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Report on the individual review of the annual submission of Bulgaria 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 Bulgaria, 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 26 to 31 October 2020 remotely.

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* 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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Contents

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"
BOD	biological oxygen demand
C	carbon
CaO	calcium oxide
CER	certified emission reduction
CH_4	methane
CKD	cement kiln dust
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"
COPERT	software tool for calculating road transport emissions
CO_2	carbon dioxide
CO_2 eq	carbon dioxide equivalent
CPR	commitment period reserve
CRF	common reporting format
CSC	carbon stock change
DE	digestible energy
DOC	degradable organic carbon
EEA	European Environment Agency
EF	emission factor
EMEP	Cooperative Programme for Monitoring and Evaluation of the Long-range Transmission of Air Pollutants in Europe
EMEP/EEA guidebook	*EMEP/EEA air pollutant emission inventory guidebook*
ERT	expert review team
ERU	emission reduction unit
EU	European Union
EU ETS	European Union Emissions Trading System
Eurostat	statistical office of the European Union
FM	forest management
FMRL	forest management reference level
$Frac_{GASF}$	fraction of synthetic nitrogen fertilizer applied to soils that volatilizes as nitrogen oxides and ammonia
GE	gross energy intake
GHG	greenhouse gas
GM	grazing land management
HFC	hydrofluorocarbon
HWP	harvested wood products
IE	included elsewhere
IEF	implied emission factor
IPCC	Intergovernmental Panel on Climate Change
IPPU	industrial processes and product use
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
Kyoto Protocol Supplement	*2013 Revised Supplementary Methods and Good Practice Guidance Arising from the Kyoto Protocol*
LULUCF	land use, land-use change and forestry
MCF	methane conversion factor
MgO	magnesium oxide
MMS	manure management system(s)
MSW	municipal solid waste
N	nitrogen
NA	not applicable
NE	not estimated
Nex	nitrogen excretion
NF_3	nitrogen trifluoride
NIR	national inventory report
NO	not occurring
N_2O	nitrous oxide
PFC	perfluorocarbon
QA/QC	quality assurance/quality control
RMU	removal unit
RV	revegetation
SF_6	sulfur hexafluoride
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"
VS	volatile solid(s)
WDR	wetland drainage and rewetting
Wetlands Supplement	*2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands*
2006 IPCC Guidelines	*2006 IPCC Guidelines for National Greenhouse Gas Inventories*
2019 Refinement to the 2006 IPCC Guidelines	*2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories*

I. Introduction

1.   This report covers the review of the 2020 annual submission of Bulgaria, 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 26 to 31 October 2020 remotely[1] and was coordinated by Claudia do Valle, Lisa Hanle and Javier Hanna (secretariat). Table 1 provides information on the composition of the ERT that conducted the review for Bulgaria.

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

Area of expertise	Name	Party
Generalist	Tomas Gustafsson	Sweden
	David Kuntze	Germany
Energy	Giorgi Machavariani	Georgia
	Yves Marenne	Belgium
	Takashi Morimoto	Japan
IPPU	Kristina Gonchar	Belarus
	Valentina Idrissova	Kazakhstan
	Kakhaberi Mdivani	Georgia
Agriculture	Shaidatul Azdawiyah Abdul Talib	Malaysia
	Braulio Pikman	Brazil
	Janka Szemesova	Slovakia
LULUCF and KP-LULUCF	Markus Didion	Switzerland
	Eray Özdemir	Turkey
	Iordanis Tzamtzis	Greece
	Marina Vitullo	Italy
Waste	Fatma Betül Demirok	Turkey
	Erick Wamalwa Masafu	Kenya
	Hans Oonk	Netherlands
Lead reviewers	Fatma Betül Demirok	
	David Kuntze	

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 Bulgaria resolve identified findings, including issues[2] designated as problems.[3] Other findings, and, if applicable, the encouragements of the ERT to Bulgaria to resolve related issues, are also included.

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[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.

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

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

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

II.   Summary and general assessment of the Party's 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 Bulgaria

Assessment		*Issue/problem ID#(s) in table 3 or 5[a]*	
Date of submission	Original submission: NIR, 15 April 2020; CRF tables (version 1), 15 April 2020; standard electronic format tables, 15 April 2020		
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?	No	
	(b) Selection and use of methodologies and assumptions?	Yes	L.1, L.3, L.4, L.7, L.8, L.14
	(c) Development and selection of EFs?	Yes	E.5, E.6, E.8, A.14, L.5
	(d) Collection and selection of AD?	Yes	E.7, I.3, L.2, W.8
	(e) Reporting of recalculations?	Yes	E.13
	(f) Reporting of a consistent time series?	Yes	L.15
	(g) Reporting of uncertainties, including methodologies?	Yes	G.10
	(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.12, A.22, L.11, KL.14
	(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?		The Party did not report any insignificant categories as "NE"
Description of trends	Did the ERT conclude that the description in the NIR of the trends for the different gases and sectors is reasonable?	Yes	
	Have any issues been identified related to the following aspects of the national system:		

Assessment			Issue/problem ID#(s) in table 3 or 5[a]
Supplementary information under the Kyoto Protocol	(a) Overall organization of the national system, including the effectiveness and reliability of the institutional, procedural and legal arrangements?	No	
	(b) Performance of the national system functions?	Yes	G.8
	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?	Yes	G.1
	Have any issues been identified related to the following reporting requirements for KP-LULUCF:		
	(a) Reporting requirements of decision 2/CMP.8, annex II, paragraphs 1–5?	Yes	KL.2
	(b) Demonstration of methodological consistency between the reference level and reporting on FM in accordance with decision 2/CMP.7, annex, paragraph 14?	Yes	KL.6, KL.9, KL.16
	(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?	Yes	KL.1, KL.8
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?	No	G.12
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?	No	
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	
Question 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 18 September 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 Bulgaria'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 Bulgaria

ID#	Issue/problem classification[a, b]	Recommendation made in previous review report	ERT assessment and rationale
General			
G.1	Article 3, paragraph 14, of the Kyoto Protocol (G.4, 2018) KP reporting adherence	Provide information on any changes in the Party's reporting of the minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol.	Not resolved. The information reported in the 2020 NIR related to Article 3, paragraph 14, of the Kyoto Protocol is the same as in the 2019 NIR. During the review, the Party clarified that there were no changes in its reporting of the minimization of adverse impacts. However, this information was not included in the NIR. The Party informed the ERT that it will include in its next submission explicit information on changes in its reporting of the minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol.
G.2	CRF tables (G.5, 2018) Comparability	Complete CRF table 9 (information on notation keys) using CRF Reporter.	Not resolved. Bulgaria did not provide information on notation keys in CRF table 9. During the review, the Party explained that CRF table 9 is empty because of difficulties with filling in CRF Reporter.
G.3	CRF tables (G.6, 2018) Comparability	Fill in information for all entries in CRF table 6.	Resolved. Bulgaria reported information for all entries in CRF table 6 (indirect emissions of N_2O and CO_2).
G.4	Key category analysis (G.7, 2018) Convention reporting adherence	Include in the NIR the summary table for key categories identified for the latest reported year (by level and trend) (e.g. in section 1.5 of the NIR).	Addressing. Bulgaria did not include in the NIR the summary table for key categories identified for the latest reported year. However, during the review, the Party provided the ERT with the summary table and explained that it will be included in the next NIR.
G.5	NIR (G.2, 2018) (G.5, 2016) (G.5, 2015) Transparency	Include all references and sources of information used in the NIR, in line with decision 24/CP.19, annex I, paragraph 50.	Not resolved. Bulgaria did not include in a separate chapter all references and sources of information used in the NIR. During the review, the Party clarified that it will include the references for each sector in its next submission.

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[4] FCCC/ARR/2018/BGR. The ERT notes that the report on the individual inventory review of Bulgaria'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.

ID#	Issue/problem classification[a, b]	Recommendation made in previous review report	ERT assessment and rationale
G.6	QA/QC and verification (G.3, 2018) (G.4, 2016) (G.4, 2015) Transparency	Clearly indicate in chapter 1 of the NIR that category-specific QA/QC checks are applied for all categories of the inventory and discuss in the corresponding sectoral chapters only the additional QA/QC checks that are done for certain categories.	Addressing. Bulgaria indicated in the NIR (section 1.3.1, pp.39–46) that category-specific QA/QC checks are applied for all categories of the inventory. However, the ERT noted that, for certain categories (e.g. fugitive emissions from fuels, rice cultivation, agricultural soils, biological treatment of solid waste and waste incineration), the NIR contains circular references for specific QA/QC checks. In the corresponding sections of the sectoral chapters, the reader is referred to the section in chapter 1 of the NIR that addresses general quality management; however, category-specific QA/QC checks are not discussed in that section. During the review, the Party clarified that it will clearly discuss in the corresponding sectoral chapters of its next submission only the additional QA/QC checks that are done for certain categories.
G.7	QA/QC and verification (G.8, 2018) Convention reporting adherence	Revise the checklist for QC activities and strengthen QA/QC procedures to avoid inconsistencies between the NIR and CRF tables.	Addressing. Bulgaria provided during the review an updated QA checklist that included a QC activity to check consistency between the CRF tables and the NIR. However, several inconsistencies between the NIR and the CRF tables remain and QA/QC procedures should be strengthened to minimize them (see also ID#s G.8 and G.9 below).
G.8	QA/QC and verification (G.8, 2018) Convention reporting adherence	Allocate sufficient time and human resources to the final stages of the inventory compilation process in which cross-sectoral work occurs in order to enhance its QC procedures (so that inconsistencies are avoided).	Not resolved. The ERT noted several inconsistencies between the NIR and the CRF tables, for example under sectoral total emissions in NIR table 199 (pp.295–296) and CRF summary table 2. For wetlands, there are inconsistencies between NIR tables 222 and 223 (p.356) and CRF tables 4.1 and 4.D, respectively; for settlements, the areas reported in NIR table 225 (p.359) are not fully consistent with those reported in CRF table 4.E; and the emission values in NIR table 226 (pp.359–360) are entirely different from those in CRF table 4.E. In addition, the CO_2 emissions from waste incineration reported in the NIR (p.368) and in NIR table 244 (p.384) are different from those reported in CRF tables 5 and 5.C, respectively. Furthermore, there are other inconsistencies between the NIR and the CRF tables in the sectoral part of this report. Therefore, the ERT concluded that allocation of sufficient human resources to enhance QC procedures is still pending (see also ID#s G.7 above and G.9 below).
G.9	QA/QC and verification (G.8, 2018) Convention reporting adherence	Document in the NIR any updated QA/QC procedures implemented to avoid inconsistencies between the NIR and CRF tables.	Not resolved. Bulgaria did not include updated information in the NIR on QA/QC procedures implemented to avoid inconsistencies between the NIR and the CRF tables (see also ID#s G.7 and G.8 above).
G.10	Uncertainty analysis (G.9, 2018) Transparency	Explain the reasons for the difference in the calculated uncertainty estimates between submissions.	Not resolved. Bulgaria did not provide any explanation in the NIR of the reasons for the increase in the uncertainty estimates in the 2020 NIR compared with the 2019 NIR. The ERT noted large differences in the uncertainty reported in NIR table 11 (p.51) between the 2019 and 2020 submissions for total GHG emissions (14.51 per cent in the 2019 NIR and 17.33 per cent in the 2020 NIR). This change appeared to be largely attributable to an increase in the EF uncertainty value for category 3.D.1 (direct N_2O emissions from managed soils), from 200 per cent in the 2019 NIR to 250 per cent in the 2020 NIR. During the review, the Party explained that the

ID#	Issue/problem classification[a, b]	Recommendation made in previous review report	ERT assessment and rationale
			uncertainty of 200 per cent in the 2019 NIR was due to a delay in the regular update of the uncertainty in the inventory.
G.11	Uncertainty analysis (G.10, 2018) Convention reporting adherence	Include the quantitative uncertainty assessment for the base year for all source and sink categories in the NIR.	Resolved. Bulgaria reported in its NIR (pp.467–480) the quantitative uncertainty assessment for the base year for all source and sink categories.

Energy

E.1	1.A Fuel combustion – sectoral approach – liquid fuels – CO_2, CH_4 and N_2O (E.14, 2018) Accuracy	Provide evidence – in the form of references to reports, publications or reference material – that the calorific values were accurately determined by Lukoil Neftohim oil refinery or use the same value of 46 MJ/kg for the years 2004–2006 instead of the values shown in the national energy balance.	Resolved. Bulgaria applied the same net calorific value for liquefied petroleum gas (46 MJ/kg) for 2004–2006 instead of the values showed in the national energy balance.
E.2	1.A.1.b Petroleum refining – liquid fuels – CO_2, CH_4 and N_2O (E.3, 2018) (E.8, 2016) (E.8, 2015) Comparability	Reallocate emissions from the use of refinery fuels to restore a catalyst under category 1.B.2.a.4 fugitive emissions – oil – refining/storage, as this combustion is performed only to restore the catalyst's activity and not for energy purposes.	Resolved. Bulgaria recalculated emissions for 2009–2018 and reallocated CO_2, CH_4 and N_2O emissions from petroleum coke combusted to restore the catalyst's activity from category 1.A.1.b (petroleum refining) to category 1.B.2.a.iv (oil – refining/storage). The ERT verified the recalculation and confirmed the reallocation (see also NIR sections 3.3.10.2.1, p.91; and 3.4.6, p.150). During the review, the Party explained that no recalculation was performed for before 2009 because the use of refinery fuel started in 2009.
E.3	1.A.1.b Petroleum refining – natural gas – CO_2 (E.4, 2018) (E.9, 2016) (E.9, 2015) Comparability	Collect relevant AD related to the energy and non-energy use of natural gas and report accordingly CO_2 emissions from hydrogen production under subcategory 1.B.2.c.ii venting/gas, ensuring that the feedstock for the hydrogen plant is not also reported as fuel.	Resolved. Bulgaria recalculated emissions for 1992–2018 and reallocated CO_2 emissions from hydrogen production from category 1.A.1.b (petroleum refining, gaseous fuels) to category 1.B.2.c.2.i (flaring/oil). The ERT verified the recalculations and confirmed the reallocation (see also NIR sections 3.3.10.2.1, p.91; and 3.4.6, p.150). Bulgaria explained during the review that emissions for 1988–1991 were not recalculated because gaseous fuels were not used for hydrogen production before 1992.
E.4	1.A.1.c Manufacture of solid fuels and other energy industries – liquid and solid fuels – CO_2, CH_4 and N_2O (E.15, 2018) Comparability	Report emissions from fuel combusted during coal mining operations under category 1.A.1.c.iii in line with the 2006 IPCC Guidelines (chap. 2, table 2.1).	Addressing. Bulgaria reported AD and emissions for fuel combusted during coal mining operations (liquid and solid fuels) under category 1.A.1.c.iii (other energy industries), but for 2017–2018 only. The AD and emissions for the other years of the time series were not reallocated and are still reported under category 1.A.1.c.i (manufacture of solid fuels). During the review, the Party explained that, owing to an error in the calculation files, the reallocation was not performed for the entire time series and that it will implement it for the next submission.
E.5	1.A.3.b Road transportation – liquid fuels – CO_2	Conduct a tier 2 estimation of CO_2 emissions from gasoline using country-specific EFs (CO_2 emission estimates resulting from the COPERT	Not resolved. Bulgaria did not apply a tier 2 method to estimate CO_2 emissions from gasoline using a country-specific EF. During the review, Bulgaria explained that it had undertaken several discussions on the topic with Bulgaria's single fuel producer

