United Nations FCCC/ARR/2019/KAZ

Framework Convention on Climate Change

Distr.: General
2 September 2020

English only

Report on the individual review of the annual submission of Kazakhstan submitted in 2019*

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 inventory review of the 2019 annual submission of Kazakhstan, 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 23 to 28 September 2019 in Bonn.

* In the symbol for this document, 2019 refers to the year in which the inventory was submitted, not to the year of publication.

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Contents

Abbreviations and acronyms

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*
AAU	assigned amount unit
AD	activity data
Annex A source	source category included in Annex A to the Kyoto Protocol
Annex I Party	Party included in Annex I to the Convention
AR	afforestation and reforestation
Article 8 review guidelines	"Guidelines for review under Article 8 of the Kyoto Protocol"
C	carbon
CaO	calcium oxide
CER	certified emission reduction
CF_4	perfluoromethane
CH_4	methane
CKD	cement kiln dust
CM	cropland management
CMP	Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol
CO_2	carbon dioxide
CO_2 eq	carbon dioxide equivalent
Convention reporting adherence	adherence to the "Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual greenhouse gas inventories"
COP	Conference of the Parties
CPR	commitment period reserve
CRF	common reporting format
CSC	carbon stock change
DOC	degradable organic carbon
DOC_f	fraction of degradable organic carbon that decomposes
EEA	European Environment Agency
EF	emission factor
EMEP	European Monitoring and Evaluation Programme
ERT	expert review team
ERU	emission reduction unit
FM	forest management
FMRL	forest management reference level
FOD	first-order decay
$Frac_{LEACH}$	fraction of nitrogen input to managed soils that is lost through leaching and run-off
GCV	gross calorific value
GE	gross energy intake
GHG	greenhouse gas
GM	grazing land management
HCFC	hydrochlorofluorocarbon
HFC	hydrofluorocarbon
IE	included elsewhere
IEA	International Energy Agency
IEF	implied emission factor

IPCC	Intergovernmental Panel on Climate Change
IPCC good practice guidance for LULUCF	*Good Practice Guidance for Land Use, Land-Use Change and Forestry*
IPPU	industrial processes and product use
JSC	joint-stock company
KP-LULUCF activities	activities under Article 3, paragraphs 3 and 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 correction factor
MSW	municipal solid waste
N	nitrogen
NA	not applicable
NCV	net calorific value
NE	not estimated
NEU	non-energy use
Nex	nitrogen excretion
NF_3	nitrogen trifluoride
NGL	natural gas liquid
NIR	national inventory report
NO	not occurring
N_2O	nitrous oxide
ODS	ozone-depleting substance(s)
PFC	perfluorocarbon
QA/QC	quality assurance/quality control
RMU	removal unit
RV	revegetation
SEF	standard electronic format
SF_6	sulfur hexafluoride
SOC	soil organic carbon
SWDS	solid waste disposal site(s)
UNFCCC Annex I inventory reporting guidelines	“Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual greenhouse gas inventories”
UNFCCC review guidelines	“Guidelines for the technical review of information reported under the Convention related to greenhouse gas inventories, biennial reports and national communications by Parties included in Annex I to the Convention”
WDR	wetland drainage and rewetting
Wetlands Supplement	*2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands*

I. Introduction[1]

1. This report covers the review of the 2019 annual submission of Kazakhstan 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" (decision 13/CP.20). The review took place from 23 to 28 September 2019 in Bonn and was coordinated by Claudia do Valle, Peter Iversen and Javier Hanna Figueroa (secretariat). Table 1 provides information on the composition of the ERT that conducted the review of Kazakhstan.

Table 1
Composition of the expert review team that conducted the review of Kazakhstan

Area of expertise	*Name*	*Party*
Generalist	Agita Gancone	Latvia
	Olia Glade	New Zealand
Energy	Leonidas Osvaldo Girardin	Argentina
	Gherghita Nicodim	Romania
	Peter Seizov	Bulgaria
IPPU	Kent Buchanan	South Africa
	Kakhaberi Mdivani	Georgia
	Jolanta Merkeliene	Lithuania
	Mingshan Su	China
Agriculture	Michael Anderl	Austria
	Juan José Rincón Cristóbal	Spain
LULUCF and KP-LULUCF activities	Maria Fernanda Alcobé	Argentina
	Valentyna Slivinska	Ukraine
	Midori Yanagawa	Japan
Waste	Cristobal Felix Diaz Morejon	Cuba
	Gábor Kis-Kovács	Hungary
	Martiros Tsarukyan	Armenia
Lead reviewers	Olia Glade	
	Kakhaberi Mdivani	

2. The basis of the findings in this report is the assessment by the ERT of the Party's 2019 annual submission in accordance with the UNFCCC review guidelines and the Article 8 review guidelines. The ERT notes that the individual inventory review of Kazakhstan's 2018 annual submission did not take place in 2018 owing to insufficient funding for the review process.

3. The ERT has made recommendations that Kazakhstan resolve the findings related to issues,[2] including issues designated as problems.[3] Other findings, and, if applicable, the encouragements of the ERT to Kazakhstan to resolve them, are also included. In accordance with the Article 8 review guidelines, the ERT recommends adjustments to the 2019 annual

[1] At the time of publication of this report, Kazakhstan had not yet submitted its instrument of ratification of the Doha Amendment, and the Amendment had not yet entered into force.

[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.

submission (see ID#s E.45, E.52, E.55 and W.15 in table 3, ID#s E.69, E.72 and I.56 in table 5 and chap. VI below).

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

5. Annex I shows annual GHG emissions for Kazakhstan, including totals excluding and including the LULUCF sector, indirect CO_2 emissions, and emissions by gas and by sector. Annex I also contains background data related to emissions and removals from KP-LULUCF activities, if elected by Kazakhstan, 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 2019 annual submission

7. Table 2 provides the assessment by the ERT of the 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 inventory of Kazakhstan

Assessment			*Issue or problem ID#(s) in table 3 and/or 5[a]*
Dates of submission	Original submission: 19 July 2019 (NIR), 15 April 2019 (CRF tables) version 2, (SEF tables – not submitted) Revised submission: 18 November 2019 (CRF tables) version 3 Unless otherwise specified, the values from the latest submission are used in this report		
Review format	Centralized		
Application of the requirements of the UNFCCC Annex I inventory reporting guidelines and Wetlands Supplement (if applicable)	Have any issues been identified in the following areas:		
	(a) Identification of key categories?	Yes	KL.4
	(b) Selection and use of methodologies and assumptions?	Yes	E.9, E.11, E.13, E.27, E.45, E.71, E.73, I.5, I.22, I.56, I.57, L.8(e), L.10, L.12, L.13, L.15, L.21, W.17
	(c) Development and selection of EFs?	Yes	E.16, E.28, E.31, E.38, E.40, E.51, E.70, I.51, A.16, W.6, W.10
	(d) Collection and selection of AD?	Yes	E.3, E.8, E.10, E.11, E.15, E.18, E.32, E.33, E.34, E.37, E.50, E.52, E.58, E.62, E.67, E.69, E.70, E.72, I.11, I.12, I.19, I.20, I.28, I.34, A.13, L.8(a), L.8(d), L.8(f), L.16, L.24, W.8, W.18, KL.5
	(e) Reporting of recalculations?	Yes	G.15, E.2, E.14, E.61, E.64, E.65, I.6, I.44, A.17, W.19

Assessment			*Issue or problem ID#(s) in table 3 and/or 5[a]*
	(f) Reporting of a consistent time series?	Yes	E.4, E.6, E.47, E.49, E.51, E.53, E.54, E.60, E.68, I.52
	(g) Reporting of uncertainties, including methodologies?	Yes	G.17
	(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/completeness?[b]	Yes	E.22, E.42, E.55, I.39, I.45, I.53, I.54, I.58, A.19, A.23, L.1, L.2, L.19, L.23, W.1, W.5, W.11, W.13, W.15, KL.2, KL.9
	(j) Application of corrections to the inventory?	No	
Significance threshold	For categories reported as insignificant, has the Party provided sufficient information showing that the likely level of emissions meets the criteria in paragraph 37(b) of the UNFCCC Annex I inventory reporting guidelines?	No	I.49, W.15
Description of trends	Did the ERT conclude that the description in the NIR of the trends for the different gases and sectors is reasonable?	No	E.29, E.30, E.49, E.51, I.27
Supplementary information under the Kyoto Protocol	Have any issues been identified related to the following aspects of the national system:		
	(a) Overall organization of the national system, including the effectiveness and reliability of the institutional, procedural and legal arrangements?	Yes	G.3, G.4
	(b) Performance of the national system functions?	Yes	G.8, G.15, G.16, G.17, G.22, E.12, L.3, KL.6
	Have any issues been identified related to the national registry:		
	(a) Overall functioning of the national registry?	Yes	G.1
	(b) Performance of the functions of the national registry and the technical standards for data exchange?	Yes	G.1
	Have any issues been identified related to reporting of information on AAUs, CERs, ERUs and RMUs and on discrepancies reported 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?	Yes	G.2
	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 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.10
	Have any issues been identified related to the following reporting requirements for KP-LULUCF activities:		

Assessment			*Issue or problem ID#(s) in table 3 and/or 5[a]*
	(a) Reporting requirements of decision 2/CMP.8, annex II, paragraphs 1–5?	Yes	G.7, KL.1, KL.3, KL.7
	(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.7
	(c) Reporting requirements of decision 6/CMP.9?	Yes	KL.5
	(d) Country-specific information to support provisions for natural disturbances, in accordance with decision 2/CMP.7, annex, paragraphs 33 and 34?	Yes	KL.8, KL.10
CPR	Was the CPR reported in accordance with the annex to decision 18/CP.7, the annex to decision 11/CMP.1 and decision 1/CMP.8, paragraph 18?	No	G.21
Adjustments	Has the ERT applied an adjustment under Article 5, paragraph 2, of the Kyoto Protocol?	Yes	See annex IV below
	Did the Party submit a revised estimate to replace a previously applied adjustment?	Yes	The ERT does not accept all the revised estimates
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 the assessment of conformity with the UNFCCC Annex I inventory reporting guidelines and any further guidance adopted by the COP?	Partially	G.21, G.22, W.17, W.18, W.19, W.20
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?	Yes	See annex III for a list of questions and issues to be considered during the in-country review
Questions of implementation	Did the ERT list any questions of implementation?	Yes	See table 7 in chapter VIII below

[a] The ERT identified additional issues and/or problems in the energy, IPPU, agriculture, LULUCF and waste sectors as well as issues and/or problems related to reporting on KP-LULUCF activities that are not listed in this table but are included in table 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 issues and/or problems raised in the previous review report

8. Table 3 compiles all the recommendations made in previous review reports that were included in the previous review report, published on 18 February 2019.[4] For each issue and/or problem, the ERT specified whether it believes the issue and/or problem has been resolved by the conclusion of the review of the 2019 annual submission and provided the rationale for its determination, which takes into consideration the publication date of the previous review report and national circumstances.

[4] FCCC/ARR/2017/KAZ. The ERT notes that the report on the individual review of Kazakhstan's 2018 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 2017 annual submission.

Table 3
Status of implementation of issues and/or problems raised in the previous review report of Kazakhstan

ID#	*Issue and/or problem classification*[a, b]	*Recommendation made in previous review report*	*ERT assessment and rationale*
General			
G.1	National registry (G.13, 2017) KP reporting adherence	Establish and maintain the national registry and report information on how the national registry performs the functions defined in the mandatory requirements for the registry's functionality for the second commitment period of the Kyoto Protocol, in accordance with the requirements set out in decision 13/CMP.1, annex, chapter II, in conjunction with decision 3/CMP.11, and the annex to decision 5/CMP.1, and thereafter report information on any change in the national registry in subsequent annual submissions.	Not resolved. The national registry of Kazakhstan was not established for the 2019 annual submission. The ERT noted that this problem was listed as a question of implementation 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 Kazakhstan (FCCC/IRR/2017/KAZ, ID# 18). The ERT also noted that the NIR did not contain information on the progress made to date on establishing the national registry. During the review, the Party informed the ERT that the national registry has not yet been established in Kazakhstan, as the Party does not yet have in place projects to reduce GHG emissions under the Kyoto Protocol. The Party is considering obtaining a software for the national registry in 2020. The ERT concluded that the national registry of Kazakhstan has not yet been developed and therefore a registry is not in place that is able to perform the mandatory requirements for the registry's functionality for the second commitment period of the Kyoto Protocol, in accordance with the requirements set out in decision 13/CMP.1, annex, chapter II, in conjunction with decision 3/CMP.11, and the annex to decision 5/CMP.1. The ERT therefore included this issue in the list of potential problems and further questions raised by the ERT. The ERT recommended that Kazakhstan prioritize the establishment of the national registry as early as possible in accordance with the requirements set out in decision 13/CMP.1, annex, chapter II, in conjunction with decision 3/CMP.11 and relevant CMP decisions and provide: (a) Information on progress made to date in the development of the national registry; (b) A detailed plan for the design and implementation of the registry; (c) Information on specific steps and defined timelines for their implementation under the detailed plan, taken to ensure that the registry adheres to the relevant provisions; (d) Information on how Kazakhstan is planning to meet the reporting requirements set out in decision 15/CMP.1, in conjunction with decision 3/CMP.11; (e) A clear statement on how the Party ensures the submission of annual information on Kyoto Protocol units using the SEF tables, in accordance with decision 15/CMP.1, in conjunction with decision 3/CMP.11 and relevant CMP decisions; (f) Clearly defined deadlines for the fulfilment of the detailed plan for the design and implementation of the registry. In response to the list of potential problems and further questions raised by the ERT, Kazakhstan indicated that it is planning to start resolving the above-mentioned problems in accordance with all the requirements

ID#	Issue and/or problem classification[a, b]	Recommendation made in previous review report	ERT assessment and rationale
			presented in the list of potential problems and further questions raised by the ERT. Some of the solutions will be implemented within the framework of the World Bank Partnership for Market Readiness project entitled "Legal and Technical Diagnostic of the State Registry of the GHG ETS of Kazakhstan" to be launched at the end of 2019, with completion scheduled for June 2020. According to the scope of the project's activities, the project will focus on an analysis of the legal and technical framework of Kazakhstan's current registry system in order to determine any potential gaps as well as any deviation from international practices. The ERT considered that Kazakhstan's response did not adequately resolve the problem. The ERT noted that, in its response, Kazakhstan stated that it is planning to start resolving the problems with the national registry and that some of the elements of this work will be implemented within the framework of a World Bank Partnership for Market Readiness project, with completion scheduled for June 2020. However, the detailed workplan for the design and implementation of the national registry was not included in the response, nor was information provided on specific steps and defined timelines for its implementation. For this reason, as the Party has not established a national registry in accordance with the requirements set out in decision 13/CMP.1, annex, chapter II, in conjunction with decision 3/CMP.11, and the annex to decision 5/CMP.1, the ERT considers this problem unresolved. Therefore, the ERT has identified this problem, which pertains to language of a mandatory nature and influences the fulfilment of commitments, as a question of implementation in accordance with decision 22/CMP.1 in conjunction with decision 4/CMP.11 (see chap. VIII below).
G.2	Kyoto Protocol units (G.14, 2017) KP reporting adherence	Provide the reporting on the Kyoto Protocol units using the SEF tables as required in decision 3/CMP.11, paragraph 13.	Not resolved. Kazakhstan did not include in the 2019 annual submission the reporting on its Kyoto Protocol units using the SEF tables as required in decision 3/CMP.11, paragraph 13. The ERT noted that this problem was listed as a question of implementation in the previous review report (FCCC/ARR/2017/KAZ, ID# G.14). The ERT included this issue in the list of potential problems and further questions raised by the ERT and recommended that Kazakhstan provide the reporting on its Kyoto Protocol units using the SEF tables in accordance with decision 15/CMP.1, annex, chapter I.E, paragraphs 12–18, in conjunction with decision 3/CMP.11. In response to the list of potential problems and further questions raised by the ERT, the Party indicated that, in accordance with paragraph 5 of the draft action plan of Kazakhstan to exit the non-compliance regime under the Kyoto Protocol, it will provide completed SEF spreadsheets for 2013–2017, as well as for 2018–2019, together with the NIR of the 2021 annual submission, by 15 April 2021. The indicated draft action plan was not included in Kazakhstan's response to the list of potential problems and further questions raised by the ERT. The ERT considered the Party's

ID#	*Issue and/or problem classification*[a, b]	*Recommendation made in previous review report*	*ERT assessment and rationale*
			response and welcomed Kazakhstan's intention to provide SEF tables for 2013–2017 by 15 April 2021; however, because Kazakhstan did not provide in its response the requested SEF tables or any description of the specific actions and steps (including time frames, deliverables and responsibilities) that would lead to the problem being addressed in the next annual submission, the ERT found that Kazakhstan has not satisfactorily resolved the problem and considered that the problem related to the reporting of Kyoto Protocol units in accordance with decision 15/CMP.1, annex, chapter I.E, paragraphs 12–18, in conjunction with decision 3/CMP.11, in the SEF tables as required in decision 3/CMP.11, paragraph 13, remains unresolved. Therefore, the ERT has identified this problem, which pertains to language of a mandatory nature and influences the fulfilment of commitments, as a question of implementation in accordance with decision 22/CMP.1 in conjunction with decision 4/CMP.11 (see chap. VIII below).
G.3	National system (G.15, 2017) KP reporting adherence	Provide an action plan and information on its implementation to address the issues identified, in particular on the steps, including those already achieved, and expected time frames for: (1) putting in place additional agreements and mechanisms to improve inter-agency cooperation and support that clearly define mandates for each inventory contributor and participant regarding inventory roles and responsibilities, inventory funding and inventory resourcing; (2) identifying roles and responsibilities for QA/QC and data verification for each inventory sector to ensure data quality and reliability; and (3) implementing arrangements for review, approval and sign-off processes to ensure timely annual submission of the NIR by the agreed submission due date.	Not resolved. The NIR did not include an action plan and information on its implementation to address the issues identified regarding the functions of the national system, in particular on the steps and expected time frames for: (1) putting in place additional agreements and mechanisms to improve inter-agency cooperation and support; (2) identifying roles and responsibilities for QA/QC and data verification; and (3) implementing arrangements for review, approval and sign-off processes. The ERT noted that this problem was listed as a question of implementation 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 Kazakhstan (FCCC/IRR/2017/KAZ, ID# 15). During the review, Kazakhstan indicated that points (1)–(3) above will be addressed in the 1990–2018 inventory (2020 annual submission). Therefore, the ERT included this issue in the list of potential problems and further questions raised by the ERT and recommended that Kazakhstan provide an action plan detailing the steps and time frames for: (a) Putting in place additional mechanisms, including necessary agreements with data providers, to improve inter-agency cooperation and support that clearly define mandates for each inventory contributor and participant regarding inventory roles and responsibilities, inventory funding and inventory resourcing; (b) Identifying roles and responsibilities for QA/QC and data verification for each inventory sector to ensure data quality and reliability; (c) Making arrangements for timely review, approval and sign-off processes of the annual submission (NIR and CRF tables) to ensure its timely submission by the agreed submission due date. In response to the list of potential problems and further questions raised by the ERT, Kazakhstan indicated that it had implemented some ad hoc actions to meet the NIR submission deadline of 15 April 2020, including

ID#	Issue and/or problem classification[a, b]	Recommendation made in previous review report	ERT assessment and rationale
			early announcement of the bidding process for the inventory preparation in December 2019. It also indicated that a number of provisions for meeting the NIR submission deadline of 15 April every year were included in the draft of a new Environmental Code that was due to be submitted to Parliament in December 2019. However, regarding this matter, Kazakhstan noted that the process of adopting the new legislation could take more than one year and, therefore, the problem would not be resolved in 2020, in particular by the due date for the annual submission in April 2020. The Party also stated that it is planning to fully implement and improve the quality of its national GHG inventory submission in accordance with relevant COP and CMP decisions, in particular decision 19/CMP.1, annex, paragraph "16(e)" (as referred to by the Party), in conjunction with decisions 3/CMP.11 and 4/CMP.11. Furthermore, Kazakhstan will prepare an inventory action plan in order to fully implement all the requirements and improvements according to the relevant COP and CMP decisions (decision 19/CMP.1, annex, para. 12(c–e), in conjunction with decisions 3/CMP.11 and 4/CMP.11). In addition, Kazakhstan indicated that it will put in place additional mechanisms to improve inter-agency cooperation and support that clearly define mandates for each inventory contributor and participant, including necessary agreements with data providers regarding points (a)–(c) of the recommendation of the ERT. The ERT considered the Party's response and welcomed the Party's efforts to address this problem, including the ad hoc arrangements for the 2020 annual submission, but found that Kazakhstan has not provided the requested action plan detailing its steps and time frames and did not satisfactorily resolve the problem for the 2019 annual submission, and in turn, for the due date of the 2020 annual submission. In addition, the ERT noted that paragraph "16(e)" in the annex to decision 19/CMP.1, as referred to by the Party, does not exist. Therefore, the ERT concluded that this problem remains unresolved, as the general and inventory planning functions defined in decision 19/CMP.1, annex, chapter V, paragraph 10(a–b) and (d), and chapter VI, paragraph 12(c–e), in conjunction with decisions 3/CMP.11 and 4/CMP.11, were not fully implemented. Therefore, the ERT has identified this problem, which pertains to language of a mandatory nature and influences the fulfilment of commitments, as a question of implementation in accordance with decision 22/CMP.1 in conjunction with decision 4/CMP.11 (see chap. VIII below).
G.4	National system (G.16, 2017) KP reporting adherence	In the NIR, provide information on planned capacity-building steps and report on progress regarding the capacity-building activities in the inventory improvement plan. Specifically, it should include	Not resolved. The NIR did not include information on planned capacity-building steps and progress regarding the capacity-building activities or specific arrangements for data-sharing and data communication. During the review, Kazakhstan provided the ERT with some information on the content of the inventory planning phase; however, this information still did not specify detailed activities

