from the NIR. The ERT concluded that the Party did not use a CH ₄ recovery factor (50 per cent) for its estimates and therefore considered this issue resolved.
W.3	5.A.2 Unmanaged waste disposal sites – CH ₄ (W.7, 2018) Transparency	Correct the description in its NIR of the default oxidation factor of 0.09 (removing “default”) and provide information on how the oxidation factor of 0.09 is calculated using assumptions and relevant information, including the national research.	Addressing. Latvia did not remove the word “default” from the description of the oxidation factor in its NIR (p.425); however, it provided information on assumptions, calculations and a reference to national research justifying the use of the oxidation factor of 0.09. The Party clarified that it chose this oxidation factor on the basis of the assumption that most old unmanaged SWDS in Latvia were covered by a soil layer until 2007, and thus applied a default oxidation factor value of 0.1 to these SWDS. It then assumed that only 10 per cent of old unmanaged SWDS have not been covered by soil since 2008 and therefore applied a calculated oxidation factor of 0.09 to take this percentage into account for 2008 onward.
W.4	5.C.1 Waste incineration – CH ₄ (W.8, 2018) Completeness	Estimate the CH ₄ emissions using the CH ₄ EF for fuel combustion in accordance with the 2006 IPCC Guidelines.	Not resolved. The ERT noted that Latvia still reported CH ₄ emissions using the notation keys “NO” and “NA” in CRF table 5.C, and reported in the NIR (p.432) that CH ₄ emissions from well-functioning incinerators are usually very low. The ERT also noted that the Party did not describe any planned improvements for this category in the NIR. During the review, the Party clarified that it finds it challenging to apply the CH ₄ EF used in the energy sector to the estimates as this requires knowing the NCV of the waste (fuel) incinerated, owing to the EF in the 2006 IPCC Guidelines (vol. 2, chap. 2, table 2.5, p.2.23) being provided on an energy content basis. However, during the review, following guidance from the ERT, Latvia provided a calculation of the CH ₄ emission estimates for this category for the complete time series, using the

ID#	Issue/problem classification ^{a, b}	Recommendation made in previous review report	ERT assessment and rationale
W.5	5.C.2 Open burning of waste – CO ₂ , CH ₄ and N ₂ O (W.9, 2018) Completeness	Investigate the possibility of applying AD from the CLRTAP inventory to estimate GHG emissions from accidental fires for the GHG inventory, or report “NE” with the justification that the emissions from open burning of waste are below the threshold defined in paragraph 37(b) of the UNFCCC Annex I inventory reporting guidelines.	<p>default values for the CH₄ EF and NCV provided in the 2006 IPCC Guidelines (vol. 2, chap. 2, table 2.5, p.2.23, and chap. 1, table 1.2, p.1.18) and available AD. The resulting CH₄ emission estimates were below the threshold of significance for Latvia (5.86 kt CO₂ eq, which corresponds to 0.05 per cent of the total national emissions in 2018, and not exceeding 500 kt CO₂ eq) for all years of the time series (e.g. 0.018 kt CO₂ eq in 2018), as defined in paragraph 37(b) of the UNFCCC Annex I inventory reporting guidelines. The Party indicated that it would consider reporting these CH₄ emissions under category 5.C.1 waste incineration or using the notation key “NE” in future annual submissions, and providing in its NIR information in accordance with the requirements of paragraph 37(b) of the UNFCCC Annex I inventory reporting guidelines. The ERT considered that, alternatively, the Party could investigate the dominant incineration technology and process (e.g. batch-type/continuous/semi-continuous) used in Latvia, since the occurrence of CH₄ emissions is dependent on the continuity of the incineration process, technology, efficiency and management practices, rather than the energy content of the incinerated material, and use this information to demonstrate whether CH₄ emissions from these processes occur in the country. The ERT further considered that the recommendation has not yet been implemented as Latvia did not provide emission estimates using the recommended CH₄ EF for fuel combustion or another appropriate CH₄ EF or sufficiently justify the exclusion of these emissions from its 2020 annual submission.</p> <p>Not resolved. Latvia reported emissions from open burning of waste as “NO” in CRF table 5.C and its NIR (p.435), indicating that open burning of waste in the country is not permitted under waste management law. During the review, the Party clarified that the AD from the CLRTAP inventory refer to number of fires and not to the composition or amount of waste burned. Nevertheless, following guidance from the ERT, during the review Latvia provided a calculation of the CO₂, CH₄ and N₂O emission estimates for this category, using assumptions on the basis of expert judgment, available statistical data on rural population, households and waste generation, and the default EF and NCV for MSW from the 2006 IPCC Guidelines (vol. 2, chap. 2, table 2.5, p.2.23 and chap. 1, table 1.2, p.1.18). The resulting total emissions for 2018 (0.865 kt CO₂ eq) were below the threshold of significance for Latvia (5.86 kt CO₂ eq, which corresponds to 0.05 per cent of the total national emissions in 2018, and not exceeding 500 kt CO₂ eq), as defined in paragraph 37(b) of the UNFCCC Annex I inventory reporting guidelines. The Party agreed to consider these emissions in future annual submissions or use the notation key “NE” instead of “NO” and provide information in its NIR in accordance with the requirements of paragraph 37(b) of the UNFCCC Annex I inventory reporting guidelines.</p>

<i>ID#</i>	<i>Issue/problem classification^{a, b}</i>	<i>Recommendation made in previous review report</i>	<i>ERT assessment and rationale</i>
W.6	5.D.2 Industrial wastewater – CH ₄ and N ₂ O (W.11, 2018) Transparency	Provide information in the NIR on CH ₄ emissions flared and CH ₄ recovered for energy and justify that these emissions are not occurring in the country.	Resolved. The Party reported in its NIR (p.451) that CH ₄ is not recovered for energy use or flared, and that CH ₄ is not recovered from industrial wastewater sludge in the country. The ERT noted that this information is consistent with use of the notation key “NO” in CRF table 5.D.
KP-LULUCF			
KL.1	General (KP-LULUCF) (KL.11, 2018) Transparency	Include a definition of natural forest in the NIR.	Resolved. Latvia reported in its NIR (p.497) that there are no natural forests in the country and therefore it does not have a definition of natural forest. During the review, the Party clarified that it did not report on natural forests in the inventory because all forests in Latvia are managed forests.
KL.2	General (KP-LULUCF) (KL.11, 2018) Convention reporting adherence	Eliminate the inconsistency in the reported information in the NIR and CRF tables regarding whether conversion of natural forests to planted forests takes place in Latvia.	Resolved. The Party reported in its NIR (p.497) that conversion of natural to planted forests does not take place in Latvia. During the review, the Party clarified that it did not report on natural forests in the inventory because all forests in the country are managed forests. The inconsistency in the reported information was also eliminated from CRF table NIR-2.1.
KL.3	General (KP-LULUCF) (KL.12, 2018) Convention reporting adherence	Eliminate the errors referred to in ID#s KL.11 and KL.13 (FCCC/ARR/2018/LVA) by developing sector-specific QA/QC procedures to avoid inconsistencies between the NIR and CRF tables for KP-LULUCF activities, and report on these changes in the next annual submission.	Resolved. The Party eliminated the errors identified in the previous review report by developing sector-specific QC procedures to avoid inconsistencies between the NIR and CRF tables for KP-LULUCF activities (see ID#s KL.2 above and KL.6 below). The implemented QC procedures were in line with those listed in the 2006 IPCC Guidelines (vol. 4, chap. 4.4.3, pp.44–45), and were applied to all calculations and, among others, include manual checks of data imported to CRF Reporter with the actual calculated values and sectoral meetings of the LULUCF inventory team to discuss any QA/QC issues, as documented in the NIR (p.368). Latvia also clarified during the review that the manual data checks before the annual submission include an additional review of the NIR to compare the data in the NIR with those in the CRF tables.
KL.4	AR – CO ₂ (KL.2, 2018) (KL.3, 2016) (KL.3, 2015) (100, 2014) Transparency	Provide figures in the NIR that demonstrate no statistically significant difference in the carbon stock in mineral soils for historical grassland and afforested land.	Not resolved. Latvia did not report figures in its NIR to demonstrate that there is no statistically significant difference in the carbon stock in mineral soils for historical grassland and afforested land. During the review, it clarified that some national studies, which were referenced in relevant NIR sections, have proved that there is no statistically significant difference of soil carbon stock in grassland and forest land, but noted that there is high uncertainty on the carbon stock data estimated through national soil monitoring programmes and used in the studies, mainly because soil characteristics in afforested lands, forest lands and typical grasslands are significantly different. The Party also indicated that studies aiming to increase the accuracy of carbon stock estimates in mineral soils have been initiated, the results of which will be implemented in the GHG inventory once peer-reviewed and published.