ID#	Issue/problem classification[a, b]	Recommendation made in previous review report	ERT assessment and rationale
	(E.5, 2018) (E.3, 2016) (E.3, 2015) (E.28, 2014) Accuracy	model may serve to cross-check the tier 2 estimates).	but still did not obtain any further information (because there is no legal requirement for a fuel producer to measure the carbon content of produced fuels). As reported in the NIR (p.128), for 1988–2003, the Party applied the default CO_2 EF from the 2006 IPCC Guidelines (69.30 t/TJ) and, for 2004–2018, EFs derived from the COPERT model, ranging from 71.49 to 71.78 t/TJ (see also ID# E.6 below).
E.6	1.A.3.b Road transportation – liquid fuels – CO_2 (E.6, 2018) (E.10, 2016) (E.10, 2015) Accuracy	Provide CO_2 emission estimates in accordance with the 2006 IPCC Guidelines by using country-specific EFs for the used liquid fuels, as category 1.A.3.b (road transportation) is a key category for CO_2 emissions.	Not resolved. Bulgaria did not provide estimated CO_2 emissions for liquid fuels using a country-specific EF. The Party explained in its NIR (section 3.3.12.3.9, p.128) the challenges in deriving country-specific EFs for liquid fuels: that the only fuel producer in Bulgaria does not have any relevant data on the carbon content of fuels produced; that 50 per cent of the liquid fuel consumed for road transportation is imported from neighbouring countries; and that testing fuel samples from gas stations to obtain fuel carbon content would not work because the fuels sold include biomass. The ERT noted that Bulgaria plans to update its calculation methodology for CO_2 emissions once country-specific CO_2 EFs are available.
E.7	1.B.1.a Coal mining and handling – CH_4 (E.8, 2018) (E.12, 2016) (E.12, 2015) Accuracy	Clarify which type of coal was used as AD for the estimates across the time series and, if the Party used the amount of saleable coal as AD, estimate the fugitive emissions from mining activities by using the entire quantity of raw coal material, in accordance with the 2006 IPCC Guidelines.	Addressing. Bulgaria explained in its NIR (section 3.4.6, p.150) that it had contacted several of the largest mines in the country in order to investigate whether there is a difference between the mined raw coal and the saleable coal; and it was confirmed that lignite – the main type of coal produced in Bulgaria – is not currently upgraded. During the review, the Party clarified that it contacted former experts, who explained that there were some coal upgrade facilities in the past, which were closed more than a decade ago. The Party also confirmed that it has contacted the Ministry of Energy in order to obtain past data provided by coal mining companies in Bulgaria for the beginning of the time series, but such data were not available for such a distant period in the past. The Party considered that, since coal had once been upgraded in the country, emissions were underestimated for the base year, but not for the later years of the time series, when the amount of raw coal was equal to the amount of saleable coal in the national data. During the review, the Party also clarified that a study on the status of coal mines had not been able to obtain historical information on the subject.
E.8	1.B.1.a Coal mining and handling – solid fuels – CH_4 (E.9, 2018) (E.4, 2016) (E.4, 2015) (E.30, 2014) Accuracy	Develop a country-specific EF for fugitive CH_4 emissions from underground coal mining and handling to enable a higher-tier method to be applied for this category.	Addressing. Bulgaria developed a country-specific CH_4 EF for category 1.B.1.a.i.3 (abandoned underground mines) and reported recalculated emissions in the 2020 submission (see ID# E.9 below). For categories 1.B.1.a.i.1 (mining activities) and 1.B.1.a.i.2 (post-mining activities), the Party reported having applied the default CH_4 EFs from the 2019 Refinement to the 2006 IPCC Guidelines, which are identical to those from the 2006 IPCC Guidelines (mining: 18 m^3/t; post-mining: 2.5 m^3/t), although this category is identified as a key category. The ERT considers that the Party's use of default EFs is not in accordance with the fact that this is a key category. During the review, Bulgaria indicated that it could not obtain data to generate country-specific CH_4 EFs for mining and post-mining activities from the

ID#	Issue/problem classification[a, b]	Recommendation made in previous review report	ERT assessment and rationale
			results of the nationwide study implemented in 2018–2019 and that there had been no active underground coal mines in Bulgaria since 2019.
E.9	1.B.1.a Coal mining and handling – solid fuels – CH_4 (E.10, 2018) (E.13, 2016) (E.13, 2015) Accuracy	Collect the relevant AD and estimate relevant GHG emissions depending on recovery practices from abandoned underground mines in accordance with the 2006 IPCC Guidelines. If the closed mines were not emitting CH_4, provide adequate evidence in the NIR.	Resolved. In its 2020 submission, Bulgaria reported revised CH_4 emissions from abandoned underground mines under category 1.B.1.a (coal mining and handling) using a tier 3 methodology for the first time in response to the recommendation made by the ERT. The Party explained in the NIR (p.145) that it had collected detailed information on the past and current state of all abandoned mines – such as type, depth, historical quantities of coal mined, year of closure and average emission rate.
E.10	1.B.2.a Oil – liquid fuels – CO_2 and CH_4 (E.11, 2018) (E.14, 2016) (E.14, 2015) Convention reporting adherence	Ensure consistency between the AD on exploration and production of oil reported in the NIR and the CRF tables.	Not resolved. Bulgaria continued to report in the NIR (table 106, pp.146–147), under category 1.B.2.a (oil), that the AD for oil exploration and production are confidential, although it reported such AD in CRF table 1.B.2. During the review, the Party explained that it had provided the AD in the CRF table to increase the transparency of the inventory and support the review process and had reported them as confidential in the NIR in response to a historical request by the National Statistical Institute, since there were only two operators in the field of oil exploration and production. The Party clarified that it will revisit this issue with the National Statistical Institute, particularly as the data were publicly available from other official sources. According to the Party, the preferred solution would be to mark the data as non-confidential in the next NIR.
IPPU			
I.1	2.A.1 Cement production – CO_2 (I.4, 2018) (I.14, 2016) (I.14, 2015) Accuracy	Further investigate the technology used in the closed and existing plants regarding CKD, apply an appropriate CKD correction factor for each plant (keeping in mind time-series consistency) and provide a justification for the used values in the NIR.	Resolved. Bulgaria investigated the technology used in cement plants and recalculated emissions for 1988–2008 applying a CKD correction factor of 1.02 (see NIR section 4.2.1.6, p.161). For 2009 onward, the Party continued to apply the same CKD correction factor, as in previous submissions, of 1.00 (on the basis of data from the EU ETS), justifying its use by referring to the modern status of cement plants, which recycle 100 per cent of the CKD as a raw material (see NIR section 4.2.1.3.1, p.160).
I.2	2.A.1 Cement production – CO_2 (I.5, 2018) (I.13, 2016) (I.13, 2015) Transparency	Provide in the NIR information that is consistent with the data used for the emission estimates (in chap. 4.2.1.7 of the NIR, Bulgaria reported that an average percentage of CaO and MgO content for 2000–2009 was used in emission calculations for 2010–2014, while in section 4.2.1.3.2 it stated that CO_2 emissions for 2014 were taken from EU ETS operators' annual emissions reports).	Resolved. Bulgaria collected data on CaO and MgO content in clinker and, as noted during the 2018 review cycle, it is no longer using an average percentage of CaO and MgO content for 2000–2009 to calculate CaO and MgO content in clinker for 2010 onward. The Party provided consistent information and reported in its 2020 NIR (section 4.2.1.3.2, p.160) that emission estimates for 2018 were taken from EU ETS data, and, in the NIR (section 4.2.1.6, p.162), noted that recalculations of CaO and MgO content in clinker were performed on the basis of data from operators for 2016–2017.
I.3	2.B.1 Ammonia production – CO_2 (I.10, 2018) (I.18, 2016)	Further investigate the use of produced urea in order to ensure that emissions from all sources of urea use are estimated and reported under the	Addressing. The NIR does not include information on investigating the use of produced urea or on current practices, nor an adequate explanation of how urea was used in the other sectors. However, in response to a recommendation from the

ID#	Issue/problem classification[a, b]	Recommendation made in previous review report	ERT assessment and rationale
	(I.18, 2015) Accuracy	respective sectors of the inventory and provide this information in the NIR.	previous review report, the Party explained that urea production in the country stopped in 2003, that it was intended for export, and that the only use of urea was as a fertilizer in agriculture and reported accordingly. Regarding current practices, Bulgaria had clarified during the previous review that urea had not been used in denitrification plants before 2012 and had been used in transport since the introduction of EU emission standards for heavy-duty vehicles in 2009; and that there was no evidence that urea had been used in the pharmaceutical and cosmetic industries in the country. During the current review, the Party explained that all known sources of urea use were reported in the inventory, but that it will continue to search for other sources in the sector. The ERT considers that the explanation provided by the Party is a good overview of the sources of urea use estimated in the inventory; however, none of these explanations were reported in the NIR (see also ID#s I.5, I.6 and I.7 below).
I.4	2.B.1 Ammonia production – CO_2 (I.12, 2018) (I.6, 2016) (I.6, 2015) (39, 2014) (44, 2013) Transparency	Clearly explain in the NIR the source of the equation used for the CO_2 emission estimate.	Resolved. Bulgaria clearly explained in its NIR (p.179) the source of the equation used for the CO_2 emission estimates and provided a clear reference to the 2006 IPCC Guidelines (vol. 3, chap. 3, equation 3.2).
I.5	2.B.1 Ammonia production – CO_2 (I.12, 2018) (I.6, 2016) (I.6, 2015) (39, 2014) (44, 2013) Transparency	Clearly report how emissions of CO_2 recovered for use in urea production are accounted for in the inventory.	Not resolved. Bulgaria did not report in the NIR how CO_2 emissions recovered for use in urea production were accounted for in its inventory (see ID# I.3 above).
I.6	2.B.1 Ammonia production – CO_2 (I.26, 2018) Transparency	Include the years of urea production (1988–2003) in NIR table 119 for clarity.	Addressing. Bulgaria did not update NIR table 119 (p.181) to include all years of urea production (1988–2003) for confidentiality reasons. However, the ERT considers that, as urea production stopped in 2003 and there were several production plants, the aggregated values could be reported without compromising confidentiality.
I.7	2.B.1 Ammonia production – CO_2 (I.26, 2018) Transparency	Include more detailed information regarding the CO_2 emissions from ammonia production used to produce urea, to facilitate a better understanding of the emissions.	Not resolved. Bulgaria did not include more detailed information regarding CO_2 emissions from ammonia production used to produce urea (see ID#s I.3, I.5 and I.6 above). The ERT considers that additional information would significantly improve the transparency of the reporting. In particular, NIR section 4.3.1 on ammonia production lacks a description of the industry in Bulgaria (i.e. whether all plants produced urea until 2003). The limited information provided in the NIR (section 4.3.1.2) on emission trends does not aid understanding of the industry's development or justify the confidentiality rules applied by the Party. NIR section 4.3.1.1 provides only a general explanation of the industry and the production process (although the

ID#	Issue/problem classification[a, b]	Recommendation made in previous review report	ERT assessment and rationale
			ERT notes that some further detail on urea production is provided in sections 4.3.2.1 and 4.3.2.2 on nitric acid production).
I.8	2.B.1 Ammonia production – CO_2 (I.26, 2018) Transparency	Ensure that the title of the relevant chart in the NIR (figure 60, p.186) is correct.	Not resolved. Bulgaria did not correct the title of the chart (figure 61, p.179) to reflect that only CO_2 emissions are reported in the chart. The Party still refers to ammonia production in the title of figure 61.
I.9	2.B.8 Petrochemical and carbon black production – CO_2 and CH_4 (I.27, 2018) Transparency	State in the NIR (section 4.3.8) that vinyl chloride production is not occurring.	Not resolved. Bulgaria did not report this information in the NIR. During the review, the Party confirmed that vinyl chloride production was not occurring.
I.10	2.B.8 Petrochemical and carbon black production – CO_2 and CH_4 (I.28, 2018) Convention reporting adherence	Revise the text in the NIR to avoid reporting that emissions from ethylene and ethylene dichloride production had been included in the reporting for the first time.	Resolved. Bulgaria no longer states in the NIR (section 4.3.8.1, p.193) that ethylene and ethylene dichloride production were included in the reporting for the first time.
I.11	2.D.3 Other (non-energy products from fuels and solvent use) – CO_2 (I.29, 2018) Accuracy	Use the method set out in the 2006 IPCC Guidelines to estimate CO_2 emissions from the road-transport use of urea-based additives in catalytic converters under category 2.D.3.d and justify any differences between the two methods in the NIR.	Resolved. Bulgaria reported in the NIR (section 4.5.3.3, p.217) that it applied the methodology from the EMEP/EEA guidebook 2013 (part B, chap. 1.A.3.b.i–iv, p.48), which is consistent with that provided in the 2006 IPCC Guidelines, to estimate CO_2 emissions from the road-transport use of urea-based additives in catalytic converters under category 2.D.3.d (other chemical products). During the review, the Party also confirmed that equation 3.2.2 from the 2006 IPCC Guidelines (vol. 2, chap. 3) was used to estimate these emissions.
I.12	2.D.3 Other (non-energy products from fuels and solvent use) – CO_2 (I.29, 2018) Completeness	Include emissions from urea-based selective catalytic reduction systems in off-road machinery for the entire time series.	Not resolved. Bulgaria did not include emissions from urea-based selective catalytic reduction systems in off-road machinery under category 2.D.3.d (other chemical products). During the review, the Party explained that, according to expert judgment, urea used in off-road machinery was not reported because it was below the threshold of significance set out in paragraph 37(b) of the UNFCCC Annex I inventory reporting guidelines. However, paragraph 37(b) provides for the exclusion of emissions at the category level only, and not for sources and activities that are part of a category. Noting that the NIR (section 4.5.3.2, p.217,) provides CO_2 emissions from urea-based selective catalytic reduction systems on the basis of total urea use in catalytic converters for the entire time series, the ERT considers that the Party could check whether this amount includes urea use in off-road machinery.
I.13	2.D.3 Other (non-energy products from fuels and solvent use) – CO_2	Clearly document in the NIR the methods used to calculate emissions from paint application, degreasing and dry cleaning and chemical	Not resolved. Bulgaria did not include in the NIR any information on how the EF of 0.013286 kt CO_2/1,000 people is applied (i.e. applied to all categories in which solvents were used) and did not clarify that emissions from other product use, printing and domestic solvent use were subtracted from the resulting emissions. The

ID#	Issue/problem classification[a, b]	Recommendation made in previous review report	ERT assessment and rationale
(I.30, 2018) Transparency		products and show all numeric calculations for all years (e.g. in tabular format).	Party did not provide a table showing the numerical values of the calculation method applied for all years of the time series and the resulting emissions.