ID#	Issue and/or problem classification[a, b]	Recommendation made in previous review report	ERT assessment and rationale
		the planned actions, roles and responsibilities for those actions and the time frame for implementation of each action regarding: (1) building technical capacity of the personnel participating in the inventory preparation and management; and (2) making specific arrangements for data-sharing and data communication to ensure uninterrupted and timely access to AD by the designated inventory agency from other organizations.	describing planned actions, roles and responsibilities for those actions and the time frame for each action as required in the recommendation from the previous review report addressing the issues identified on national system functions (FCCC/ARR/2017/KAZ, ID# G.16). The ERT noted that this problem was listed as a question of implementation 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 Kazakhstan (FCCC/IRR/2017/KAZ, ID# 16). The ERT included this issue in the list of potential problems and further questions raised by the ERT and recommended that Kazakhstan undertake further steps in building inventory capacity and the technical competence of its relevant staff and provide information thereon, together with planned capacity-building steps, as well as information on the planned actions, roles and responsibilities for those actions and the time frame for implementation of each action with regard to: (a) Building the technical competence of the personnel participating in the inventory preparation and management, specifically by: (i) Putting in place the capacity-building plan, identifying specific needs to develop competence in each inventory sector, the roles and responsibilities of key persons and organizations involved in the implementation of the plan, relevant funding and resource mobilization, key steps, expectations and relevant deliverables, and the time frame for implementation of the plan; (ii) Focusing on improving knowledge, skills and expertise in: a. Understanding key COP/CMP decisions governing the inventory and supplementary information preparation and reporting process; b. Understanding the 2006 IPCC Guidelines as a methodological basis for inventory preparation; (iii) Improving business continuity for the personnel preparing the inventory by documenting details of the national system and process, the QA/QC and verification processes and procedures, the process for performing the uncertainty analysis, the institutional arrangements in place, and the inventory sectoral information associated with the preparation of estimates across all inventory sectors; (b) Making specific arrangements for data-sharing and data communication to ensure uninterrupted and timely access to AD from other organizations by the designated inventory agency and its staff. In response to the list of potential problems and further questions raised by the ERT, Kazakhstan indicated that it will undertake steps to build capacity and develop the technical competence of the relevant staff through participation in UNFCCC training for GHG inventory experts and planned capacity-building activities. These capacity-building arrangements will be included in the inventory improvement plan and, together with the reporting on the progress made with respect to

ID#	Issue and/or problem classification[a, b]	Recommendation made in previous review report	ERT assessment and rationale
			capacity-building, will be reported in the next annual submission. The Party also indicated that these steps will include the planned actions, roles and responsibilities for those actions and the time frame for implementation of each action regarding points (a) and (b) of the recommendation of the ERT. The ERT noted that the relevant action plan for capacity-building activities has been envisioned but not yet developed and, moreover, has not been provided to the ERT together with the required specific information on capacity-building activities. The ERT considered the Party's response and found it insufficient and concluded that Kazakhstan has not satisfactorily resolved the problem and that the general and inventory planning functions defined in decision 19/CMP.1, annex, chapter V, paragraph 10(b), and chapter VI, paragraph 12(c), in conjunction with decisions 3/CMP.11 and 4/CMP.11, were not fully implemented. Therefore, the ERT has identified this problem, which pertains to language of a mandatory nature and influences the fulfilment of commitments, as a question of implementation in accordance with decision 22/CMP.1 in conjunction with decision 4/CMP.11 (see chap. VIII below).
G.5	National system (G.17, 2017) Transparency	In the NIR, include details of the national system structure and operation regarding the different stages of inventory data collection and processing. Specifically, it should include detailed information on: (1) which organizations participate in data collection for each sector and whether those data providers are the same every year; (2) who is responsible for the preliminary (raw data) processing; and (3) how the quality and reliability of plant-specific and country-specific EFs are ensured and who is responsible for this.	Not resolved. The NIR (section 1.2.2, pp.17–19, and section 1.3, pp.28–29) did not include specific details on the allocation of roles for preliminary data collection and processing. The NIR included only a general statement indicating that data collection is performed through official letters of request to relevant ministries, committees and industrial enterprises, without specifying which ministries, committees or industrial enterprises were involved in providing data and for which sectors and categories, or whether those ministries, committees and industrial enterprises were involved in the preliminary data processing. In addition, the NIR did not include information on how the quality and reliability of plant-specific and country-specific EFs are ensured and who is responsible for this activity.
G.6	National system (G.19, 2017) Transparency	Through the national system, which ensures that areas of land subject to KP-LULUCF activities are identifiable, include in the NIR a detailed and transparent description of the process established for this purpose.	Not resolved. The ERT noted that the entire chapter related to the reporting of KP-LULUCF activities was not included in the NIR. Therefore, Kazakhstan did not provide in the NIR any detailed and transparent descriptions of the established process for ensuring that areas of land subject to KP-LULUCF activities are identifiable through the national system in accordance with decision 2/CMP.7, annex, paragraph 25. During the review, Kazakhstan informed the ERT that amendments and additions to the functions of the national system that ensure the ability to identify land plots with land use selected for reporting under the Kyoto Protocol in accordance with Article 3, paragraphs 3 and 4, of the Kyoto Protocol will be implemented by 15 March 2020 in accordance with paragraph 2 of the draft action plan of Kazakhstan to

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			exit the non-compliance regime under the Kyoto Protocol (see ID# KL.6 in table 5).
G.7	KP-LULUCF supplementary information (G.19, 2017) Transparency	In the NIR, include transparent information on geographical identification of lands where deforestation, AR, FM and GM activities occurred on the territory, in line with the methodological recommendations of the 2006 IPCC Guidelines (vol. 4) and the Kyoto Protocol Supplement.	Not resolved. The NIR did not include information on geographical identification of lands where deforestation, AR, FM and GM activities occurred on the territory of Kazakhstan. During the review, Kazakhstan explained that this information will be included in the 1990–2018 inventory (2020 annual submission) (see ID# KL.7 in table 5).
G.8	Inventory management (G.18, 2017) KP reporting adherence	Enhance the inventory archiving system and ensure that all inventory documentation is readily available to both inventory compilers and the ERTs.	Not resolved. The ERT noted that the NIR included a general description of how the process for ensuring security of documentation in the inventory archive is organized (section 1.3, pp.28–29). However, the NIR did not include any information on actions taken to enhance the inventory archiving system or explain which actions were undertaken to improve the accessibility of the archived information located in Almaty from remote locations (e.g. Nursultan) for the inventory personnel and the ERT, when a review is taking place. In addition, the ERT noted that the national inventory archive is part of the national system and according to the NIR (section 1.2.4, p.28), no changes to the national system have been made since 2017, meaning that no changes were introduced in the inventory archiving system. The ERT also noted that, during the review, Kazakhstan's responses to the requests made by the ERT for clarifying inventory information were not provided in a timely manner in accordance with Article 8 of the Kyoto Protocol, showing that some data or information were not readily available from the national inventory archive (see ID# G.22 in table 5). The ERT included this issue in the list of potential problems and further questions raised by the ERT and recommended that Kazakhstan provide information on a communication plan and explain how it will put in place and implement the plan to ensure that: (a) Requests made by the ERT for clarifying inventory information are actioned and communicated in a timely manner; (b) The location of the inventory data and related information is clearly documented to improve accessibility to and navigation through the inventory archiving system. In response to the list of potential problems and further questions raised by the ERT, Kazakhstan indicated that a communication plan will be developed, which will include ways of clarifying all inventory information and a mechanism for approving the responses to the ERT, including a clear description of the roles and responsibilities of relevant staff and the agreed timelines. The Party also indicated that the location of the inventory data and related information will be

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			clearly documented to improve accessibility to and navigation through the inventory archiving system. The ERT considered the Party's response and found that Kazakhstan has not satisfactorily resolved the problem. The ERT noted that Kazakhstan's response did not contain the communication plan or a description of the specific actions and steps (including time frames, deliverables and responsibilities) that would provide further details of the plan and its implementation. The ERT also noted that the inventory management functions defined in decision 19/CMP.1, annex, chapter VI, paragraph 16(a–b), in conjunction with decisions 3/CMP.11 and 4/CMP.11, were not fully implemented. Therefore, the ERT has identified this problem, which pertains to language of a mandatory nature and influences the fulfilment of commitments, as a question of implementation in accordance with decision 22/CMP.1 in conjunction with decision 4/CMP.11 (see chap. VIII below).
G.9	Inventory management (G.4, 2017) (G.12, 2016) (G.12, 2015) (15, 2013) (24, 2012) (26, 2011) Transparency	Provide, in the NIR, more information on: the archiving system, including the responsibilities of different institutions for the flow of data and archiving; whether the archiving system includes information generated through external and internal reviews, documentation on annual key category analysis, key category identification and planned inventory improvements; and how this system is maintained by the Kazakh Scientific Research Institute of Ecology and Climate.	Addressing. In the NIR (section 1.2.3.5, p.27 and section 1.3, pp.28–29) the Party included brief and general information regarding the security of the archiving system, the structure of the archiving system, and the roles and responsibilities of relevant staff regarding data archiving. However, the Party did not provide in the NIR or during the review any information on whether the archiving system includes information generated through external and internal reviews, documentation on annual key category analysis, key category identification and planned inventory improvements, how this system is maintained by JSC "Zhasyl Damu" (formerly the Kazakh Scientific Research Institute of Ecology and Climate) and, importantly, whether there have been any changes to improve the archiving system since it was assessed during the in-country review of the 2017 annual submission of Kazakhstan.
G.10	Article 3, paragraph 14, of the Kyoto Protocol (G.20, 2017) KP reporting adherence	Report in subsequent annual submissions any change to the information under Article 3, paragraph 14, in accordance with decision 15/CMP.1, in conjunction with decision 3/CMP.11.	Not resolved. The 2019 annual submission did not contain information on the minimization of adverse impacts or changes to this information, which is a mandatory requirement under Article 3, paragraph 14, of the Kyoto Protocol, in accordance with decision 15/CMP.1 in conjunction with decision 3/CMP.11. The ERT included this issue in the list of potential problems and further questions raised by the ERT and recommended that Kazakhstan report information on any changes in the information reported in the previous annual submission on the minimization of adverse impacts required under Article 3, paragraph 14, of the Kyoto Protocol, in accordance with decision 15/CMP.1 in conjunction with decision 3/CMP.11. In response to the list of potential problems and further questions raised by the ERT, Kazakhstan indicated that it will report on changes in the information reported on the minimization of adverse impacts since the previous annual submission. The ERT considered the Party's response and found that Kazakhstan has not satisfactorily resolved the problem, as information regarding the minimization of adverse impacts

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			required under Article 3, paragraph 14, of the Kyoto Protocol, in accordance with decision 15/CMP.1, annex, chapter I.H, in conjunction with decision 3/CMP.11, or regarding changes to this information since the previous annual submission, has not been provided. Therefore, the ERT has identified this problem, which pertains to language of a mandatory nature and influences the fulfilment of commitments, as a question of implementation in accordance with decision 22/CMP.1 in conjunction with decision 4/CMP.11 (see chap. VIII below).
G.11	NIR (G.5, 2017) (G.16, 2016) (G.15, 2015) Transparency	Provide detailed information on the assessment of completeness (e.g. in an annex) in the NIR.	Not resolved. A detailed assessment of completeness was not included in the NIR, which should include explanations for each instance of the use of the notation keys "IE" and "NE" by category and by gas in accordance with paragraphs 37 and 50 of the UNFCCC Annex I inventory reporting guidelines.
G.12	CRF tables (G.6, 2017) (G.17, 2016) (G.16, 2015) Comparability	Complete all cells and do not leave blank cells in the CRF tables and ensure the correct use of the notation keys (including "NA") in the CRF tables in line with decision 24/CP.19, annex I, paragraph 37.	Not resolved. The ERT noted several instances of blank cells left in the CRF tables (e.g. CRF tables 1 and 5.C have blank cells for 2017). The ERT also noted the incorrect use of notation keys or a lack of proper justification for their use; for example, AD for oil – exploration (subcategory 1.B.2.a.1) were reported as "NE" for 1990–1998 and 2000–2017, and as "NA" for 1999. However, according to data from the United States Energy Information Administration (https://www.eia.gov/beta/international/analysis_includes/countries_long/Kazakhstan/background.htm), Kazakhstan has been an oil producer since 1911 and has the second-largest oil reserves and the second-largest oil production after the Russian Federation among the countries of the former Soviet Union.
G.13	Notation keys (G.7, 2017) (G.17, 2016) (G.16, 2015) Transparency	Provide justification on the use of notation keys, particularly the notation keys "NE" and "IE", in the NIR and in CRF table 9.	Not resolved. The ERT noted that the NIR did not include explanations for the use of the notation keys "NE" and "IE". Also, CRF table 9 did not provide any information on the use of the notation key "NE" and very limited or confusing information on the use of the notation key "IE". CRF table 9 included a note for two categories indicating that "according to the Agency of Statistics of Kazakhstan since 2009, other fuels in the Fuel-Energy Balance are included, but not separately monitored due to the codes lack of entering into a common software package". During the review, Kazakhstan confirmed this statement. However, this statement does not provide information on the specific category where the Party allocated the emissions, as required in CRF table 9.
G.14	Notation keys (G.1, 2017) (G.2, 2016) (G.2, 2015) (table 3, 2013) Convention reporting adherence	Use the notation key "NO" if the activity is not occurring and "IE" if emissions are included elsewhere.	Not resolved. The ERT noted the incorrect use of the notation keys "IE" and "NO" in multiple instances in the CRF tables, for example, for feedstocks, reductants and other NEU of fuels (see ID# E.12 below), international aviation (see ID# E.13 below), the reference approach (see ID# E.59 in table 5) and N_2O from product uses (see ID# I.49 below).
G.15	Recalculations (G.11, 2017) Transparency	In the NIR of the future annual submissions, include detailed information explaining the reasons for	Not resolved. The ERT noted that the NIR did not include the chapter on recalculations and improvements of the suggested outline and general structure for NIRs contained in decision 24/CP.19,

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		recalculations, the specifics of methods and assumptions, and the impact of recalculations on the emissions from the particular category, on the entire sector and the total emissions (including and excluding LULUCF).	annex I, and in many cases did not contain all the required information explaining the reasons for recalculations, the specifics of methods and assumptions, and the impact of recalculations on the emissions from a particular category, on the entire sector and the total emissions (including and excluding LULUCF). During the review, Kazakhstan explained some of the recalculations made and stated that it intends to include the explanatory information on recalculations in the next annual submission. Owing to a lack of information on recalculations, in many cases, the ERT was not able to assess the accuracy of the resulting emission estimates or determine whether they were prepared in accordance with the 2006 IPCC Guidelines (see, for example, ID#s E.2, E.14, I.6 and I.44 below and ID#s E.61, E.64, E.65, A.17 and W.19 in table 5). The ERT also noted that according to the UNFCCC Annex I inventory reporting guidelines, paragraphs 43–45 and 50(h), the NIR shall include information on any recalculations relating to previously submitted inventory data, including changes in methodologies, sources of information and assumptions, in particular in relation to recalculations made in response to the review process. The ERT further noted that according to decision 19/CMP.1, annex, paragraph 14(e), in conjunction with decisions 3/CMP.11 and 4/CMP.11, as part of their inventory preparation, Parties shall ensure that any recalculations of previously submitted inventory estimates are prepared in accordance with the 2006 IPCC Guidelines, as implemented through the UNFCCC Annex I inventory reporting guidelines. The ERT included this issue in the list of potential problems and further questions raised by the ERT and recommended that Kazakhstan provide information on how it intends to put in place a mechanism aimed at improving the inventory preparation function of its national system in order to include in its annual submissions detailed information explaining the reasons for recalculations, the specifics of methods and assumptions, and the impact of recalculations on the emissions from the particular category, on the entire sector and the total emissions (including and excluding LULUCF). In response to the list of potential problems and further questions raised by the ERT, Kazakhstan indicated that it will include detailed information explaining the reasons for recalculations, the specifics of methods and assumptions, and the impact of recalculations on the emissions from the particular category, on the entire sector and the total emissions (including and excluding LULUCF). Kazakhstan also indicated that it will undertake all recalculations in accordance with the 2006 IPCC Guidelines, the UNFCCC Annex I inventory reporting guidelines, the Kyoto Protocol Supplement and the Wetlands Supplement, as implemented in accordance with decisions 24/CP.19 and 6/CMP.9 and relevant decisions of the COP and/or the CMP. The ERT considered the Party's response and found that Kazakhstan has not satisfactorily resolved the

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			problem because it provided insufficient information on how it intends to put in place and implement a mechanism and actions for providing complete information on recalculations with the aim of improving the related inventory preparation function of its national system, in accordance with decision 19/CMP.1, annex, paragraph 14(e), in conjunction with decisions 3/CMP.11 and 4/CMP.11, and decision 24/CP.19, annex I, paragraphs 43–45 and 50(h). Therefore, the ERT has identified this problem, which pertains to language of a mandatory nature and influences the fulfilment of commitments, as a question of implementation in accordance with decision 22/CMP.1 in conjunction with decision 4/CMP.11 (see chap. VIII below).
G.16	QA/QC and verification (G.12, 2017) Convention reporting adherence	In the NIR, include a specific procedure in the QA/QC process to ensure that the number of inconsistencies between the NIR and the CRF tables across all inventory sectors is minimized and report the updated QA/QC plan, and include information on this procedure.	Not resolved. The ERT noted that the description of the QA/QC plan in the NIR (section 1.2.3, pp.19–27) did not include information on specific actions aiming to check for inconsistencies between the NIR and the CRF tables. The ERT also noted that there are still multiple inconsistencies between the CRF tables and the NIR in the 2019 annual submission, for example, the ERT noted that CO_2 emissions from steel production under category 2.C.1 iron and steel production were reported as 648.88 kt for 2017 in the CRF tables; however, in table 4-13 of the NIR (p.163), CO_2 emissions from steel production were reported as 589.1 kt for 2017.
G.17	Uncertainty analysis (G.9, 2017) (G.19, 2016) (G.18, 2015) Convention reporting adherence	Improve on the reporting of uncertainty by including information on the quantitative estimates of the uncertainty of data used for all source and sink categories using the 2006 IPCC Guidelines, and report uncertainties for the base year and the latest inventory year, as well as the methods and underlying assumptions used, and how the analysis helps in prioritizing efforts to improve the accuracy of national inventories in the future, in line with decision 24/CP.19, annex I, paragraph 42.	Addressing. The ERT noted that although the NIR included uncertainty estimates for the latest reported year and for the trend between the base year and the latest reported year, it did not include uncertainty estimates for the base year. The ERT also noted that the NIR (section 1.6, p.31) stated that Kazakhstan used a 95 per cent confidence interval for estimating emission uncertainties and that the uncertainty table reported follows table 3.2 of the 2006 IPCC Guidelines (vol. 1, p.3.31); however, in accordance with decision 24/CP.19, annex I, paragraph 42, this information should be presented using table 3.3 of the 2006 IPCC Guidelines (vol. 1, p.3.42). The ERT further noted that the NIR did not provide details on the methods and underlying assumptions used, as required by decision 24/CP.19, annex I, paragraph 42, and how the analysis helped in prioritizing efforts to improve the accuracy of the inventory in the future. During the review, Kazakhstan informed the ERT that the calculations of the base-year uncertainties will be included in the 2020 annual submission. The ERT further noted that reporting the base-year uncertainties is mandatory in line with decision 24/CP.19, annex I, paragraphs 15 and 42, and that according to decision 19/CMP.1, annex, paragraph 14(d), in conjunction with decisions 3/CMP.11 and 4/CMP.11, as part of their inventory preparation, Parties shall make a quantitative estimate of inventory uncertainty for each category and for the inventory in total, following the 2006 IPCC Guidelines, as implemented through the UNFCCC Annex I inventory reporting guidelines.