<i>ID#</i>	<i>Issue/problem classification^{a, b}</i>	<i>Recommendation made in previous review report</i>	<i>ERT assessment and rationale</i>
KL.5	AR – CO ₂ (KL.3, 2018) (KL.10, 2016) (KL.10, 2015) Transparency	Include detailed information explaining the link between the definition of afforestation in the NIR and the AD trends in KP-LULUCF tables 4(KP-I)A.1 and 4(KP-I)B.1 in order to allow a thorough assessment of changes to be made.	Resolved. The Party reported in its NIR (pp.481–483) detailed information on the link between the definition of afforestation and the AD trends in CRF tables 4(KP-I)A.1 and 4(KP-I)B.1. The ERT noted that the NIR (p.494) also contained detailed information on the definitions of land converted to forest land and afforested land. During the review, Latvia clarified that, for both land converted to forest land and afforested land, the estimates were based on NFI data. Additional parameters were used for reporting on afforested lands, including NFI data on implementation of FM activities for enhancing afforestation (e.g. soil scarification, early tending, pre-commercial and commercial thinning, and regenerative felling) or when land-use changes are included in the State land register.
KL.6	AR (KL.13, 2018) Transparency	Include in the NIR a detailed explanation as to how management practices are judged to be evidence of purposeful human actions for afforestation.	Resolved. Latvia explained in detail in its NIR (pp.482–483 and 486) how management practices are judged to be evidence of purposeful human actions for afforestation. During the review, the Party clarified that afforested areas are reported under afforestation if anthropogenic activities (e.g. planting or sowing, soil scarification, pre-commercial or commercial thinning) are identified by the teams conducting NFIs or when the land use is changed to forestry in the State land register.
KL.7	FM – CO ₂ (KL.4, 2018) (KL.8, 2016) (KL.8, 2015) (108, 2014) (125, 2013) Comparability	Estimate the carbon losses due to harvesting that took place on AR areas and on FM areas separately and report this transparently in the NIR.	Not resolved. The Party did not estimate the carbon losses due to harvesting that took place on AR areas and on FM areas separately, or report related information in its NIR. During the review, Latvia explained that the methodology for separating harvesting into different land-use categories is under development and will be implemented in the next annual submission. A related preliminary research study aimed at determining increment, mortality and harvest rate in Latvia was published in a peer-reviewed publication (Krumsteds et al., 2019a); however, Latvia considered that the estimated carbon losses in this study were not yet sufficiently accurate and their accuracy has yet to be increased by integration of complete data sets from three NFI cycles.
KL.8	FM – CO ₂ (KL.5, 2018) (KL.11, 2016) (KL.11, 2015) Transparency	Transparently describe both qualitatively and quantitatively in the NIR the recalculation of forest land estimates in conjunction with technical corrections to the FMRL.	Not resolved. The Party did not describe qualitatively and quantitatively in the NIR the recalculation of FM estimates in conjunction with technical corrections to the FMRL. However, it provided in the NIR (p.498) details on the reasons for undertaking a technical correction to the FMRL. During the review, the Party clarified that it did not perform a technical correction to the FMRL in the 2020 annual submission owing to prioritization of the development of the FRL for Latvia, which meant that no recalculations were performed. The FRL for Latvia has been estimated for the period 2021–2025 and the work on the technical correction to the FMRL will be completed in 2021 with the implementation in the calculations of the Forest Growth Model (known as AGM) and other models, which were used to develop the FRL in 2018 as part of the national forestry accounting plan and proposed FRL for 2021–2025.

<i>ID#</i>	<i>Issue/problem classification^{a, b}</i>	<i>Recommendation made in previous review report</i>	<i>ERT assessment and rationale</i>
KL.9	FM – CO ₂ (KL.7, 2018) (KL.13, 2016) (KL.13, 2015) Accuracy	More accurately estimate emissions and removals from forest land and FM by including, and where necessary revising, soil and litter estimates, on the basis of the ongoing monitoring of NFI plots.	Not resolved. Latvia did not report more accurate estimates of emissions and removals from FM. However, Latvia reported CSC estimates for litter and used the notation key “NA” for mineral soils in CRF table 4(KP-I)B.1. During the review, the Party clarified that it is still working to implement the Yasso model, with the aim of improving the accuracy of emission and removal estimates for soils and litter and that this implementation will be finished in future annual submissions. The Party also indicated that the lack of country-specific and verified equations for calculating above- and below-ground litter input to CSC is a major knowledge gap preventing it from obtaining reliable estimates of emissions and removals from FM, as well as the lack of information on the significant area of wet and ameliorated mineral and organic soils in the country, where existing models that were evaluated earlier, including Yasso and the Carbon Budget Model (known as CBM), underestimate CSCs in soils and litter (see ID# KL.10 in table 5).

^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 2019 annual submission of Latvia was not available at the time of this review. Therefore, the recommendations reflected in this table are taken from the 2018 annual review report. For the same reason, 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 2020 annual submission of Latvia, and had not been addressed by the Party at 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 Latvia

<i>ID#</i>	<i>Previous recommendation for the issue</i>	<i>Number of successive reviews issue not addressed^a</i>
General	No issues identified.	
Energy		
E.5	Recalculate excluded carbon under the reference approach in accordance with the 2006 IPCC Guidelines (vol. 2, chap. 6.6, equation 6.4) for the entire time series (the EFs for lubricants and coke were not consistent with the 2006 IPCC Guidelines and the excluded carbon for bitumen and other oil was reported as “NO”).	3 (2015/2016–2020)
E.10	Aggregate detailed individual data and present them in the NIR so as to highlight the information that is important for the transparency of the inventory without disclosing individual data that would compromise confidentiality.	3 (2015/2016–2020)

<i>ID#</i>	<i>Previous recommendation for the issue</i>	<i>Number of successive reviews issue not addressed^a</i>
E.11	Describe methods and data used in the NIR, including more detailed background information, such as on the length of the pipeline and the materials used for the distribution network, on the pressure conditions of the different parts of the network, on flow rates and on annual reconstruction rates to explain the improvements made to the network.	5 (2013–2020)
IPPU		
I.1	Implement the planned improvement to undertake capacity-building projects to achieve better time-series consistency for several categories in the early years of the time series.	4 (2014–2020)
I.3	Update the text in the NIR to reflect the revised EF calculation and AD for CO ₂ emissions from lime production.	3 (2015/2016–2020)
Agriculture		
No issues identified.		
LULUCF		
L.6	Provide in the NIR the following information to support the use of a 150-year transition period: progress on, or results of, the implementation of the Yasso model for afforestation to evaluate actual CSC in deadwood and soils on afforested land (the model has already been implemented for cropland, grassland and forest land).	3 (2015/2016–2020)
L.7	Continue the methodological work for estimating CSC in living biomass, deadwood and litter for cropland converted to forest land, wetlands converted to forest land and settlements converted to forest land as well as in mineral soils (cropland converted to forest land and settlements converted to forest land) and organic soils (wetlands converted to forest land), and report the estimates in the annual submission.	3 (2015/2016–2020)
L.11	Continue the methodological work for estimating CSC in living biomass, deadwood and litter for forest land converted to grassland, wetlands converted to grassland and settlements converted to grassland as well as in mineral soils (forest land converted to grassland and settlements converted to grassland) and organic soils (wetlands converted to grassland), and report the estimates in the annual submission.	3 (2015/2016–2020)
L.12	Continue the methodological work for estimating CSC in living biomass and dead organic matter for cropland converted to settlements and grassland converted to settlements and report the estimates in the annual submission.	3 (2015/2016–2020)
Waste		
W.1	Provide justification in the NIR and the CRF tables for reporting that there is no significant underestimation of emissions resulting from Latvia's use of solid waste disposal data from 1970, using as a proxy for this significance determination the values contained in paragraph 37(b) of the UNFCCC Annex I inventory reporting guidelines.	3 (2015/2016–2020)
KP-LULUCF		
KL.4	Provide figures in the NIR that demonstrate no statistically significant difference in the carbon stock in mineral soils for historical grassland and afforested land.	4 (2014–2020)
KL.7	Estimate the carbon losses due to harvesting that took place on AR areas and on FM areas separately and report this transparently in the NIR.	5 (2013–2020)
KL.8	Transparently describe both qualitatively and quantitatively in the NIR the recalculation of forest land estimates in conjunction with technical corrections to the FMRL.	3 (2015/2016–2020)

<i>ID#</i>	<i>Previous recommendation for the issue</i>	<i>Number of successive reviews issue not addressed^a</i>
KL.9	More accurately estimate emissions and removals from forest land and FM by including, and where necessary revising, soil and litter estimates, on the basis of the ongoing monitoring of NFI plots.	3 (2015/2016–2020)

^a Reports on the reviews of the 2017 and 2019 annual submissions of Latvia have not yet been published. Therefore, 2017 and 2019 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 2020 annual submission

10. Table 5 presents findings made by the ERT during the individual review of the 2020 annual submission of Latvia that are additional to those identified in table 3.

Table 5

Additional findings made during the individual review of the 2020 annual submission of Latvia

<i>ID#</i>	<i>Finding classification</i>	<i>Description of the finding with recommendation or encouragement</i>	<i>Is finding an issue/problem?^a</i>
General			
G.5	National system	<p>The Party reported in the NIR (section 1.2.1, p.33) that cabinet of ministers regulation 737 of 12 December 2017 determines which institutions are responsible for GHG inventory preparation and sets out the model for the national inventory system in Latvia. NIR figure 1.1 (p.34) presented an overview of the national inventory system, and section 1.2.1 of the NIR (pp.33–36) described the roles and responsibilities of many of the main organizations within the system; however, the scope of responsibilities for some organizations was not described. During the review, Latvia clarified that the annexes to regulation 737 set out the specific data reporting obligations of different organizations. For example, companies in specific economic sectors and activities (e.g. cement production, iron and steel production, and transportation, storage, and sale of natural gas) must submit information to the Latvian Environment, Geology and Meteorology Centre annually by 1 October. The Party also clarified that, under this regulation, natural gas enterprises are not only required to provide data, but are also responsible for the calculation methods and for calculating annual gas leakage and emission estimates for use by the Latvian Environment, Geology and Meteorology Centre in reporting emissions under subcategory 1.B.2.b natural gas.</p> <p>The ERT recommends that the Party improve the description in the NIR of the national system regarding the corresponding roles and responsibilities of all organizations involved within the system, in particular by including further details on responsibilities and their scope, of the natural gas transmission, storage and distribution enterprises, and clarify that their responsibilities consist of gathering data, estimating emissions, developing the calculation methods and enabling QA/QC activities and verification.</p>	Yes. Transparency
G.6	National system	<p>The Party reported in the NIR (sections 1.2.1–1.2.2, pp.33–45) on its national system, including descriptions of the roles and responsibilities of many of the main organizations within the system, as established by cabinet of ministers regulation 737. The ERT noted that, in some economic sectors, the data and information provided by private companies, as established within the national system, did not fully enable the Latvian inventory agency to report</p>	Yes. KP reporting adherence