Agriculture

ID#	Issue/problem classification[a, b]	Recommendation made in previous review report	ERT assessment and rationale
A.1	3. General (agriculture) (A.4, 2018) (A.9, 2016) (A.9, 2015) Transparency	Provide information in the NIR on how AD such as livestock population, milk production, crop production and synthetic fertilizer consumption, for 1988 to the latest year available, are collected and regulated in Bulgaria's agricultural statistics.	Resolved. Bulgaria provided information in its NIR on how AD are collected and regulated in Bulgaria's agricultural statistics for livestock population and milk production (section 5.4.2.3.1, pp.264–265), crop production (section 5.7.2.3, p.288) and synthetic fertilizers (section 5.7.2.3, p.287).
A.2	3. General (agriculture) (A.5, 2018) (A.10, 2016) (A.10, 2015) Transparency	Report in the NIR AD for synthetic fertilizer use for the entire time series.	Resolved. Bulgaria included in NIR table 190 (p.288) AD for synthetic fertilizer use for the relevant years of the time series. Data for the entire time series are given in CRF table 3.D under category 3.D.1.1 (inorganic fertilizers).
A.3	3. General (agriculture) (A.5, 2018) (A.10, 2016) (A.10, 2015) Transparency	Clearly indicate the source of AD for synthetic fertilizer and clarify the differences between national and international sources regarding synthetic fertilizer use.	Resolved. Bulgaria indicated in its NIR (section 5.7.2.3, p.287) that the sources of data for synthetic fertilizers for 1988–2016 were the Bulgarian Food Safety Agency and the National Service for Plant Protection and that since 2017 the data are provided by the Ministry of Agriculture, Food and Forestry. During the review, the Party clarified that the Bulgarian Food Safety Agency and the National Service for Plant Protection are two different institutions (secondary bodies) under the Ministry of Agriculture, Food and Forestry. The Party further clarified in the NIR that it did not use data presented by the FAO database because "FAO data is obtained as balance".
A.4	3. General (agriculture) – CO_2, CH_4 and N_2O (A.24, 2018) Convention reporting adherence	Improve the QA/QC procedures to be applied to resolve inconsistencies within the NIR and between the NIR and the CRF tables regarding total N_2O emissions and total CO_2 eq emissions from the agriculture sector.	Addressing. Bulgaria corrected NIR table 154 (p.256) and total GHG emissions from the agriculture sector were reported consistently between the NIR and CRF table 10s1. In addition, N_2O emissions for 1988–2016 and 2018 were corrected in NIR table 153 (p.255). However, a small inconsistency remains for 2017: namely, a value of 16.02 Gg N_2O was given in the NIR and 16.01 kt N_2O in CRF table 10s4.
A.5	3. General (agriculture) – CO_2, CH_4 and N_2O (A.26, 2018) Convention reporting adherence	Address inconsistencies between NIR tables 169 and 183 on the swine population and between the NIR and the CRF tables.	Addressing. Bulgaria corrected the data in NIR table 179 (p.279) on the population size of pigs greater than 100 kg and boars for 2016 (from 25,347 to 26,347 head), making the total swine population consistent for that year in NIR tables 179 and 165 (p.266) and CRF table 3.B(b). However, inconsistencies remain among the NIR tables and CRF table 3.B(b) for 2017 and 2018. For 2017 CRF table 3.B(b) and NIR table 165 show a total swine population of 604,790 head while NIR table 179 shows a total of 604,922 head. For 2018 CRF table 3.B(b) and NIR table 165 show a total swine population of 623,854 head while NIR table 179 shows a total of 623,856 head.
A.6	3.A.4 Other livestock – CH_4	Document and justify the recommended approach from the 2006 IPCC Guidelines (i.e.	Resolved. Bulgaria included a footnote to NIR table 163 (section 5.4.2.2, p.264) explaining that the default EF (65.67 kg CH_4/head/year) was estimated taking into

ID#	Issue/problem classification[a, b]	Recommendation made in previous review report	ERT assessment and rationale
	(A.10, 2018) (A.15, 2016) (A.15, 2015) Transparency	multiplying the default EF of reference by $(380/300)^{0.75}$).	account the average country-specific animal weight (380 kg) and multiplying the default EF of reference (55 kg CH_4/head/year) by $(380/300)^{0.75}$ in accordance with table 10.10 of the 2006 IPCC Guidelines (vol. 4, chap. 10.3.2, p.10.28).
A.7	3.B Manure management – CH_4 (A.13, 2018) (A.16, 2016) (A.16, 2015) Transparency	Provide information on all parameters used for estimating CH_4 emissions (manure management) from sheep and poultry in the NIR and justify why the EF values deviate from the default values in the 2006 IPCC Guidelines.	Resolved. Bulgaria reported in its NIR (section 5.5.2.1, pp.273–274) that it used a tier 2 method to estimate CH_4 emissions from sheep and poultry. The Party also explained in the NIR the parameters used for estimating CH_4 emissions for sheep and poultry, including the country-specific MCF values for poultry (table 173, p.274), for which waste management was distributed equally between dry lot and solid storage (50 per cent for each).
A.8	3.B Manure management – CH_4 (A.27, 2018) Transparency	Provide in the NIR justification of the specific temperature value chosen (12 °C), especially if the source of the information is available only in Bulgarian, in order to improve transparency.	Not resolved. Bulgaria did not provide justification in the NIR for the specific temperature value chosen (12 °C). As the report provided by the Party during the previous review was in Bulgarian only (see http://eea.government.bg/bg/soer/2017/climate/climate0), the Party should explain in the NIR (in English) how the temperature of 12 °C applies to the climate circumstances of Bulgaria. The ERT checked the information in the link above, and it states that an average annual temperature of 12.3 °C in 2017 for Bulgaria is among the 15 warmest years for 1988–2017. The temperature for 1988–2017 can range from 10.6 to 13.0 °C, with an average value of 12 °C. According to the World Meteorological Organization, the average annual temperature for Bulgaria ranges from 10.1 to 12.1 °C. During the review, the Party clarified that this recommendation will be addressed in the next submission.
A.9	3.B Manure management – N_2O (A.28, 2018) Transparency	Explain in the NIR how the N_2O IEF for poultry is calculated, the sources of parameters chosen for maximum theoretical methane-producing capacity and volatile solids and the MMS distribution chosen.	Not resolved. Bulgaria did not include an explanation in the NIR (section 5.5.2.1, p.273) on how the N_2O IEF for poultry was calculated, the sources of parameters chosen for maximum theoretical methane-producing capacity and volatile solids and the MMS distribution chosen. During the review, the Party clarified that it will include such data in its next submission.
A.10	3.B.1 Cattle – CH_4 (A.18, 2018) (A.18, 2016) (A.18, 2015) Transparency	Document the explanation provided by the Agricultural University of Plovdiv to justify the choice of dry lot management system.	Not resolved. Bulgaria did not document the explanation provided by the Agricultural University of Plovdiv to justify its choice of dry lot management system for cattle. During the review, the Party clarified that this recommendation will be addressed in its next submission.
A.11	3.B.1 Cattle – N_2O (A.29, 2018) Transparency	Provide a detailed explanation in the NIR of the methods and values applied to estimate Nex for cattle in order to improve transparency.	Not resolved. Bulgaria did not include the required explanation in the NIR (section 5.5.2.2.2, p.277). In addition, the link provided in the NIR, supposedly to a document containing AD, methods and assumptions for calculating Nex values (http://www.ias.bg/english/index_en.html), was to the home page of the Institute of Animal Science. During the review, Bulgaria provided a spreadsheet containing feeding characteristics and calculations for estimating Nex for cattle. The ERT noted that this information was not reflected in NIR tables 175 and 176 (p.277). According to the spreadsheet, N fraction in food is multiplied by undigested N to calculate daily N excretion and annual Nex. Nex values are given as 99.89 for mature dairy cattle;

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			65.88 for mature non-dairy cattle; 35.30 for cattle, 1 year; and 48.47 for cattle, 1–2 years. The Party also provided the ERT with a study (from Lazar Koselov) on DE, average feed rations per day, amount of crude protein in daily rations and percentage of N. The Party clarified that the method and values for calculating Nex were based on this study. The ERT considers that the Party should reference this study as a source of data in the NIR, explaining (for the different types of cattle) how N fraction in food is calculated and providing all data used in the calculations (e.g. in NIR table 175) for N fraction in food, undigested N, daily N excretion and annual Nex.
A.12	3.B.3 Swine – CH_4 (A.30, 2018) Transparency	Include a detailed explanation of the methods and values used to estimate CH_4 emissions from manure management of swine.	Not resolved. Bulgaria did not provide a detailed explanation in its NIR (section 5.5.2.1, p.274) of the methods and values used to estimate CH_4 emissions from manure management of swine. During the review, the Party provided to the ERT a spreadsheet showing the values for GE and DE for different swine categories and the calculation of VS. It also provided a paper used as a data source for the country-specific DE and GE (Penko et al., 2014). According to the spreadsheet, GE and DE percentages are, respectively, 23.18 and 92.00 for pigs up to 20 kg; 17.05 and 87.54 for pigs, 20–50 kg; 26.95 and 85.00 for pigs, 50–80 kg; 34.32 and 81.00 for pigs, 80–110 kg; 37.12 and 78.80 for pigs over 110 kg; 50.66 and 86.00 for breeding pigs; and 42.71 and 78.00 for boars. The spreadsheet also provided data on ash content of manure and VS for each of these animal types. Values for GE, DE, ash content and VS were constant for the entire time series. The ERT considers that the Party should reference the data source for the method used to calculate country-specific DE and GE values and include both a description of the methodology applied to calculate average VS and GE and a table setting out the parameters for each animal type and the average values used in the emission estimates.
A.13	3.D Direct and indirect N_2O emissions from agricultural soils – N_2O (A.32, 2018) Transparency	Revise the relevant section of the NIR (including table 194) to reflect the correct AD applied in the recalculation of emissions from inorganic N fertilizers (3.D.a.1), atmospheric deposition (3.D.b.1) and N leaching and run-off (3.D.b.2) for 2016.	Resolved. Bulgaria reported the correct AD for 2016 fertilizer consumption (365,913 t N) in its 2019 NIR (section 5.7.2.3, table 193, p.290) and the 2020 NIR (section 5.7.2.3, table 190, p.289) as recommended by the previous ERT. The ERT noted that the values are in accordance with those reported on the Eurostat website (http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=aei_fm_usefert&lang=en).
A.14	3.D.a.1 Inorganic N fertilizers – N_2O (A.31, 2018) Accuracy	Include ammonium phosphate in the emission calculations.	Not resolved. Bulgaria did not indicate in the NIR that ammonium phosphate was considered in calculating emission estimates. In addition, no recalculations were included under category 3.D.a.1 (inorganic fertilizers) and AD for inorganic fertilizers remain the same as in the 2018 submission. The Party stated during the review that recalculations were performed; however, the ERT noted that N_2O emissions and AD in CRF table 3.D have remained the same since the 2016 submission. Noting that the amount of synthetic fertilizer included in the inventory (e.g. 339,329 t N for 2018) is the same as that reported by Eurostat, the ERT considers that ammonium phosphate is included in the AD used for calculating

ID#	Issue/problem classification[a, b]	Recommendation made in previous review report	ERT assessment and rationale
			emissions from inorganic fertilizers. However, the NH_3 EF for ammonium phosphate was not included in the calculation of the $Frac_{GASF}$ value. According to the EMEP/EEA guidebook 2016, the NH_3 EF for ammonium phosphate is 0.050. The ERT made a rough calculation and, including the NH_3 EF of ammonium phosphate of 0.050 in the average of the $Frac_{GASF}$, it increased from 0.064 (as in NIR table 187) to 0.071 (see ID# A.15 below). During the review, the Party clarified that it will include the NH_3 EF for ammonium phosphate in the calculation of the $Frac_{GASF}$ value, in accordance with the EMEP/EEA guidebook 2019 (chap. 3.D, table A1.2), and recalculate emissions accordingly.
A.15	3.D.a.1 Inorganic N fertilizers – N_2O (A.31, 2018) Transparency	Include detailed information in the NIR on the rationale for choosing a $Frac_{GASF}$ value from the EMEP/EEA guidebook 2016.	Not resolved. Bulgaria did not include in its NIR detailed information on the rationale for choosing a $Frac_{GASF}$ value from the EMEP/EEA guidebook 2016. During the review, the Party noted that its $Frac_{GASF}$ value is lower than the IPCC default value owing to the limited consumption of urea, which has a higher EF than other fertilizers. However, the ERT noted that urea represents 31 per cent of the inorganic fertilizers used in the country (329,329 t N for 2018, according to NIR table 190) and has an EF of 0.155 NH_3-N per kg N. The only fertilizer that accounts for a higher proportion is ammonium nitrate, at 55 per cent of total inorganic fertilizers, with an EF of 0.015 NH_3-N per kg N. The ERT therefore considers that the explanation provided by the Party does not justify the lower $Frac_{GASF}$ value, and that the real reason could be the failure to account for ammonium phosphate in calculating the $Frac_{GASF}$ value. By reproducing the calculation performed by the Party and including ammonium phosphate, the ERT determined that the $Frac_{GASF}$ value should be 0.071 (see ID# A.14 above).
A.16	3.D.a.2.b Sewage sludge applied to soils – N_2O (A.20, 2018) (A.21, 2016) (A.21, 2015) Transparency	Document and clearly report that the application of sewage sludge to soils did not occur before 2007 and provide details of the corresponding legislation.	Addressing. Bulgaria reported in the NIR (section 5.7.2.1, p.286) that the application of sewage sludge to soils did not occur before 2007 for legislative reasons, but did not provide details of the relevant legislation. Moreover, it did not clearly report that the agronomic practice in the country of using sewage sludge began in 2007 or explain how this was in accordance with its legislation either before or after 2007. During the review, the Party clarified that this recommendation will be addressed in its next submission.
A.17	3.D.a.2.b Sewage sludge applied to soils – N_2O (A.33, 2018) Transparency	Include detailed information about the source of sewage sludge applied to agricultural soils and explain how AD are coordinated between the agriculture and waste sectors to prevent N_2O emissions from being double counted in the inventory.	Addressing. Bulgaria indicated in the NIR (section 5.7.2.3, p.288) that data for sewage sludge were provided by the Executive Environment Agency of Bulgaria. However, it did not include an explanation in the NIR that "IE" is reported for sludge under wastewater treatment and discharge in CRF table 5.D to avoid double counting. The Party also did not include in CRF table 9 a corresponding explanation about "IE" used for sludge under wastewater treatment and discharge.
A.18	3.D.a.4 Crop residues – N_2O (A.34, 2018) Transparency	Include detailed information in the NIR on the process and parameters used to estimate N_2O emissions from the crop residues returned to soils (e.g. a table presenting information on the	Not resolved. Bulgaria did not include detailed information in its NIR on the process and parameters used to estimate N_2O emissions from crop residues returned to soils. During the review, the Party clarified that this recommendation will be addressed in its next submission.

ID#	Issue/problem classification[a, b]	Recommendation made in previous review report	ERT assessment and rationale
		plant waste composition of a list of crops) in order to improve transparency.	
A.19	3.G Liming – CO_2 (A.35, 2018) Transparency	Explain in the NIR that liming had not been carried out in the country since 1988, following agricultural reforms and the closure of so-called labour cooperative farms, which made liming unprofitable, in order to improve the transparency of the report.	Resolved. Bulgaria explained in its NIR (section 5.9, p.292) that liming has not been practised in the country since 1988, following political reforms in the country. According to the Party, the closure of so-called labour cooperative farms made liming no longer profitable.