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			The ERT included this issue in the list of potential problems and further questions raised by the ERT and recommended that Kazakhstan provide information on the quantitative estimates of the uncertainty of data used for all source and sink categories in accordance with the requirements of the 2006 IPCC Guidelines, and report uncertainties for the base year and the latest inventory year, as well as the methods and underlying assumptions used, in line with decision 19/CMP.1, annex, paragraph 14(d), in conjunction with decisions 3/CMP.11 and 4/CMP.11, and decision 24/CP.19, annex I, paragraph 42, and how this analysis helps in prioritizing efforts to improve the accuracy of national inventories in the future. In response to the list of potential problems and further questions raised by the ERT, Kazakhstan provided two tables with an uncertainty assessment for the base year (1990), including and excluding the LULUCF sector. However, the Party did not provide any information on the methods and underlying assumptions used, and how this analysis helps in prioritizing efforts to improve the accuracy of national inventories in the future. The ERT considered the Party's response and found that Kazakhstan has not satisfactorily resolved the problem, because it did not provide information on the quantitative estimates of the uncertainty of data used for all source and sink categories and on methods and underlying assumptions used, in line with decision 19/CMP.1, annex, paragraph 14(d), in conjunction with decisions 3/CMP.11 and 4/CMP.11, and decision 24/CP.19, annex I, paragraphs 15 and 42, and how this analysis helps in prioritizing efforts to improve the accuracy of national inventories in the future. In addition, the ERT noted that the uncertainty assessment provided by the Party for 1990 was not fully in line with the requirements of the 2006 IPCC Guidelines, as it included an assessment of the uncertainty of the trend for the base year, which it is not possible to perform. Therefore, the ERT has identified this problem, which pertains to language of a mandatory nature and influences the fulfilment of commitments, as a question of implementation in accordance with decision 22/CMP.1 in conjunction with decision 4/CMP.11 (see chap. VIII below).
G.18	Follow-up to previous reviews (G.10, 2017) (G.20, 2016) (G.20, 2015) Transparency	Provide summary information on addressing the recommendations raised in previous annual review reports in line with the UNFCCC Annex I inventory reporting guidelines both in the sector-specific sections and in chapter 10 ("Recalculations and improvements") of the NIR.	Not resolved. The NIR did not provide summary information on addressing the recommendations raised in previous annual review reports in line with the UNFCCC Annex I inventory reporting guidelines both in the sector-specific sections and in chapter 10 ("Recalculations and improvements") of the NIR. During the review, Kazakhstan indicated that it is of the view that the general and sector-specific chapters of the NIR provide information on the incorporation of recommendations made in previous annual review reports, in accordance with the UNFCCC Annex I inventory reporting guidelines. The Party also indicated that summary information on the implementation of recommendations made in previous annual review reports will be provided in a separate

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			section of the NIR ("Recalculations and improvements") in the 2020 annual submission.
Energy			
E.1	1. General (energy sector) – other fossil fuels – CO_2, CH_4 and N_2O (E.1, 2017) (E.2, 2016) (E.2, 2015) (22, 2013) Transparency	Use the notation key "IE" instead of "NO" or "NA" in cases in which emissions are included elsewhere, and include appropriate explanations in CRF table 9 and the NIR.	Not resolved. In the 2019 annual submission, the Party included an explanation in CRF table 9 for one of the cases, in which the notation key "IE" was used in relation to the reallocation of other fossil fuels to the respective subcategories by fuel type (liquid, gaseous and solid fuels), in accordance with the energy balance. Nevertheless, the Party still used the notation keys "NA" or "IE" to report the AD and GHG emissions from other fossil fuel consumption for different periods of the time series. For example, for subcategory 1.A.1.a public electricity and heat production, the AD and emissions from other fossil fuels were reported as "NA" for 1992–1998 and as "IE" for 2009–2017; and for subcategory 1.A.1.b petroleum refining, the AD and emissions from other fossil fuels were reported as "NA" for 2006 and as "IE" for 2009–2017. Owing to the lack of transparency in the reported information in the NIR, the ERT considered that it is still possible that the notation key "IE" was used in place of the notation keys "NO" or "NE", or that the notation key "NA" was incorrectly used in place of the notation keys "NE", "NO" or "IE" for other fossil fuels for different periods of the time series, and also among fuel combustion subcategories.
E.2	1. General (energy sector) – all fuels – CO_2, CH_4 and N_2O (E.2, 2017) (E.3, 2016) (E.3, 2015) (23, 2013) (32, 2012) Transparency	Report in the NIR all information regarding the reasons for recalculations and the methodologies used for the recalculated categories.	Not resolved. The ERT identified a number of recalculated categories in the 2019 annual submission for which the justifications and the methodological approach used are still not transparently documented. For example, significant recalculations for the entire time series were performed for CO_2, CH_4 and N_2O emissions for gas/diesel oil consumption and the corresponding CH_4 and N_2O EFs for domestic navigation, and for gasoline consumption under this category (see ID#s E.64 and E.65 in table 5). The explanations provided in the NIR referring to the splitting of fuel consumption between domestic and international navigation did not clarify why the total gas/diesel oil and gasoline consumption reported in the 2019 annual submission is significantly lower than the total consumption reported in the 2017 annual submission. For example, a total of 2,941.06 TJ of gas/diesel oil consumption in navigation (domestic and international) for 2015 was reported in the 2017 annual submission, while in the 2018 and 2019 annual submissions, gas/diesel oil consumption in navigation decreased to 387.87 TJ for 2015 (see ID# E.32 below).
E.3	1. General (energy sector) – all fuels – CO_2, CH_4 and N_2O (E.3, 2017) (E.4, 2016) (E.4, 2015) (28, 2013) (42, 2012) (49, 2011) Transparency	Explain the underlying assumptions and the degree of expert judgment used in the applied interpolation methodology to fill in the time series for AD of national statistics and report it in the NIR.	Addressing. In its NIR (section 3.2.2, p.49), Kazakhstan reported that the statistics system has imperfections and the gaps in AD are difficult to fill using data from handbooks and bulletins for the 1990s. The Party explained during the review that the inconsistency between the AD for 1991–1998 (when no energy balance had been developed) and the AD for the rest of the time series had not been resolved owing to the fact that the national statistics do not contain archived records on historical energy consumption and energy resources. Kazakhstan is currently using the

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			available energy data and indicators to revise AD and decrease the inconsistency of the AD between the two periods.
E.4	1. General (energy sector) – all fuels – CO_2, CH_4 and N_2O (E.4, 2017) (E.5, 2016) (E.5, 2015) (28, 2013) (42, 2012) Consistency	Ensure the consistency of the entire time series and provide comparisons of AD obtained from different sources.	Addressing. The Party did not provide in the NIR comparisons of AD obtained from different energy data sources and has not yet reconciled the AD for 1990–1998, the period when the Agency of Statistics of Kazakhstan had not yet started to develop the national energy balance. During the review, Kazakhstan explained that obtaining accurate data for the years before 1999 is not possible, and that the inconsistencies between the two periods of the time series (1990–1998 and 1999 onward) had significantly decreased owing to the use of available data and energy indicators, but it was not possible to reduce them to zero.
E.5	1. General (energy sector) – all fuels – CO_2, CH_4 and N_2O (E.5, 2017) (E.6, 2016) (E.6, 2015) (29, 2013) Transparency	Include the description of QA/QC procedures applied for transport and fugitive emissions.	Resolved. The Party included in the NIR the description of QA/QC procedures applied for transport and fugitive emissions categories (section 3.5.2.4, pp.106–107; section 3.5.3.4, p.108; section 3.5.4.4, p.111; section 3.5.5.4, p.113; section 3.5.6.4, p.116; section 3.5.7.4, p.120; section 3.6.2.4, p.126; section 3.6.3.4, p.130; and section 3.6.3.9, p.133).
E.6	1. General (energy sector) – all fuels – CO_2 (E.46, 2017) Transparency	Improve the transparency and consistency of the reporting by including CO_2 emissions from all specific types of fuels classified in the energy balance as "other fossil fuels"; use relevant country-specific NCVs and carbon content for each fuel; ensure consistency of the time series of the revised CO_2 emission estimates reported in CRF table 1.A(b) for the period 1990–2015; and, in the NIR, provide information on the source, method of calculation or justifications on country-specific NCVs and CO_2 EFs for specific types of fuels, accompanied by relevant explanations.	Addressing. Kazakhstan did not report CO_2 emissions from "other fossil fuels" and the notation key "NO" was used for the entire time series in CRF table 1.A(b) for apparent consumption as well as for CO_2 emissions. Energy consumption and CO_2, CH_4 and N_2O emission estimates for other fossil fuels were reported under the sectoral approach for 1990–2010, and using the notation keys "NO", "IE" and "NA" for 2011–2017. The Party explained in the documentation box of the sectoral approach CRF tables that beyond 2009 the national statistics cannot separate other fossil fuels from liquid, solid or gaseous fuels. Kazakhstan used default NCVs from the 2006 IPCC Guidelines (vol. 2, chap. 1, p.1.18) to report the energy consumption of all fuels, except for household stove fuel, for which it used a plant-specific EF (NIR, table 3.8, p.59), but no explanation was provided on how this plant-specific EF was obtained. In the note to table 3.7 of the NIR (p.57) on the NEU of fuels, Kazakhstan explained that household stove fuel is included under diesel oil. The ERT noted that the carbon content coefficients of the fuels are consistently used for the entire time series to report the CO_2 emissions in CRF table 1.A(b). The Party reported apparent consumption for energy coal, high ash coal, other coal and coal concentrate in the reference approach under other solid fossil fuels. At the same time, Kazakhstan still reported NGLs under crude oil and reported fuel consumption for category 1.A.5 other in an aggregated manner under subcategory 1.A.5.a stationary. Lastly, the ERT noted that anthracite is still not reported under the sectoral approach in the NIR, but is reported in CRF table 1.A(b) for the reference approach for 1990 only.
E.7	Fuel combustion – reference approach – all fuels – CO_2, CH_4 and N_2O	Cross-check the AD and provide explanations for the differences in inter-annual changes between the	Addressing. The difference in CO_2 emissions between the reference and sectoral approaches in the original 2019 annual submission ranged from 26.76 per cent for 1992 to –5.81 per cent for 2015. For 2017, the

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	(E.7, 2017) (E.8, 2016) (E.8, 2015) (33, 2013) (46, 2012) (44, 2011) Transparency	reference and sectoral approaches.	difference in CO_2 emissions was –2.78 per cent. Larger differences were noted in the submitted revised CRF tables (6.30 per cent for 2017). The figures in the original 2019 annual submission result from compensating for the large negative and positive differences in CO_2 emissions between the sectoral and reference approaches by type of fuel, especially for 2003–2017, where the difference in liquid fuels is generally negative, while the difference in gaseous fuels is positive, except for 2017, and the difference in solid fuels is positive until 2013. Kazakhstan indicated in the NIR (section 3.2.2, pp.48–52) that difficulties in collecting AD for production, export or import of liquid fuels (crude oil) and solid fuels (coking coal and different types of coal) had caused the differences in both energy consumption and CO_2 emissions, which also explains the inter-annual changes in the values of the differences between the reference and sectoral approaches. Kazakhstan did not explain in the NIR the difference in CO_2 emissions between the reference and sectoral approaches for other fossil fuels, which was reported as –100 per cent for 1990–2010 (for energy consumption and CO_2 emissions reported under the sectoral approach, but not under the reference approach) and as "NO", "IE" and "NA" for 2011–2017.
E.8	Fuel combustion – reference approach – solid fuels – CO_2 (E.8, 2017) (E.9, 2016) (E.9, 2015) (34, 2013) Comparability	Carry out the planned improvement to separate coking coal consumption from the total other bituminous coal consumption.	Addressing. The ERT noted that Kazakhstan reported coking coal consumption separately from other types of coal (sub-bituminous and lignite) starting from 2014. Nevertheless, the Party still reported coking coal consumption in an aggregate manner under lignite and sub-bituminous coal for 1990–2013. During the review, Kazakhstan informed the ERT that a further request will be sent to the Agency of Statistics of Kazakhstan asking it to provide disaggregated coal consumption data by type of coal for the historical period.
E.9	Fuel combustion – reference approach – all fuels – CO_2 (E.18, 2017) (E.27, 2016) (E.27, 2015) Accuracy	Reconsider the accuracy of the data concerning the combusted fuels and the fuels used as feedstocks in order to further reduce the level of difference between the sectoral and reference approaches across the time series and include additional information in the NIR explaining the observed differences in the CO_2 emission estimates from the two approaches.	Not resolved. Kazakhstan continued to report in the 2019 annual submission large differences in energy consumption and CO_2 emissions by type of fuel between the sectoral and reference approaches, which cannot be explained only by the NEU of these fuels. For example, in the original submission, the ERT noted a difference for the energy use of coking coal of 122.53 PJ, or 42.5 per cent, for 2017 (the apparent consumption and the NEU of coking coal reported under the reference approach were 291.08 PJ and 2.90 PJ, respectively, and the energy consumption of coking coal under the sectoral approach was 165.65 PJ according to the NIR (tables 3.9, 3.14 and 3.19, p.62, p.74 and p.88, respectively)). Nevertheless, at the aggregated level for solid fuels, the difference in energy consumption was –0.51 per cent for 2017. Kazakhstan did not provide in the NIR an assessment of the accuracy of the data for the combustion of fuels by type and the fuels used as feedstock, or explanations of the reasons for the significant differences in the CO_2 emission estimates for the two approaches at the level of fuel type.

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E.10	Fuel combustion – reference approach – all fuels – CO_2 (E.19, 2017) (E.28, 2016) (E.28, 2015) Accuracy	Improve the accuracy and consistency of the reporting of energy consumption in the reference approach, particularly paying attention to the correct completion of cells for "Apparent consumption (excluding NEU, reductants and feedstocks)" and ensure that the differences between the approaches are reasonable.	Addressing. Kazakhstan corrected the reporting of apparent consumption excluding the NEU of fuels in CRF table 1.A(c). However, in the original submission the ERT noted that the relatively small differences in reported CO_2 emissions between the sectoral and reference approaches were still a result of compensating for the large positive and negative differences in the fuels by type and were not due to an improvement in the accuracy of the data on energy consumption in the reference approach. In the revised submission provided by Kazakhstan in response to the list of potential problems and further questions raised by the ERT, the differences in reported CO_2 emissions increased owing to the allocation of a value of coking coal consumption, equal to the coking coal difference reported in the reference approach, to the sectoral approach, under category 1.A.5 other.
E.11	Fuel combustion – reference approach – liquid, solid, gaseous and other fossil fuels – CO_2 (E.47, 2017) Accuracy	Strengthen the QC procedures for the AD used for the emission estimates across fuel combustion activities; disaggregate the AD included in category 1.A.5 other and reallocate emissions to appropriate categories; estimate carbon excluded from NEU and feedstocks of NGLs and associated petroleum gas separately from natural gas; implement the recommendations provided in ID#s E.51 and E.53 (FCCC/ARR/2017/KAZ); and provide clear and detailed explanations in the NIR for the differences between the CO_2 emissions reported in the reference and sectoral approaches for each fuel type.	Addressing. The ERT noted that NGLs are still reported as "IE" in CRF table 1.A(b) for the reference approach (production, imports, exports and stock change), and according to comments provided by Kazakhstan in the corresponding cells of CRF table 1.A(b), data for NGLs are reported under crude oil. Therefore, estimates of the apparent consumption of NGLs were not reported separately from crude oil. In addition, carbon excluded from NEU and feedstocks for both NGLs and crude oil was reported as "NE". Further, imports and exports of associated petroleum gas were reported together with natural gas in CRF table 1.A(b) and it was unclear whether the reported carbon excluded from natural gas included carbon excluded from associated petroleum gas. The ERT also noted that, in the NIR (table 3.19, p.88), Kazakhstan reported fuel consumption by type of fuel for subcategory 1.A.5.a stationary, but in CRF table 1.A(a) (sheet 4) the consumption and corresponding emissions were reported only in an aggregated manner. Further, in the revised estimates submitted by Kazakhstan, under subcategory 1.A.5.a stationary, a value equivalent to the difference in consumption of coking coal between the reference and sectoral approaches was included; thus, in general, the consumption of fuels and corresponding emissions reported under this category have not been reallocated to the appropriate categories. The ERT further noted that the NIR did not include detailed information explaining the observed differences in the CO_2 emission estimates between the two approaches by type of fuel and did not provide information on actions to strengthen QC procedures for the AD used for the emission estimates across fuel combustion activities. Lastly, the ERT noted that Kazakhstan did not fully implement the recommendations provided in ID#s E.51 and E.53 of the previous review report (FCCC/ARR/2017/KAZ) regarding domestic aviation and domestic navigation (see ID# E.9 above and ID#s E.24, E.25 and E.32 below).
E.12	Feedstocks, reductants and other NEU of fuels – all fuels – CO_2	Improve the QA/QC procedures relevant to the estimation of the use of the feedstocks, reductants and	Not resolved. Kazakhstan did not provide any information in the NIR on QA/QC procedures relevant to the estimation of the use of feedstocks, reductants and NEU of fuels and, for example, still reported the

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	(E.21, 2017) (E.30, 2016) Convention reporting adherence	NEU of fuels and ensure consistent reporting across CRF table 1.A(b) and table 1.A(d).	carbon excluded from natural gas liquids as "NE" in CRF table 1.A(b), while in CRF table 1.A(d), the carbon excluded was reported as "IE". For crude oil, the carbon excluded was reported as "NE" in CRF table 1.A(b), while in CRF table 1.A(d), it was reported as "NO".
E.13	International aviation – liquid fuels – CO_2, CH_4 and N_2O (E.45, 2017) (E.59, 2016) Convention reporting adherence	Ensure consistency between CRF table 1.D (fuel consumption of the international aviation/ international bunkers) and CRF table 1.A(b) (reference approach – fuel consumption of the international bunkers).	Not resolved. Kazakhstan continued to use the notation key "NO" to report international bunkers of jet kerosene in CRF table 1.A(b), while the AD and emissions from jet kerosene used as bunker fuel in aviation were reported in CRF table 1.D. For aviation gasoline, the notation key "NA" was used in CRF table 1.D, but in CRF table 1.A(b) it was reported as "NO" (under both other kerosene and gasoline) (see ID# E.59 in table 5).
E.14	International aviation – liquid fuels – CO_2, CH_4 and N_2O (E.59, 2017) Accuracy	Correct the CO_2, CH_4 and N_2O EFs used for the emission estimates for international aviation and provide in the NIR detailed explanations on any recalculations made in accordance with the 2006 IPCC Guidelines, including description of methods and EFs used and considering the availability of updated data.	Addressing. The ERT noted that Kazakhstan reported in its 2018 annual submission recalculated fuel consumption and GHG emissions from use of jet kerosene in international aviation for the entire time series, including by changing the CO_2 EF used. To estimate CO_2, CH_4 and N_2O emissions, Kazakhstan used the tier 1 and default EFs provided in the 2006 IPCC Guidelines. Nevertheless, Kazakhstan still reported in the NIR (p.113) that it considered the take-off and landing cycles (tier 2 method) to estimate the GHG emissions from domestic aviation and international aviation, but at the same time indicated the use of the tier 1 method. In addition, the NIR did not include the EFs corresponding to the tier 1 or 2 method, used to estimate CO_2, CH_4 and N_2O emissions from this category. Lastly, the ERT noted that the NIR included limited information on recalculations that were made in the 2019 annual submission for the complete time series, and mainly referred to domestic aviation and the related disaggregation of fuels used in domestic aviation and international aviation.
E.15	International navigation – liquid fuels – CO_2, CH_4 and N_2O (E.9, 2017) (E.11, 2016) (E.11, 2015) (37, 2013) (50, 2012) (46, 2011) Accuracy	Obtain relevant navigation statistics and use the appropriate EFs for reporting emissions.	Addressing. The ERT noted that Kazakhstan reported gas/diesel oil consumption and emission estimates for the entire time series under the international navigation category in CRF table 1.D. In the NIR (p.119), Kazakhstan reported that it was not possible to disaggregate international bunker navigation fuels, including fuels for military operations, from fuels used in domestic navigation owing to a lack of statistics. To separate the consumption for the two navigation categories, Kazakhstan split the fuel consumption as a function of the quantity of transported goods. The ERT noted that the IEFs resulting from the GHG emission estimates are similar to the values of the default CO_2, CH_4 and N_2O EFs provided in the 2006 IPCC Guidelines for gas/diesel oil used in navigation (vol. 2, chap. 3, tables 3.5.2–3.5.3, p.3.50) and the default CO_2, CH_4 and N_2O EFs provided in the 2006 IPCC Guidelines for motor gasoline uncontrolled used in road transportation, (vol. 2, chap. 3, tables 3.2.1–3.2.2, p.3.16 and p.3.21, respectively). However, Kazakhstan did not provide an explanation for using this approach (see ID#s E.64 and E.65 in table 5). In addition, Kazakhstan did not explain why residual fuel oil, which was reported in the 2017 annual submission,