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue/problem? ^a
G.7	Uncertainty analysis	<p>GHG inventory estimates in accordance with the 2006 IPCC Guidelines, including conducting QA/QC procedures for the estimates. For example, gas transmission and distribution companies did not provide detailed information on their methods for estimating gas leakages from the network and in residential and commercial properties, thus preventing replication of the emission estimates reported under subcategory 1.B.2.b natural gas. In addition, cement companies did not provide the clinker production data needed to inform estimates under category 2.A.1 cement production, inhibiting the Party achieving higher accuracy for those estimates and limiting the scope for category-specific QC procedures and peer review of estimates. During the review, the Party clarified that the methods for estimating gas leakages from natural gas transmission, storage and distribution systems in Latvia and at the end-user level are considered commercially confidential, preventing it from providing methodological details in the NIR. Further, in response to questions from the ERT during the review, the Party did not clarify whether the natural gas enterprises conducted any QA/QC or verification procedures for the national methods used to generate the emission estimates reported in the inventory. The ERT noted that the national system did not appear to fully fulfil its required functions in terms of establishing clear institutional roles and responsibilities for some private companies and requiring them to deliver inventory data in accordance with IPCC data quality objectives, such as transparency, thus allowing verification of results obtained with the use of country-specific methods.</p> <p>The ERT recommends that Latvia, where necessary, strengthen its institutional, legal and procedural national system arrangements for organizations other than the Latvian inventory agency that are required to collect data and estimate emissions, such as cement companies and natural gas transmission, storage and distribution enterprises, with the aim of collecting sufficient additional information to ensure the quality of the GHG inventory, as indicated in decision 19/CMP.1, annex, paragraph 7, in conjunction with decisions 3/CMP.11 and 4/CMP.11, and include in the NIR information on the steps taken to strengthen these arrangements, as well as information required by paragraph 50(a) of the UNFCCC Annex I inventory reporting guidelines on the country-specific methods used, as necessary.</p> <p>Latvia reported on the inventory uncertainty analysis in the NIR (section 1.6.1, pp.62–63) and included further details in annex 2 to the NIR. The ERT noted that, while the method (approach 1) is in accordance with the 2006 IPCC Guidelines, some of the input values for uncertainties associated with the AD and EFs for specific categories, fuels and gases appeared to be inconsistent with those applied to similar categories, fuels and gases or across the years within a category, but a justification for the uncertainty input values selected was not provided. For example, a 0 per cent uncertainty value was applied to EFs for CO₂ and CH₄ emissions for subcategories 1.B.2.b natural gas and 1.B.2.c venting and flaring, while a 50 per cent uncertainty value was applied to the CO₂ EF for gaseous fuels for subcategory 1.A.4.c agriculture/forestry/fishing, and a 5 per cent uncertainty value was applied to CO₂ EFs for gaseous fuels use for most other categories. In addition, the uncertainty values of AD applied for the base year for subcategories 1.A.3.a domestic aviation and 1.A.3.d domestic navigation were 10 times higher than those applied for the latest reported year, and for category 3.H urea application the uncertainty value was 2,500 per cent higher for the base year than for the latest reported year. The ERT considered that there may be errors in these uncertainty values, which could result in inaccurate overall uncertainty analysis results. During the review, the Party provided a series of clarifications, some of which justified the selected uncertainty values, including (1) the higher uncertainty values for the AD for fuels used in aviation and shipping in 1990 compared with the latest year reported were due to CSB having access to more detailed data on flight and shipping movements for 2006 onward, whereas fuel use estimates in 1990 were based on an extrapolation method as reported in a 2004 study “Evaluation of fuel consumption for domestic aviation and navigation” by the Institute of Physical Energetics; and (2) the AD uncertainty for category</p>	Yes. Convention reporting adherence

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue/problem? ^a
Energy	E.13 Fuel combustion – reference approach – gaseous fuels – CO ₂	<p>3.H urea application in 1990 was higher compared with later years as there were no statistical data for that year, meaning that use of urea was estimated on the basis of total N fertilizer use, whereas for later years CSB has access to official statistics on urea use. Latvia indicated that the uncertainty values for some categories were incorrect, for example (1) the CO₂ EF uncertainty of 50 per cent applied to gaseous fuels under subcategory 1.A.4.c agriculture/forestry/fishing should be 5 per cent; and (2) the uncertainty of 0 per cent for EFs for CO₂ and CH₄ applied for subcategories 1.B.2.b natural gas and 1.B.2.c venting and flaring should be 10 per cent for each subcategory under 1.B.2.b and 1.B.2.c, except for 1.B.2.b.6 other, for which the value should be 35 per cent.</p> <p>The ERT recommends that Latvia correct the errors in the uncertainty values for the CO₂ EF for gaseous fuels for subcategory 1.A.4.c agriculture/forestry/fishing, and for the CO₂ and CH₄ EFs for subcategories 1.B.2.b natural gas and 1.B.2.c venting and flaring to improve the accuracy of the overall uncertainty assessment in the next annual submission. The ERT also recommends that Latvia include in the NIR the valid uncertainty values applied in the analysis, including the explanations provided to the ERT during the review and justifications for (1) the high uncertainty estimate for 3.H urea application in 1990; (2) the higher uncertainty value for AD of fuels used in aviation and shipping in 1990 compared with the latest year; and (3) the variable AD uncertainty for N₂O in category 5.D.2 industrial wastewater across the time series.</p> <p>The ERT noted that, in the NIR (section 3.2.1.1, p.96), the Party explained that the differences in natural gas consumption between the sectoral and reference approaches arise mainly owing to losses that occur annually in the national natural gas systems that are not accounted for under the sectoral approach. The statistical differences and losses of natural gas reported in the energy balance for the whole time series were presented transparently in annex A.3.1 to the NIR. The ERT also noted that the statistical differences and losses data reported for natural gas in annex A.3.1 to the NIR were consistent with the differences in natural gas consumption between the sectoral and reference approaches. However, the ERT further noted that the natural gas losses provided in annex A.3.1 to the NIR (pp.294–296) did not match the natural gas leakage data provided in NIR table 3.59 (p.176), which correspond to the data on natural gas leakage reported as AD in CRF table 1.B.2 for the complete time series. For example, for 2018, in annex A.3.1 (p.296) the Party reported natural gas losses of 530 TJ, whereas losses of natural gas in the network (upstream of gas meters) only amounted to around 25 TJ according to the data in CRF table 1.B.2 (transmission and storage and distribution losses of 743,682 m³) and the NCV presented in NIR table 3.17 (p.111) (34.25 GJ/1,000 m³). During the review, Latvia did not clearly explain this data inconsistency or clarify the scope of the losses reported in the energy balance, as presented in annex A3.1 to the NIR. Therefore, the ERT was not able to assess the validity of the explanation for the differences in natural gas consumption between the sectoral and reference approaches or determine whether these differences represented an issue of accuracy or completeness of the estimates of fugitive emissions from natural gas (see ID# E.17 below).</p> <p>The ERT recommends that the Party conduct an investigation, in cooperation with the gas companies and CSB (as the institution responsible for the energy balance), in order to (1) clarify and document the scope of losses in the natural gas system of Latvia, (2) harmonize reporting of gas leakages reported in the GHG inventory and the energy balance losses, and (3) understand and accurately clarify the reasons for the differences in the reported natural gas consumption between the sectoral and reference approaches, make any recalculation found necessary, and document in the NIR of the next annual submission all the relevant findings of this investigation.</p>	Yes. Accuracy