LULUCF

ID#	Issue/problem classification[a, b]	Recommendation made in previous review report	ERT assessment and rationale
L.1	Land representation – all gases (L.15, 2018) Accuracy	Review the assumptions used to assign land areas to other land and avoid unjustifiable increases in the land area that is assigned to the other land category, ensuring that the IPCC definition is consistently applied and avoiding any possible omission or double counting in the reporting of the LULUCF sector.	Addressing. Bulgaria revised the land-use definitions and assumptions in the NIR (p.302) and improved the allocation of land areas to other land categories. However, there were still inconsistencies in land representation. The Party explained in the recalculation section of the NIR (p.302) that the most significant change made was to the treatment of lands with grassy cover and shrubs. In previous submissions these areas were included under the category other land, and land-use changes to or from other land were reported. However, the ERT noted that Bulgaria did not report on differences and changes in relation to previous submissions as per paragraphs 43–45 of the UNFCCC Annex I inventory reporting guidelines. The ERT acknowledged the difficulties faced by the Party in compiling land-use statistics, which, as reported in the NIR (p.305), were not synchronized between authorities. Moreover, it appreciated the Party's efforts to ensure the accurate allocation of land areas to different categories by using a hierarchical approach to prioritize the most accurate data (NIR p.308). During the review, the Party clarified that the entire time series had been recalculated and time-series consistency was ensured. The Party acknowledged the need to further improve reporting on land representation by collecting additional information on land-use changes among annual and perennial crops, pastures and shrubs, as well as between cropland and grassland (NIR p.303).
L.2	4.A Forest land – CO_2 (L.16, 2018) Accuracy	Review the data on land areas and removals, the assumptions used for land representation and other factors possibly affecting the removals trend in the forest land category (e.g. presence and condition of a large share of coniferous plantations at lower altitudes and the share of old coppice and low-stem forest which are now intensively harvested) and provide clear justification for the resulting removals trend in the submission.	Addressing. Bulgaria revised the data on land representation (area) and performed recalculations of carbon stocks for living biomass and deadwood pools (NIR p.302). The Party also provided additional information in its NIR (pp.313–316) on time-series trends in emissions and removals for the forest land category. However, the ERT considers that the revision made by the Party does not fully explain the factors affecting the removal trends. While in its NIR (p.315) the Party noted the need to further investigate the dramatic decrease in CO_2 removals from forest land in 2001–2005, it did not clarify the effect of data quality on the time-series consistency of reported emissions and removals. During the review, the Party noted that the inconsistencies could be due to the fact that the area of forest land reported in the inventory included temporarily unstocked forest land, whereas the area reported in the official statistics did not (see also ID# L.15 in table 5). It also acknowledged the need to increase transparency in this regard. The ERT observed that the

ID#	Issue/problem classification[a, b]	Recommendation made in previous review report	ERT assessment and rationale
			inconsistencies were reflected in the high uncertainty for this category, as reported in the NIR (pp.331–334).
L.3	4.A.1 Forest land remaining forest land – CO_2 (L.5, 2018) (L.2, 2016) (L.2, 2015) (67, 2014) (74, 2013) Accuracy	Apply a higher-tier method to estimate emissions and removals from the dead organic matter (deadwood and litter) and soil carbon pools.	Addressing. Bulgaria implemented a tier 2 method for CSC in deadwood (NIR pp.303 and 323) (see also ID# L.14 in table 5). For CSC in litter and mineral soils the Party still applies a tier 1 method (it assumes CSC is zero) (NIR pp.313, 323 and 325; CRF table 4.A). Noting that in its 2018 NIR the Party applied a tier 2 method for estimating CSC in litter and mineral soils, the ERT asked why it had applied a tier 1 method for its 2019 submission onward. In response, the Party clarified that, in an attempt to report CSC in litter and mineral soils, in its 2018 submission it had used the direct results of a study on the application of the Carbon Budget Model of the Canadian Forest Sector in the EU (see http://publications.jrc.ec.europa.eu/repository/handle/JRC102498). However, since the previous ERT had pointed out that the methodology and results were not appropriate for Bulgaria's situation, it had returned to using a tier 1 method as a conservative approach. The Party explained that data for 1993 onward had been compiled but still require further analysis and improvement in order to apply a tier 2 method for litter and mineral soils. The Party also clarified that this issue was included in its list of planned improvements (NIR section 6.1.8, p.303).
L.4	4.A.1 Forest land remaining forest land – CO_2 (L6, 2018) (L.8, 2016) (L.8, 2015) Accuracy	Provide estimates of changes in carbon stock in living biomass by applying the gain–loss method in future annual submissions for verification purposes.	Addressing. Bulgaria applied the stock-difference method for living biomass (NIR section 6.3.2.1.1, p.320) but did not verify estimates by comparing this method with the gain–loss method (in accordance with good practices in the Kyoto Protocol Supplement, chap. 2.4.5). During the review, the Party explained that a project launched in 2019 to assess emissions and removals from living biomass by applying the gain–loss method had been challenging because, among other reasons, national forest statistics did not include species-specific data. The preliminary results of that assessment – provided by the Party during the review – showed that the level of uncertainty associated with the gain–loss method was much lower (35 per cent) than with the stock-difference method (greater than 300 per cent). However, the Party stated that further analysis would be required to ensure that the results of the gain–loss method were accurate. This would include the stratification by forest type and the consideration of any changes in forestry statistics that could affect the estimation of increment data. The ERT notes that the Party may wish to consider including information in its NIR on its progress in this regard, drawing on the information provided to the ERT during the review.
L.5	4.A.2 Land converted to forest land – CO_2 (L.8, 2018) (L.9, 2016) (L.9, 2015) Accuracy	Develop country-specific values for both deadwood and litter.	Addressing. As noted in the previous review report, Bulgaria developed a country-specific value for carbon stock in litter of 10.23 t C/ha (NIR p.329), which is within the lower range of the default values provided in the 2006 IPCC Guidelines (vol. 4, chap. 2, table 2.2) and the revised values provided in the 2019 Refinement to the 2006 IPCC Guidelines (vol. 4, chap. 2, table 2.2) for temperate forests. However, the ERT notes that the high variability of the data on litter stocks from sample plots,

ID#	Issue/problem classification[a, b]	Recommendation made in previous review report	ERT assessment and rationale
			referred to by the Party during the review, lowers the accuracy of the estimates of carbon stock in litter. During the review, the Party clarified that its efforts to improve estimates of carbon stocks on forest land included plans to obtain separate estimates for conifer and broadleaved forests. In its NIR (p.328) the Party stated that, owing to the young age of forests on land converted to forest land, it is assumed that there was no deadwood or change in this carbon stock. The ERT notes that this is consistent with a tier 1 approach (2006 IPCC Guidelines, vol. 4, chap. 4.3.2) and agrees with the Party that deadwood accumulation in young forests can be expected to be minimal, although further justification is needed to demonstrate that this is indeed the case.
L.6	4.A.2 Land converted to forest land – CO_2 (L.17, 2018) Transparency	Include in the NIR clarification on the detailed application of the gain–loss method, including data used.	Resolved. Bulgaria provided additional information in its NIR (pp.326–328) transparently explaining that it applies a tier 2 method to estimate emissions and removals resulting from CSC in living biomass on land converted to forest land.
L.7	4.A.2 Land converted to forest land – CO_2 (L.18, 2018) Accuracy	Apply higher-tier methods to stratify and disaggregate data by forest type and species in the estimation of CSCs in land converted to forest land, and provide improved estimates.	Addressing. Bulgaria included in the NIR (p.327) a clear explanation of how the annual biomass increment was derived as the average for coniferous and deciduous forest and was applied to all areas of land converted to forest land for the reported year. However, the Party continued to report CSC in living biomass without stratifying and disaggregating the relevant area by forest type (coniferous and deciduous), as it did for forest land remaining forest land. The two forest types represent species-specific aggregated information. During the review, the Party clarified that it did not stratify the data owing to data limitations. The ERT notes that the relative share of deciduous and broadleaved forest used to derive the weighted mean expansion factors for the growing stock, as reported in the NIR (p.327), could be used for stratification.
L.8	4.B.1 Cropland remaining cropland – CO_2 (L.11, 2018) (L.12, 2016) (L.12, 2015) Accuracy	Develop country-specific estimates for all pools, in particular those that are significant.	Addressing. Bulgaria continued to apply a tier 1 method to estimate net CSC for living biomass and dead organic matter (deadwood and litter) for category 4.B.1, which is a key category. In its 2020 submission, the Party reported for the first time CSC in mineral soils using a tier 2 method for annual cropland remaining annual cropland and perennial cropland remaining perennial cropland (under category 4.B.1 in CRF table 4.B), which were reported in previous submissions as "NO" (NIR p.342). For annual cropland converted to perennial cropland and perennial cropland converted to annual cropland, the Party continued to apply a tier 1 method. During the review, the Party noted that, since according to the 2006 IPCC Guidelines (vol. 4, chap. 5.2.2) croplands generally have no litter or deadwood in crop residues, with the exception of agroforestry systems, it had understood that the recommendation of the previous ERT applied only to the soil pool. The ERT considers that for annual cropland remaining annual cropland the Party can continue to use a tier 1 approach for the living biomass and dead organic matter pools since, according to the 2006 IPCC Guidelines (vol. 4, chap. 5.2.2.1), it can be assumed that there is no net

ID#	Issue/problem classification[a, b]	Recommendation made in previous review report	ERT assessment and rationale
			accumulation of biomass carbon stocks. By the same token, tier 1 can also be applied for the dead organic matter pool for perennial cropland remaining perennial cropland, although for living biomass using a tier 2 approach would be good practice, unless the Party can justify that the vegetation has reached a steady state as per the 2006 IPCC Guidelines (vol. 4, chap. 5.2.1.1). For annual cropland converted to perennial cropland and perennial cropland converted to annual cropland, a tier 2 approach should be applied for the dead organic matter and living biomass pools.
L.9	4.B.1 Cropland remaining cropland – CO_2 (L.19, 2018) Completeness	Report estimates of CSCs in mineral soils for the two subcategories annual and perennial crops under cropland remaining cropland as planned.	Resolved. Bulgaria estimated and separately reported CSC for annual and perennial crops under cropland and also calculated changes for conversions between the two subcategories (NIR pp.342–343).
L.10	4.C.1 Grassland remaining grassland – CO_2 (L.12, 2018) (L.13, 2016) (L.13, 2015) Transparency	Include in the NIR information on changes in carbon stock in the dead organic matter pool.	Addressing. Bulgaria included information on the treatment of CSC in the dead organic matter pool. The tier 1 approach applied by the Party assumes that litter and deadwood are at equilibrium (NIR p.348). On the basis of the explanation provided in the NIR (p.304) that vegetation under the grassland category comprises no woody vegetation, the ERT considers that this assumption may be correct in Bulgaria's case. However, a more thorough explanation should be provided in the NIR to justify the application of a tier 1 approach, including, for example, references to studies or literature demonstrating that there is no woody vegetation under that category.
L.11	4.C.2 Land converted to grassland – CO_2 (L.13, 2018) (L.14, 2016) (L.14, 2015) Completeness	Include consideration of the dead organic matter pool in the NIR to ensure the completeness of the reporting.	Not resolved. Bulgaria did not include estimates of dead organic matter under this key category and reported "NO" and "NE" in CRF table 4.C for categories 4.C.2.1 and 4.C.2.2. The ERT noted that the assumption under the tier 1 approach applied by the Party for this category that carbon pools prior to conversion are zero is consistent with the 2006 IPCC Guidelines (vol. 4, chap. 6.3.2), which applies for all pools on land converted to grassland except for forest land and wetlands converted to grassland. The ERT considers that a tier 1 approach may be appropriate for the conversions from cropland to grassland but not from forest land and wetlands to grassland.
Waste			
W.1	5. General (waste) (W.9, 2018) Transparency	Improve the transparency of the NIR by providing a footnote to NIR table 235 clearly indicating that the symbol refers to which GHGs are estimated for each subcategory.	Resolved. Bulgaria improved the transparency of the information reported by including a footnote to NIR table 235 (p.370) clarifying that the symbol indicates for which gases (for each category) the emissions were estimated.
W.2	5.A Solid waste disposal on land – CH_4 (W.1, 2018) (W.2, 2016) (W.2, 2015) (74, 2014) Transparency	Make further efforts to increase transparency by reporting on the industrial waste amounts and the types considered.	Addressing. Bulgaria reported in its NIR (section 7.2.3.2, p.374) that the description of the methodology for collecting information on industrial waste in the country was provided by the National Statistical Institute. During the review, the Party clarified that a detailed description of the methodology for collecting information on

ID#	Issue/problem classification[a, b]	Recommendation made in previous review report	ERT assessment and rationale
			industrial waste assimilated to MSW in the country will be provided in its next submission.
W.3	5.A Solid waste disposal on land – CH_4 (W.10, 2018) Transparency	Improve the transparency of the degradable waste and DOC values presented in the NIR by modifying the format of table 240.	Resolved. Bulgaria modified the format of NIR table 240 (p.376) so as to clearly represent that degradable waste and DOC values are applied to all waste compositions.
W.4	5.A Solid waste disposal on land – CH_4 (W.11, 2018) Transparency	Include information on the current methodology for collecting information on MSW, as well as the methods used to quantify or estimate solid waste disposed of by the industrial sector, including solid waste disposed of in specific on-site industrial landfills.	Resolved. Bulgaria included information in the NIR (section 7.2.3.2, p.374) on the current methodology for collecting data on industrial waste. According to the Party, since 2004, information on non-hazardous waste from production activity has been collected through a sample representative of active economic entities in the country. After weighing, the data from the sample are transferred to the national level and supplemented with data from the National Environmental Monitoring System of the Executive Environment Agency. The Party also explained in the NIR that the methodology for collecting data on industrial waste was developed in accordance with the EU regulation on waste statistics (regulation 2150/2002/EC).
W.5	5.A Solid waste disposal on land – CH_4 (W.12, 2018) Transparency	Improve the transparency of the DOC value presented in the table entitled "Default waste composition 1950–2001" in the NIR.	Resolved. Bulgaria did not include a table for default waste composition in its 2020 NIR as reported previously. Instead the Party included the information in the textual part of its NIR (section 7.2.3.2, p.376), explaining that the waste composition data and default DOC values used for 1950–2001 were in accordance with the 2006 IPCC Guidelines (vol. 5, chap. 2, tables 2.3 and 2.4). The waste composition and DOC percentages applied, respectively, were 21.80 and 40 for paper/paperboard; 30.10 and 15 for food waste; 7.50 and 43 for wood waste; 4.70 and 24 for textile; and 1.40 and 39 for rubber/leather. The Party added that the average DOC value for all waste composition (unmanaged disposal sites) was 18.13 per cent.
W.6	5.A Solid waste disposal on land – CH_4 (W.13, 2018) Transparency	Improve the transparency of the NIR by clearly reporting on the gradual decrease in MSW disposal sites in the country since 2000.	Resolved. Bulgaria reported information in its NIR (section 7.2.2, p.372) on the gradual decrease in the number of MSW disposal sites in the country since 2000. During the review, the Party added that the number of MSW disposal sites in the country has been gradually decreasing since 2000 owing to the closure of unmanaged landfills in line with national legislation.
W.7	5.D Wastewater treatment and discharge – CH_4 (W.14, 2018) Transparency	Include in the NIR a description of the national circumstances justifying the use of a methane correction factor of 0.1 for latrines (e.g. regarding climate conditions in Bulgaria and the average number of persons per family).	Not resolved. Bulgaria did not include in its NIR a description of the national circumstances justifying the methane correction factor of 0.1 for latrines. The ERT notes that IPCC default values range from 0.1 to 0.7 (2006 IPCC Guidelines, vol. 5, chap. 6, table 6.3). The Party stated during the review that the value of 0.1 was selected because of climate conditions in Bulgaria and the average number of persons per family (which is three, according to the National Statistical Institute). Therefore, it used a methane correction factor value of 0.1 for dry climates and small families (3–5 persons) and BOD value of 60 g/person/day in accordance with the 2006 IPCC Guidelines (vol. 5, chap. 6, table 6.3) (see NIR section 7.5.3.2, p.389). It also stated that this description will be included in the next submission.