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			was reported as "NO" in the 2018 and 2019 annual submissions.
E.16	1.A Fuel combustion – sectoral approach – solid fuels – CO_2 (E.10, 2017) (E.14, 2016) (E.17, 2015) (39, 2013) (53, 2012) Accuracy	Investigate the possibility of calculating country-specific CO_2 EFs for lignite and sub-bituminous coal as weighted average values based on information on specific coal production and CO_2 EFs for each mining field, as the majority of coal used in Kazakhstan is from domestic production.	Not resolved. The NIR did not contain any information on the Party's efforts to investigate the possibility of calculating country-specific CO_2 EFs for lignite and sub-bituminous coal. To estimate CO_2 emissions from consumption of these fuels, Kazakhstan used default CO_2 EFs.
E.17	1.A Fuel combustion – sectoral approach – all fuels – CO_2, CH_4 and N_2O (E.11, 2017) (E.16, 2016) (E.15, 2015) (26, 2013) Transparency	Include detailed data on energy consumption by fuel for all subcategories in the energy sector.	Addressing. In its NIR, Kazakhstan included detailed information on energy consumption data by fuel type for most of the categories, including subcategory 1.A.5.a. stationary. However, the NIR did not cover category 1.A.3 transport, for which no information on energy consumption by fuel type was provided.
E.18	1.A Fuel combustion – sectoral approach – all fuels – CO_2 (E.12, 2017) (E.18, 2016) (E.18, 2015) (40, 2013) (54, 2012) (47, 2011) Comparability	Investigate the allocation of AD and emissions from the energy sector to the industrial processes sector and correct any misallocations.	Addressing. Kazakhstan provided in the NIR (table 3.7, p.57) information on the NEU of fuels. The ERT noted that table 3.7 does not contain the same information as reported in CRF table 1.A(d). For example, energy coal, high ash coal, other coal and coal concentrate are not reported in table 3.7 of the NIR. The ERT also noted some inconsistencies in the data reported in CRF table 1.A(d); for example, CO_2 from NEU of high ash coal and NEU of coal concentrate were reported as allocated under the iron and steel production category, but AD (fuel quantity for NEU) for coal concentrate were reported as "NA" for 2017. In the NIR (note 3 to table 3.14, p.74 and section 3.4.2.2, p.84), Kazakhstan explained that the consumption of coke and coal concentrate used in the ferrous and non-ferrous metallurgy categories is allocated under the IPPU sector and, to avoid double counting, is not taken into account in the energy sector. Nevertheless, the quantity of NEU of coke in CRF table 1.A(d) is reported only under ferroalloys production. During the review, Kazakhstan explained that large quantities of coking coal are used as raw material to produce coke for the iron and steel industry (JSC ArcelorMittal Temirtau used 9,306.36 kt equivalent to 262,439.38 TJ of coking coal to produce coke in 2017). However, in CRF table 1.A(d) the NEU of coking coal is only reported for the ferroalloys industry and amounts to 2,902.15 TJ (see ID# E.62 in table 5).
E.19	1.A Fuel combustion – sectoral approach – solid fuels – CO_2, CH_4 and N_2O (E.48, 2017) Transparency	In the NIR, provide verifiable information on consumption of coking coal in the country by category, provide a carbon balance for coking coal used in the calculations, report correctly emission estimates in the respective CRF tables and provide information on the source, method of	Addressing. The ERT noted that Kazakhstan provided information on consumption of coking coal by category in its 2018 and 2019 annual submissions, but did not provide a carbon balance of the use of this fuel. Kazakhstan recalculated in its 2018 annual submission the GHG emission estimates for coking coal for 2014 and 2015, using the tier 1 methodology provided in the 2006 IPCC Guidelines, as explained in the NIR of the 2018 annual submission (section 3.4.6, p.66, and section 3.5.1.5, p.78). The same explanation is

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		calculation and justifications for the NCV and country-specific CO_2 EF for coking coal used for the emission estimates.	provided in the NIR of the 2019 annual submission (section 3.4.2.5, pp.86–87). Kazakhstan reported in table 3.8 of the NIRs of both the 2018 and 2019 annual submissions (p.65 and p.59, respectively) the default values used for the NCV (28.2 TJ/kt) and carbon content (25.8 kg/GJ) of coking coal, as provided in the 2006 IPCC Guidelines (vol. 2, chap. 1, tables 1.2–1.3, p.1.18 and p.1.21, respectively). Kazakhstan did not provide any information on the default CO_2, CH_4 and N_2O EFs used to estimate the GHG emissions in the sectoral approach categories, in accordance with the provisions of the 2006 IPCC Guidelines. Kazakhstan recalculated the consumption of coking coal for 2014 and 2015 on the basis of adjusted data received from the Agency of Statistics of Kazakhstan confirming that coking coal in Kazakhstan is mainly used for producing coke oven coke for the iron and steel industry, which is excluded from the energy sector (NIR, note 3 to table 3.14, p.74). Nevertheless, the ERT noted that in CRF table 1.A(d) the reported NEU of coking coal is very small in comparison with the total coking coal apparent consumption reported in CRF table 1.A(b). For example, the NEU of coking coal for 2017 is 2.90 PJ, which represents approximately 1 per cent of the total apparent consumption of 291.08 PJ reported in CRF table 1.A(b). As such, there was a significant difference in coking coal consumption between the reference and sectoral approaches for 2016 and 2017 (88.87 PJ, or 34.19 per cent of the total apparent consumption, and 122.53 PJ, or 42.5 per cent of the total apparent consumption, respectively), continuing to show a trend of large differences, which was also observed in previous years, indicating a possible underestimation of GHG emissions from the use of coking coal. Therefore, the ERT included this issue in the list of potential problems and further questions raised by the ERT (see ID# E.62 in table 5).
E.20	1.A Fuel combustion – sectoral approach – other fossil fuels – CO_2, CH_4 and N_2O (E.49, 2017) Transparency	In the NIR, include detailed information on the allocation of other fossil fuels to ensure transparency of reporting emissions from these fuels and use appropriate notation keys, where necessary.	Not resolved. The NIR did not include detailed information on the allocation of other fossil fuels and their corresponding emissions. However, the ERT noted that Kazakhstan indicated during the previous review that the Agency of Statistics of Kazakhstan had reallocated other fossil fuels to the corresponding fuel types (liquid, solid and gaseous) and therefore other fossil fuels were not included in the energy balance of the country from 2010 onward (FCCC/ARR/2017/KAZ, ID# E.49). The ERT noted that Kazakhstan continued to report CO_2, CH_4 and N_2O emissions from other fossil fuels using the notation keys “IE” or “NA” for categories 1.A.1 energy industries, 1.A.2 manufacturing industries and construction, and 1.A.4 other sectors for 2009 onward and the notation keys “NO or “NA” for category 1.A.3 transport for 2010 onward. Given the reallocation of other fossil fuels made by the Agency of Statistics of Kazakhstan, the ERT assessed that the Party used the notation key “IE” appropriately in the CRF tables. Regarding the use of the notation keys “NA” or “NO”, in the original and revised 2019 annual submissions, Kazakhstan reported recalculations of consumption of other fossil fuels for some categories without

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			providing any explanation of the changes, including replacing one notation key with another. For example, for subcategory 1.A.3.e.i pipeline transport the notation key "NA" was changed to "NO" for the entire time series, except for 2014–2016, where the quantities that had previously been reported for other fossil fuels were also replaced by the notation key "NO"; for subcategory 1.A.3.e.ii other, the previously reported values for consumption of other fossil fuels were replaced by the notation key "NA" for 2011–2016; and for subcategories 1.A.4.a commercial/institutional and 1.A.4.c.i stationary, the previously reported fuel consumption values or the notation key "NA" were replaced by the notation key "IE" for 2014–2016. The ERT further noted that table 1.1 of the 2006 IPCC Guidelines (vol. 2, chap. 1, pp.1.12–1.16) contains the fuel definitions to be used in the reporting of GHG inventories, including the definition of other fossil fuels that should contain municipal wastes (non-biomass fraction), industrial wastes and waste oils.
E.21	1.A.2.a Iron and steel – solid fuels – CO_2, CH_4 and N_2O (E.50, 2017) Transparency	In the NIR, provide information on AD for coking coal combusted for own needs by JSC ArcelorMittal Temirtau for all relevant years of the time series and ensure the consistency of the time series by performing relevant recalculations for the period 1990–2013, as necessary.	Not resolved. Kazakhstan did not provide in the NIR information on AD for coking coal combusted or used for its own needs by JSC ArcelorMittal Temirtau for the relevant years of the time series. The NIR (pp.86–87) reported that recalculations of the consumption of coking coal for 1990–2013 were not performed (see ID# E.62 in table 5).
E.22	1.A.2.d Pulp, paper and print – all fuels – CH_4 and N_2O (E.23, 2017) (E.32, 2016) (E.31, 2015) Completeness	Include emissions of CH_4 and N_2O from the subcategory 1.A.2.d pulp, paper and print or provide justification to support that these emissions are insignificant and use a notation key in accordance with decision 24/CP.19, annex I, paragraph 37.	Addressing. The ERT noted that Kazakhstan still used the notation key "NA" to report gaseous fuel consumption and emissions of CO_2, CH_4 and N_2O for 1990–1998, instead of the notation key "NO", following the information provided by Kazakhstan to the ERT during the review indicating that only solid fuels were used in this subcategory during that period. Although AD were reported for 1999–2001, the notation key "NA" was used to report N_2O emissions for 1999–2001 and CH_4 emissions for 1999–2000. However, AD and emissions from solid and liquid fuels were reported for the entire time series. The ERT also noted that CH_4 and N_2O emissions from biomass were reported for 1992–2008 and 2017, while the notation key "NA" was used incorrectly for other years, as the notation key "NO" should have been used instead, since the Party explained during the review that biomass was not used for those years. Kazakhstan also informed the ERT that CH_4 and N_2O emissions for 1999, 2000 and 2001 will be reported in the next annual submission.
E.23	1.A.3.a Domestic aviation – liquid fuels – CH_4 and N_2O (E.24, 2017) (E.34, 2016) (E.33, 2015) Consistency	Correct the identified errors in the CH_4 and N_2O IEFs for aviation gasoline (e.g. change of the constant value of CH_4 IEF from 0.5 kg/TJ to 5 kg/TJ in 1993 and 0.05 kg/TJ in 2014).	Resolved. The ERT noted that Kazakhstan used the correct default EF values for the CH_4 and N_2O estimates for aviation gasoline consumption in domestic aviation (0.5 kg/TJ for CH_4 and 2 kg/TJ for N_2O) for the entire time series.

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E.24	1.A.3.a Domestic aviation – liquid fuels – CO_2 (E.51, 2017) Consistency	Correct the identified errors in the CO_2 IEFs for jet kerosene for 1990 and for other years and revise the estimates.	Resolved. The ERT noted that Kazakhstan corrected the CO_2 EF for jet kerosene for 1990 and for all other years of the time series and used the default value (71.50 t/TJ) provided in the 2006 IPCC Guidelines (vol. 2, chap. 3, table 3.6.4, p.3.64).
E.25	1.A.3.a Domestic aviation – liquid fuels – CO_2 (E.51, 2017) Transparency	In the NIR, report correct CO_2 EFs and provide a detailed explanation on the methodological approaches used for the emission estimates from the category, as well as on selection of the AD.	Addressing. The ERT noted that Kazakhstan corrected the CO_2 EF for jet kerosene and used the default value provided in the 2006 IPCC Guidelines (see ID# E.24 above). The ERT also noted that Kazakhstan reported CO_2, CH_4 and N_2O emissions from jet kerosene consumption in domestic aviation for the entire time series using the tier 1 and default EFs provided in the 2006 IPCC Guidelines. Nevertheless, Kazakhstan still reported in the NIR (p.113) that it used the take-off and landing cycles to estimate the GHG emissions from domestic aviation and international bunkers. The NIR did not include data sets or information on the selection of AD or EFs used to estimate CO_2, CH_4 and N_2O emissions from domestic aviation using either a tier 1 or tier 2 method.
E.26	1.A.3.b Road transportation – liquid fuels – CO_2, CH_4 and N_2O (E.13, 2017) (E.21, 2016) (E.21, 2015) (42, 2013) Comparability	Reallocate AD and emissions from transportation in agriculture/forestry/fisheries to the subcategory agriculture/forestry/fishing and emissions from industrial and construction off-road transport to the category manufacturing industries and construction.	Addressing. Kazakhstan reported in the NIR (section 3.4.2.2, p.84) that the consumption and GHG emissions from off-road transport in industry and construction (gasoline, kerosene and diesel fuel) were included under subcategory 1.A.3.e.ii other in order to eliminate double counting in the subcategories under category 1.A.2 manufacturing industries and construction, as confirmed by the Party during the review. In addition, during the review the Party explained that it is working to disaggregate fuel consumption in off-road activities by type of fuel, and that it cannot estimate when this disaggregation will be ready for use in the GHG inventory. The Party further explained that there is no information on fuel consumption in off-road activities for 1990–2006. Further, the Party informed the ERT that the fuel used for its own technological needs is included in the subcategories under category 1.A.2 manufacturing industries and construction. Nevertheless, in accordance with the 2006 IPCC Guidelines (vol. 2, chap. 2, table 2.1, pp.2.8–2.9), the consumption and corresponding emissions for off-road activities should be included in the industry where these activities are occurring. During the review, Kazakhstan explained that all consumption in subcategory 1.A.4.c agriculture/forestry/fishing corresponds to off-road activities and the corresponding CO_2, CH_4 and N_2O emissions were calculated for off-road vehicles, in accordance with the 2006 IPCC Guidelines (vol. 2, chap. 3, table 3.3.1, p.3.41). Kazakhstan reported off-road transport fuel consumption and the corresponding GHG emissions from agriculture/forestry/fishing activities in subcategory 1.A.4.c.ii off-road vehicles and other machinery and subcategory 1.A.4.c.i stationary, which includes the AD and corresponding emissions from subcategory 1.A.4.c.iii fishing.
E.27	1.A.3.b Road transportation – liquid fuels – N_2O (E.14, 2017) (E.22,	Improve the accuracy of the N_2O emission estimates for gasoline consumption, taking into account the pollution	Not resolved. In the NIR (section 3.5.2.2, p.105), the Party indicated that it was not possible to assess the number of vehicles that have oxidation catalysts in the country and that a tier 1 method and default EF have

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	2016) (E.22, 2015) (43, 2013) (60, 2012) Accuracy	control technologies introduced over time in the vehicle fleet.	been used for estimating the N_2O emissions from this subcategory. During the review, Kazakhstan explained that the composition of the fleet is starting to change, but not significantly. It also indicated that the share of new cars that are possibly equipped with pollution control technologies is less than 5–6 per cent of the entire fleet, and this percentage does not significantly affect the N_2O emission estimates for the subcategory. The ERT noted that to accurately estimate N_2O emissions from fuels consumed by vehicles with oxidation catalysts, it is good practice to ensure that default N_2O EFs, if used, best represent local fuel quality and combustion or emission control technologies, in accordance with the 2006 IPCC Guidelines (vol. 2, chap. 3, tables 3.2.2–3.2.5, pp.3.21–3.24). The ERT believes that future ERTs should consider this issue further to ensure that there is not an underestimation of emissions from this activity (see ID# E.63 in table 5).
E.28	1.A.3.b Road transportation – liquid fuels – CO_2 (E.25, 2017) (E.35, 2016) Accuracy	Verify the road transportation related AD for diesel oil consumption with a view to being able to report the emissions for the entire time series, investigate the technology used and the background information on road transportation activities within the country, and justify the EF used or use the default EF suggested by the 2006 IPCC Guidelines.	Addressing. Kazakhstan reported diesel oil consumption for subcategories 1.A.3.b.i cars, 1.A.3.b.ii light-duty trucks and 1.A.3.b.iii heavy-duty trucks and buses and the corresponding CO_2, CH_4 and N_2O emission estimates for the entire time series (for cars since 1991) using default EFs (74.1 t/TJ, 3.9 kg/TJ and 3.9 kg/TJ, respectively) from the 2006 IPCC Guidelines (vol. 2, chap. 3, tables 3.2.1–3.2.2, p.3.16 and p.3.21, respectively). However, Kazakhstan still did not provide information in the NIR on the verification of AD, information on the technology used for road transportation or background information on road transportation activities, which, if provided, would allow the accuracy of the estimates to be assessed.
E.29	1.A.3.b Road transportation – liquid fuels – N_2O (E.26, 2017) (E.36, 2016) Transparency	Provide in the NIR explanatory information on the trend of the N_2O IEF for diesel oil between 1990 and 2014.	Not resolved. Kazakhstan used the default N_2O EF (3.9 kg/TJ) provided in the 2006 IPCC Guidelines (vol. 2, chap. 3, table 3.2.2, p.3.21) for the entire time series, with the exception of 2008, for which it reported a value of 3.16 kg/TJ. The NIR did not include an explanation for the use of different EFs. During the review, the Party explained that an error had occurred, and that it will be fixed in the next annual submission.
E.30	1.A.3.b.i Cars – liquid fuels – CH_4 (E.27, 2017) (E.37, 2016) (E.34, 2015) Accuracy	Verify the road transportation related AD for gasoline consumption, the technology used and the background information about road transportation and justify the relatively high, and increasing, CH_4 IEF.	Not resolved. The ERT noted that Kazakhstan did not provide in the NIR information on the verification of gasoline AD, information on the technology used or background information on road transportation, nor did the Party justify the relatively high CH_4 EF value used for the gasoline emission estimates. Kazakhstan continued to use the default CH_4 EF (33.00 kg/TJ) for uncontrolled motor gasoline vehicles from the 2006 IPCC Guidelines (vol. 2, chap. 3, table 3.2.2, p.3.21) for the entire time series, except for 2010, for which it used a value of 30.12 kg/TJ. During the review, the Party informed the ERT that a technical error was introduced in CRF table 1.A(a) (sheet 3) for the EF (30.12 kg/TJ) used to estimate CH_4 emissions from gasoline consumption in road transportation for 2010.
E.31	1.A.3.b.i Cars – liquid fuels – CH_4	Finalize the investigation of the technologies used in the	Not resolved. In the NIR (section 3.5.2.2, p.105), Kazakhstan stated that it was not possible to provide