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue/problem? ^a
E.14	Feedstocks, reductants and other NEU of fuels – liquid fuels – CO ₂	<p>The ERT noted inconsistencies in the NEU data on lubricants between NIR table 3.14 (p.105) and CRF table 1.A(d), and between NIR table 3.14 and CRF table 1.A(b), with the exception of data for 2002 and 2008–2014. In the NIR (p.140) Latvia explained that CO₂ emissions from lubricant consumption in road transportation were calculated and reported under subcategory 1.A.3.b road transportation; however, information on lubricant consumption in road transportation and the resulting emissions were not reported transparently in the section on road transportation (section 3.2.6.1.2, pp.135–148). During the review, the Party provided detailed data enabling a comparison of NEU data on lubricants, lubricants consumed in road transportation and apparent consumption of lubricants under the reference approach for 1990–2018, and clarified that the lubricant AD reported in NIR table 3.14 comprised both the NEU of lubricants and lubricants consumed in road transportation engines, despite the latter not being included in the table title (“Activity data for feedstocks and non-energy use of fuels in 1990–2018 (TJ)”). Latvia further clarified that the differences between the data in NIR table 3.14 and the data in CRF table 1.A(b) are due to interproduct transfers of lubricants, reflecting the use of lubricants in the blending of petroleum-derived fuels to produce other fuels (e.g. residual fuel oil).</p> <p>The ERT recommends that the Party improve the data on and documentation of lubricant consumption in the NIR, in particular for energy purposes, and enhance the consistency and transparency of reporting on NEU data on lubricants in both the NIR and CRF tables 1.A(b) and 1.A(d), including by clearly documenting lubricant consumption in road transportation engines and the resulting CO₂ emissions, and in interproduct transfers of lubricants.</p>	Yes. Transparency
E.15	Feedstocks, reductants and other NEU of fuels – liquid fuels – CO ₂	<p>The ERT noted that the NEU data presented in NIR table 3.14 (p.105) for other oil (i.e. the sum of white spirit and paraffin waxes) were consistent with the data for other oil reported in CRF table 1.A(b) for 2011, 2012 and 2015–2018; however, the ERT noted differences in the information reported for 2013–2014 (10.0 and 9.3 per cent, respectively), and significant differences for 1990–2010 (ranging from 200 to 3,139 per cent). During the review, in response to a question from the ERT, the Party stated that data reported under other oil encompassed data on white spirit, paraffin waxes and unspecified other oil products and provided AD for other oil reported in CRF table 1.A(b) disaggregated into white spirit, paraffin waxes, and unspecified other oil products across the time series. The ERT noted that, since there is no refinery in Latvia, it is not clear what these unspecified other oil products reported for the complete time series refer to. Hence, the ERT was not able to fully understand the data inconsistencies observed in the time series.</p> <p>The ERT recommends that Latvia investigate the scope of other oil data reported in the inventory, particularly for unspecified other oil products, for example by consulting with CSB, clearly document in the NIR the scope of fuels that are included within the other oil AD, present in the NIR disaggregated AD for all fuels reported under other oil across the time series and provide in the NIR and CRF tables consistent AD in accordance with the fuel type definitions in the 2006 IPCC Guidelines (vol. 2, chap. 1, table 1.1, pp.1.12–1.16).</p>	Yes. Transparency
E.16	1.A.3.e.i Pipeline transport – all fuels – CO ₂ , CH ₄ and N ₂ O	<p>In CRF table 1.A(a) (sheet 3), CO₂, CH₄ and N₂O emissions for subcategory 1.A.3.e.i pipeline transport were reported using the notation key “IE” for all fuel types, with the explanation that those emissions were included under subcategory 1.A.4.a.i stationary combustion under 1.A.4.a commercial/institutional. Latvia did not provide any information on emissions from pipeline transport in the NIR sections on transport (section 3.2.6) or commercial and institutional (section 3.2.7). During the review, Latvia explained that emissions from natural gas consumed in pipeline transport were reported under subcategory 1.A.4.a.i stationary combustion for 1990–1993 and under subcategory 1.A.1.c.i manufacture of solid fuels for 1994–2018 (emissions from other types of fuels did not occur in</p>	Yes. Comparability

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue/problem? ^a
E.17	1.B.2.b Natural gas – gaseous fuels – CO ₂ and CH ₄	<p>the country), and provided CO₂, CH₄ and N₂O emission estimates for natural gas used in pipeline transport for 1990–2018. Latvia indicated that it will use the notation key “NO” instead of “IE” for liquid, solid and other fossil fuels and biomass for subcategory 1.A.3.e.i pipeline transport across the entire time series in the next annual submission. The Party also indicated that it will use the notation key “IE” for reporting gaseous fuels for subcategory 1.A.3.e.i pipeline transport, with the explanation that emissions were reported under subcategory 1.A.4.a.i stationary combustion, across the entire time series in future annual submissions. The ERT considered that this planned reporting, as indicated by Latvia, is not in accordance with the UNFCCC Annex I inventory reporting guidelines.</p> <p>The ERT recommends that Latvia report CO₂, CH₄ and N₂O emissions for subcategory 1.A.3.e.i pipeline transport for liquid, solid and other fossil fuels and biomass using the notation key “NO” instead of “IE” for the entire time series, providing relevant explanations in the NIR, and report CO₂, CH₄ and N₂O emissions from gaseous fuels (natural gas) under this subcategory in CRF table 1.A(a) (sheet 3) for the entire time series, providing relevant documentation on the method, AD and EFs used in the estimates in the NIR.</p> <p>The ERT noted that Latvia reported in the NIR (section 3.3.2.2, pp.175–177) that fugitive emissions from natural gas systems were estimated using tier 3 methods with country-specific data. The ERT also noted that, when a country-specific method is applied, it is good practice to report information on the verification of the reported estimates, for example a comparison of the results obtained using the country-specific method with those that would have been derived using a tier 1 method; however, the Party did not provide such or other information on verification of the country-specific method in the NIR. During the review, Latvia provided estimates of fugitive CH₄ emissions derived using the tier 1 method and default EFs from the 2006 IPCC Guidelines (vol. 2, chap. 4, table 4.2.4, p.4.49) for transmission and storage, distribution and venting of natural gas from transmission systems. The ERT noted that the total CH₄ emissions reported in CRF table 1.B.2 were consistently higher than those derived using the tier 1 method across the time series, with differences in the range of 25–540 per cent.</p> <p>The ERT recommends that Latvia provide in the NIR a time series of CH₄ and CO₂ emission estimates for subcategories 1.B.2.b.4 transmission and storage, 1.B.2.b.5 distribution and 1.B.2.c.ii gas (venting) using the tier 1 method and default EFs presented in tables 4.2.4–4.2.5, as appropriate, from the 2006 IPCC Guidelines (vol. 2, chap. 4, p.4.41 and p.4.49 or p.4.57, respectively) and provide information in the NIR on the comparison of these estimates with the tier 3 estimates, including explanations of any differences, as a verification of the reported estimates in accordance with paragraph 41 of the UNFCCC Annex I inventory reporting guidelines.</p>	Yes. Transparency
E.18	1.B.2.b Natural gas – gaseous fuels – CO ₂ and CH ₄	<p>The ERT noted that the greatest source of fugitive emissions in the country was natural gas leakage at industrial plants and power stations and leakage in residential and commercial sectors as described in the NIR (p.173 and table 3.59, p.176) and reported in CRF table 1.B.2 under subcategory 1.B.2.b.6 other. The description of the methodology for this emissions source in the NIR (section 3.3.2.2, pp.175–177) merely indicated that emission data were provided by JSC Latvijas Gaze until 2016 and by JSC Gazo for 2017 onward, but did not specify how these gas companies obtained or calculated AD on natural gas leakages or how emissions were estimated. The ERT also noted that there is no explanation of the significant inter-annual variations in emissions reported, for example the higher value reported in 2017 (5.10 kt CH₄) compared with those in 2016 and 2018 (3.54 and 2.88 kt CH₄, respectively). During the review, the Party clarified that the sources of fugitive emissions included in the estimates refer to leakages in gas stoves, boilers and water heaters in the residential and commercial sectors, and that no such emissions were reported for industrial plants and power stations by the gas companies. It also explained that the methodology developed by the</p>	Yes. Transparency

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue/problem? ^a
IPPU	2.F.1 Refrigeration and air conditioning – HFCs	<p>gas companies for estimating fugitive emissions is confidential, but stated that, in cooperation with JSC Gazo, a description of the methodology, without disclosing confidential information, will be provided in the next annual submission (see ID#s E.10, E.11 and E.12 in table 3).</p> <p>The ERT recommends that Latvia provide in the NIR a clear description of the methodology and AD used by the gas companies for estimating fugitive CO₂ and CH₄ emissions for subcategory 1.B.2.b.6 other, including information on the coverage of emission sources under the subcategory, and clearly explain in the NIR the reported trend in emissions across the time series.</p> <p>In CRF table 2(II).B-H (sheet 2) Latvia reported HFC emissions (HFC-134a, HFC-32, HFC-125, HFC-143a, HFC-152a and HFC-23) from disposal of equipment for subcategories 2.F.1.a commercial refrigeration, 2.F.1.c industrial refrigeration and 2.F.1.f stationary air conditioning under category 2.F.1 refrigeration and air conditioning using the notation key “NE” for all years of the time series, including during the second commitment period of the Kyoto Protocol (2013–2018). During the review, the Party explained that emissions from disposal of equipment for these subcategories could not be estimated owing to lack of data and indicated the years for which these emissions could not occur because the average lifetime of the relevant equipment (15 years) had not yet elapsed for these three subcategories and other subcategories under category 2.F.1 refrigeration and air conditioning. In its reply to the Party, the ERT suggested that Latvia consider using the splicing techniques described in the 2006 IPCC Guidelines (vol. 1, chap. 5.3.3, pp.5.8–5.14) to calculate the missing HFC estimates for the relevant years of the time series, in particular for 2013–2018. During the review, the Party resubmitted its CRF tables and reported the missing HFC emission estimates for subcategories 2.F.1.a commercial refrigeration, 2.F.1.c industrial refrigeration and 2.F.1.f stationary air conditioning for 2004–2018 and used the notation key “NO” for 1990–2003 because HFC emissions from disposal of equipment did not occur during those years. For its emission estimates, Latvia used the amount of gas filled in new manufactured products as the basic AD and applied the average EFs for residual charge of gas in equipment being disposed of and recovery efficiency at disposal from the 2006 IPCC Guidelines (vol. 3, chap. 7, table 7.9, p.7.52). The ERT agreed with the revised estimates reported in the CRF tables resubmitted by Latvia.</p> <p>As a result of the revision, the estimated emissions for category 2.F.1 refrigeration and air conditioning increased by 38.32 kt CO₂ eq (0.34 per cent of the national total and 4.73 per cent of total emissions from the IPPU sector) for 2013; by 37.54 kt CO₂ eq (0.34 per cent of the national total and 4.55 per cent of total emissions from the IPPU sector) for 2014; by 34.92 kt CO₂ eq (0.31 per cent of the national total and 4.62 per cent of total emissions from the IPPU sector) for 2015; by 32.99 kt CO₂ eq (0.30 per cent of the national total and 5.02 per cent of total emissions from the IPPU sector) for 2016; by 31.32 kt CO₂ eq (0.28 per cent of the national total and 4.25 per cent of total emissions from the IPPU sector) for 2017; and by 29.58 CO₂ eq (0.25 per cent of the national total and 3.44 per cent of total emissions from the IPPU sector) for 2018.</p> <p>The ERT recommends that Latvia include in its NIR detailed information on the methodology, assumptions, AD and EFs used for estimating HFC emissions from disposal of equipment for subcategories 2.F.1.a commercial refrigeration, 2.F.1.c industrial refrigeration and 2.F.1.f stationary air conditioning, clearly explaining the use of notation keys for relevant years of the time series where numerical values are not reported, and continue reporting HFC emissions from disposal of equipment for relevant subcategories under category 2.F.1 refrigeration and air conditioning in future annual submissions.</p>	Yes. Transparency