ID#	Issue/problem classification[a, b]	Recommendation made in previous review report	ERT assessment and rationale
W.8	5.D Wastewater treatment and discharge – CH_4 (W.15, 2018) Accuracy	Extend the extrapolation of the sludge AD to before 2004.	Addressing. Bulgaria reported in its NIR (p.373) that it had extrapolated the AD for sludge for 2002–2003, and that the fraction of sludge disposed at landfill sites was estimated to be 19.67 Gg for 2002 and 19.55 Gg for 2003. It was not clear to the ERT why the extrapolation was not extended for before 2002. During the review, the Party clarified that the extrapolation of AD for sludge to before 2002 will be addressed in its next submission. In response to a question raised by the ERT, the Party provided a spreadsheet showing the balance of sewage sludge landfilled and composted, used in agriculture and in reclamation of disturbed areas, for the entire time series. The ERT commends the Party for providing this information and notes that when the Party performs the extrapolation for the next submission it should take into account that the extrapolation of data for landfilled sludge across the time series should be included under category 5.A.

KP-LULUCF

ID#	Issue/problem classification[a, b]	Recommendation made in previous review report	ERT assessment and rationale
KL.1	General (KP-LULUCF) – CO_2, CH_4 and N_2O (KL.2, 2018) (KL.9, 2016) (KL.9, 2015) Transparency	Strengthen QC procedures to ensure that information in the NIR on the intention to use the natural disturbance provision to exclude emissions from natural disturbances applies to both AR and FM areas, to ensure the transparency of the reporting.	Not resolved. Bulgaria did not include information in its NIR on its intention to use the natural disturbance provision to exclude emissions from natural disturbances for both AR and FM areas. The ERT notes that the clear and separate reporting of this information for lands subject to Article 3, paragraphs 3–4, of the Kyoto Protocol is required under decision 2/CMP.7, annex, paragraph 33. During the review, the Party justified this omission by explaining that it has not yet applied the natural disturbance provision. The ERT notes that this is not consistent with decision 2/CMP.7, which requires Parties to indicate whether they intend to apply the natural disturbance provision (see also ID# KL.6 below).
KL.2	General (KP-LULUCF) – CO_2, CH_4 and N_2O (KL.14, 2018) Transparency	Report in the NIR the single spatial assessment unit used for determining the areas for the accounting of AR, deforestation and FM, as required by decision 2/CMP.8, annex II, paragraph 2(c).	Addressing. Bulgaria did not include in the NIR information on the single spatial assessment unit used for determining the areas for the accounting of AR, deforestation and FM. During the review, the Party explained that the spatial assessment unit used to determine the areas of AR, deforestation and FM is the area of subcompartments (1–25 ha) within the area of each State forest enterprise. Information on AR units, including their geographical location, was provided in NIR table 254 (p.408) for each State forest enterprise of the respective administrative district, although these figures relate to land-use changes at the subcompartment level. The Party further explained that, according to forestry experts, the average area of a subcompartment is 2.5 ha and there are around 1,300,000 subcompartments in the country. The Party informed the ERT that it will include this information in its next submission.
KL.3	General (KP-LULUCF) – CO_2, CH_4 and N_2O (KL.15, 2018) Transparency	Meet the requirements of decision 2/CMP.8, annex II, paragraph 2(b), in reporting the geographical location of the boundaries of the KP-LULUCF land areas in the relevant CRF tables and section of the NIR.	Resolved. Bulgaria reported in the NIR (section 11.2, p.407) that the geographical location of the boundaries of the KP-LULUCF land areas corresponds to the entire country. The Party included in the NIR (section 11.2.3) the maps and a database identifying the geographical locations and explained that geographical locations are identified using the national forest inventory database. The ERT considers that the

ID#	Issue/problem classification[a, b]	Recommendation made in previous review report	ERT assessment and rationale
			information provided in the NIR reflects the country-specific circumstances relating to the consistent stratification of land.
KL.4	AR – CO$_2$ (KL.5, 2018) (KL.4, 2016) (KL.4, 2015) Comparability	Include an explanation in the documentation box of the CRF tables where the notation key "IE" is used.	Not resolved. Bulgaria did not include in the documentation box of CRF table 4(KP-I)A.2 information on where "IE" was used. In addition, the ERT noted that CRF table 9 was left empty (see ID# G.2 above). When asked by the ERT why "IE" was reported for below-ground biomass in CRF 4(KP-I)A.1, the Party clarified that this was because the relevant emissions and removals were included in the above-ground biomass pool. Below-ground biomass was also reported as "IE" under the Convention. The Party informed the ERT that it will include explanations in its next submission for its use of notation keys.
KL.5	AR – CO$_2$ (KL.6, 2018) (KL.2, 2016) (KL.2 2015) (90, 2014) Transparency	Transparently describe in the NIR how the carbon loss on land subject to AR is estimated.	Resolved. Bulgaria transparently reported in its NIR (pp.416–418) how carbon loss on land subject to AR was estimated.
KL.6	AR – CO$_2$ (KL.16, 2018) Accuracy	Include the result of the technical correction to the background level and margin.	Not resolved. Bulgaria did not include the result of the technical correction to the background level and margin. The ERT noted that, consistently with decision 2/CMP.7, the Party reported in its NIR 2015 (section 11.4.4) as well as in later submissions up to 2018 (in the same NIR section) that it intended to apply the natural disturbance provision for lands subject to AR activities during the second commitment period. Consistently with decision 2/CMP.7, annex, paragraph 33, the Party documented the background level and margin applicable for FM in its NIR. The ERT also noted that the Party did not report in its 2019 and 2020 NIRs any information related to the treatment of natural disturbance emissions from lands subject to AR activities. During the review, the Party explained that, since it did not yet apply the natural disturbance provision, no information on the background level was included in the NIR. The ERT notes that this is not consistent with decision 2/CMP.7, which requires Parties to indicate whether they intend to apply the natural disturbance provision and, if so, to document the background level and margin (see also ID# KL.1 above).
KL.7	FM – CO$_2$ (KL.17, 2018) Transparency	Provide detailed documentation on the methods and data used to estimate CSCs and associated removals and emissions for all pools under FM.	Resolved. Bulgaria transparently reported in its NIR (pp.416–419) the methods and data that it used to obtain CSC estimates for all pools for AR, deforestation and FM activities.
KL.8	FM – CO$_2$ (KL.18, 2018) Accuracy	Include the result of the technical correction of the background level and margin.	Not resolved. Bulgaria did not report the result of the technical correction of the background level and margin (see ID#s KL.1 and KL.6 above). There is still a discrepancy between the 2016 and the 2018 and subsequent submissions in the estimated background level and margin for applying the natural disturbance provision in the accounting of FM activities.

ID#	Issue/problem classification[a, b]	Recommendation made in previous review report	ERT assessment and rationale
KL.9	FM – CO_2 (KL.19, 2018) Transparency	Provide detailed documentation on the updated technical correction, in line with decision 2/CMP.7.	Not resolved. Bulgaria did not update the technical correction. In addition, it did not report the results of the calibration of the model used in constructing the FMRL or indicate whether any changes had been made to the inputs and assumptions used in the model, or provide any justification (see also ID#s KL.1, KL.6 and KL.8 above).
KL.10	FM – CO_2 (KL.20, 2018) Transparency	Specify in the NIR the FMRL value used for the purposes of accounting for the FM in the second commitment period in accordance with decision 2/CMP.7, annex, paragraphs 12–15.	Resolved. Bulgaria reported in the NIR (section 11.5.2.2, p.428) the FMRL value used for the purposes of accounting for the FM in the second commitment period. The ERT notes that to further improve transparency the Party could include an explanation in the documentation box for CRF table 4(KP-I)B1.1 on how HWP are included in the FMRL, on the basis of footnote 2 to that CRF table.
KL.11	HWP – CO_2 (KL.13, 2018) (KL.12, 2016) (KL.12, 2015) Transparency	Provide in the NIR transparent information on the calculation of emissions from HWP.	Resolved. Bulgaria reported information in the NIR on how the harvest production from deforestation and FM is estimated. The estimation of emissions from HWP under Article 3, paragraphs 3–4, of the Kyoto Protocol is reported in the NIR (sections 11.4.5, p.427, and 11.5.2.5, pp.428–429).

[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 Bulgaria 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 Bulgaria, 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 Bulgaria

ID#	Previous recommendation for the issue	Number of successive reviews issue not addressed [a]
General		
G.5	Include all references and sources of information used in the NIR, in line with decision 24/CP.19, annex I, paragraph 50.	3 (2015/2016–2020)
G.6	Clearly indicate in chapter 1 of the NIR that category-specific QA/QC checks are applied for all categories of the inventory and discuss in the corresponding sectoral chapters only the additional QA/QC checks that are done for certain categories.	3 (2015/2016–2020)
Energy		
E.5	Conduct a tier 2 estimation of CO_2 emissions from gasoline using country-specific EFs (CO_2 emission estimates resulting from the COPERT model may serve to cross-check the tier 2 estimates).	4 (2014–2020)

ID#	Previous recommendation for the issue	Number of successive reviews issue not addressed [a]
E.6	Provide CO_2 emission estimates in accordance with the 2006 IPCC Guidelines by using country-specific EFs for the used liquid fuels, as category 1.A.3.b (road transportation) is a key category for CO_2 emissions.	3 (2015/2016–2020)
E.7	Clarify which type of coal was used as AD for the estimates across the time series and, if the Party used the amount of saleable coal as AD, estimate the fugitive emissions from mining activities by using the entire quantity of raw coal material, in accordance with the 2006 IPCC Guidelines.	3 (2015/2016–2020)
E.8	Develop a country-specific EF for fugitive CH_4 emissions from underground coal mining and handling to enable a higher-tier method to be applied for this category.	4 (2014–2020)
E.10	Ensure consistency between the AD on exploration and production of oil reported in the NIR and the CRF tables.	3 (2015/2016–2020)
IPPU		
I.3	Further investigate the use of produced urea in order to ensure that emissions from all sources of urea use are estimated and reported under the respective sectors of the inventory and provide this information in the NIR.	3 (2015/2016–2020)
I.5	Clearly report how emissions of CO_2 recovered for use in urea production are accounted for in the inventory.	5 (2013–2020)
Agriculture		
A.10	Document the explanation provided by the Agricultural University of Plovdiv to justify the choice of dry lot management system.	3 (2015/2016–2020)
A.16	Document and clearly report that the application of sewage sludge to soils did not occur before 2007 and provide details of the corresponding legislation.	3 (2015/2016–2020)
LULUCF		
L.3	Apply a higher-tier method to estimate emissions and removals from the dead organic matter (deadwood and litter) and soil carbon pools.	5 (2013–2020)
L.4	Provide estimates of changes in carbon stock in living biomass by applying the gain–loss method in future annual submissions for verification purposes.	3 (2015/2016–2020)
L.5	Develop country-specific values for both deadwood and litter.	3 (2015/2016–2020)
L.8	Develop country-specific estimates for all pools, in particular those that are significant.	3 (2015/2016–2020)
L.10	Include in the NIR information on changes in carbon stock in the dead organic matter pool.	3 (2015/2016–2020)
L.11	Include consideration of the dead organic matter pool in the NIR to ensure the completeness of the reporting.	3 (2015/2016–2020)
Waste		
W.2	Make further efforts to increase transparency by reporting on the industrial waste amounts and the types considered.	4 (2014–2020)
KP-LULUCF		

ID#	Previous recommendation for the issue	Number of successive reviews issue not addressed [a]
KL.1	Strengthen QC procedures to ensure that information in the NIR on the intention to use the natural disturbance provision to exclude emissions from natural disturbances applies to both AR and FM areas, to ensure the transparency of the reporting.	3 (2015/2016–2020)
KL.4	Include an explanation in the documentation box of the CRF tables where the notation key "IE" is used.	3 (2015/2016–2020)

[a] Reports on the reviews of the 2017 and 2019 annual submissions of Bulgaria 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 Bulgaria that are additional to those identified in table 3.

Table 5
Additional findings made during the individual review of the 2020 annual submission of Bulgaria

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue/problem?[a]
General			
G.12	CPR	According to decision 15/CMP.1, annex, paragraph 18, Parties shall report the calculation of their CPR by comparing 100 per cent of eight times the total emissions in the most recently reviewed inventory with 90 per cent of their assigned amount and maintain in their registry whichever is lowest. Bulgaria stated in the NIR (p.433) that "it has interpreted that the most recently reviewed inventory as the year 2016, which will be reviewed in October 2018". However, the ERT noted that the values used in calculating the CPR referred to emissions for 2018 (57,815,589 t CO_2), which is from its most recently reviewed inventory (2020 submission). During the review, the Party clarified that, in its 2020 submission, it used the total emissions for 2018 for calculating the CPR but did not update the NIR accordingly.	Yes. Convention reporting adherence
		The ERT recommends that Bulgaria update the information in the NIR to reflect correctly which submission and inventory year was used to calculate its CPR.	
G.13	CRF tables	Bulgaria reported "NO" for indirect CO_2 emissions from all sectors in CRF table 6. The ERT noted that this is not in accordance with the 2006 IPCC Guidelines (vol. 1, chap. 7), since CH_4, carbon monoxide and non-methane volatile organic compound emissions will eventually be oxidized to CO_2 in the atmosphere. During the review, the Party clarified that all identified indirect emissions were reported in CRF table 6 on the basis of the calculations for the different sectors.	Yes. Comparability
		The ERT recommends that the Party report "NE" for indirect CO_2 emissions for relevant categories if no emissions are estimated.	