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	(E.52, 2017) Accuracy	country, provide more detailed background information about road transportation and, with this information, justify the relatively high CH_4 EF used, in particular for the latest years of the time series, or revise the estimates using corresponding more appropriate IPCC default values.	an assessment of the share of gasoline vehicles with catalytic converters. In addition, the NIR did not provide further information on the technologies used, detailed background information on road transportation or any justification for the relatively high CH_4 EF used. However, in the NIR (section 3.5.2.1, p.102), the Party provided some information on the age structure of the vehicle fleet in Kazakhstan. The ERT considered that, on the basis of that information, it might be possible to provide an estimate of the share of vehicles with catalytic converters and adjust the default EFs used accordingly. During the review, in response to a question raised by the ERT, the Party explained that a detailed analysis will be provided in the NIR of the next annual submission.
E.32	1.A.3.d Domestic navigation – liquid fuels – CO_2, CH_4 and N_2O (E.53, 2017) Accuracy	Estimate emissions from subcategory 1.A.3.d domestic navigation in accordance with the 2006 IPCC Guidelines by: (1) collecting relevant data on fuel consumption by type of fuel, separately for domestic and international navigation, or use appropriate interpolation/ extrapolation techniques based on existing indicators or expert judgment to allow this disaggregation, and documenting comprehensively these data in the NIR; and (2) using appropriate EFs for CO_2, CH_4 and N_2O (e.g. default EFs from the 2006 IPCC Guidelines) to calculate emissions from fuels used for domestic navigation for the complete time series.	Addressing. In its 2019 annual submission, the Party reported separately consumption of fuel by type and the corresponding emissions for domestic and international navigation for the complete time series. During the review, the Party explained that the AD cannot be collected separately for the two types of navigation and the relevant fuel consumption was derived from the information on the known type of transported goods in domestic and international navigation. Nevertheless, the methodology used is not comprehensively documented in the NIRs of the 2018 and 2019 annual submissions. The ERT noted that the Party reported significant recalculations of AD since the 2017 annual submission, resulting in lower figures for total navigation consumption for 2001–2015 (see ID#s E.64 and E.65 in table 5). Following the recommendation from the previous review report, Kazakhstan used the default EFs from the 2006 IPCC Guidelines (vol. 2, chap. 3, tables 3.5.2–3.5.3, p.3.50) for estimating the corresponding CO_2, CH_4 and N_2O emissions from gas/diesel oil and gasoline consumption.
E.33	1.A.4.c Agriculture/forestry/ fishing – liquid fuels – CO_2, CH_4 and N_2O (E.54, 2017) Comparability	Disaggregate CO_2, CH_4 and N_2O emissions from subcategory 1.A.4.c by type of fuels under the correct subcategories (i.e. 1.A.4.c.ii off-road vehicles and other machinery and 1.A.4.c.iii fishing) for the entire time series and, in the NIR, provide detailed explanations on the methods used to allow such reallocation.	Not resolved. The Party maintained the reporting used in the previous annual submission for the entire time series; consumption of all fuel types in subcategory 1.A.4.c.ii off-road vehicles and other machinery was reported under other liquid fuels, with the notation key "IE" used for all other fuel types. No explanations were provided in the NIR as to why such reporting was used. In addition, consumption of all fuel types in subcategory 1.A.4.c.iii fishing was reported using the notation key "IE" and included under subcategory 1.A.4.c.i stationary. No explanation was provided in the NIR as to why such reporting was used. During the review, Kazakhstan indicated that fuels used in subcategory 1.A.4.c agriculture/forestry/fishing are partially presented in the national energy balance and that it was assumed that all these fuels were used in off-road vehicles.
E.34	1.A.5 Other (fuel combustion activities) – all fuels – CO_2, CH_4 and N_2O	Revise the AD and emission allocations to ensure that they are included in the appropriate categories in the CRF tables according to the	Addressing. In the NIR (section 3.4.3.5, p.97), the Party reported that no recalculations were performed for this category in the 2019 annual submission. In the NIR of the 2018 annual submission, the Party reported recalculations for 2014 and 2015 by taking into

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	(E.55, 2017) Comparability	UNFCCC Annex I inventory reporting guidelines and, in the NIR of the next annual submission, include information on the revised allocations, provide detailed explanations on all reallocations and provide revised emission estimates.	consideration the use of the default NCV and CO_2 EF for coking coal consumption. The Party explained that category 1.A.5 other includes sources of GHG emissions not included in any other categories. In particular, subcategory 1.A.5.a stationary includes public administration, defence (aviation and navigation activities) and compulsory social security, while subcategory 1.A.5.b mobile includes other fuel consumption. The ERT noted that, according to the 2006 IPCC Guidelines (vol. 2, chap. 2, table 2.1, p.2.10), mobile defence activities should be included in subcategory 1.A.5.b mobile. Although Kazakhstan reported AD by type of fuel in table 3.19 of the NIR (p.88), the AD and GHG emissions were reported in an aggregated manner in CRF table 1.A(a) (sheet 4).
E.35	1.B.1.a Coal mining and handling – solid fuels – CH_4 (E.15, 2017) (E.23, 2016) (E.23, 2015) (44, 2013) (56, 2012) Transparency	Include the background information about the measurements made and time series of the CH_4 concentration in the NIR (underground mines).	Not resolved. The Party did not provide in the NIR background information on the measurements made and on the time series of the CH_4 concentration for operations in underground mines. During the review, Kazakhstan provided references to the national methodology used to estimate emissions from underground mines (https://www.egfntd.kz/upload/NTD/MERK/5.pdf [in Russian]). The ERT was not able to identify in that methodology any information related to the original research on the basis of which the country-specific EF was derived. However, the ERT noted that, according to the NIR (section 3.6.2.2, p.125), Kazakhstan used the higher value of the range of default CH_4 EFs for mining activities (25 m^3/t) from the 2006 IPCC Guidelines (vol. 2, chap. 4, section 4.1.3.2, p.4.12), but applied an inappropriate CH_4 density of 0.64 kg/m^3 instead of 0.67 kg/m^3.
E.36	1.B.1.a Coal mining and handling – solid fuels – CH_4 (E.16, 2017) (E.24, 2016) (E.24, 2015) (45, 2013) (56, 2012) Transparency	Include all relevant information about the calculation of the country-specific CH_4 EF for coal mining and handling (surface mines) in the NIR and ensure the consistency of the time series.	Not resolved. The Party did not provide in the NIR information about the calculation of the country-specific CH_4 EF for coal mining and handling in surface mines. The ERT noted that the Party reported a practically constant CH_4 IEF for the complete time series (6.87 kg/t) (see ID# E.39 below). During the review, Kazakhstan provided references to the national methodology used to estimate emissions from surface mining (https://www.egfntd.kz/upload/NTD/MERK/4.pdf [in Russian]). The ERT was not able to identify in the document provided by the Party any information related to the calculation of the country-specific EF used by Kazakhstan.
E.37	1.B.1.a Coal mining and handling – solid fuels – CH_4 (E.28, 2017) (E.38, 2016) (E.35, 2015) Accuracy	Report the recovery/flaring of CH_4 from underground mines in CRF table 1.B.1 or use the relevant notation key in accordance with decision 24/CP.19, annex I, paragraph 37.	Not resolved. Kazakhstan used the notation key "NA" for CH_4 recovery/flaring in CRF table 1.B.1 for the entire time series. During the review, the Party explained that no data were available for estimating CH_4 recovery/flaring from coal mining and handling operations. In light of this, the ERT considered that reporting CH_4 recovery/flaring using the notation key "NE" would be more appropriate.
E.38	1.B.1.a Coal mining and handling – solid fuels – CH_4 (E.29, 2017) (E.39,	Investigate and transparently document the use of the country-specific CH_4 EF for the post-mining activities of the underground mines.	Not resolved. The ERT noted that the NIR (section 3.6.2.2, p.125) states that the EF for post-mining activities is assumed to be 10 per cent of the EFs for mining activities, based on the approach described in the 2006 IPCC Guidelines (vol. 2, chap. 4, section

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	2016) (E.36, 2015) Transparency		4.1.3.2, p.4.12) to be applied for tier 2 estimates for mines with pre-drainage. The ERT also noted that the Party applied the higher value of the range of the IPCC default CH_4 EFs for mining activities (see ID# E.35 above), but the EF for post-mining activities appears to be based on country-specific data, as explained by Kazakhstan during the review. This information is not clearly presented and documented in the NIR.
E.39	1.B.1.a Coal mining and handling – solid fuels – CH_4 (E.30, 2017) (E.40, 2016) (E.37, 2015) Transparency	Assess and verify the data provided by the coal mining companies and verify if the conversion between the volume and mass units is properly done, and justify the country-specific CH_4 EF of the surface mining activities in the NIR and the changes in the IEF for the period 1990–2014.	Addressing. The ERT noted that the inconsistency in the time series of the CH_4 IEF used for the estimates of surface mining activities has been resolved, and an EF of 6.87 kg/t was applied across the time series. Although this EF is higher than the IPCC default EF of 1.34 kg/t (2 m^3/t), Kazakhstan reported in the NIR that it based the country-specific EF on a national methodology using measurements per coal basin. However, the information on the approaches used for the measurements and EFs was not sufficiently detailed in the NIR, including on the differentiation between the EFs used for underground and surface mines, and for mining and post-mining activities.
E.40	1.B.1.a Coal mining and handling – solid fuels – CO_2 (E.31, 2017) (E.41, 2016) (E.38, 2015) Transparency	Transparently document in each NIR the methodology and the background information used for the estimation of the CO_2 EF from surface mining activities.	Not resolved. The ERT noted that the NIR (section 3.6.2.2, p.125) provided some information on the method applied for the measurements of the CO_2 content of the in situ gas in underground and surface mining activities, but did not provide transparent and documented information on the actual method used for the determination of the CO_2 EF used for the emission estimates for surface mining activities, which was based on the measurements of the CO_2 content of the in situ gas (1.80 m^3/t coal).
E.41	1.B.1.a Coal mining and handling – solid fuels – CH_4 (E.32, 2017) (E.42, 2016) (E.39, 2015) Completeness	Determine if the level of CH_4 emissions/removals would meet the definition of "insignificant" as contained in decision 24/CP.19, annex I, paragraph 37(b), and report the appropriate notation keys.	Resolved. The Party provided estimates for CH_4 (and CO_2) emissions from post-mining activities in surface mines for the entire time series.
E.42	1.B.1.a Coal mining and handling – solid fuels – CO_2 and CH_4 (E.56, 2017) Completeness	Provide CO_2 and CH_4 emission estimates from abandoned underground coal mines using the methodological approach provided in the 2006 IPCC Guidelines (vol. 2, chap. 4, p.4.24) and strengthen the inventory arrangements procedure to ensure completeness of reporting.	Addressing. Kazakhstan continued to report CO_2 and CH_4 emissions from abandoned underground coal mines using the notation key "NO". The ERT noted that in the NIRs of the 2018 and 2019 annual submissions, Kazakhstan reported that all abandoned underground mines are in conservation and flooded; thus, CH_4 and CO_2 emissions did not occur, according to the guidance provided in the 2006 IPCC Guidelines (vol. 2, chap. 4, p.4.26). During the review, the Party explained that it formally requested companies to provide information on the condition of mines, their level of sealing and the methods used to control emissions. The Party indicated that this information will be provided in the next annual submission. Nevertheless, the ERT believes that information from the study referred to in the 2017 annual review report (FCCC/ARR/2017/KAZ, ID# E.56) should be considered further by Kazakhstan regarding the implementation of measurements and data processing for gas drain pipes at abandoned shafts, pit-holes and boreholes for a significant number of gassy closed mines. The ERT also believes that future ERTs should

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			consider this issue further to ensure that there is not an underestimation of emissions from this subcategory.
E.43	1.B.1.b Solid fuel transformation – solid fuels – CH_4 (E.17, 2017) (E.26, 2016) (E.26, 2015) (46, 2013) Convention reporting adherence	Ensure the correct use of notation keys and report the information in the documentation boxes in the CRF tables.	Not resolved. While acknowledging that a methodology for estimating fugitive emissions from solid fuel transformation (e.g. coke and charcoal production) is not provided in the 2006 IPCC Guidelines, the ERT noted that Kazakhstan continued to use the inappropriate notation key "NA" to report emissions from this subcategory.
E.44	1.B.2 Oil, natural gas and other emissions from energy production – liquid and gaseous fuels – CO_2, CH_4 and N_2O (E.33, 2017) (E.44, 2016) (E.41, 2015) Transparency	Ensure that the description and units regarding the AD for the calculation of fugitive CO_2 and CH_4 emissions are provided in a consistent and complete manner in CRF table 1.B.2.	Addressing. The Party included associated units for all AD reported in CRF table 1.B.2, but did not include a description of any of the AD reported. In addition, the ERT noted some discrepancies in the order of magnitude of the values reported in CRF tables 1.B.2 and 1.A(a) and in the NIR for the same fuel and activity, showing a clear problem with the values and units reported. For example, the production of crude oil for 2017 is reported as 72,900 t in CRF table 1.B.2, but as 72.900 Mt in the NIR (table 3.27, p.129) and as 86,194,400.00 t in CRF table 1.A(b). During the review, Kazakhstan informed the ERT that the value of 86,194,400.00 t is the correct one (see ID# E.69 in table 5).
E.45	1.B.2.a Oil – liquid fuels – CO_2, CH_4 and N_2O (E.34, 2017) (E.45, 2016) (E.42, 2015) Accuracy	Estimate and include emissions from oil exploration or, if data for the estimation of the emissions from this subcategory are not available, use the notation key "NE" with the relevant explanation in the CRF tables and in the NIR.	Addressing. Kazakhstan did not provide in the original 2019 annual submission CO_2, CH_4 and N_2O emission estimates for oil exploration, and the notation key "NE" was used for this subcategory in CRF table 1.B.2 for the complete time series. During the review, the Party explained that it was not possible to obtain the corresponding AD for the estimates and that a request for data is submitted each year to the Committee of Geology and Subsoil Use of Kazakhstan, but it may be possible to receive the requested information for the 2020 annual submission onward. The ERT noted that according to the 2006 IPCC Guidelines (vol. 2, chap. 4, table 4.2.4, p.4.48 or table 4.2.5, p.4.55), the AD for oil production volume could be used to estimate emissions from this subcategory and that these data were included in CRF tables 1.B.2 and 1.A(b). The ERT concluded that omitting emission estimates from this subcategory led to a potential underestimation of CO_2, CH_4 and N_2O emissions from subcategory 1.B.2.a.1 oil – exploration for 2017. The ERT included this issue in the list of potential problems and further questions raised by the ERT and recommended that Kazakhstan use the AD for crude oil production reported in CRF table 1.A(b) (86,194,400.00 t) (see ID#E.44 above) and the default CO_2, CH_4 and N_2O EFs for well drilling, testing and servicing provided in the 2006 IPCC Guidelines (vol. 2, chap. 4, table 4.2.4, p.4.48) to calculate emissions of CO_2, CH_4 and N_2O from subcategory 1.B.2.a.1 oil – exploration for 2017. Following the principle of consistency, the ERT also recommended that Kazakhstan estimate CO_2, CH_4 and N_2O emissions for all other years of the time series using the corresponding AD for crude oil production reported in CRF table 1.A(b) and default EFs for CO_2, CH_4 and N_2O from tables 4.2.4–4.2.5 of the 2006

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			IPCC Guidelines (vol. 2, chap. 4, p.4.48 and p.4.55, respectively). In response to the list of potential problems and further questions raised by the ERT, Kazakhstan resubmitted a complete set of CRF tables for 1990–2017 with revised estimates for CO_2, CH_4 and N_2O emissions from subcategory 1.B.2.a.1 oil – exploration. However, Kazakhstan did not follow the recommendations of the ERT to calculate CO_2, CH_4 and N_2O emissions using oil production volumes as AD and relevant default EFs from the 2006 IPCC Guidelines. In its response, Kazakhstan indicated that AD represented by the number of drilled wells were used for the estimates, which were derived from the volume of oil production and the "inherent proportion of the number of wells for oil exploration to the number of employees". According to its response, Kazakhstan assumed that the number of drilled wells for exploration is 8 per cent of the number of workers and that 3,600 t of oil is produced per working well in one year. However, in the revised CRF table 1.B.2, the Party reported a value of 7,028.43 as AD for oil exploration for 2017, using "10 m^3" as the unit for these AD, but did not include a description of these AD, which made it unclear which specific AD had been used for the calculations. The AD reported and the units included in the resubmitted CRF tables did not reflect either the number of wells or the volume of oil produced, which was not explained in the Party's response. Also, the Party did not provide a clear description of the methodology or the EFs and other parameters used to estimate the revised CO_2, CH_4 and N_2O emissions from subcategory 1.B.2.a.1 oil – exploration, even though the Party mentioned in its response that the "coefficients used" were presented in a table, which was not actually included in the response. In addition, a graph included in the response showed an unrealistic number of drilled wells for oil exploration, which in 2017 represented more than 35,000,000. The ERT noted that, by applying, for example, the default EFs for well drilling, testing and servicing for developed countries provided in table 4.2.4 of the 2006 IPCC Guidelines (vol. 2, chap. 4, p.4.48) to estimate CO_2, CH_4 and N_2O emissions from oil exploration and using the volume of oil production reported in CRF table 1.A(b) as AD, the resulting emission estimates (1,450.98 kt CO_2 eq) for 2017 were well above the estimate reported by Kazakhstan in table 1 of its response (65.48 kt CO_2 eq) and in the revised CRF table 1.B.2 for subcategory 1.B.2.a.1 oil – exploration (0.099 kt CO_2 eq). This suggested that Kazakhstan underestimated GHG emissions from oil exploration for 2017 and all other years of the time series. The ERT disagreed with the Party's revised estimates and concluded that Kazakhstan has not satisfactorily resolved the problem for subcategory 1.B.2.a.1 oil – exploration for 2017 (and for all other years of the second commitment period of the Kyoto Protocol), and, therefore, the problem remains unresolved and an adjustment should be applied.

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			Therefore, in accordance with the guidance for adjustments under Article 5, paragraph 2, of the Kyoto Protocol (annex to decision 20/CMP.1, in conjunction with decision 4/CMP.11), the ERT carried out the procedure for the calculation of adjustments for this subcategory for 2013–2017 (see chap. VI below and tables 1–2 of annex IV).
E.46	1.B.2.a Oil – liquid fuels – CO_2 (E.35, 2017) (E.46, 2016) (E.43, 2015) Completeness	Estimate the fugitive emissions of CO_2 from the oil production and oil transport processes for the period 1990–2014 (CRF table 1.B.2), and if country-specific EFs are not available, use the tier 1 EFs from the 2006 IPCC Guidelines (vol. 2, tables 4.2.4–4.2.5) for oil production and oil transport processes.	Resolved. The Party reported CO_2 (and CH_4) emissions from oil production and oil transportation activities using AD in t and default CO_2 (and CH_4) EFs from the 2006 IPCC Guidelines (vol. 2, chap. 4, tables 4.2.4–4.2.5, p.4.48 and p.4.55, respectively). Kazakhstan split the times series into two periods (1990–2000 and 2001–2017) for the application of the EFs for developing and developed countries, respectively, in accordance with the oil and natural gas infrastructure conditions in the country. Kazakhstan explained in the NIR (section 3.6.3.2, p.128) and to the ERT during the review that after 2001, the Government, through a series of regulatory acts, decided to modernize the oil and natural gas infrastructure; therefore, starting with 2001, Kazakhstan used the default EFs provided in the 2006 IPCC Guidelines for developed countries (vol. 2, chap. 4, table 4.2.5, p.4.55) to estimate GHG emissions. However, the ERT noted an accuracy issue with the AD used for the emission estimates for subcategory 1.B.2.a.2 oil – production and included this issue in the list of potential problems and further questions raised by the ERT (see ID# E.44 above and ID# E.69 in table 5).
E.47	1.B.2.a Oil – liquid fuels – CH_4 (E.36, 2017) (E.47, 2016) Consistency	Improve the QA/QC procedures to verify the CH_4 EF for oil production and ensure the time-series consistency for the IEF for the whole time series.	Not resolved. Kazakhstan provided in the NIR information on general QA/QC activities for fugitive emissions from oil activities, but not on QC procedures to verify the CH_4 EF for oil production. The ERT noted that the Party provided revised estimates using two different sets of CH_4 EFs (for developing or developed countries) across the two periods of the time series (1990–2000 and 2001–2017). Kazakhstan indicated in the NIR (section 3.6.3.2, p.128) and to the ERT during the review that, starting from 2001, the oil and gas production technology has been improved in Kazakhstan and, in the light of this, the Party used the default CH_4 EF provided in the 2006 IPCC Guidelines for developed countries for its emission estimates starting from 2001. Kazakhstan continued to report inconsistently the CH_4 IEF for 2012 and 2013 as in the 2017 and 2018 annual submissions (e.g. for 2012, the CH_4 IEF is 100 times lower, and for 2013 it is 10 times higher than the CH_4 IEF reported for other years in the time series).
E.48	1.B.2.a Oil – liquid fuels – CH_4 (E.37, 2017) (E.48, 2016) Consistency	Verify the time-series consistency of the CH_4 estimates and the IEF for refining/storage processes for the period 1990–2014, and provide appropriate justification/documentation in the NIR.	No longer relevant. The Party reported the notation key "NA" for the AD in the 2018 and 2019 annual submissions, replacing the values (without units) reported in its 2017 annual submission. The notation key "NA" also replaced the previously reported CH_4 emissions and the notation key "NO", which was used in the 2017 annual submission to report CO_2 and N_2O emissions from this subcategory for all years of the time series. The ERT concluded that the missing emissions from this subcategory led to an