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue/problem? ^a
Agriculture			
A.9	3.A.1 Cattle – CH ₄	<p>Latvia reported in CRF table 3.B(a) (sheet 1) the CH₄ IEF values for other mature cattle, and the ERT noted significant inter-annual fluctuations in the CH₄ IEF values (e.g. 5.4 per cent in 2004–2005, 3.6 per cent in 2006–2007, –5.5 per cent in 2007–2008, 3.2 per cent in 2008–2009, 2.0 per cent in 2009–2010, 1.8 per cent in 2011–2012 and 1.7 per cent in 2014–2015). These fluctuations could not be clearly explained on the basis of information provided in the NIR (p.299), which provided only a breakdown of animal population by subcategory for 2018, but not the GE values by animal subcategory. During the review, Latvia provided more information on the three different animal subgroups considered under other mature cattle (i.e. bulls, heifers and other cows over two years old) and the impact of animal weight on the calculation of GE for these three animal subgroups for category 3.A.1 cattle. The observed fluctuations in the CH₄ IEF values were explained by the differences in animal weight between the three subgroups under other mature cattle and the changes in the animal population of these subgroups, which is very sensitive to changes in the economic situation of the country.</p> <p>The ERT recommends that Latvia include in the NIR or in an annex to the NIR, information on its calculation of GE values for the whole time series for the animal subgroups considered under other mature cattle, including changes in animal weight and population, and, if possible, for all subcategories of cattle.</p>	Yes. Transparency
A.10	3.B Manure management – CH ₄	<p>The ERT noted that Latvia reported in CRF table 3.B(a) (sheet 2) a significant increase in the share of manure handled in anaerobic digesters in recent years. For example, for mature dairy cattle, the percentage of manure handled in digesters increased from 0.1 per cent in 2009 to 19.3 per cent in 2018, and from 13.8 to 19.3 per cent between 2017 and 2018. However, the Party provided limited information on this increase in the NIR; therefore, it was not clear to the ERT how the MCF value of 2 per cent for anaerobic digesters reported in the NIR (p.306) was derived, as the NIR appears to refer only to adoption of this value on leakages from biogas plants based on Swedish experience. During the review, Latvia provided further information on the biogas industry in the country, including the number of biogas plants, explaining that these are usually single-farm plants at which manure is transferred daily from the MMS to the digester. Latvia also provided further references to studies documenting CH₄ leakage from biogas plants. However, the ERT noted that the provided original reference to the 2012 Swedish study “Methane losses in the biogas system” by Jonerholm and Lundborg was no longer available electronically.</p> <p>The ERT recommends that Latvia report in the NIR information on the nature of the biogas plants operating in the country, including documentation explaining that the residence time of the manure is short (daily emptying) and further document, as part of the next annual submission, the assumed leakage value from biogas plants using references that are available to be reviewed.</p>	Yes. Transparency
A.11	3.B Manure management – CH ₄ and N ₂ O	<p>Latvia reported the MMS distribution used in the calculations in CRF table 3.B(a) (sheet 2) and in NIR annex A.3.6. Latvia provided a reference in the NIR (p.306) to a technical paper (Priekulis and Aboltins, 2015) explaining the methodology for estimating the MMS distribution, but it did not provide further details on input data for calculating this distribution, such as length of the grazing periods of livestock. The ERT noted that the shares of different MMS provided in the cited paper did not match the values reported in the CRF tables or NIR for 2013, which were unchanged since the 2016 annual submission. Further, the cited paper only documented MMS distribution for cattle; and it was therefore unclear to the ERT how the MMS distribution for other animal categories was derived. During the review, Latvia explained that the MMS distribution was calculated using specialized software at the Latvia University of Life Sciences and Technologies, and that MMS distribution is revised periodically, explaining why it</p>	Yes. Transparency

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue/problem? ^a
A.12	3.B.1 Cattle – CH ₄ and N ₂ O	<p>could not be assumed that the data reported would match the cited reference. The ERT considered that the current description in the NIR of the methodology for estimating MMS distribution is not transparent, but noted that it was possible to better understand the methodology applied when using the additional information provided by Latvia.</p> <p>The ERT recommends that Latvia expand the information provided in the NIR on how it derives the MMS distribution used in the calculations for the complete time series, including by specifying the changes made compared with the MMS distribution provided in the technical paper by Priekulis and Aboltins (2015), considering that the same MMS distribution values for 2013 have been reported since the 2016 annual submission and that these values differ from those in the cited paper. Further, the ERT recommends that Latvia provide information in the NIR on grazing days, including references for the values used, for each animal category or subcategory, as appropriate.</p> <p>Latvia reported in the NIR (p.306) that only four MMS are considered for cattle: solid storage; liquid storage; pasture, range and paddock; and digesters. However, the ERT noted that it is common practice in cattle farming for calves to be housed in deep litter (deep bedding) systems, and that the MCF for deep litter systems is different to the MCF for solid storage of manure provided in the 2006 IPCC Guidelines (vol. 4, chap. 10, table 10.17, pp.10.44–10.47) and therefore the N₂O EF to be used is different (vol. 4, chap. 10, table 10.21, pp.10.62–10.64). The ERT further noted that according to Priekulis et al. (2018), calves in Latvia are housed on deep litter. During the review, Latvia confirmed that calves and young cattle could be kept on deep litter, but that this housing system is not considered in cabinet of ministers regulation 829 of 23 December 2014 on special requirements for the performance of polluting activities in animal housing and hence was not considered in the inventory. The ERT believes that future ERTs should consider this issue further to ensure that there is not an underestimate of emissions from this category.</p> <p>The ERT recommends that Latvia clarify in the NIR whether and to what extent deep bedding is used in national cattle production, in particular for calves, and consider the possible use of deep bedding in estimating CH₄ and N₂O emissions from manure management for subcategory 3.B.1 cattle, considering the applicable different default MCFs and EFs provided in the 2006 IPCC Guidelines (vol. 4, chap. 10, tables 10.17 and 10.21, pp.10.44–10.47 and 10.62–10.64, respectively) compared with solid storage of manure.</p>	Yes. Accuracy
A.13	3.B.3 Swine – CH ₄	<p>Latvia reported in its NIR (p.308) that it used a DE of 80 per cent for sows and fattening pigs, and a DE of 85 per cent for piglets. The ERT noted that the DE value for piglets is the midpoint of the range provided by the 2006 IPCC Guidelines (vol. 4, chap. 10, table 10.2, p.10.14), while the upper limit of the range of representative DE (70–80 per cent) was used for sows and fattening pigs. During the review, Latvia clarified that it used several publications (e.g. Frolova et al., 2019; Kaasik et al., 2002) and consulted with experts from the Latvian Pig Breeding Association to establish the most accurate values of DE under Latvian conditions. The ERT agreed with the explanations provided by the Party.</p> <p>The ERT recommends that Latvia provide in the NIR references to the additional publications mentioned during the review (e.g. Frolova et al., 2019; Kaasik et al., 2002) and include the explanation provided to the ERT of how it sought to establish the most accurate values of DE under Latvian conditions used in the calculations.</p>	Yes. Transparency
A.14	3.D.a.4 Crop residues – N ₂ O	<p>Latvia reported in its NIR (p.330) that it recalculated N₂O emissions for subcategory 3.D.a.4 crop residues owing to updated information on N content in wheat residues. The Party referred in its NIR (p.330) to a 2018 publication in Latvian by Kārkliņš and Līpenīte for the country-specific N content in wheat residues used, but did not provide a link or any additional information. The ERT noted that the recalculation was very significant (–26.5 per cent in 2017) and asked the Party for further clarification. During the review, Latvia clarified which values it changed in the 2020</p>	Yes. Transparency