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue/problem?[a]
Energy			
E.10	International aviation – liquid fuels – CO_2	The ERT noted that there is a discrepancy between the values reported in CRF tables 1.D and 1.A(b) for the consumption of jet kerosene for international aviation for 1988–1996, excluding 1990. For example, for 1996, a value of 8,305.14 TJ is given in CRF table 1.D and 9,417 TJ in CRF table 1.A(b).	Yes. Convention reporting adherence
		During the review, the Party clarified that, since data on jet kerosene consumption were taken from the energy balance, and the energy balances for 1988–1989 and 1991–1996 did not disaggregate those data into domestic and international aviation, it allocated some of the reported total consumption to domestic aviation. The Party explained that it will correct the inconsistency in its next submission.	
		The ERT recommends that Bulgaria revise the values for the consumption of jet kerosene for international aviation in order to avoid inconsistencies between CRF tables 1.A(b) and 1.D. The ERT also recommends that the Party provide in the NIR information on the methodology applied for disaggregating jet kerosene consumption into domestic and international aviation for 1988–1996, excluding 1990.	
E.11	1.B.1.a Coal mining and handling – CH_4	Bulgaria explained in its NIR (p.148) that it used raw coal production as AD to estimate fugitive emissions for category 1.B.1.a (coal mining and handling). However, in response to a previous recommendation (see ID# E.7 in table 3), Bulgaria clarified that the amount of saleable coal instead of the amount of raw coal was used for previous years of the time series. The Party provided additional information on AD for this category in the recalculation section of the NIR (section 3.4.6), but the ERT considers that this information should be provided in the methodological section (section 3.4.3) to clarify which type of coal was used as AD (such as mined raw coal or upgraded saleable coal) and for which years of the time series.	Yes. Transparency
		The ERT recommends that Bulgaria provide in the methodological section of the NIR (section 3.4.3) information to clarify which type of coal was used as AD (mined raw coal or upgraded saleable coal) and for which years of the time series.	
E.12	1.B.1.a Coal mining and handling – CH_4	In response to a previous recommendation, Bulgaria recalculated CH_4 emissions for category 1.B.1.a.i.3 (abandoned underground mines) using a tier 3 approach (see ID# E.9 in table 3). The Party explained in the NIR (p.145) that detailed information on the past and current state of abandoned mines was collected and that, of the 21 mines closed in 1942–2017, 19 were found to be non-flooded and were a source of fugitive emissions. However, the Party did not provide any further information on the parameters used to estimate abandoned mine emissions, such as closure year of the 19 non-flooded mines, the average emission rate at time of mine closure and the default EFs.	Yes. Transparency
		During the review, Bulgaria provided a spreadsheet with the parameters, including information on which mines were flooded or non-flooded, closure year, average emission rate and EFs applied. The Party also explained that the EFs were calculated on the basis of coefficients from table 4.1.9 of the 2006 IPCC Guidelines (vol. 2, chap. 4).	
		The ERT recommends that Bulgaria include in the NIR the main parameters used for estimating CH_4 emissions from abandoned underground mines using a tier 3 method (e.g. closure year, average emission rate and EFs applied).	
E.13	1.B.2.a Oil – CO_2, CH_4 and N_2O	In response to a previous recommendation, Bulgaria reallocated CO_2, CH_4 and N_2O emissions from petroleum coke combusted to restore the catalyst's activity from category 1.A.1.b (petroleum refining) to category 1.B.2.a.iv (oil – refining/storage) for 2009–2018 (see ID# E.2 in table 3). The ERT noted that CO_2 and N_2O emissions increased significantly for category 1.B.2.a.iv between 2008 and 2009 owing to this reallocation (e.g. for CO_2, from 48.72 to	Yes. Transparency

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue/problem?[a]
		250.12 kt CO_2). Moreover, it could not check the recalculation or the reallocated values because Bulgaria did not provide the AD values applied or any information on how the AD (i.e. the amount of petroleum coke combusted to restore the catalyst's activity) are distinguished from the AD used for category 1.A.1.b.	
		During the review, the Party explained that the AD for petroleum coke combusted to restore the catalyst's activity are reported separately by the operator and accounted for as refinery fuel in the energy balance. The Party also explained that new EFs were applied for this category for the 2020 submission. The ERT noted that emissions were reallocated correctly, taking into account the new EFs applied by the Party.	
		The ERT recommends that Bulgaria include in the NIR relevant information on the scope and coverage of the AD used under category 1.B.2.a.iv (oil – refining/storage) and an explanation of the reasons for the significant increase in emissions between 2008 and 2009. The ERT also recommends that, if recalculations are performed for this category for the next submission, the Party include information in the NIR on those recalculations in accordance with paragraphs 43–45 of the UNFCCC Annex I inventory reporting guidelines.	
IPPU			
I.14	2.A.1 Cement production – CO_2	The Party reported in NIR section 4.2.1.3.2 (p.160) that estimated emissions for 2018 were taken from the EU ETS and in NIR section 4.2.1.6 (p.162) that recalculations were performed on the basis of data from operators on CaO and MgO content in clinker for 2016–2017 (see ID# I.2 in table 3). However, it did not provide information on CaO and MgO content for any particular year. The ERT considers that the reporting of CaO and MgO content with explanations and data sources would improve the transparency of the reporting.	Yes. Transparency
		During the review, the Party provided a spreadsheet containing data from operators on CaO and MgO content for the entire time series and informed the ERT that those data were confidential under domestic law. However, the ERT considers that the Party could provide more information (qualitative data) without violating confidentiality (e.g. range of CaO and MgO content, AD in 100 base indexed on 1990 or presenting trends as graphics without any numbers).	
		The ERT recommends that Bulgaria make efforts to report more qualitative data on CaO and MgO content without violating confidentiality, such as range of CaO and MgO content, AD in 100 base indexed on 1990 or presenting trends as graphics without any numbers. The ERT encourages the Party to provide the legislative basis for the confidentiality of the data.	
I.15	2.A.2 Lime production – CO_2	The ERT noted an outlier in the CO_2 IEF for lime production between 2008 (0.796 t CO_2/t) and 2009 (0.78 t CO_2/t), whereas it remained constant for 1998–2008, at 0.796 t CO_2/t, and for 2009–2018, at 0.78 t CO_2/t. No information was included in the NIR on the changes in the trends between 2008 and 2009.	Yes. Transparency
		During the review, the Party explained that the IEF had decreased from 2009 onward because one of the lime producers (integrated steel production plant) had ceased operating in November 2008. In addition, owing to the 2008 economic crisis, construction work and other quicklime-consuming production processes had also decreased. The ERT notes that the AD and emissions from lime production follow the same trend across the time series; however, this is not the case for the CO_2 IEF. In addition, the CO_2 IEF is a correlation between AD and emissions and its reduction occurred due to changes in the process (e.g. abatement technologies, different raw materials).	

		The ERT recommends that Bulgaria provide in the NIR an explanation of the reasons for the changes in the trend in the CO_2 IEF between 2008 and 2009.	
I.16	2.A.3 Glass production – CO_2	Bulgaria reported emissions from limestone and soda ash for glass production under two categories: limestone for glass production under category 2.A.3 (glass production); and soda ash for glass production under category 2.A.4.b (other use of soda ash). The ERT noted that such disaggregation leads to issues with comparability, because only a proportion of emissions from glass production are reported under category 2.A.3, thereby lowering the IEF reported in CRF table 2(I).A-Hs1. The ERT noted that the 2006 IPCC Guidelines (vol. 3, chap. 2.5.1.4, p.2.37) recommend that soda ash emissions from glass production be reported under category 2.A.3.	Yes. Comparability
		During the review, the Party explained that statistics on soda ash production, imports and exports were obtained from the National Statistical Institute, and that a balance of the data is made in order to obtain the aggregated quantity of soda ash used in the country, which is reported under category 2.A.4.b.	
		The ERT recommends that Bulgaria obtain data on soda ash used in glass production and reallocate its emissions from category 2.A.4.b to category 2.A.3 in accordance with the 2006 IPCC Guidelines, noting that, to avoid double counting, the amount of soda ash used in glass production should be subtracted from the total amount of soda ash use reported under category 2.A.4.b.	
I.17	2.A.4 Other process uses of carbonates – CO_2	Bulgaria stated in the NIR (section 4.2.5.3.1, p.172) that the default EF of 415.229 kg CO_2/t soda ash from the 2006 IPCC Guidelines was used to estimate emissions from soda ash use. However, the ERT noted that the EF should in fact be 0.41492 t CO_2/t soda ash (2006 IPCC Guidelines, vol. 3, chap. 2, table 2.1).	Yes. Convention reporting adherence
		During the review, the Party confirmed that the text of the NIR was outdated and provided a spreadsheet with the country-specific EF that was calculated on the basis of data reported by operators and used to estimate soda ash emissions. The ERT considers that the emission estimates are correct.	
		The ERT recommends that Bulgaria update the information in the NIR to reflect the correct method applied for calculating emissions from soda ash use and the correct value of the country-specific EF applied.	
I.18	2.B.2 Nitric acid production – N_2O	Bulgaria explained in its NIR (section 4.3.2.2, p.183) that N_2O abatement technologies introduced in 2005 and 2011 had led to greater reductions in N_2O emissions from plants. It also explained in the NIR (section 4.3.2.3.2, p.184) that a plant-specific N_2O EF for 2000–2012 was estimated on the basis of measured data from plant operators and that for 1988–2000 it was assumed that technology and abatement types were similar. The ERT considered that the explanation was not consistent because abatement technologies were introduced after 2005.	Yes. Transparency
		During the review, the Party clarified that the N_2O EF was calculated for every year from 2000 to 2012 on the basis of measurement data from plant operators and that for previous years the EF was based on data for 2000–2004 (for which limited abatement technology was assumed). It also provided all relevant EFs to the ERT for reference.	
		The ERT recommends that Bulgaria clearly explain in the NIR how the N_2O EF for 1988–2000 was calculated (i.e. that it was based on data from 2000–2004 for which limited abatement technology was assumed).	
I.19	2.B.5 Carbide production – CO_2	Bulgaria reported in NIR figure 63 (p.187) that CO_2 emissions from carbide production were the sum of emissions from carbide production and carbide use. However, NIR table 122 (p.188) provides the same CO_2 emission values for carbide production, carbide use and total CO_2 emissions (carbide use and production combined). The ERT noted	Yes. Convention reporting adherence

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		that CO_2 emission values reported in CRF table 2(I).A-Hs1 correspond to total emissions from carbide use and production reported in NIR table 122 (5.15 Gg CO_2 for 2018).	
		During the review, the Party clarified that the emissions reported in CRF table 2(I).A-Hs1 are correct and correspond to the total CO_2 emissions reported in NIR table 122. The inconsistencies in emission values for carbide production and carbide use in NIR table 122 resulted from a technical error.	
		The ERT recommends that Bulgaria correct the emission values in NIR table 122 for carbide production and carbide use.	
I.20	2.C.1 Iron and steel production – CO_2	Bulgaria reported in NIR table 124 (p.200) AD, EFs and emissions for iron and steel production. The ERT noted that between 1988 and 1990 AD decreased by 24 per cent (from 2,880 to 2,180 kt), while emissions decreased significantly, by 64 per cent (from 3,481.44 to 1,283.24 kt CO_2), and there was a lower EF for 1990 (0.589 t CO_2/t steel compared with 1.209 t CO_2/t steel for 1988). Such a reduction in emissions cannot be explained by political and economic events alone, as reported by the Party in its NIR (section 4.4.1.2, p.198).	Yes. Transparency
		During the review, the Party explained that the reason why the CO_2 EF is lower for 1990 lies with the primary data from the energy balance related to coke oven coke. The energy balance for 1990 provides a different allocation of the quantities of coke oven coke – much lower quantities were reported under process use in blast furnaces and much higher quantities under energy use, but the total quantity is stable and correlated with the produced steel. This reflects the fact that, owing to the economic crisis that reduced the production of steel (as reported by the Party in its NIR (p.198)), coke oven coke was used for energy at the steel plant, as reflected in the peak of emissions under category 1.A.2.a (iron and steel) for 1990. Lower coke consumption as a reducing agent resulted in lower emissions under this category in the IPPU sector.	
		The ERT recommends that Bulgaria include, in the description of the trends, the reasons for the lower CO_2 EF for 1990.	
I.21	2.F.1 Refrigeration and air conditioning – HFCs	Bulgaria explained in the NIR (chap. 4.7.1.2.1) that emissions from disposal of equipment under commercial and industrial refrigeration (categories 2.F.1.a and 2.F.1.c, respectively) were accounted for only where explicitly mentioned in the reports of any of the 16 regional inspectorates of environment and water for the equipment operators. The ERT considers that this approach could lead to underestimation of emissions from disposal of commercial and industrial refrigerators. During the review, the Party explained that while operators were not obliged to report emissions from disposal, they did provide information on commercial air-conditioning systems that, while not disposed of, were not in use (although these systems could subsequently be brought back into use). The Party also explained that volumes of cooling agents refilled were reported to the relevant regional inspectorate of environment and water. Cooling agents that are not restored are assumed to be lost at a rate of 10 per cent per year. So, unless volumes refilled are mentioned in the reports of the regional inspectorates of environment and water, commercial refrigeration equipment disposed of after 10 years is no longer considered a source of emissions, as 100 per cent of the cooling agent will already have been reported as lost.	Yes. Transparency
		The ERT recommends that Bulgaria clearly explain in the NIR its approach to estimating emissions from disposal of commercial refrigeration equipment.	

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue/problem?[a]

Agriculture

A.20	3. General (agriculture) – CH_4	The ERT noted inconsistencies in the amount of CH_4 emissions reported between NIR table 153 (p.255) and CRF table 10s3. For example, for 2017, the amount of CH_4 emissions reported in NIR table 153 is 70.16 Gg while in CRF table 10s3 it is 70.09 Gg. During the review, the Party clarified that the inconsistency resulted from a technical error in NIR table 153 and that the values in CRF table 10s3 are correct. The ERT recommends that Bulgaria correct the value reported in NIR table 153 for total CH_4 emissions from the agriculture sector to reflect the value reported in CRF table 10s3.	Yes. Convention reporting adherence
A.21	3.B.3 Swine – CO_2, CH_4 and N_2O	The ERT noted inconsistencies in the values reported for the total swine population among NIR tables 165 (p.266) and 179 (p.279) and CRF table 3.B(b). For example, for 2017, Bulgaria reported in NIR table 165 and CRF table 3.B(b) a total swine population of 604,790 head while NIR table 179 (p.279) shows a total of 604,922 head. For 2018, NIR table 165 and CRF table 3.B(b) show a total swine population of 623,854 head while NIR table 179 shows a total of 623,856 head. During the review, the Party clarified that the inconsistencies resulted from a technical error in the reported population of pigs weighing more than 110 kg and pigs weighing 20–50 kg. The ERT recommends that the Party ensure consistency among NIR tables 165 and 179 and CRF table 3.B(b) regarding the total swine population.	Yes. Convention reporting adherence
A.22	3.G Liming – CO_2	Bulgaria reported in its NIR (section 5.9.3, p.292) that there has been no liming in Bulgaria since 1987 and that, following political reforms and the closure of so-called labour cooperative farms, liming was no longer profitable (see also ID# A.19 in table 3). However, the ERT found studies which claimed that liming was required in some agricultural areas in Bulgaria owing to soil acidity (Fajtondzhiev, 2008; Pelovski et al., 2017; Yordanova et al., 2015). The ERT asked the Party to provide the balance of lime production, imports and exports and whether it had examined practices and the amount of lime being applied in the agriculture sectors of nearby countries (e.g. Czechia, Hungary, Romania and Serbia) in order to calculate an average volume of lime applied per area of agricultural land and possibly check the threshold of significance in accordance with paragraph 37(b) of the UNFCCC Annex I inventory reporting guidelines. During the review, the Party stated that it will contact the National Statistical Institute to obtain data for lime production, imports and exports for 1988–2019. It reiterated that liming is not a current practice in the country and that the inventory team had already discussed the matter with the National Institute of Soil Science, Agrotechnology and Plant Protection. Nevertheless, the Party added that it will examine the amount of lime being applied in other EU member States that practise liming and make a comparison to check the threshold of significance and include the results in the next NIR. The ERT recommends that Bulgaria obtain the balance of lime production, imports and exports to check whether any lime remains in the country. In addition, the ERT recommends that the Party research agricultural practices in nearby countries and, if liming occurs, determine the average volume of lime applied per area of agricultural land and calculate the values for Bulgaria. The ERT also recommends that the Party report in its NIR on the progress and results of its investigations.	Yes. Completeness

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue/problem?[a]
LULUCF			
L.12	4. General (LULUCF) – all gases	The ERT noted inconsistencies in the information reported between NIR table 199 (p.295) and CRF table summary 2. For example, total CO_2 removals for 2018 are reported in NIR table 199 as 8,556.59 kt CO_2 eq and in CRF table summary 2 as 8,460.61 kt CO_2 eq. During the review, the Party clarified that it had made a mistake in updating the values in the NIR and will correct this error in its next submission.	Yes. Convention reporting adherence
		The ERT recommends that Bulgaria correct the values in NIR table 199 to ensure consistency with CRF table summary 2.	
L.13	4.A Forest land – CO_2	Bulgaria stratified the reported area of forest land remaining forest land into three forest types: deciduous, coniferous and out of yield. In CRF table 4.A it included emission estimates for coniferous and deciduous forest; however, for out-of-yield forest it reported "NO". In addition, the ERT noted that the Party did not include in the NIR the definition of out-of-yield forest. Definitions of coniferous and deciduous forest were included in the NIR (section 11.3.1.2, p.416).	Yes. Transparency
		During the review, the Party explained that, while forests defined as out of yield represented less than 1 per cent of total forested areas, it had included them as a separate stratum to ensure full compliance with the forest definition and consistency of the area reported. The out-of-yield stratum included areas covered by mountain pine (*Pinus mugo*), common in high-elevation habitats. As there was no commercial use for such forests, it was assumed that all gains were equal to losses and a tier 1 method was applied.	
		The ERT recommends that Bulgaria provide in the NIR a definition for out-of-yield forest clarifying why "NO" is reported for this forest type.	
L.14	4.A.1 Forest land remaining forest land – CO_2	Bulgaria recalculated CSC in deadwood using a new method; namely, a model that estimates deadwood stock based on the ratio of mortality to standing volume per tree species and age class (NIR pp.303 and 323). The ERT noted that the model presented in the NIR (figure 104, p.324) takes the form of a negative exponential relationship, whereas related literature (i.e. Monserud and Sterba, 1999; and Chen et al., 2008) suggests a U-shaped correlation between stand age and mortality. The ERT also noted that the Party does not adequately justify the model and that the current method applied by the Party does not account for the fact that the decomposition of deadwood depends on the dimensions of pieces of deadwood, since larger pieces decay more slowly than smaller ones.	Yes. Accuracy
		During the review, the Party provided a document with detailed information on the model used to calculate mortality. It explained that quantitative data on deadwood were not systematically collected in Bulgaria for the purpose of enabling it to derive CSC factors for deadwood in forest land remaining forest land. The approach reported in the NIR was based on a model that quantified mortality. However, in calculating emissions and removals from the deadwood pool, it did not include the initial stock of deadwood for the beginning of the time series. The Party clarified that it will elaborate on the method in its next submission by estimating the initial stock of deadwood in forests for the base year, using reference data from other countries or estimating the relative share of the deadwood from the total growing stock. The ERT considers that the document provided by the Party during the review satisfactorily explained the method applied for CSC in deadwood; however, the Party should improve the description of the model in the NIR. In addition, the ERT notes that, according to the 2006 IPCC Guidelines (vol. 4, chap. 4, p.4.44), it is good practice to implement general QC checks by comparing, for example, estimates against field measurements and other data sources.	