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			underestimation of CH_4 emissions, and CO_2 and N_2O emissions for subcategory 1.B.2.a.4 oil – refining/storage for 2017 and all other years of the time series (see ID# E.70 in table 5).
E.49	1.B.2.a Oil – liquid fuels – CH_4 (E.38, 2017) (E.49, 2016) Accuracy	Ensure consistency in the estimation of the CH_4 emissions from transport (1.B.2.a.3), fill the gaps for the period 1990–1996, verify the CH_4 IEF for the year 2014, and ensure consistency in the IEF for the entire time series.	Addressing. The Party reported in the 2018 and 2019 annual submissions AD and estimates for CH_4 (and CO_2) emissions for the entire time series and, as reported in the NIR (section 3.6.3.2, p.128), the Party used two different sets of default CH_4 (and CO_2) EFs (for developing or developed countries) provided in the 2006 IPCC Guidelines (vol. 2, chap. 4, tables 4.2.4–4.2.5, p.4.48 and p.4.55, respectively) for the two periods of the time series (1990–2000 and 2001–2017). Nevertheless, the ERT noted that in the 2019 annual submission, the CH_4 IEF for subcategory 1.B.2.a.3 oil – transport decreased from 20.52 kg/unit in 1990 to 7.69 kg/unit in 2017, with a peak in 2003 of 129.19 kg/unit. The trend of the CO_2 IEF was not linear either, decreasing from 1.29 kg/unit in 1990 to 0.7 kg/unit in 2017. In addition, the ERT noted that in CRF table 1.B.2, no description of the AD was provided to enable an understanding of the possible reasons for these trends. During the review, the Party explained that for 2003, there was an error and the correct CH_4 IEF is 0.913 kg/unit, and that the fluctuations in the CO_2 and CH_4 IEFs were associated with the introduction of new technologies in the oil and gas industry. The ERT noted that the fluctuations in the CH_4 (and CO_2) IEFs cannot be explained solely by the use of different EFs for the two periods in the time series with different technologies and related infrastructure in the oil and gas industry, because significant fluctuations in these IEFs within both periods, when the same technology and infrastructure were used, can be observed, but, more importantly, because fluctuations are not expected given that the Party used single values of the default EFs provided in the 2006 IPCC Guidelines and not country-specific EFs dependent on specific technologies. The ERT believes that future ERTs should consider this issue further to ensure that there is not an underestimation of emissions from this subcategory.
E.50	1.B.2.a Oil – liquid fuels – CH_4 (E.57, 2017) Transparency	In the next annual submission: validate the AD for the subcategory and strengthen QC procedures to ensure that AD for the period 1990–1996 for the subcategory oil transport are correct; include the AD description and units in the CRF tables; and use an appropriate and consistent CH_4 EF to estimate emissions from the subcategory for the period 1990–1996.	Addressing. Kazakhstan provided in the NIR information on general QA/QC activities for fugitive emissions from oil activities, but not on QC procedures to verify the AD for 1990–1996 for oil transport. The ERT found no evidence that the Party had strengthened QC procedures for the AD used for this subcategory or regarding their validation. In its revised estimates, Kazakhstan reported in CRF table 1.B.2 the quantities of oil transported in t and CH_4 emissions from oil transport for the entire time series. In the NIR (table 3.27, p.129), Kazakhstan reported the quantities of oil transported by type of transportation in Mt. The Party also explained the recalculations of the AD, which had been undertaken to add oil transportation by road and rail to oil transport by pipelines, and the use of default EFs provided in the 2006 IPCC Guidelines (vol. 2, chap. 4, tables 4.2.4–4.2.5, p.4.48 and p.4.55, respectively), namely the EF for developing countries for 1990–2000 and the EF for

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			developed countries for 2001–2017. However, the ERT noted that the description of the AD for subcategory 1.B.2.a.3 oil – transport was still not included in CRF table 1.B.2 and no explanation of the fluctuating trend in the EFs for the entire time series was provided in the NIR (see ID# E.49 above).
E.51	1.B.2.b Natural gas – gaseous fuels – CO_2 and CH_4 (E.39, 2017) (E.52, 2016) (E.46, 2015) Consistency	Verify the CO_2 and CH_4 IEF for the production of natural gas for the years 2013 and 2014, ensure time-series consistency of the EFs, and describe the emission trends in the NIR.	Addressing. Kazakhstan briefly explained in the NIR (pp.132–133) the increasing trend for natural gas production and the corresponding emissions, and the influence of new technologies on natural gas operations. The Party also provided in the NIR the default EFs used for the CH_4 and CO_2 emission estimates for subcategory 1.B.2.b.2 natural gas – production, which were provided in the 2006 IPCC Guidelines (vol. 2, chap. 4, tables 4.2.4–4.2.5, p.4.48 and p.4.55, respectively), namely the default EFs for developing countries for 1990–2000 (from table 4.2.5) and the EFs for developed countries for 2001–2017 (from table 4.2.4). The default EFs for CH_4 and CO_2 were consistently used for each of the above two periods, including for 2013 and 2014. However, this approach introduced a significant step change between 2000 and 2001, which created an inconsistency in the EFs used in these two periods of the time series (see ID# E.68 in table 5). Besides this, the ERT noted that the observed emission trends may not be correctly described in the NIR, because it identified discrepancies between CRF tables 1.B.2 and 1.A(b) and the NIR regarding the quantities of natural gas produced in Kazakhstan and the units of AD reported (see ID# E.72 in table 5).
E.52	1.B.2.b Natural gas – gaseous fuels – CO_2 and CH_4 (E.40, 2017) (E.53, 2016) (E.47, 2015) Accuracy	Provide a complete estimate of the fugitive CH_4 and CO_2 emissions from the processing of natural gas in the country.	Addressing. The ERT noted that Kazakhstan in its original 2019 annual submission used the notation key "NE" to report CH_4 and CO_2 emission estimates and AD for subcategory 1.B.2.b.3 natural gas – processing for the entire time series. The ERT also noted that the NIR did not contain information on natural gas processing activities in the country, even though Kazakhstan has several gas processing plants, for example, the Bolashak oil and gas processing plant in the Atyrau region and the Kazakh gas refinery, which confirms that natural gas processing activities occur in Kazakhstan. The ERT further noted that data on natural gas production in Kazakhstan required for performing calculations of emissions for this subcategory were available in CRF table 1.B.2 for the entire time series. During the review, the Party explained that Kazakhstan is an important producer of natural gas and therefore AD for natural gas production were reported in its 2019 annual submission. However, data on the amount of gas processed have not yet been provided by the natural gas processing facilities and these data have not yet been reflected in the Party's national statistics. Kazakhstan indicated that it requested the AD related to subcategory 1.B.2.b.3 natural gas – processing and that it expects to receive these data from the Agency of Statistics of Kazakhstan for use in future annual submissions. The ERT concluded that emission estimates from subcategory 1.B.2.b.3 natural gas – processing were omitted, which could lead to a

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			potential underestimation of CH_4 and CO_2 emissions for 2017. The ERT included this issue in the list of potential problems and further questions raised by the ERT and recommended that Kazakhstan use the AD for natural gas production reported in CRF table 1.A(b) to report revised emission estimates for subcategory 1.B.2.b.3 natural gas – processing for 2017, using default CH_4 and CO_2 EFs provided in table 4.2.4 of the 2006 IPCC Guidelines (vol. 2, chap. 4, pp.4.48–4.55). In addition, and following the principle of consistency, the ERT recommended that Kazakhstan use the corresponding default EFs for CH_4 and CO_2 from tables 4.2.4–4.2.5 of the 2006 IPCC Guidelines (vol. 2, chap. 4, p.4.48 and p.4.55, respectively) to estimate emissions from subcategory 1.B.2.b.3 natural gas – processing for the entire time series. In response to the list of potential problems and further questions raised by the ERT, Kazakhstan resubmitted a complete set of CRF tables for 1990–2017. In its response, Kazakhstan indicated that the AD values for natural gas production presented in CRF table 1.A(b) with default EFs for developed countries were used to calculate the GHG emissions from subcategory 1.B.2.b.3 natural gas – processing. For 2017, Kazakhstan reported a revised value of 0.637 kt CO_2 eq for subcategory 1.B.2.b.3 natural gas – processing (0.025 kt CH_4 and 0.007 kt CO_2) in CRF table 1.B.2. The ERT noted that Kazakhstan did not report which values of the default EFs for developed countries it used or to which subcategory of type of processing plant they belong. The Party reported a CH_4 IEF of 0.59 kg/unit and a CO_2 IEF of 0.166 kg/unit. To assess and compare the revised emission estimates for subcategory 1.B.2.b.3 natural gas – processing submitted by Kazakhstan, the ERT calculated these emissions using the AD from CRF table 1.A(b) (42,675 million m^3) and, for example, the averages of the default EFs for developed countries (default weighted total for fugitives) from table 4.2.4 of the 2006 IPCC Guidelines (vol. 2, chap. 4, p.4.49): CH_4 EF = 5.90×10^{-4} Gg/10^6 m^3 gas production; CO_2 EF = 1.66×10^{-4} Gg/10^6 m^3 gas production; and CO_2 EF (raw CO_2 venting) = 4.00×10^{-2} Gg/10^6 m^3 gas production. The ERT noted a significant difference between the emissions from gas processing calculated from its assessment and the emission estimates resubmitted by Kazakhstan for 2017. The ERT estimated 2,343.54 kt CO_2 eq including raw CO_2 venting, and 636.54 kt CO_2 eq excluding raw CO_2 venting, while Kazakhstan reported an overall value of 0.64 kt CO_2 eq. These significant differences were observed for all years of the time series. The ERT disagreed with the Party's response and concluded that emissions from subcategory 1.B.2.b.3 natural gas – processing, as reported in CRF table 1.B.2, were underestimated for 2017 (and for all other years of the second commitment period of the Kyoto Protocol), that the problem remains unresolved and that an adjustment should be applied. Therefore, in accordance with the guidance for adjustments under

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			Article 5, paragraph 2, of the Kyoto Protocol (annex to decision 20/CMP.1, in conjunction with decision 4/CMP.11), the ERT carried out the procedure for the calculation of adjustments for this subcategory for 2013–2017 (see chap. VI below and tables 7–8 of annex IV).
E.53	1.B.2.b Natural gas – gaseous fuels – CO_2 and CH_4 (E.41, 2017) (E.54, 2016) Consistency	Verify the CH_4 emission estimates for 2014 for the transmission and storage of natural gas, provide a consistent time series for the period 1990–2014, estimate the CO_2 emissions for the same subcategory for the period 1990–2013 and provide a consistent time series for the CO_2 emissions.	Addressing. The Party provided CH_4 and CO_2 emission estimates for the complete time series, using the corresponding default EFs from the 2006 IPCC Guidelines (vol. 2, chap. 4, tables 4.2.4–4.2.5, p.4.48 and p.4.55, respectively), namely the EFs for developing countries for 1990–2000 and the EFs for developed countries for 2001–2017. The ERT noted that Kazakhstan inconsistently reported AD and units between table 3.29 of the NIR, containing volumes of production, transportation and distribution of natural gas and emissions from natural gas operations, and CRF table 1.B.2. The ERT believes that future ERTs should consider this issue further to ensure that there is not an underestimation of emissions from this subcategory.
E.54	1.B.2.b Natural gas – gaseous fuels – CO_2 and CH_4 (E.42, 2017) (E.55, 2016) Consistency	Verify the CH_4 emission estimate for 2014 for the distribution of natural gas, ensure time-series consistency for the period 1990–2014, estimate the CO_2 emissions for the same subcategory for the period 1990–2013 and provide a consistent time series for the CO_2 emissions.	Addressing. The Party reported in its 2019 annual submission CO_2 and CH_4 emission estimates for subcategory 1.B.2.b.5 natural gas – distribution for the entire time series, using default EFs from the 2006 IPCC Guidelines (vol. 2, chap. 4, tables 4.2.4–4.2.5, p.4.48 and p.4.55, respectively), namely the EFs for developing countries for 1990–2000 and the EFs for developed countries for 2001–2017. However, this approach introduced a significant step change between 2000 and 2001, which created an inconsistency in the EFs used and in the resulting CO_2 and CH_4 emissions for these two periods of the time series (see ID# E.68 in table 5). The ERT noted that for the AD, Kazakhstan reported the same value used for natural gas production, which is unlikely to be correct and could lead to an overestimation of emissions. However, as no information was provided on the actual AD used for the estimates, the ERT also believes that future ERTs should consider this issue further to ensure that there is not an underestimation of emissions from this subcategory.
E.55	1.B.2.c Venting and flaring – liquid and gaseous fuels – CO_2 and CH_4 (E.43, 2017) (E.56, 2016) Completeness	Review and estimate the CO_2 and CH_4 emissions from the relevant venting and flaring of the liquid and gaseous fuels for the years 2013 and 2014, and provide a complete and consistent estimate of the emissions from this subcategory.	Not resolved. The ERT noted that Kazakhstan in its original 2019 annual submission used the notation key "NA" to report AD and CO_2 and CH_4 emission estimates for venting of oil, gas and combined under subcategory 1.B.2.c venting and flaring for the entire time series. In the NIR, Kazakhstan did not provide information on venting activities, which commonly occur in the oil and gas industry, but reported that associated operations for both oil and natural gas occur in the country (section 3.6.3.1, p.127). The Party reported CO_2, CH_4 and N_2O emissions from flaring of combined oil and gas for the entire time series in CRF table 1.B.2. Nevertheless, the ERT also noted that the level of these emissions reported in CRF table 1.B.2 was very low and unrealistic (1.96 kt CO_2 eq for 2017), resulting from the use of AD that were also unrealistic and reported without a description (896.10 t for 2017). The ERT believes that future ERTs should consider this issue further to ensure that there is not an

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			underestimation of emissions from flaring under subcategory 1.B.2.c venting and flaring. During the review, Kazakhstan explained that it used the notation key "NA" because no data were available to estimate GHG emissions from venting of natural gas and oil operations, although they had been requested from the oil and gas companies. Given that oil and gas production activities occurred in the country, and emissions of CO_2 and CH_4 from flaring were reported, the ERT concluded that CO_2 and CH_4 emissions from venting occurred but were not reported by Kazakhstan in the 2019 annual submission. This led to a potential underestimation of CO_2 and CH_4 emissions from venting under the subcategory 1.B.2.c venting and flaring for 2017. Therefore, the ERT included this issue in the list of potential problems and further questions raised by the ERT and recommended that Kazakhstan provide AD for venting under subcategory 1.B.2.c venting and flaring for 2017, which correspond to production of natural gas and production of oil, and estimate CO_2 and CH_4 emissions from venting for 2017 under subcategory 1.B.2.c venting and flaring using CO_2 and CH_4 default EFs provided in table 4.2.4 of the 2006 IPCC Guidelines (vol. 2, chap. 4, p.4.48). In addition, and following the principle of consistency, the ERT recommended that Kazakhstan use the corresponding CO_2 and CH_4 default EFs from tables 4.2.4–4.2.5 of the 2006 IPCC Guidelines (vol. 2, chap. 4, p.4.48 and p.4.55, respectively) to estimate emissions from venting under subcategory 1.B.2.c venting and flaring for the entire time series. In response to the list of potential problems and further questions raised by the ERT, Kazakhstan resubmitted a complete set of CRF tables for 1990–2017. The ERT noted that Kazakhstan continued to use the notation key "NA" to report CO_2 and CH_4 emission estimates, AD and units of AD in CRF table 1.B.2 for venting of oil and natural gas under subcategory 1.B.2.c venting and flaring, and the notation key "IE" for CO_2 and CH_4 emissions, AD and units of AD for combined venting for the entire time series. In addition, Kazakhstan left blank cells for the description of the AD. In its response, Kazakhstan explained that to avoid double counting in subcategory 1.B.2.c venting and flaring, it included venting emissions in subcategory 1.B.2.a.1 oil – exploration. However, the ERT also noted that the reported revised emissions from subcategory 1.B.2.a.1 oil – exploration were unrealistically low, and therefore identified a problem of underestimation of emissions from this subcategory (see ID# E.45 above). In addition, the ERT noted that according to the 2006 IPCC Guidelines (vol. 2, chap. 4, table 4.2.4, p.4.48 or table 4.2.5, p.4.55), venting and flaring subcategories are related to activities in different industry segments of oil and natural gas operations, for which Kazakhstan did not estimate and report complete emissions in its resubmission. Namely, for venting, Kazakhstan did not report emissions from gas processing, gas transmission, oil production and oil transport activities that may produce CO_2 and CH_4 emissions.

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			The ERT concluded that CO_2 and CH_4 emissions from subcategory 1.B.2.c venting and flaring – venting were underestimated for 2017 (and for all other years of the second commitment period of the Kyoto Protocol) and, thus, the problem remains unresolved and an adjustment should be applied. Therefore, in accordance with the guidance for adjustments under Article 5, paragraph 2, of the Kyoto Protocol (annex to decision 20/CMP.1, in conjunction with decision 4/CMP.11), the ERT carried out the procedure for the calculation of adjustments for this subcategory for 2013–2017 (see chap. VI below and tables 9–10 of annex IV).
E.56	1.C CO_2 transport and storage – CO_2 (E.44, 2017) (E.57, 2016) Convention reporting adherence	Estimate CO_2 emissions for this category or ensure the correct use of notation keys in CRF table 1.C, and include a category-specific discussion in the NIR for this activity, in accordance with paragraph 50 of the UNFCCC Annex I inventory reporting guidelines.	Not resolved. Kazakhstan continued to use the notation key "NA" to report CO_2 emissions from categories 1.C.1 transport of CO_2 and 1.C.2 injection and storage and for all associated relevant information, such as the AD and IEFs. The NIR did not contain any information on category 1.C CO_2 transport and storage or a category-specific discussion. During the review, Kazakhstan explained that no technologies are in use in Kazakhstan for transporting and storing CO_2 and for this reason, it used the notation key "NA" for category 1.C, which the ERT considers to be incorrect, as the correct notation key to be used in this case is "NO".
IPPU			
I.1	2. General (IPPU) – CO_2 (I.1, 2017) (I.1, 2016) (I.1, 2015) (49, 2013) (69, 2012) Transparency	Strengthen the QA/QC processes to ensure correct use of notation keys and consistency of the information provided in the inventory submission. Explain in CRF table 9(a) in which category the emissions reported as "IE" are included.	Addressing. In general, QA/QC processes have been strengthened to ensure the correct use of notation keys and the consistency of information provided in the inventory. The use of the notation key "IE" for subcategory 2.C.1.f other (the only use of this notation key in the sector) was explained in CRF table 9. The ERT noted, however, that instances of notation keys being used incorrectly in the CRF tables are still common, especially for category 2.F product uses as substitutes for ODS. For example, for HFC emissions reported in CRF table 2(II).B-H (sheet 2), the notation key "NO" was used for the AD ("filled into new manufactured products", "in operating systems" and "remaining in products at decommissioning") and for the IEFs ("product manufacturing factor", "product life factor" and "disposal loss factor").
I.2	2. General (IPPU) – CO_2 and HFCs (I.2, 2017) (I.10, 2016) (I.10, 2015) Convention reporting adherence	Strengthen the QA/QC procedures and update all comments in the CRF tables, and make the reporting consistent between the NIR and the CRF tables of the same submission.	Addressing. The ERT noted that QA/QC procedures for the IPPU sector have been strengthened, all comments in the CRF tables have been updated and the reporting is mostly consistent between the NIR and the CRF tables. However, some discrepancies were still identified, for example between the CO_2 emissions reported in CRF table 2(I).A-H (sheet 2) (648.88 kt) and in the NIR (table 4-13, p.163) (589.1 kt) for subcategory 2.C.1.a steel under category 2.C.1 iron and steel production for 2017. In response to a question raised by the ERT, Kazakhstan explained that the correct value is indicated in CRF table 2(I).A-H (sheet 2) and that this error will be corrected in the next annual submission.
I.3	2. General (IPPU) – CO_2, CH_4 and N_2O (I.3, 2017) (I.11, 2016)	Include the relevant AD descriptions in CRF table 2(I).A-H in order to improve	Not resolved. AD descriptions were not included in CRF table 2(I).A-H.