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue/problem? ^a
A.15	3.D.a.6 Cultivation of organic soils (i.e. histosols) – N ₂ O	<p>annual submission compared with the 2019 annual submission. The changes concerned the dry matter content of sugar beets, flax straw and crops for green feed and silage, as well as the following parameters for wheat: N content on above-ground residues, N content in below-ground residues and R_{AG}. The most significant change was for R_{AG}, which changed from the value of 1.74, which was based on the crop yield and the default parameters for slope and intercept provided in the 2006 IPCC Guidelines (vol. 4, chap. 11, table 11.2, p.11.17), to a value of 1.00 based on the 2018 national study by Kārklīš and Līpenīte. Latvia provided excerpts from the referenced publication documenting the national values.</p> <p>The ERT recommends that Latvia explain in the NIR which values used for estimating N₂O emissions from crop residues are country-specific and which are default values, and provide more information on the referenced 2018 national study by Kārklīš and Līpenīte, specifically on the country-specific value of 1.00 for R_{AG}.</p> <p>Latvia reported in its NIR (p.330) that it recalculated the area of organic soils for N₂O emissions for subcategory 3.D.a.6 cultivation of organic soils (i.e. histosols), providing a reference to a paper (Petaja et al., 2018) for the source of improved data used for the recalculations. The ERT noted that, since this paper was published in 2018, it was not clear how the results led to recalculations in both the 2019 and 2020 annual submissions. Further, it was not able to find the areas reported in the inventory in the cited paper. The ERT further noted that the paper refers to a certain percentage of cropland and grassland areas in 1990 and 2015 being organic, but the ERT was not able to replicate this from the figures reported in the CRF tables. During the review, Latvia clarified how the area of organic soils in cropland and grassland was estimated using data from the NFI, specified the uncertainties involved when establishing the specific land use and described the impact of using three NFI cycles to assess land-use changes. The ERT agreed with the explanations provided by the Party.</p> <p>The ERT recommends that Latvia expand the information in the NIR on the methodology used for estimating the area of organic soils, specifically by including the explanations provided to the ERT during the review on how the area of organic soils in cropland and grassland was estimated using data from the NFI and giving reasons why changes (recalculations) in the area of organic soils can be expected to occur regularly to take into account the results from the NFI cycles.</p>	Yes. Transparency
LULUCF			
L.14	Land representation	<p>The Party reported in its NIR (pp.352–353) a description of the methodology applied in the 2020 annual submission for land representation based on NFI data, clarifying that in previous annual submissions satellite data (Landsat data) had been used. During the review, the ERT informed the Party that freely available Sentinel and Landsat data would enhance continuity and consistency in the AD time series. In response, Latvia clarified that the methodology applied since the 2020 annual submission calculated land-use changes using the most recent NFI data and auxiliary information provided by the land parcel information system (known as LPIS) and the stand-wise forest inventory (Krumsteds et al., 2019b). In general, the new methodology utilizes elaborated geographic information system tools which considerably improve the quality of the AD by eliminating possible errors from manual calculations and reducing non-existing land-use changes through linearization of the land-use change trends. Latvia further stated that it plans to use satellite data to increase the accuracy of data sets between NFI site visits in future and mentioned the option of using information from Global Forest Watch. In addition, Latvia indicated that it is looking for development of Sentinel technology and repeated laser imaging, detection and ranging data sets (known as LiDAR), which can provide more accurate information.</p>	Not an issue/problem

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue/problem? ^a
Waste			
W.7	5.A Solid waste disposal on land – CH ₄	<p>The Party reported in its NIR (pp.421–422) that it selected a methane correction factor of 0.8 for urban areas (deep unmanaged waste disposal sites) and 0.4 for rural areas (shallow unmanaged waste disposal sites) for 1970–2001. For 2002–2011 it used a methane correction factor of 1.0 for all the biggest SWDS, which have been considered managed, and kept the use of a methane correction factor of 0.8 for deep unmanaged waste disposal sites in urban areas and 0.4 for shallow unmanaged waste disposal sites in rural areas. From 2012 onward, all waste disposal sites in the country started to be considered managed and a methane correction factor of 1.0 was used for all sites. The ERT noted that in CRF table 5.A a methane correction factor of 0.676 was reported throughout the time series for unmanaged waste disposal sites, but this was not justified or explained in the NIR. During the review, Latvia clarified that this was a reporting error in CRF table 5.A, and that the value of the methane correction factor used to estimate emissions in 2018 was 0.64. However, the Party clarified that this error in CRF table 5.A did not affect the emission estimates. The ERT also noted that, on the basis of the AD for urban (deep) and rural (shallow) unmanaged waste disposal sites reported in NIR tables 7.5–7.6 (pp.420–422), and using the default methane correction factor values of 0.8 and 0.4, respectively, the weighted average methane correction factor for all unmanaged waste disposal sites was 0.524 for 1990–2001, 0.676 for 2002–2010, 0.60 for 2011 and 2012, and then not relevant for 2013 onward, as waste disposal in unmanaged sites was reported using the notation key “NO”. This indicated that the reporting of methane correction factors in CRF table 5.A was incorrect for 1990–2001, 2011 and 2012.</p> <p>The ERT recommends that the Party correct the reporting errors related to the methane correction factor values in CRF table 5.A for 1990–2001, 2011 and 2012, use an appropriate notation key for 2013 onward, document and justify in the NIR the methane correction factors used since 1990 and enhance its QC procedures to ensure consistency of information reported in the NIR and the CRF tables.</p>	Yes. Transparency
W.8	5.A Solid waste disposal on land – CH ₄	<p>The Party reported in NIR table 7.7 (p.422) the composition of waste disposed of at SWDS in Latvia. The Party also reported in the NIR (p.423) that it used the same waste composition for all years from 2002 in its calculations. The ERT noted that waste management practices within the Party’s territory have evolved, with increases in recycling, composting and site covering/capping and prohibition of disposal of hazardous waste together with MSW. The ERT also noted, however, that Latvia did not take into account such developments when incorporating into its data changes in waste composition and DOC values in accordance with the 2006 IPCC Guidelines (vol. 5, chap. 3.2.2, p.3.12). During the review, Latvia indicated that it will take these changes into account in future annual submissions once new and reliable research and data become available.</p> <p>The ERT recommends that Latvia collect representative data that take into account changes in waste composition and DOC values caused by developments in waste management practices, in particular for all years since 2002, revise the CH₄ emission estimates for this category accordingly as part of the planned improvements for its next annual submission and document in the NIR the updated information used on waste composition and DOC values. Further, the ERT encourages the Party to include an improvement plan for this category in the NIR of its future annual</p>	Yes. Accuracy

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue/problem? ^a
W.9	5.A Solid waste disposal on land – CH ₄	<p>submissions, including information on planned or ongoing research aimed at enhancing AD on waste composition and associated DOC values.</p> <p>Latvia reported in its NIR (pp.423–424) data and information on recovered CH₄ in landfills consistent with those reported in CRF table 5.A. However, the ERT could not find in the NIR information clearly documenting the basis for the reporting of CH₄ recovery in line with the 2006 IPCC Guidelines (vol. 5, chap. 3, p.3.19). From the information provided, it is unclear whether CH₄ recovery is based on a certain number of SWDS with recovery capacity or on actual measurements from gas collection systems. During the review, the Party clarified that data on CH₄ recovery were obtained directly from landfill operators, which report monthly volumes of recovered landfill gas and CH₄ concentrations to the inventory agency, in accordance with cabinet of ministers regulation 1032 on the construction of landfill sites and management, closure and recultivation of landfill sites and waste dumps in Latvia, but mentioned that the inventory agency does not know how CH₄ recovery is measured or calculated. The ERT noted that the information provided in the NIR is not fully in accordance with the 2006 IPCC Guidelines (vol. 5, chap. 3, pp.3.18–3.19) since the basis for reporting CH₄ recovery is not clearly documented or understood by the inventory agency.</p> <p>The ERT recommends that the Party obtain detailed information (e.g. through consultations with landfill operators) on how CH₄ recovery data are measured or calculated, and reported by landfill operators under national legislation, and document in the NIR how CH₄ recovery data are verified and applied to the estimates in the national inventory, in accordance with the 2006 IPCC Guidelines (vol. 5, chap. 3, pp.3.18–3.19), specifying all underlying assumptions used in the estimates and the choice of uncertainty values applied.</p>	Yes. Transparency
W.10	5.A Solid waste disposal on land – CH ₄	<p>Latvia reported in its NIR (p.87) that municipal and industrial waste is used as a fuel for combustion in cement production plants. Data on waste generation were sourced from the annual waste statistics report and population was used as a driver for estimating solid waste generation in Latvia for 1970–2001. The Party also reported in its NIR (p.421) that, during this period, the waste amount disposed of was divided into rural and urban areas, using as a driver the proportion of population living in these areas. However, the ERT noted that Latvia did not document in the NIR which assumptions were applied for 1970–2001 in order to avoid accounting for the portion of MSW sent for combustion in cement production plants. During the review, the Party clarified that there was no double counting of emissions as information on waste amounts disposed of was collected directly from waste landfill operators through the “3-Waste” annual survey; therefore, MSW combusted in cement production plants was not reported as having been disposed of. However, the ERT also noted that the Party indicated in the NIR (pp.420–421) that data for waste disposal on land for 2002–2017 were taken from the “3-Waste” annual survey database, which became available in 2002.</p> <p>The ERT recommends that the Party investigate the occurrence of co-firing of MSW in stationary combustion activities for 1970–2001 and report in the NIR how it avoided the potential double counting of CH₄ emissions from waste disposed of at SWDS during this period, when it used population as a driver for estimating the amount of MSW disposed of. In addition, the ERT recommends that Latvia document in the NIR the assumptions used to account for the portion of MSW sent for combustion in cement production plants and any other stationary combustion activities.</p>	Yes. Transparency

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue/problem? ^a
KP-LULUCF			
KL.10	General (KP-LULUCF) – CO ₂	<p>The Party reported in its NIR (p.382) that the use of the soil carbon model Yasso07 for afforestation, deforestation and FM needs to be evaluated for the calculation of actual CSC in deadwood and soils on afforested land and that the model is already implemented for forest land, cropland and grassland. During the review, Latvia clarified that recent studies demonstrate the lack of sufficient data on below-ground litter carbon input in forest land, resulting in CSC in the soil pool being underestimated. Further, the Party indicated that it is still working to implement the Yasso07 model with the aim of using it for mineral soils and to develop country-specific EFs for afforestation estimates, but there are still major knowledge gaps regarding country-specific or verified equations for calculating above- and below-ground litter input. The ERT noted that Latvia has developed a road map linked to ongoing national research studies (with different deadlines) containing milestones with priorities for development, which should lead to implementing the Yasso07 model and obtaining accurate CSC estimates for afforestation and FM (see ID#s L.2, L.5, L.6 and KL.9 in table 3).</p> <p>The ERT encourages the Party to follow the established road map containing milestones for the implementation of the Yasso07 model in order to allow the Party to obtain accurate CSC estimates for afforestation and FM before the end of second commitment period of the Kyoto Protocol.</p>	Not a problem

^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 2020 annual submission of Latvia.