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue/problem?[a]
		The ERT recommends that Bulgaria elaborate in the NIR on the method and calculate emissions and removals from the deadwood pool by estimating the initial stock of the deadwood in forests for the base year. The ERT also recommends that the Party improve the documentation in the NIR of its modelling approach. The ERT encourages the Party to include a verification of the model, considering that it is good practice to implement general QC checks for a tier 2 approach, as outlined in the 2006 IPCC Guidelines (vol. 4, chap. 4, p.4.44).	
L.15	4.A.1 Forest land remaining forest land – CO_2	The Party performed recalculations for CSC in living biomass as explained in the NIR (p.302) and also reported adjustments to the area of forest land (p.319) due to differences between official statistics and the identification of new forest areas that were forested before 1990. The ERT noted a significant decrease in CSC in living biomass – by more than 50 per cent between 2000 (4,348.02 kt C) and 2001 (1,868.46 kt C) and then remaining almost constant (at this lower value) from 2001 to 2005. This trend in the time series between 2000 and 2005 was not observable in previous submissions, indicating a problem of time-series consistency due to the adjustments in the area of forest land. During the review, the Party clarified that it was aware of the drop in the CSC in living biomass per area between 2000 and 2001, and the trend between 2001 and 2005, and that it was investigating the potential causes, as reported in the NIR (p.315). Regarding the differences in the forest area given in the official statistics and the area reported under the inventory, the Party clarified that the latter also includes temporarily unstocked forest land. The Party also clarified in the NIR (p.319) that it has plans to perform further analysis to identify the cause of the decrease in the values of CSC in living biomass.	Yes. Consistency
		The ERT recommends that Bulgaria investigate the causes of the decrease in the values of CSC in living biomass between 2000 and 2005 and provide in the NIR a relevant explanation for the trends observed in the time series for 2000–2005.	
L.16	4.E Settlements – CO_2	The ERT noted inconsistencies between NIR tables 225 and 226 (p.359) and CRF table 4.E. In NIR table 225 the Party reported AD and in NIR table 226 emissions and removals for all categories and subcategories under 4.E (settlements). However, these values do not match the values reported in CRF table 4.E. For example, in NIR table 225 the Party reported for 2018 under category 4.E.1 an area of 532.25 kha and in CRF table 481.03 kha; in NIR table 226 the Party reported for 2018 under category 4.E.2 emissions of 478.38 Gg CO_2 eq and in the CRF table 601.92 Gg CO_2 eq.	Yes. Convention reporting adherence
		During the review, the Party clarified that it had made a mistake in updating the values in the NIR and will correct this error in its next submission.	
		The ERT recommends that Bulgaria correct the values in NIR tables 225 and 226 to ensure consistency with CRF table 4.E.	
Waste			
W.9	5.B.1 Composting – CH_4 and N_2O	The ERT noted that the values reported in NIR table 243 (p.382) for waste treated at biological treatment facilities for 2011–2018 are inconsistent with the AD reported in CRF table 5.B. During the review, the Party clarified that the AD in the NIR were reported on a wet weight basis while those in the CRF table were reported on a dry weight basis. In response to a question raised by the ERT, the Party explained that emission calculations were not affected by this inconsistency because it had correctly applied the default EFs for CH_4 and N_2O based on wet and dry weight from the 2006 IPCC Guidelines (vol. 5, table 4.1, p.4.6). The EF for dry waste was estimated from that for wet waste	Yes. Transparency

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue/problem?[a]
		assuming moisture content of 60 per cent in wet waste in accordance with the 2006 IPCC Guidelines (vol. 5, table 4.1, p.4.6).	
		The ERT recommends that Bulgaria either include information in its NIR to explain that the AD are reported on a wet weight basis or modify NIR table 243 (p.382) to provide the AD on a dry weight basis, as reported in CRF table 5.B, to ensure consistency between the NIR and the CRF tables.	
W.10	5.B.1 Composting – CH_4 and N_2O	Bulgaria reported in NIR table 243 (p.382) that, during the review of the annual emission allocation under the EU effort-sharing decision, the technical review team had noted a significant reduction in the amount of waste composted between 2017 and 2018 (from 238.000 to 95.538 Gg) and therefore it had asked the National Statistical Institute for clarification. Although no answer had been received by the inventory submission date, the Party was able to clarify during the review that the reduction was attributable to the implementation of an ordinance for the separate collection of biowaste and treatment of biodegradable waste, which introduced more stringent requirements for the fraction of separated waste to be composted.	Yes. Transparency
		The ERT recommends that Bulgaria clarify in the NIR (section 7.3.1.2) the trends in AD for waste composted, explaining that, between 2017 and 2018, the amount of composted waste decreased in line with more stringent requirements for the fraction of separated waste to be composted, and including a reference to the law providing for the introduction of those requirements.	
W.11	5.C.1 Waste incineration – CH_4	Bulgaria reported in NIR table 244 (p.384) the amount of clinical waste incinerated under category 5.C.1. It was not clear to the ERT whether all clinical waste was accounted for under this category or whether a proportion of clinical waste was disposed of at landfills. During the review, the Party clarified that under regulation 1 of 9 February 2015 on the requirements for activities involving the collection and treatment of waste on the premises of medical and health institutions, clinical waste is identified as hazardous and therefore incinerated.	Yes. Transparency
		The ERT recommends that Bulgaria explain in the NIR (e.g. in section 7.2.1) that all clinical waste is considered hazardous waste by law and is therefore incinerated.	
W.12	5.C.1 Waste incineration – CO_2	Bulgaria reported total CO_2 emissions in NIR tables 233 (p.368) and 244 (p.384) by type of waste (clinical and hazardous). The ERT calculated the value of total CO_2 emissions from clinical and hazardous waste, using the values presented in NIR table 244, and obtained a value different from that reported in CRF table 5.C (e.g. NIR table 244, 8.29 kt for 2018; and CRF table 5.C, 6.77 kt for 2018).	Yes. Convention reporting adherence
		During the review, the Party explained that the CO_2 emissions reported in CRF table 5.C are correct and relate to only the non-biogenic part of the waste, whereas the emissions reported in the NIR (tables 233 and 244) relate to the biogenic and non-biogenic part of the waste.	
		The ERT recommends that Bulgaria correct NIR tables 233 and 244 to reflect the total CO_2 emissions reported in CRF table 5.C for category 5.C.1.	
KP-LULUCF			
KL.12	Deforestation – CO_2	Bulgaria reported a value of 10.23 t C/ha for carbon stock in litter in the LULUCF sector under the Convention (NIR p.329) but a value of 5.38 t C/ha under the Kyoto Protocol (NIR p.419). Since carbon stock in litter on forest land is used to estimate emissions and removals for conversions of forest land to other land uses, values should be applied consistently under the Convention and the Kyoto Protocol in accordance with decision 6/CMP.9, paragraph 9.	Yes. KP reporting adherence

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		During the review, the Party stated that it had not updated this value in the part of the NIR relating to the Kyoto Protocol, and that it will improve the consistency of its reporting under the Kyoto Protocol and the Convention in its next submission.	
		The ERT recommends that Bulgaria correct the value of carbon stock in litter for KP-LULUCF to be consistent with the value applied in the LULUCF sector for forest land converted to other land uses.	
KL.13	Deforestation and FM – CO_2	Bulgaria reported in its NIR (p.418) that, for estimating changes in deadwood stock due to deforestation, it was assumed that the deadwood stocks (before deforestation) were equal to 5 per cent of the standing biomass stock of forests in the country. The Party also reported in its NIR (pp.323–325) that it uses a model to estimate deadwood stocks on forest land remaining forest land (category 4.A.1) (see also ID# L.14 above). The ERT noted that this results in an inconsistency between land subject to deforestation (and also forest land converted to other land under the Convention) and the estimates of deadwood stock changes on land subject to FM (and also on forest land remaining forest land under the Convention). The ERT considered that for the sake of consistency between activities reported under the Kyoto Protocol and between reporting under the Convention and the Kyoto Protocol, and to improve accuracy, the Party should report deadwood stock changes consistently on the basis of the model estimates.	Yes. Transparency
		During the review, the Party clarified that it had neglected to update the documentation in the section of the NIR relating to the Kyoto Protocol. The Party stated explicitly that all reported stock changes in the deadwood pool both under Kyoto Protocol activities (FM and deforestation) and under the Convention for forest land remaining forest land and forest land converted to other land are based on the revised modelled carbon stocks in the deadwood pool.	
		The ERT recommends that Bulgaria update the information in the NIR to reflect the correct methodology applied for deadwood stock changes under deforestation and FM activities.	
KL.14	FM – CO_2	Bulgaria reported "NO" or "NE" in CRF table 4(KP-I)B.1 for emissions and removals from CSC in litter, mineral soils and organic soils. In its NIR, the Party did not justify why these pools were not estimated or why emissions and removals are not occurring. The ERT noted that this is not in accordance with decision 2/CMP.7, annex, paragraph 26, which specifies that Parties shall account for all changes in pools, including litter and soil organic carbon, unless they provide transparent and verifiable information demonstrating that the pool is not a source. The ERT also noted that the pools had been estimated in previous submissions and that mineral soils was reported in the 2018 NIR as a source of carbon for 2016.	Yes. Completeness
		During the review, the Party clarified that it did not account for these pools for the same reason that it did not account for them for forest land remaining forest land under the Convention: for example, there are no data available for applying a tier 2 method for litter, mineral soils and organic soils; although some data were gathered for 1993 onward, there is still a lot of imperfection on these data and more analysis is needed (see ID# L.3 in table 3).	
		The ERT recommends that Bulgaria provide estimates for CSC in litter, mineral soils and organic soil or present verifiable information demonstrating that these pools are not a net source of anthropogenic GHG emissions, in accordance with decision 2/CMP.7, annex, paragraph 26, and decision 2/CMP.8, annex II, paragraph 2(e).	
KL.15	FM – CO_2	Bulgaria reported in NIR table 203 (p.211) and CRF table 4.A emissions and removals from forest land remaining forest land using three forest strata (coniferous, deciduous and out of yield); however, the Party did not use the same stratification for reporting FM under the Kyoto Protocol. The ERT noted that, as per the Kyoto Protocol Supplement (chap. 1, p.1.5), Parties are encouraged to harmonize estimations under the Convention and the Kyoto Protocol to	Not a problem

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue/problem?[a]
		increase transparency, accuracy and consistency. During the review, the Party clarified that consistency was ensured since the estimates for FM were based on the same stratification, but that the strata were not shown.	
		The ERT encourages Bulgaria to follow good practice and report emissions and removals from FM using the same stratification as for forest land remaining forest land.	
KL.16	FM – CO_2	Bulgaria has yet to make a technical correction to the FMRL (NIR section 11.5.2.3, p.428). Since Bulgaria has elected commitment period accounting it can, in accordance with decision 2/CMP.7, report its final technical correction at the end of the second commitment period. However, the ERT noted that in its previous submission the Party made a number of methodological changes that resulted in inconsistencies between the reporting of FM and the FMRL, including in the recalculation of the average soil organic carbon stock in soils (NIR p.302), the recalculation of deadwood stocks using a new methodology (NIR p.303) and the estimation of the average biomass growth of stands from first and second age classes following the recalculation of the expansion and conversion factors (NIR p.420). According to the Kyoto Protocol Supplement (chap. 2.7.6.3), it is good practice to assess annually the need for a technical correction by evaluating the criteria set out in its table 2.7.1. The ERT noted that no information on such an assessment was provided in the NIR. During the review, the Party acknowledged that the methodological changes require a technical correction and stated that it will implement such a correction and report the results at the end of the commitment period.	Yes. KP reporting adherence
		The ERT recommends that Bulgaria follow good practice and include in its NIR a list of all elements identified as leading to a technical correction to the FMRL in accordance with the Kyoto Protocol Supplement (chap. 2.7.6.3).	

[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 Bulgaria.