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	(I.11, 2015) Transparency	the comparability and transparency of reported data.	
I.4	2. General (IPPU) – (I.4, 2017) (I.12, 2016) (I.12, 2015) Convention reporting adherence	Apply the structure and names of the inventory categories in the NIR following the UNFCCC Annex I inventory reporting guidelines, as per decision 24/CP.19.	Addressing. The ERT noted that the sector and category names used are largely consistent with the category names used in the 2006 IPCC Guidelines and follow the UNFCCC Annex I inventory reporting guidelines; however, the structure of the sectoral chapters is different from the one suggested in the UNFCCC Annex I inventory reporting guidelines. The ERT noted that the description of categories 2.F product uses as substitutes for ODS and 2.G.1 electrical equipment is included in the NIR (section 4.4, p.176) under metal industry, and the description of category 2.G.3 N_2O from product uses is included in the NIR (section 4.5, p.200) under non-energy products from fuels and solvent use.
I.5	2. General (IPPU) – (I.25, 2017) Convention reporting adherence	Report in the NIR, for the key categories identified by the trend or level, an explanation if the recommended methods from the appropriate decision trees in the 2006 IPCC Guidelines are not used, as required by the UNFCCC Annex I inventory reporting guidelines, paragraph 50(c).	Not resolved. For the key category 2.A.4 other process uses of carbonates and its significant subcategory 2.A.4.d other process uses of carbonates – other, the Party did not provide an explanation in the NIR as to why the recommended method (tier 2) from the appropriate decision tree in the 2006 IPCC Guidelines (vol. 3, chap. 2, figure 2.4, p.2.35) was not used. Similarly, for the key category 2.F.1 refrigeration and air conditioning, the Party did not provide an explanation in the NIR as to why the recommended method (tier 2a or tier 2b) from the appropriate decision tree in the 2006 IPCC Guidelines (vol. 3, chap. 7, figure 7.6, p.7.46) was not used. During the review, Kazakhstan informed the ERT that this information will be reported in the next annual submission.
I.6	2. General (IPPU) – (I.26, 2017) Transparency	Provide the description of the recalculations of emissions in the IPPU sector in accordance with the UNFCCC Annex I inventory reporting guidelines, paragraphs 43–45, and report in the NIR the reasons for recalculations, the assessment of the impact of recalculations on GHG emission trends, and changes of calculation methods, AD and EFs.	Addressing. The ERT noted that some of the recalculations made in the 2019 annual submission were explained in the NIR and an assessment of the impact of the recalculations on GHG emission trends and changes in calculation methods, AD and EFs were provided, but descriptions of the recalculations made in subcategory 2.A.4.a ceramics and in categories 2.C.2 ferroalloys production (for 2016) and 2.C.6 zinc production (for 2016) were not provided in the NIR. The ERT also noted that the Party reported in the NIR (p.185) that emissions from category 2.F.1 refrigeration and air conditioning were revised, but no recalculations of emissions were in fact made between the 2018 and 2019 annual submissions for this category.
I.7	2.A.1 Cement production – CO_2 (I.5, 2017) (I.2, 2016) (I.2, 2015) (50, 2013) Transparency	Provide the same detailed information about lime content in clinker and the CKD correction factor for all the years in the time series as has been provided in the NIR for 2011.	Addressing. Information on the constant CaO content in clinker and on the CKD correction factor values used for the entire time series was reported in the NIR (table 4.2, p.141). However, this information is not provided at the same level of detail as the information included in the NIR of the 2011 annual submission, where company-level data were provided. The ERT also noted a discrepancy between the CaO content in clinker values reported in the NIR (table 4.2, p.141) and the values used in the calculation of emissions (see ID# I.50 in table 5).

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I.8	2.A.1 Cement production – CO_2 (I.6, 2017) (I.13, 2016) (I.13, 2015) Transparency	Strengthen the QA/QC procedures and correct the value for CKD used to estimate the 2011 emissions, and provide in the NIR the same detailed information as for 2014 for all the years in the time series, in order to explain the large variations in the IEFs across the time series.	Addressing. The ERT noted that the value for CKD used to estimate the 2011 emissions has been corrected. However, the ERT also noted that implementation of QA/QC procedures was lacking, resulting in a discrepancy between the CaO content in clinker values reported in the NIR (table 4.2, p.141) and the values used in the calculation of emissions (see ID# I.50 in table 5). Detailed information on clinker production, CaO values and CKD by individual cement company (e.g. similar to that provided for 2014 in the NIR of the 2016 annual submission) was not included in the NIR, nor did the Party provide an explanation for the variations in the CO_2 IEFs across the time series starting from 2000.
I.9	2.A.1 Cement production – CO_2 (I.27, 2017) Transparency	Provide in the NIR clear and consistent information on the AD, CKD correction factor and methods used for CO_2 emission estimates from 2.A.1 cement production, and include clarifications on changes to the methods and AD sources for 2000 onwards.	Addressing. Kazakhstan reported in the NIR (section 4.2.1, pp.140–142) information on the AD, CKD correction factor and methods used for CO_2 emissions from category 2.A.1 cement production, but clarifications on the changes to the methods and AD sources from 2000 onward were not included in the NIR. The ERT noted a discrepancy between the CaO content in clinker values reported in the NIR (table 4.2, p.141) and the values used in the calculation of emissions (see ID# I.50 in table 5).
I.10	2.A.1 Cement production – CO_2 (I.28, 2017) Transparency	Include in the NIR a detailed explanation about how non-carbonate sources of CaO are used in the cement plants of the country and that this use does not affect the CO_2 emissions.	Resolved. The NIR (section 4.2.1.1, p.140) contained an explanation about how blast furnace slag is used as an additive for grinding cement, which takes place after burning the clinker and does not affect CO_2 emissions.
I.11	2.A.1 Cement production – CO_2 (I.29, 2017) Accuracy	Determine the average fraction of clinker in cement for 2000–2015 and use this value for revising the clinker production for 1990–1999 if the technologies for cement production and types of cement produced in Kazakhstan were similar to the current state. Otherwise, the use of the default value of clinker share in cement (0.75) is appropriate to estimate emissions in 1990–1999.	Addressing. The default value of clinker share in cement (0.75) was used to estimate emissions for 1990–1999. However, the Party did not provide an explanation in the NIR as to why an average fraction of clinker in cement for 2000–2015 was not used for revising clinker production for 1990–1999.
I.12	2.A.1 Cement production – CO_2 (I.29, 2017) Accuracy	Clarify whether export and import of clinker occurred in the period 1990–1999 and take this information into consideration for the calculation of clinker production in Kazakhstan for the estimates for 2.A.1 cement production.	Not resolved. Information on possible clinker export and import in the period 1990–1999 was not included in the NIR, and no information was provided on whether these data were taken into consideration for the calculation of CO_2 emission estimates for category 2.A.1 cement production. During the review, Kazakhstan informed the ERT that data on export and import of clinker are not available.
I.13	2.A.1 Cement production – CO_2 (I.30, 2017) Accuracy	Revise the CO_2 emissions from category 2.A.1 cement production using the default CKD correction factor 1.02, report the revised estimates in	Resolved. CO_2 emissions from category 2.A.1 cement production were estimated using the default CKD correction factor 1.02 in the 2019 annual submission. The resulting recalculations are explained in the NIR (p.143).

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		accordance with the UNFCCC Annex I inventory reporting guidelines, paragraph 50(h), and explain the resulting recalculations in the NIR of the next annual submission.	
I.14	2.A.2 Lime production – CO_2 (I.31, 2017) Transparency	Improve the transparency of the information on the category 2.A.2 lime production in the NIR by providing the list of industries where the lime is produced and which are included in the aggregated data on lime production in Kazakhstan (e.g. pig iron and steel plants, copper plants, construction industry, sugar plants, etc.) and clarify, based on the procedures used for the compilation of national statistics, whether non-marketed lime production is included in the total national lime production used for the CO_2 emission calculation from the category.	Not resolved. The ERT noted that detailed information on industries where lime is produced and which are included in the aggregated data on lime production in Kazakhstan (e.g. metallurgy, pulp and paper, sugar refining, precipitated calcium carbonate, water softeners) was not provided in the NIR. Clarification of whether non-marketed lime production is included in the total national lime production used for the calculation of CO_2 emissions from the category was also not provided. During the review, Kazakhstan provided an incomplete list of industries where lime is produced. The Party stated that there are 26 lime production companies in the country, and identified six major producers among them, without providing further details. Also, the Party's response did not specify whether non-marketed lime production was included in the total national lime production used for the calculation of CO_2 emissions. As it was not clear from the Party's response whether non-marketed lime production was included in the total national lime production used for the calculation of the emission estimates, the ERT concluded that CO_2 emissions from category 2.A.2 lime production may be underestimated for 2017. Therefore, the ERT included this issue in the list of potential problems and further questions raised by the ERT and recommended that Kazakhstan collect specific information on non-marketed lime production by industry, including amounts of lime produced by each industry, add these data to the national totals used for estimating CO_2 emissions from category 2.A.2 lime production for 2017 and provide revised estimates of CO_2 emissions for this category. In addition, following the principle of consistency, the ERT recommended that Kazakhstan revise its CO_2 emission estimates for category 2.A.2 lime production by including specific information on the total non-marketed lime production in the country for other years of the second commitment period of the Kyoto Protocol (2013–2016). In its response to the list of potential problems and further questions raised by the ERT, the Party confirmed that 26 lime producers are registered in Kazakhstan according to the official national statistics. It also indicated that, according to the national statistical monitoring publication "Report of the enterprise on the production and shipment of products (goods, services)" (appendix 6 to the order of the Chairman of the Agency of Statistics of Kazakhstan of 13 December 2018), the "industrial production in physical terms is the gross output of specific types of products in physical terms, including products spent on industrial production needs within a given enterprise and produced from tolling raw materials"; thus, the data obtained from the Agency of Statistics of

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			Kazakhstan on the production of lime used for calculating GHG emissions in the 2019 annual submission include all aggregated data (including non-marketable lime) for the whole country. The ERT considered the Party's response and noted that Kazakhstan has not collected specific information on non-marketed lime production by industry, including amounts of lime produced by each industry, as requested by the ERT. However, Kazakhstan explained that the term 'industrial production' is used by enterprises for reporting statistical data to the Agency of Statistics of Kazakhstan and that these data include data on products consumed for industrial production needs within a given enterprise. The ERT concluded that Kazakhstan has demonstrated that lime production statistics include all aggregated data in the country, including non-marketable lime, and therefore concluded that the potential problem is resolved; however, it considers that all the above information should be included in future NIRs.
I.15	2.A.2 Lime production – CO_2 (I.32, 2017) Transparency	Include in the NIR clear information on the fact that statistical data on lime production used for the calculations for the submission by 15 April each year could be revised by the Agency of Statistics of Kazakhstan after the inventory submission and, if that is the case, recalculated subsequently.	Not resolved. Information on possible statistical revisions of lime production data after the inventory submission was not included in the NIR.
I.16	2.A.2 Lime production – CO_2 (I.33, 2017) Accuracy	Revise the CO_2 emission estimates from lime production according to the tier 1 method from the 2006 IPCC Guidelines without using a correction on the ratio of hydrated lime or justify the use of an appropriate correction factor for hydrated lime, taking into account the different types of lime produced in the country.	Resolved. The NIR (p.144) indicated that CO_2 emission estimates from lime production were calculated using the tier 1 method from the 2006 IPCC Guidelines. The ERT noted that although CO_2 emissions from lime production were recalculated in the 2018 annual submission, it is still not clear from the NIR of the 2019 annual submission whether Kazakhstan has fully addressed the recommendation to avoid using a correction on the ratio of hydrated lime. However, in response to a question raised by the ERT during the review, Kazakhstan informed the ERT that CO_2 emissions from lime production were estimated according to the tier 1 method from the 2006 IPCC Guidelines without using a correction factor on the ratio of hydrated lime and provided a spreadsheet with the related calculations. The ERT confirmed that the Party used the tier 1 method from the 2006 IPCC Guidelines without using a correction factor on the ratio of hydrated lime and concluded that the reported CO_2 emissions from category 2.A.2 lime production were accurate and were not underestimated for 2017.
I.17	2.A.3 Glass production – CO_2 (I.34, 2017) Transparency	Report relevant information in the NIR according to paragraph 50(a–b) of the UNFCCC Annex I inventory reporting guidelines for category 2.A.3 glass production and clarify in the	Resolved. The Party estimated CO_2 emissions from category 2.A.3 glass production, provided descriptions of the method used and reported in the NIR (section 4.2.3, p.145) that production of glass fibre and glass wool does not occur in Kazakhstan.

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		NIR whether or not production of glass fibre and glass wool occurs in Kazakhstan.	
I.18	2.A.4 Other process uses of carbonates – CO_2 (I.8, 2017) (I.15, 2016) (I.15, 2015) Transparency	Provide in the NIR a clear explanation of how limestone and dolomite use, and the related CO_2 emissions from the use of those carbonates, have been allocated in the new CRF structure.	Resolved. The NIR (pp.149–151) contains an explanation of how limestone and dolomite use, and the related CO_2 emissions from the use of those carbonates, have been allocated in the CRF structure.
I.19	2.A.4 Other process uses of carbonates – CO_2 (I.35, 2017) Accuracy	Estimate CO_2 emissions from 2.A.4.a ceramics by using available data on production of ceramic bricks, refractory products, home ceramics products and ceramic tiles and total carbonate content in these products and equation 2.14 in volume 3 of the 2006 IPCC Guidelines.	Addressing. Kazakhstan estimated CO_2 emissions from subcategory 2.A.4.a ceramics using available statistical data and the tier 1 method described in the 2006 IPCC Guidelines (vol. 3, chap. 2, p.2.34). However, the ERT noted that emissions were estimated assuming a lower value of carbonate content of clay than suggested by the 2006 IPCC Guidelines (see ID# I.50 in table 5).
I.20	2.A.4 Other process uses of carbonates – CO_2 (I.35, 2017) Accuracy	Calculate the mass of ceramic bricks production (e.g. using the densities provided in the "Interstate Standard GOST 530-2012. Ceramic bricks and stones. General technical conditions") and the clay consumption for ceramics product production using the default loss factor provided in the 2006 IPCC Guidelines (vol. 3, chap. 2.5.1.3) and the default content of carbonates provided in the 2006 IPCC Guidelines (vol. 3, chap. 2.5.1.1), if country-specific values are not available.	Addressing. Kazakhstan estimated the mass of ceramic bricks production using recommended country-specific densities and the clay consumption for production of ceramics products using the default loss factor provided in the 2006 IPCC Guidelines. The ERT noted, however, that emissions were estimated assuming a lower value for the carbonate content of clay than that suggested in the 2006 IPCC Guidelines (see ID# I.50 in table 5).
I.21	2.A.4 Other process uses of carbonates – CO_2 (I.36, 2017) Comparability	Improve the comparability of the inventory by reallocating CO_2 emissions from limestone and dolomite use for pig iron and steel production from subcategory 2.A.4.d to category 2.C.1.	Resolved. The ERT noted that in the NIR (section 4.2.5, p.150), the Party reported that in order to avoid double counting of emissions, some of the CO_2 emissions from limestone and dolomite use under subcategory 2.A.4.d other process uses of carbonates – other were allocated to category 2.C.1 iron and steel production. During the review, Kazakhstan provided data on the amount of limestone/dolomite used for pig iron and steel production, which was subtracted from subcategory 2.A.4.d other process uses of carbonates – other, and explained that this amount of carbonates was included in subcategory 2.C.1.b pig iron.
I.22	2.B.1 Ammonia production – CO_2 (I.9, 2017) (I.16, 2016) (I.16, 2015) Accuracy	Move to a tier 2 method to calculate CO_2 emissions from ammonia production, based on the amount of natural gas used and ensure consistent reporting of the category across the time series.	Not resolved. CO_2 emissions from ammonia production were still estimated using the tier 1 method. In response to a question raised by the ERT during the review, Kazakhstan informed the ERT that category 2.B.1 ammonia production is not a key category and it is not possible to move to a higher-tier method for estimating emissions owing to a lack of information on consumption of natural gas for 1990–2005, as the company JSC KazAzot, which currently produces

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			ammonia, has only been operating since 2006 and does not have previous records of consumption of natural gas, and the Agency of Statistics of Kazakhstan does not have such information either. The ERT noted that although ammonia production is not a key category, according to the decision tree for the estimation of CO_2 emissions from ammonia production provided in the 2006 IPCC Guidelines (vol. 3, figure 3.1, p.3.14), if ammonia production data by fuel type and process type are available, the tier 2 method should be used. The ERT also noted that there are several splicing techniques available in the 2006 IPCC Guidelines (vol. 1, chap. 5.3, pp.5.8–5.14) that can be used for estimating missing AD, provided that it is not possible to use the same method or data source for all years of the time series.
I.23	2.B.1 Ammonia production – CO_2 (I.37, 2017) Transparency	Include in the NIR clear information on the fact that statistical data on ammonia production used for the calculations for the submission by 15 April each year could be revised by the Agency of Statistics of Kazakhstan after the inventory submission and, if that is the case, recalculated subsequently.	Not resolved. Information on possible statistical data revisions of ammonia production data after the inventory submission was not included in the NIR.
I.24	2.B.2 Nitric acid production – N_2O (I.38, 2017) Completeness	Collect AD on nitric acid production and information about the technology and abatement systems used for 1990–2005 and estimate N_2O emissions according to the 2006 IPCC Guidelines, ensuring consistency of the estimates for the whole time series. If nitric acid was not produced in the country in 1990–2005, report in the NIR clear information on this fact, and information about the technology and abatement system used at JSC KazAzot and any other chemical plant which produced nitric acid, together with other relevant information in accordance with paragraph 50(a–b) of the UNFCCC Annex I inventory reporting guidelines.	Resolved. Kazakhstan reported in the NIR (section 4.3.2, p.157) that nitric acid was produced in the country at JSC KazAzot only from 2006 onward. Information on the technology used at JSC KazAzot was provided in the NIR (atmospheric pressure plant – low pressure). The ERT noted an issue concerning a discrepancy between the reported AD for nitric acid production in the NIR and the nitric acid production data published on the website of JSC KazAzot for 2015 (see ID# I.52 in table 5).
I.25	2.B.5 Carbide production – CO_2 (I.10, 2017) (I.4, 2016) (I.4, 2015) (52, 2013) Transparency	Explore the use and potential imports or exports of calcium carbide and revise the EF, if necessary.	Addressing. The ERT noted that in the NIR (section 4.3.3, p.161), the Party stated that calcium carbide is not used in Kazakhstan for the production of acetylene and, therefore, CO_2 emissions from this activity do not occur. The Party did not provide further clarification in the NIR on how calcium carbide is used within the country and whether emissions occur from its use, or on potential imports and exports of calcium carbide. During the review, Kazakhstan informed the ERT that most of the calcium carbide produced is exported and

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			the remaining part is used for flue gas desulfurization of pig iron, which is not an emissive process.
I.26	2.B.5 Carbide production – CO_2 (I.39, 2017) Transparency	Transparently report in the NIR the EFs and AD used for the CO_2 emission estimates from 2.B.5 carbide production and continue estimating CO_2 emissions from this category using the actual data on coke consumption for carbide production available from the production plant and the corresponding EF from the 2006 IPCC Guidelines (vol. 3, table 3.8).	Addressing. Kazakhstan reported in the NIR (section 4.3.3, pp.159–160) the production volume of calcium carbide and the EF used, but the actual data used in the calculation of emissions (coke consumption) were not provided in the NIR.
I.27	2.C.1 Iron and steel production – CO_2 (I.11, 2017) (I.17, 2016) (I.17, 2015) Transparency	Include in the NIR a justification for the decreasing trend of the CO_2 IEF since 2012.	Not resolved. The ERT noted that the values of the CO_2 IEF for subcategory 2.C.1.b pig iron did not change compared with the values reported in the 2017 annual submission. A justification for the decreasing trend of the CO_2 IEF for pig iron production since 2012 was not provided in the NIR.
I.28	2.C.1 Iron and steel production – CO_2 and CH_4 (I.13, 2017) (I.19, 2016) (I.19, 2015) Accuracy	Investigate the ratio of sinter + pellets to steel + pig iron and describe the reasons for the observed ratio in the NIR, including the possibility of exports of sinter and/or pellets, which could explain the ratio; and review the AD for the whole time series, if found necessary.	Not resolved. Information on an investigation of the ratios and a description of the reasons for the observed ratios were not provided in the NIR. A review of the AD for the whole time series was not performed. During the review, Kazakhstan informed the ERT that this information will be presented in the 2020 annual submission.
I.29	2.C.1 Iron and steel production – CO_2 (I.41, 2017) Transparency	Include in the NIR clear descriptions of the method, AD and EFs used in the emission estimates for subcategory 2.C.1.a steel in accordance with paragraph 50(a–b) of the UNFCCC Annex I inventory reporting guidelines.	Addressing. The ERT noted that the method, AD and EFs used in the emission estimates for subcategory 2.C.1.a steel were included in the NIR (p.164); however, an explanation of whether the same method and EFs were used for the largest steel production company, JSC ArcelorMittal Temirtau, and for other steel plants, for which AD were obtained from the Agency of Statistics of Kazakhstan, was not provided in the NIR.
I.30	2.C.1 Iron and steel production – CO_2 (I.42, 2017) Transparency	Provide in the NIR clear and complete information on the method, AD and EFs used for the estimates and ensure consistency of this information with the information reported in the CRF tables.	Addressing. The ERT noted that the method, AD and EFs used to estimate CO_2 emissions from subcategory 2.C.1.b pig iron were reported in the NIR (p.163); however, the information provided in the NIR and CRF tables is still unclear and contradictory. For example, an explanation of the different sources of coke consumption data used for 1990–1999 and 2010–2015 was not provided in the NIR. The ERT also noted that although the Party reported that CO_2 emissions were estimated using a tier 2 method, in the CRF tables the EFs used were reported as "default" EFs.
I.31	2.C.1 Iron and steel production – CO_2 (I.43, 2017) Accuracy	Revise the CH_4 emissions from subcategory 2.C.1.b pig iron using a documented country-specific CH_4 EF or report these emissions as "NE" because of the absence	Resolved. Owing to the absence of a default CH_4 EF in the 2006 IPCC Guidelines, CH_4 emissions from subcategory 2.C.1.b pig iron were reported as "NE" in CRF table 2(I)A-H.