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

12. Latvia elected commitment period accounting and therefore the issuance and cancellation of units for KP-LULUCF is not applicable to the 2020 review.

VIII. Questions of implementation

13. No questions of implementation were identified by the ERT during the individual review of the Party's 2020 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 Latvia in its 2020 annual submission

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

Table I.1

Total greenhouse gas emissions for Latvia, base year^a–2018

(kt CO₂ eq)

	<i>Total GHG emissions excluding indirect CO₂ emissions</i>		<i>Total GHG emissions including indirect CO₂ emissions^b</i>		<i>Land-use change (Article 3.7 bis as contained in the Doha Amendment)^c</i>	<i>KP-LULUCF (Article 3.3 of the Kyoto Protocol)^d</i>	<i>KP-LULUCF (Article 3.4 of the Kyoto Protocol)</i>	
	<i>Total including LULUCF</i>	<i>Total excluding LULUCF</i>	<i>Total including LULUCF</i>	<i>Total excluding LULUCF</i>			<i>CM, GM, RV, WDR</i>	<i>FM</i>
FMRL								–16 302.00
Base year	16 097.16	26 305.87	16 137.65	26 346.36	NA		NO, NA	
1990	16 079.86	26 288.57	16 120.34	26 329.06				
1995	174.90	12 954.57	206.91	12 986.57				
2000	657.99	10 561.51	682.65	10 586.16				
2010	12 068.10	12 309.64	12 084.42	12 325.96				
2011	10 869.09	11 519.61	10 880.04	11 530.57				
2012	9 329.11	11 336.64	9 341.75	11 349.28				
2013	10 515.46	11 264.06	10 531.01	11 279.61		946.14	NO, NA	–6 628.04
2014	14 160.22	11 166.00	14 180.83	11 186.61		688.55	NO, NA	–942.54
2015	12 928.05	11 214.00	12 945.11	11 231.06		707.38	NO, NA	–2 727.10
2016	11 065.84	11 203.13	11 083.63	11 220.92		726.41	NO, NA	–1 866.59
2017	9 927.10	11 248.15	9 946.23	11 267.28		741.80	NO, NA	–3 103.11
2018	13 162.80	11 745.26	13 174.61	11 757.06		760.91	NO, NA	–2 334.01

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

^a “Base year” refers to the base year under the Kyoto Protocol, which is 1990 for CO₂, CH₄ and N₂O, and 1995 for HFCs, PFCs, SF₆ and NF₃. Latvia 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.

^b The Party reported indirect CO₂ emissions in CRF table 6.

^c 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 report to facilitate the calculation of the assigned amount for the second commitment period of the Kyoto Protocol of the Party.

^d Activities under Article 3, para. 3, of the Kyoto Protocol, namely AR and deforestation.

Table I.2
Greenhouse gas emissions by gas for Latvia, excluding land use, land-use change and forestry, 1990–2018
 (kt CO₂ eq)

	<i>CO₂^a</i>	<i>CH₄</i>	<i>N₂O</i>	<i>HFCs</i>	<i>PFCs</i>	<i>Unspecified mix of HFCs and PFCs</i>	<i>SF₆</i>	<i>NF₃</i>
1990	19 544.62	3 594.97	3 189.47	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA
1995	9 122.31	2 160.04	1 686.92	17.13	NO, NA	NO, NA	0.17	NO, NA
2000	7 089.38	1 872.60	1 558.71	64.60	NO, NA	NO, NA	0.88	NO, NA
2010	8 565.20	1 791.27	1 748.09	214.05	NO, NA	NO, NA	7.35	NO, NA
2011	7 816.35	1 742.77	1 748.12	215.86	NO, NA	NO, NA	7.47	NO, NA
2012	7 527.85	1 784.29	1 813.36	216.01	NO, NA	NO, NA	7.78	NO, NA
2013	7 397.54	1 806.24	1 837.80	229.53	NO, NA	NO, NA	8.50	NO, NA
2014	7 203.24	1 853.73	1 877.42	243.65	NO, NA	NO, NA	8.58	NO, NA
2015	7 289.76	1 755.00	1 921.70	254.48	NO, NA	NO, NA	10.12	NO, NA
2016	7 238.54	1 780.87	1 916.71	274.91	NO, NA	NO, NA	9.89	NO, NA
2017	7 241.91	1 813.31	1 933.33	268.41	NO, NA	NO, NA	10.32	NO, NA
2018	7 871.09	1 733.57	1 873.76	268.10	NO, NA	NO, NA	10.54	NO, NA
Percentage change 1990– 2018	–59.7	–51.8	–41.3	NA	NA	NA	NA	NA

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

^a Including indirect CO₂ emissions as reported in CRF table 6.

Table I.3
Greenhouse gas emissions by sector for Latvia, 1990–2018
 (kt CO₂ eq)

	<i>Energy</i>	<i>IPPU</i>	<i>Agriculture</i>	<i>LULUCF</i>	<i>Waste</i>	<i>Other</i>
1990	19 378.69	654.31	5 593.02	–10 208.72	703.04	NO
1995	9 567.08	225.55	2 575.14	–12 779.67	618.81	NO
2000	7 405.64	285.07	2 211.51	–9 903.52	683.95	NO
2010	8 519.74	748.15	2 406.35	–241.54	651.72	NO
2011	7 645.44	845.64	2 416.58	–650.52	622.91	NO
2012	7 332.17	903.88	2 498.11	–2 007.53	615.12	NO
2013	7 275.10	847.65	2 555.35	–748.59	601.51	NO
2014	7 100.38	862.39	2 628.86	2 994.22	594.98	NO
2015	7 208.68	790.34	2 673.60	1 714.05	558.44	NO

	<i>Energy</i>	<i>IPPU</i>	<i>Agriculture</i>	<i>LULUCF</i>	<i>Waste</i>	<i>Other</i>
2016	7 281.45	690.17	2 678.94	-137.29	570.36	NO
2017	7 264.84	768.30	2 697.52	-1 321.05	536.62	NO
2018	7 708.92	890.32	2 609.40	1 417.54	548.43	NO
Percentage change 1990–2018	-60.2	36.1	-53.3	-113.9	-22.0	NA

Note: Totals include indirect CO₂ emissions reported 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^a–2018, for Latvia
(kt CO₂ eq)

	<i>Article 3.7 bis as contained in the Doha Amendment^b</i>	<i>Activities under Article 3.3 of the Kyoto Protocol</i>		<i>FM and elected activities under Article 3.4 of the Kyoto Protocol</i>				
	<i>Land-use change</i>	<i>AR</i>	<i>Deforestation</i>	<i>FM</i>	<i>CM</i>	<i>GM</i>	<i>RV</i>	<i>WDR</i>
FMRL				-16 302.00				
Technical correction				11 703.39				
Base year	NA				NA	NA	NO, NA	NA
2013		-179.78	1 125.92	-6 628.04	NA	NA	NO, NA	NA
2014		-194.10	882.64	-942.54	NA	NA	NO, NA	NA
2015		-208.54	915.92	-2 727.10	NA	NA	NO, NA	NA
2016		-222.73	949.14	-1 866.59	NA	NA	NO, NA	NA
2017		-240.66	982.46	-3 103.11	NA	NA	NO, NA	NA
2018		-254.53	1 015.45	-2 334.01	NA	NA	NO, NA	NA
Percentage change base year–2018					NA	NA	NA	NA

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

^a Latvia 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.

^b The value reported in this column relates to 1990.

2. Table I.5 provides an overview of key relevant data from Latvia's reporting under Article 3, paragraphs 3–4, of the Kyoto Protocol.

Table I.5

Key relevant data for Latvia under Article 3, paragraphs 3–4, of the Kyoto Protocol from its 2020 annual submission

<i>Parameter</i>	<i>Data values</i>
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	No
3.5% of total base-year GHG emissions, excluding LULUCF and including indirect CO ₂ emissions	924.317 kt CO ₂ eq (7 394.541 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	NA
2. Deforestation	NA
3. FM	NA

Annex II

Information to be included in the compilation and accounting database

Tables II.1–II.6 include the information to be included in the compilation and accounting database for Latvia. 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 2018, including on the commitment period reserve, for Latvia

(t CO₂ eq)

	<i>Original submission</i>	<i>Revised estimate</i>	<i>Adjustment</i>	<i>Final</i>
CPR	68 970 096	–	–	68 970 096
Annex A emissions				
CO ₂	7 871 093	–	–	7 871 093
CH ₄	1 733 574	–	–	1 733 574
N ₂ O	1 873 756	–	–	1 873 756
HFCs	238 512	268 096	–	268 096
PFCs	NO, NA	–	–	NO, NA
Unspecified mix of HFCs and PFCs	NO, NA	–	–	NO, NA
SF ₆	10 543	–	–	10 543
NF ₃	NO, NA	–	–	NO, NA
Total Annex A sources	11 727 478	11 757 063	–	11 757 063
Activities under Article 3, paragraph 3, of the Kyoto Protocol				
AR	–254 532	–	–	–254 532
Deforestation	1 015 446	–	–	1 015 446
FM and elected activities under Article 3, paragraph 4, of the Kyoto Protocol				
FM	–2 334 007	–	–	–2 334 007