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

12. Bulgaria 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 Bulgaria in its 2020 annual submission

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

Table I.1

Total greenhouse gas emissions for Bulgaria, base year[a]–2018

(kt CO_2 eq)

| | Total GHG emissions excluding indirect CO_2 emissions | | Total GHG emissions including indirect CO_2 emissions[b] | | Land-use change (Article 3.7 bis as contained in the Doha Amendment)[c] | KP-LULUCF (Article 3.3 of the Kyoto Protocol)[d] | KP-LULUCF (Article 3.4 of the Kyoto Protocol) | |
	Total including LULUCF	Total excluding LULUCF	Total including LULUCF	Total excluding LULUCF			CM, GM, RV, WDR	FM
FMRL								–7 950.00
Base year	97 531.39	116 759.43	NA	NA	NA		NA	
1990	82 470.44	101 794.34	NA	NA				
1995	55 621.14	74 614.54	NA	NA				
2000	41 258.07	59 580.03	NA	NA				
2010	48 066.69	60 726.73	NA	NA				
2011	56 217.53	65 995.81	NA	NA				
2012	51 743.63	60 940.95	NA	NA				
2013	47 764.77	55 666.99	NA	NA		–1 451.38	NA	–7 535.19
2014	49 506.46	58 679.25	NA	NA		–1 688.86	NA	–7 586.83
2015	53 239.29	61 920.68	NA	NA		–1 704.51	NA	–7 740.93
2016	50 702.97	59 345.03	NA	NA		–1 890.81	NA	–7 410.01
2017	53 286.09	61 682.76	NA	NA		–2 034.09	NA	–7 333.87
2018	49 354.98	57 815.59	NA	NA		–2 293.58	NA	–7 318.33

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 1988 for CO_2, CH_4 and N_2O and 1995 for HFCs, PFCs, SF_6 and NF_3. Bulgaria 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 did not report indirect CO_2 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 Bulgaria, excluding land use, land-use change and forestry, 1988–2018
(kt CO_2 eq)

	$CO_2{}^a$	CH_4	N_2O	HFCs	PFCs	Unspecified mix of HFCs and PFCs	SF_6	NF_3
1988	89 606.70	16 638.29	10 506.22	NO, NA	NO, NA	NO, NA	3.30	NO, NA
1990	76 698.98	15 936.77	9 154.90	NO, NA	NO, NA	NO, NA	3.69	NO, NA
1995	57 716.37	11 744.36	5 145.59	3.33	NO, NA	NO, NA	4.90	NO, NA
2000	45 305.03	10 068.65	4 166.83	33.02	NO, NA	NO, NA	6.49	NO, NA
2010	47 862.93	7 844.18	4 337.75	663.05	0.06	NO, NA	18.76	NO, NA
2011	53 178.04	8 056.33	3 991.73	752.68	0.06	NO, NA	16.97	NO, NA
2012	48 349.01	7 686.29	4 066.37	823.14	0.05	NO, NA	16.10	NO, NA
2013	42 649.51	7 564.70	4 463.95	968.38	0.04	NO, NA	20.42	NO, NA
2014	45 169.33	7 459.82	4 925.23	1 107.96	0.03	NO, NA	16.88	NO, NA
2015	48 194.28	7 450.42	5 035.81	1 222.08	0.03	NO, NA	18.07	NO, NA
2016	45 353.72	7 213.21	5 360.00	1 399.33	0.02	NO, NA	18.75	NO, NA
2017	47 505.16	7 001.14	5 342.27	1 816.64	0.03	NO, NA	17.51	NO, NA
2018	43 551.60	6 753.67	5 239.79	2 252.53	0.01	NO, NA	17.99	NO, NA
Percentage change 1988–2018	**–51.4**	**–59.4**	**–50.1**	**NA**	**NA**	**NA**	**445.2**	**NA**

Note: Emissions and removals reported in the sector other (sector 6) are not included in this table.
[a] Bulgaria did not report indirect CO_2 emissions in CRF table 6.

Table I.3
Greenhouse gas emissions by sector for Bulgaria, 1988–2018
(kt CO_2 eq)

	Energy	IPPU	Agriculture	LULUCF	Waste	Other
1988	81 278.65	13 480.60	13 767.95	–19 228.04	8 227.31	NO
1990	71 271.69	10 084.04	12 461.57	–19 323.90	7 977.03	NO
1995	51 196.20	10 485.91	5 933.28	–18 993.40	6 999.15	NO
2000	40 763.64	7 230.48	5 205.33	–18 321.96	6 380.58	NO
2010	46 219.59	4 441.44	5 454.64	–12 660.04	4 611.06	NO
2011	51 293.93	5 016.99	5 105.53	–9 778.27	4 579.36	NO
2012	46 496.37	4 780.17	5 236.18	–9 197.32	4 428.22	NO
2013	40 718.71	4 754.73	5 717.59	–7 902.22	4 475.96	NO

	Energy	IPPU	Agriculture	LULUCF	Waste	Other
2014	43 055.73	5 115.24	6 187.48	−9 172.79	4 320.80	NO
2015	45 694.13	5 764.40	6 236.25	−8 681.39	4 225.90	NO
2016	42 622.42	6 051.32	6 585.68	−8 642.06	4 085.61	NO
2017	44 939.01	6 407.65	6 555.36	−8 396.67	3 780.74	NO
2018	41 197.21	6 525.73	6 415.69	−8 460.61	3 676.96	NO
Percentage change average for 1988–2018	**−49.3**	**−51.6**	**−53.4**	**−56.0**	**−55.3**	**NA**

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

Table I.4

Greenhouse gas emissions and removals from activities under Article 3, paragraphs 3–4, of the Kyoto Protocol by activity, base year[a]–2018, for Bulgaria
(kt CO_2 eq)

	Article 3.7 bis as contained in the Doha Amendment[b]	*Activities under Article 3.3 of the Kyoto Protocol*		*FM and elected activities under Article 3.4 of the Kyoto Protocol*				
	Land-use change	*AR*	*Deforestation*	*FM*	*CM*	*GM*	*RV*	*WDR*
FMRL				−7 950.00				
Technical correction				NA				
Base year	NA				NA	NA	NA	NA
2013		−1 596.20	144.81	−7 535.19	NA	NA	NA	NA
2014		−1 751.69	62.83	−7 586.83	NA	NA	NA	NA
2015		−1 894.22	189.71	−7 740.93	NA	NA	NA	NA
2016		−2 048.63	157.82	−7 410.01	NA	NA	NA	NA
2017		−2 202.00	167.91	−7 333.87	NA	NA	NA	NA
2018		−2 364.37	70.79	−7 318.33	NA	NA	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] Bulgaria 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 value reported in this column relates to 1990.

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

Table I.5
Key relevant data for Bulgaria under Article 3, paragraphs 3–4, of the Kyoto Protocol from its 2020 annual submission

Parameter	Data values
Periodicity of accounting	(a) AR: commitment period accounting
	(b) Deforestation: commitment period accounting
	(c) FM: commitment period accounting
	(d) CM: not elected
	(e) GM: not elected
	(f) RV: not elected
	(g) WDR: not elected
Elected activities under Article 3, paragraph 4, of the Kyoto Protocol	None
Election of application of provisions for natural disturbances	Yes, for AR and FM
3.5% of total base-year GHG emissions, excluding LULUCF	3 993.686 kt CO_2 eq (31 949.490 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 Bulgaria. 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 Bulgaria
(t CO$_2$ eq)

	Original submission	Revised submission	Adjustment	Final value
CPR	**200 651 385**	**–**	**–**	**200 651 385**
Annex A emissions				
CO$_2$	43 551 599	–	–	43 551 599
CH$_4$	6 753 665	–	–	6 753 665
N$_2$O	5 239 787	–	–	5 239 787
HFCs	2 252 530	–	–	2 252 530
PFCs	14	–	–	14
Unspecified mix of HFCs and PFCs	NO, NA	–	–	NO, NA
SF$_6$	17 993	–	–	17 993
NF$_3$	NO, NA	–	–	NO, NA
Total Annex A sources	**57 815 589**	**–**	**–**	**57 815 589**
Activities under Article 3, paragraph 3, of the Kyoto Protocol				
AR	–2 364 368	–	–	–2 364 368
Deforestation	70 787	–	–	70 787
FM and elected activities under Article 3, paragraph 4, of the Kyoto Protocol				
FM	–7 318 331	–	–	–7 318 331

Table II.2
Information to be included in the compilation and accounting database for 2017 for Bulgaria
(t CO$_2$ eq)

	Original submission	Revised submission	Adjustment	Final value
Annex A emissions				
CO$_2$	47 505 164	–	–	47 505 164
CH$_4$	7 001 140	–	–	7 001 140
N$_2$O	5 342 274	–	–	5 342 274
HFCs	1 816 636	–	–	1 816 636
PFCs	31	–	–	31
Unspecified mix of HFCs and PFCs	NO, NA	–	–	NO, NA
SF$_6$	17 514	–	–	17 514
NF$_3$	NO, NA	–	–	NO, NA
Total Annex A sources	**61 682 758**	**–**	**–**	**61 682 758**
Activities under Article 3, paragraph 3, of the Kyoto Protocol				
AR	–2 202 001	–	–	–2 202 001
Deforestation	167 908	–	–	167 908
FM and elected activities under Article 3, paragraph 4, of the Kyoto Protocol				
FM	–7 333 872	–	–	–7 333 872

Table II.3
Information to be included in the compilation and accounting database for 2016 for Bulgaria
(t CO$_2$ eq)

	Original submission	Revised submission	Adjustment	Final value
Annex A emissions				
CO$_2$	45 353 723	–	–	45 353 723
CH$_4$	7 213 215	–	–	7 213 215
N$_2$O	5 359 999	–	–	5 359 999
HFCs	1 399 327	–	–	1 399 327
PFCs	23	–	–	23
Unspecified mix of HFCs and PFCs	NO, NA	–	–	NO, NA
SF$_6$	18 747	–	–	18 747
NF$_3$	NO, NA	–	–	NO, NA
Total Annex A sources	**59 345 035**	**–**	**–**	**59 345 035**
Activities under Article 3, paragraph 3, of the Kyoto Protocol				
AR	–2 048 630	–	–	–2 048 630
Deforestation	157 820	–	–	157 820
FM and elected activities under Article 3, paragraph 4, of the Kyoto Protocol				
FM	–7 410 006	–	–	–7 410 006

Table II.4
Information to be included in the compilation and accounting database for 2015 for Bulgaria
(t CO$_2$ eq)

	Original submission	Revised submission	Adjustment	Final value
Annex A emissions				
CO$_2$	48 194 280	–	–	48 194 280
CH$_4$	7 450 421	–	–	7 450 421
N$_2$O	5 035 811	–	–	5 035 811
HFCs	1 222 076	–	–	1 222 076
PFCs	28	–	–	28
Unspecified mix of HFCs and PFCs	NA, NO	–	–	NA, NO
SF$_6$	18 066	–	–	18 066
NF$_3$	NA, NO	–	–	NA, NO
Total Annex A sources	**61 920 681**	**–**	**–**	**61 920 681**
Activities under Article 3, paragraph 3, of the Kyoto Protocol				
AR	–1 894 224	–	–	–1 894 224
Deforestation	189 713	–	–	189 713
FM and elected activities under Article 3, paragraph 4, of the Kyoto Protocol				
FM	–7 740 928	–	–	–7 740 928

Table II.5
Information to be included in the compilation and accounting database for 2014 for Bulgaria
(t CO$_2$ eq)

	Original submission	Revised submission	Adjustment	Final value
Annex A emissions				
CO$_2$	45 169 330	–	–	45 169 330
CH$_4$	7 459 825	–	–	7 459 825
N$_2$O	4 925 232	–	–	4 925 232
HFCs	1 107 956	–	–	1 107 956
PFCs	33	–	–	33
Unspecified mix of HFCs and PFCs	NA, NO	–	–	NA, NO
SF$_6$	16 878	–	–	16 878

	Original submission	Revised submission	Adjustment	Final value
NF_3	NA, NO	–	–	NA, NO
Total Annex A sources	**58 679 253**	**–**	**–**	**58 679 253**
Activities under Article 3, paragraph 3, of the Kyoto Protocol				
AR	–1 751 689	–	–	–1 751 689
Deforestation	62 833	–	–	62 833
FM and elected activities under Article 3, paragraph 4, of the Kyoto Protocol				
FM	–7 586 834	–	–	–7 586 834

Table II.6
Information to be included in the compilation and accounting database for 2013 for Bulgaria
(t CO_2 eq)

	Original submission	Revised submission	Adjustment	Final value
Annex A emissions				
CO_2	42 649 508	–	–	42 649 508
CH_4	7 564 695	–	–	7 564 695
N_2O	4 463 951	–	–	4 463 951
HFCs	968 375	–	–	968 375
PFCs	39	–	–	39
Unspecified mix of HFCs and PFCs	NA, NO	–	–	NA, NO
SF_6	20 419	–	–	20 419
NF_3	NA, NO	–	–	NA, NO
Total Annex A sources	**55 666 988**	**–**	**–**	**55 666 988**
Activities under Article 3, paragraph 3, of the Kyoto Protocol				
AR	–1 596 198	–	–	–1 596 198
Deforestation	144 813	–	–	144 813
FM and elected activities under Article 3, paragraph 4, of the Kyoto Protocol				
FM	–7 535 189	–	–	–7 535 189

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.D.3 Other – non-energy products from fuels and solvent use (CO_2) (see ID# I.12 in table 3);

(b) 3.G Liming (CO_2) (see ID# A.22 in table 5);

(c) 4.C.2 Land converted to grassland (CO_2) (see ID# L.11 in table 3);

(d) FM (CO_2) (see ID# KL.14 in table 5).

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/.

IPCC. 2019. *2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories*. E Calvo Buendia, K Tanabe, A Kranjc, et al. (eds.). Geneva: IPCC. Available at https://www.ipcc.ch/report/2019-refinement-to-the-2006-ipcc-guidelines-for-national-greenhouse-gas-inventories/.

B. UNFCCC documents

Annual review reports

Reports on the individual reviews of the 2013, 2014, 2015, 2016 and 2018 annual submissions of Bulgaria, contained in documents FCCC/ARR/2013/BGR, FCCC/ARR/2014/BGR, FCCC/ARR/2015/BGR, FCCC/ARR/2016/BGR and FCCC/ARR/2018/BGR, 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 2020_final.pdf.

Annual status report for Bulgaria for 2020. Available at https://unfccc.int/sites/default/files/resource/asr2020_BGR.pdf.

C. Other documents used during the review

Responses to questions during the review were received from Detelina Petrova (Climate Change Policy Directorate of the Ministry of Environment and Water of Bulgaria), including additional material on the methodology and assumptions used. The following references have been reproduced as received:

Monserud, R., Sterba, H. 1999. *Modeling individual tree mortality for Austrian forest species*. Forest Ecology and Management 113:109-123.

Chen, H. Y. H., Songling, F., Monserud, R., Gillies, I. 2008. *Relative size and stand age determine Pinus banksiana mortality*. Forest Ecology and Management 255:3980-3984.

Penko, D., Gerzilov, V., Hristev, H. Depotov, P. 2014. *Methods for determining the release of greenhouse gas emissions from pig and poultry production in the Republic of Bulgaria*. Global Journal of Science Frontier Research (D), volume 14, issue 5, version 1, 2014, pp. 41-46.

Koselov, Lazart. *Obtaining up-to-date data, scientific justifications and calculations for the diet of sheep and pigs (digestible energy, average feed rations per day, amount of crude protein in the daily ration, percentage of nitrogen in it)*. Internal report.

EMEP/EEA. 2013. *Emission air pollutant inventory guidebook. Technical guide to prepare national emission inventories.* EEA Technical report No 12/2013, European Environment Agency. Available at https://www.eea.europa.eu//publications/emep-eea-guidebook-2013.

EMEP/EEA. 2019. *Emission air pollutant inventory guidebook. Technical guide to prepare national emission inventories.* EEA Technical report No 13/2019, European Environment Agency. Available at https://www.eea.europa.eu//publications/emep-eea-guidebook-2019.

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Fajtondzhiev, L. 2008. *Problems of soil acidity and liming*. Soil Science Agrochemistry and Ecology, volume 42, issue 2, pp.3-16. Available at https://agris.fao.org/agris-search/search.do?recordID=BG2008000478.

Pelovski, Y., Petkova, V., Serafimova, E. 2017. *Balanced fertilisation for sustainable agriculture and climate stability in Bulgaria*. Journal of Environmental Protection, volume 18, issue 1, pp. 264-270. Available at https://www.researchgate.net/publication/317743041_Balanced_fertilisation_for_sutainable_agriculture_and_climate_stability_in_Bulgaria.

Yordanova, N., Minev, N., Almaliev, M., Trendafilov, K., Valcheva, V., Todorova, S. 2015. *Research the suitability of the land for growth of berries and medical plants: recommendable fertilization rates*. Sixth International Scientific Agricultural Symposium „Agrosym 2015". Available at https://www.researchgate.net/publication/321797437_RESEARCH_THE_SUITABILITY_OF_THE_LAND_FOR_GROWTH_OF_BERRIES_AND_MEDICAL_PLANTS_RECOMMENDABLE_FERTILIZATION_RATES.