Table II.2

Information to be included in the compilation and accounting database for 2017 for Latvia

(t CO₂ eq)

	<i>Original estimate</i>	<i>Revised estimate</i>	<i>Adjustment</i>	<i>Final value</i>
Annex A emissions				
CO ₂	7 241 912	–	–	7 241 912
CH ₄	1 813 308	–	–	1 813 308
N ₂ O	1 933 333	–	–	1 933 333
HFCs	237 082	268 406	–	268 406
PFCs	NO, NA	–	–	NO, NA
Unspecified mix of HFCs and PFCs	NO, NA	–	–	NO, NA
SF ₆	10 321	–	–	10 321
NF ₃	NO, NA	–	–	NO, NA
Total Annex A sources	11 235 957	11 267 280	–	11 267 280
Activities under Article 3, paragraph 3, of the Kyoto Protocol				
AR	–240 663	–	–	–240 663
Deforestation	982 464	–	–	982 464
FM and elected activities under Article 3, paragraph 4, of the Kyoto Protocol				
FM	–3 103 113	–	–	–3 103 113

Table II.3

Information to be included in the compilation and accounting database for 2016 for Latvia(t CO₂ eq)

	<i>Original submission</i>	<i>Revised estimate</i>	<i>Adjustment</i>	<i>Final</i>
Annex A emissions				
CO ₂	7 238 537	–	–	7 238 537
CH ₄	1 780 868	–	–	1 780 868
N ₂ O	1 916 707	–	–	1 916 707
HFCs	241 927	274 914	–	274 914
PFCs	NO, NA	–	–	NO, NA
Unspecified mix of HFCs and PFCs	NO, NA	–	–	NO, NA
SF ₆	9 891	–	–	9 891
NF ₃	NO, NA	–	–	NO, NA
Total Annex A sources	11 187 931	11 220 917	–	11 220 917
Activities under Article 3, paragraph 3, of the Kyoto Protocol				
AR	–222 730	–	–	–222 730
Deforestation	949 137	–	–	949 137
FM and elected activities under Article 3, paragraph 4, of the Kyoto Protocol				
FM	–1 866 588	–	–	–1 866 588

Table II.4

Information to be included in the compilation and accounting database for 2015 for Latvia(t CO₂ eq)

	<i>Original submission</i>	<i>Revised estimate</i>	<i>Adjustment</i>	<i>Final</i>
Annex A emissions				
CO ₂	7 289 758	–	–	7 289 758
CH ₄	1 754 997	–	–	1 754 997
N ₂ O	1 921 701	–	–	1 921 701
HFCs	219 563	254 482	–	254 482
PFCs	NO, NA	–	–	NO, NA
Unspecified mix of HFCs and PFCs	NO, NA	–	–	NO, NA
SF ₆	10 118	–	–	10 118
NF ₃	NO, NA	–	–	NO, NA
Total Annex A sources	11 196 137	11 231 056	–	11 231 056
Activities under Article 3, paragraph 3, of the Kyoto Protocol				
AR	–208 535	–	–	–208 535
Deforestation	915 916	–	–	915 916
FM and elected activities under Article 3, paragraph 4, of the Kyoto Protocol				
FM	–2 727 098	–	–	–2 727 098

Table II.5

Information to be included in the compilation and accounting database for 2014 for Latvia(t CO₂ eq)

	<i>Original submission</i>	<i>Revised estimate</i>	<i>Adjustment</i>	<i>Final</i>
Annex A emissions				
CO ₂	7 203 242	–	–	7 203 242
CH ₄	1 853 725	–	–	1 853 725
N ₂ O	1 877 416	–	–	1 877 416
HFCs	206 108	243 646	–	243 646
PFCs	NO, NA	–	–	NO, NA
Unspecified mix of HFCs and PFCs	NO, NA	–	–	NO, NA

	<i>Original submission</i>	<i>Revised estimate</i>	<i>Adjustment</i>	<i>Final</i>
SF ₆	8 578	–	–	8 578
NF ₃	NO, NA	–	–	NO, NA
Total Annex A sources	11 149 069	11 186 606	–	11 186 606
Activities under Article 3, paragraph 3, of the Kyoto Protocol				
AR	–194 099	–	–	–194 099
Deforestation	882 645	–	–	882 645
FM and elected activities under Article 3, paragraph 4, of the Kyoto Protocol				
FM	–942 538	–	–	–942 538

Table II.6

Information to be included in the compilation and accounting database for 2013 for Latvia(t CO₂ eq)

	<i>Original submission</i>	<i>Revised estimate</i>	<i>Adjustment</i>	<i>Final</i>
Annex A emissions				
CO ₂	7 397 538	–	–	7 397 538
CH ₄	1 806 239	–	–	1 806 239
N ₂ O	1 837 799	–	–	1 837 799
HFCs	191 207	229 526	–	229 526
PFCs	NO, NA	–	–	NO, NA
Unspecified mix of HFCs and PFCs	NO, NA	–	–	NO, NA
SF ₆	8 503	–	–	8 503
NF ₃	NO, NA	–	–	NO, NA
Total Annex A sources	11 241 286	11 279 605	–	11 279 605
Activities under Article 3, paragraph 3, of the Kyoto Protocol				
AR	–179 780	–	–	–179 780
Deforestation	1 125 923	–	–	1 125 923
FM and elected activities under Article 3, paragraph 4, of the Kyoto Protocol				
FM	–6 628 039	–	–	–6 628 039

Annex III

Additional information to support findings in table 2

Missing categories that may affect completeness

The categories for which estimation methods are included in the 2006 IPCC Guidelines that were reported as “NE” or for which the ERT otherwise determined that there may be an issue with the completeness of the reporting in the Party’s inventory are the following:

- (a) 2.F.1 refrigeration and air conditioning (HFCs) (see ID# I.7 in table 3);
- (b) 4.A.2 land converted to forest land (CO₂) (see ID# L.7 in table 3);
- (c) 4.B.2.2 grassland converted to cropland (CO₂) (see ID# L.10 in table 3);
- (d) 4.C.2 land converted to grassland (CO₂) (see ID# L.11 in table 3);
- (e) 4.E.2 land converted to settlements (CO₂) (see ID# L.12 in table 3);
- (f) 5.C.1 waste incineration (CH₄) (see ID# W.4 in table 3);
- (g) 5.C.2 open burning of waste (CO₂, CH₄ and N₂O) (see ID# W.5 in table 3).

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 2013, 2014, 2015, 2016 and 2018 annual submissions of Latvia, contained in documents FCCC/ARR/2013/LVA, FCCC/ARR/2014/LVA, FCCC/ARR/2015/LVA, FCCC/ARR/2016/LVA and FCCC/ARR/2018/LVA, 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/sites/default/files/resource/AGI%202020_final.pdf.

Annual status report for Latvia for 2020. Available at http://unfccc.int/sites/default/files/resource/asr2020_LVA.pdf.

C. Other documents used during the review

Responses to questions during the review were received from Agita Gancone (Ministry of Environmental Protection and Regional Development of Latvia), including additional material on the methodology and assumptions used. The references below that were received from the Party have been reproduced as received:

Engineering ToolBox, 2003. *Fuels - Higher and Lower Calorific Values*. [online]. Available at https://www.engineeringtoolbox.com/fuels-higher-calorific-values-d_169.html.

Krumsteds, L, Lazdiņš, A, Butlers, A, and Ivanovs, J., 2019a. *Recalculation of forest increment, mortality and harvest rate in Latvia according to updated land use data*. Rural Development 2019, (1), 295–299. Available at <https://doi.org/10.15544/RD.2019.037>.

Krumsteds, L. L., Ivanovs, J., Jansons, J., and Lazdiņš, A., 2019b. *Development of Latvian land use and land use change matrix using geospatial data of National forest inventory*. Agronomy Research, 17. Available at <https://doi.org/10.15159/AR.19.195>.

Lazdiņš, A., Lazdiņa, D., 2013. *Greenhouse gas emissions in Latvia due to incineration of harvesting residues and forest fires*.

Lupiķis A., Lazdiņš A., 2017. *Soil carbon stock changes in transitional mire drained for forestry in Latvia: A case study*. Proceedings of 23rd Annual International Scientific Conference “Research for Rural Development 2017”, pp.55–61, DOI: 10.22616/rrd.23.2017.008.

Natural gas parameters measured by the Latvian gas company Conexus Baltic Grid. Available at <https://capacity.conexus.lv/?id=122&lang=eng>.

Petaja, G., Okmanis, M., Polmanis, K., Stola, J., Spalva, G., Jansons, J., 2018. *Evaluation of greenhouse gas emissions and area of organic soils in cropland and grassland in Latvia – integrated National Forest Inventory data and soil maps approach*. Available at <https://doi.org/10/gd23x5>.

Priekulis, J., Abolciņš, A., 2015. *Calculation methodology for cattle manure management systems based on the 2006 IPCC Guidelines*. Proceedings of the 25th NJF Congress “Nordic View to Sustainable Rural Development”. Riga, pp.274–280.

Priekulis, J., Abolciņš, A., Laurs, A. and Melece, L., 2018. *Farm manure amount calculation using statistical data in Latvia*. Agronomy Research 16(4), 1830–1836, 2018).

Sudars, R., Berzina, L., Grinberga, L., 2016. *Analysis of agricultural run-off monitoring program results for estimation of nitrous oxide indirect emissions in Latvia*. Engineering for rural development. Jelgava. Available at <http://tf.llu.lv/conference/proceedings2016/Papers/N198.pdf>.