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		of a default CH_4 EF in the 2006 IPCC Guidelines.	
I.32	2.C.1 Iron and steel production – CO_2 (I.44, 2017) Transparency	Revise the description of category 2.C.1 in the NIR to improve the transparency of the inventory by providing a clear statement that direct reduced iron production is not occurring in the country, including relevant references to the existing iron and steel plants.	Not resolved. The Party reported the notation key "NO" for emissions from subcategory 2.C.1.c direct reduced iron in CRF table 2(I)A-H. The ERT noted that under the description of category 2.C.1 iron and steel production in the NIR, the Party did not provide a statement that direct reduced iron production was not occurring in the country, including references to the existing iron and steel plants.
I.33	2.C.1 Iron and steel production – CO_2 (I.45, 2017) Accuracy	Collect AD of fuels, reducing agents (coke breeze) and limestone used for sinter production, revise the CO_2 emission estimates for 2.C.1.d sinter for the complete time series using tier 2 or 3 methods from the 2006 IPCC Guidelines and demonstrate that emissions from fuels used for sinter production are excluded from the energy sector.	Addressing. The ERT noted that CO_2 emissions from subcategory 2.C.1.d sinter were estimated using a tier 2 method from the 2006 IPCC Guidelines (vol. 3, chap. 4.2.2.2, pp.4.22–4.23) on the basis of data provided by JSC ArcelorMittal Temirtau. Emissions were estimated using an average EF (0.043 t coke/t sinter produced) based on the carbon content of consumed fuels and reducing agents. However, the ERT noted that the Party did not demonstrate in the NIR that emissions from fuels used for sinter production were excluded from reporting in the energy sector.
I.34	2.C.1 Iron and steel production – CO_2 (I.46, 2017) Accuracy	Collect AD of fuels (natural gas), reducing agents and limestone used for pellet production, revise the CO_2 emission estimates for 2.C.1.e pellet for the complete time series using tier 2 or 3 methods from the 2006 IPCC Guidelines and demonstrate that emissions from fuels used for pellet production are excluded from the energy sector.	Not resolved. The ERT noted that CO_2 emissions from subcategory 2.C.1.e pellet are still estimated using a tier 1 method from the 2006 IPCC Guidelines (vol. 3, chap. 4.2.2.2, pp.4.21–4.22). During the review, the Party explained that owing to the lack of data on fuel consumption (natural gas), reducing agents and limestone for the entire time series (1990–2017) and because subcategory 2.C.1.e pellet is not a key category, the tier 1 method was used to calculate CO_2 emissions. The ERT also noted that according to the key category assessment reported in CRF table 7 and in the NIR (annex 2, tables P2.1–P2.5), category 2.C.1 iron and steel production is a key category for Kazakhstan. The ERT further noted that the decision tree provided in the 2006 IPCC Guidelines (vol. 3, figure 4.7, p.4.20) is for all subcategories under category 2.C.1 iron and steel production; the Party should therefore make efforts to estimate emissions using a tier 2 method for all subcategories under category 2.C.1 iron and steel production.
I.35	2.C.1 Iron and steel production – CO_2 (I.47, 2017) Transparency	Provide in the NIR clear and documented information justifying that CO_2 and CH_4 emissions from coke production are not double counted under 2.C.1 iron and steel production, 1.A.1.b pig iron and 1.A.2.a iron and steel.	Addressing. The ERT noted that CO_2 and CH_4 emissions from coke production were reported under subcategory 2.C.1.f other as "IE" and were included in the energy sector. However, the NIR did not include documented information demonstrating that CO_2 and CH_4 emissions from coke production are not double counted under category 2.C.1 iron and steel production, subcategory 1.A.1.b pig iron and subcategory 1.A.2.a iron and steel. During the review, Kazakhstan indicated that the double counting of CO_2 and CH_4 emissions is not possible, since the calculations of emissions from subcategories 2.C.1.b pig iron and 2.C.1.a steel are based on a carbon balance.

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I.36	2.C.2 Ferroalloys production – CO_2 (I.14, 2017) (I.5, 2016) (I.5, 2015) (53, 2013) Transparency	Further improve transparency by providing the AD disaggregated by type of ferroalloy for the entire time series.	Not resolved. AD disaggregated by type of ferroalloy were not provided in the NIR.
I.37	2.C.2 Ferroalloys production – CO_2 (I.48, 2017) Transparency	Include in the NIR clear descriptions of the method, AD and EFs used in the emission estimates from 2.C.2 ferroalloys production in accordance with paragraph 50(a–b) of the UNFCCC Annex I inventory reporting guidelines.	Addressing. The descriptions of the method, AD and EFs used in the emission estimates for category 2.C.2 ferroalloys production were included in the NIR (section 4.4.2, pp.169–170). However, the ERT noted an incorrect reference in the NIR to table 4.6 of the 2006 IPCC Guidelines (p.4.38) for the CO_2 EF used for ferroalloys production, which was not identified by type of ferroalloy. The Party clarified that the correct reference should be table 4.5 of the 2006 IPCC Guidelines (p.4.37), from which the default EF of 1.6 t CO_2/t ferroalloys was selected.
I.38	2.C.3 Aluminium production – CO_2 (I.16, 2017) (I.21, 2016) (I.21, 2015) Transparency	Improve the reporting of information on aluminium technology and parameters provided in the NIR and strengthen the QA/QC procedures in preparing the report with a view to eliminating internal inconsistencies in the NIR.	Addressing. The ERT noted that the reporting of information on aluminium technology was improved and the parameters used to estimate emissions were provided in the NIR (section 4.4.3, pp.172–174). However, the ERT still noted a lack of implementation of QA/QC procedures; for example, the Party reported in the NIR (p.174) an incorrect reference to equation 4.14 (the equation for calculating CH_4 emissions from direct reduced iron production) of the 2006 IPCC Guidelines (vol. 3, chap. 4, p.4.24) instead of the correct reference to equation 4.21 (vol. 3, chap. 4, p.4.45).
I.39	2.C.3 Aluminium production – CO_2 (I.50, 2017) Completeness	Estimate CO_2 emissions associated with anode baking furnaces using the tier 2 or 3 methods from the 2006 IPCC Guidelines and report these emissions in the CRF tables with relevant and detailed explanations in the NIR.	Not resolved. The ERT noted that CO_2 emissions associated with anode baking furnaces were not estimated by the Party, leading to a potential underestimation of emissions for this category. The ERT performed preliminary estimates of CO_2 emissions using the assumption from the 2006 IPCC Guidelines (vol. 3, chap. 4, p.4.43) that other sources of process-related CO_2 emissions associated with prebake anode baking account for less than 10 per cent of total non-energy-related CO_2 emissions. The ERT concluded that the reported CO_2 emissions were underestimated for 2017 (emissions for 2017 would increase by approximately 48 kt CO_2 eq, accounting for 0.014 per cent of the national total). However, the likely level of underestimation of emissions does not exceed the significance threshold of 0.05 per cent of the national total (183.09 kt CO_2 eq), or 500 kt CO_2 eq. Therefore, this issue was not included in the list of potential problems and further questions raised by the ERT.
I.40	2.C.3 Aluminium production – PFCs (I.49, 2017) Transparency	Include in the NIR transparent information and data to justify the choice of country-specific values for the slope coefficient for CF_4 anode effect minutes per cell-day for 2.C.3 aluminium production estimates.	Resolved. Transparent information and data to justify the choice of country-specific values for the slope coefficient for CF_4 anode effect minutes per cell-day for category 2.C.3 aluminium production estimates were provided in the NIR (section 4.4.3, p.173).
I.41	2.C.6 Zinc production – CO_2	Demonstrate in the NIR that complete AD for zinc	Addressing. The Party clarified in the NIR (section 4.4.8, p.189) that only the AD for zinc production in

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	(I.17, 2017) (I.22, 2016) (I.22, 2015) Transparency	production are reported in the CRF tables, providing an explanation for any differences between the data in the CRF tables and the data on the website of the only zinc-producing company in the country using CO_2-emitting technology. If an error is identified in the AD reported in the CRF tables, recalculate the AD and update the whole time series for this category, as appropriate.	the Waelz process were taken into account and zinc production with non-CO_2-emitting technologies was not considered. However, Kazakhstan did not provide explanations or a quantitative analysis in the NIR of the differences between the data in CRF table 2(I).A-H (e.g. 167.67 kt zinc for 2017) and the official data on the website of the only zinc-producing company in the country (e.g. 317.0 kt zinc for 2017).
I.42	2.D Non-energy products from fuels and solvent use – CO_2 and N_2O (I.18, 2017) (I.23, 2016) (I.23, 2015) Completeness	Provide estimates for the emissions from the category or evidence to show the insignificance of this category, in accordance with decision 24/CP.19, annex I, paragraph 37(b); and include clear information of the category included under other in CRF table 2(I).A-H.	Addressing. CO_2 emissions from category 2.D.1 lubricant use were estimated and relevant information was provided in the NIR (section 4.5.2, pp.192–193). However, CO_2 emissions from category 2.D.2 paraffin wax use were not estimated and were reported as "NA"; CO_2 emissions from category 2.D.3 other – urea-based catalytic converters were also not estimated and were reported as "NO". The NIR did not provide evidence to show the insignificance of these categories, in accordance with decision 24/CP.19, annex I, paragraph 37(b) (see ID#s I.53 and I.54 in table 5). N_2O emissions used in anaesthesia, which were previously reported under category 2.D.3 other, were reported as "NO" (see ID# I.49 below). The ERT believes that future ERTs should consider this issue further to ensure that there is not an underestimation of emissions from these categories.
I.43	2.F.1 Refrigeration and air conditioning – HFCs (I.20, 2017) (I.7, 2016) (I.7, 2015) (55, 2013) Transparency	Provide a transparent explanation in the NIR to justify the choice of the notation key "NO" for years prior to 2007, or collect AD and estimate emissions of HFC-32, HFC-125 and HFC-143a from refrigeration and air-conditioning equipment for the entire time series.	Addressing. Kazakhstan revised the HFC emission estimates for category 2.F.1 refrigeration and air conditioning and reported the emissions from 1995 onward; however, the NIR lacks justification that HFC emissions were not occurring before 1995.
I.44	2.F.1 Refrigeration and air conditioning – HFCs (I.21, 2017) (I.25, 2016) (I.25, 2015) Transparency	Provide transparent information on methods, AD and EFs for this category, provide information on how time-series consistency is ensured for the category and provide clear information on the recalculations made across the entire time series, as well as correct the reporting of the emissions in the CRF tables by providing data per subcategory, and clearly distinguish emissions from manufacturing, from stocks and from disposal.	Addressing. The ERT noted some progress in the reporting in the CRF tables with regard to providing emission data per subcategory. Nevertheless, the NIR still lacks transparent information on the methods, AD and EFs used and on how time-series consistency was ensured for this category. The ERT noted that only emissions from stocks were reported in the CRF tables (see ID# I.45 below). In addition, the recalculations for category 2.F.1 refrigeration and air conditioning were not reported transparently (see ID# I.1 above).
I.45	2.F.1 Refrigeration and air conditioning – HFCs	Collect relevant AD (manufacturing, stocks and recovery), in particular for	Addressing. The ERT noted that in CRF table 2(II).B-H (sheet 2) only emissions from stocks in operating systems were reported. During the review, the Party

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	(I.51, 2017) Completeness	equipment in operation and disposal, and estimate HFC emissions from 2.F.1 refrigeration and air conditioning by applying the corresponding method from the 2006 IPCC Guidelines; however, if that is not possible, estimate HFC emissions from this category using the techniques on data gathering presented in the 2006 IPCC Guidelines (vol. 1, chap. 2) and apply the corresponding method from the 2006 IPCC Guidelines.	explained that HFCs were not produced in Kazakhstan, therefore emissions could occur only from the stock of refrigerants. The ERT also noted that some of the refrigeration and air-conditioning equipment could be imported by Kazakhstan not pre-filled, and charging of this new equipment could occur in the country. Therefore, emissions from manufacturing could also occur in Kazakhstan. The ERT further noted that information concerning HFC disposal was not provided in the NIR and emissions from this activity were not reported. The ERT also noted that category 2.F.1 refrigeration and air conditioning is a key category; therefore, according to the decision tree in the 2006 IPCC Guidelines (vol. 3, chap. 7, figure 7.6, p.7.46), higher-tier methods should be used for this category (e.g. tier 2a, tier 2b), which is not the case. Kazakhstan did not provide an explanation in the NIR as to why the methods used differ from the recommended methods (see ID# I.5 above). The ERT also identified several additional issues with regard to completeness in category 2.F.1 refrigeration and air conditioning (see ID#s I.55, I.56 and I.57 in table 5).
I.46	2.F.3 Fire protection – HFCs, PFCs and SF_6 (I.22, 2017) (I.8, 2016) (I.8, 2015) (56, 2013) Transparency	Use the notation key "NO" for HFC, PFC and SF_6 emissions from fire extinguishers if this activity does not occur.	Resolved. The notation key "NO" was used to report AD and emissions of HFCs, PFCs and SF_6 from fire extinguishers in CRF table 2(II).B-H (sheet 2) and relevant information was provided in the NIR (section 4.4.5, p.180).
I.47	2.G.1 Electrical equipment – SF_6 (I.23, 2017) (I.9, 2016) (I.9, 2015) (57, 2013) (87, 2012) Completeness	Choose the appropriate method to estimate SF_6 emissions from electrical equipment and estimate the emissions.	Resolved. Kazakhstan collected the information on the total charge in electrical equipment using SF_6 and applied the default EF provided in the 2006 IPCC Guidelines for the SF_6 emission estimates for category 2.G.1 electrical equipment (NIR, section 4.4.4, pp.176–179).
I.48	2.G.1 Electrical equipment – SF_6 (I.24, 2017) (I.26, 2016) (I.26, 2015) Completeness	Collect information on the total charge in electrical equipment using SF_6 and apply the default EF provided in the 2006 IPCC Guidelines if a complete mass balance is not possible. Otherwise, use the notation key "NE" and provide arguments that the category is insignificant, as per decision 24/CP.19, annex I, paragraph 37(b).	Resolved. Kazakhstan collected the information on the total charge in electrical equipment using SF_6 and applied the default EF provided in the 2006 IPCC Guidelines for the SF_6 emission estimates for category 2.G.1 electrical equipment (NIR, section 4.4.4, pp.176–179).
I.49	2.G.3 N_2O from product uses – N_2O (I.52, 2017) Convention reporting adherence	Estimate N_2O emissions from subcategory 2.G.3.a medical application and report these emissions in the next annual submission and include in the NIR information in accordance with paragraph 50(a–b) of the UNFCCC Annex I inventory reporting guidelines.	Addressing. The ERT noted that Kazakhstan provided preliminary estimates of N_2O emissions from N_2O use in anaesthesia in the NIR (section 4.5.8, pp.200–201). The estimates were based on per capita data from other countries with similar conditions (Belarus and Russian Federation) and showed that emissions from this subcategory were insignificant (80 kt CO_2 eq), as they do not exceed the significance threshold of 0.05 per cent of the national total (183.09 kt CO_2 eq in 2017), or 500 kt CO_2 eq, in accordance with decision 24/CP.19, annex I, paragraph 37(b). However, the ERT also noted that in CRF table 2(I).A-H (sheet 2), the Party reported these emissions as "NO" instead of

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			providing these estimates or using the notation key "NE".
Agriculture			
A.1	3. General (agriculture) – CH_4 and N_2O (A.2, 2017) (A.14, 2016) (A.14, 2015) Convention reporting adherence	Implement a specific QC procedure to correct the allocation of manure to different manure management systems, the units for GE and the AD in CRF table 3.D (3.D.b.2).	Resolved. The ERT noted that Kazakhstan corrected the allocation of manure to different manure management systems in CRF table 3.B(a) (sheet 2) and reported correct units and values of GE in CRF table 3.A (sheet 2), as well as corrected the AD in CRF table 3.D for subcategory 3.D.b.2 nitrogen leaching and run-off (see ID# A.22 in table 5).
A.2	3. General (agriculture) – CH_4 and N_2O (A.11, 2017) Transparency	In the NIR, include information on the AD and method used to estimate CH_4 and N_2O emissions from manure management systems of rabbits. For the livestock subcategories of marals, ostriches and fur animals, emissions of which are considered negligible, the provisions of paragraph 37(b) of the UNFCCC Annex I inventory reporting guidelines may be applied and relevant justifications, including preliminary estimates, should be included in the NIR.	Addressing. Kazakhstan included AD for rabbits in its NIR (table 5.3, p.211). The tier 1 default EF used for the CH_4 emission calculations was provided in table 5.16 of the NIR (p.2.23), while the EFs and parameters used for the N_2O emission calculations were provided in tables 5.18–5.19 and 5.21 of the NIR (pp.226–227). However, Kazakhstan did not include in the NIR any justifications to underpin the reporting of the notation key "NO" in CRF tables 3.A, 3.B(a) and 3.B(b) for other livestock subcategories of marals, ostriches and fur animals, for which the Party provided preliminary estimates for 2015 during the previous review (CH_4 emissions from enteric fermentation and manure management for marals; CH_4 emissions from manure management systems for ostriches; and CH_4 and N_2O emissions from manure management systems from fur animals), as referred to in the 2017 annual review report (FCCC/ARR/2017/KAZ, ID# A.11).
A.3	3.B.1 Cattle – N_2O (A.12, 2017) Transparency	In the NIR of the next annual submission, include information on the parameters and method used to estimate N_2O emissions from manure management systems of non-dairy cattle under 3.B.1 cattle.	Resolved. Information on the parameters and method used to estimate N_2O emissions from non-dairy cattle manure management was included in the NIR (section 5.3.2, p.224).
A.4	3.B.3 Swine – N_2O (A.14, 2017) Transparency	In the NIR of the next annual submission, include information on the assumptions, AD and method used to estimate N_2O emissions from manure management systems for category 3.B.3 swine.	Resolved. Information on the assumptions, AD and method used to estimate N_2O emissions from swine manure management was included in the NIR (section 5.3.2, p.224).
A.5	3.B.4 Other livestock – CH_4 (A.15, 2017) Transparency	In the NIR of the next annual submission, include information on the AD and method used to estimate CH_4 emissions from manure management systems for category 3.B.4 other livestock – buffalo.	Resolved. Information on the AD and method used to estimate CH_4 emissions from buffalo manure management was included in the NIR (section 5.3.1, p.220).
A.6	3.C Rice cultivation – CH_4 (A.16, 2017) Transparency	In the NIR of the next annual submission, include documented information on the AD and method used to estimate CH_4 emissions from category 3.C rice cultivation.	Resolved. Information on the AD and method used to estimate CH_4 emissions from rice cultivation was included in the NIR (section 5.4, p.228).

ID#	*Issue and/or problem classification*[a, b]	*Recommendation made in previous review report*	*ERT assessment and rationale*
A.7	3.D.a.2.a Animal manure applied to soils – N_2O (A.8, 2017) (A.21, 2016) (A.21, 2015) Accuracy	Verify the amount of N in animal manure that has been piled up in the country over the years and how much is applied to soil (as reported in CRF table 3.D), and include in the NIR the justifications explaining the assumptions used in the inventory or make the necessary recalculations of emission estimates in the next submission.	Resolved. The ERT noted that Kazakhstan revised its calculations of the amount of N in animal manure applied to soils during the previous review, as referred to in the 2017 annual review report (FCCC/ARR/2017/KAZ, ID# A.17), and no longer applied the assumption that manure is piling up in the country over a period of years. This approach continued to be applied in the 2019 annual submission. Kazakhstan considered the total annual manure for the emission calculations, taking into account N losses occurring prior to soil application (NIR, section 5.5.2, p.234).
A.8	3.D.a.2.a Animal manure applied to soils; 3.D.b Indirect N_2O emissions from managed soils – N_2O (A.17, 2017) Transparency	In the NIR, include information on the AD and method used to estimate the amount of organic fertilizers applied and the associated direct and indirect N_2O emissions from agricultural soils (3.D.a.2.a organic N fertilizers – animal manure applied to soils and 3.D.b indirect N_2O emissions from managed soils).	Resolved. Kazakhstan provided information on the AD and method used to estimate the amount of organic fertilizers applied to soils and the associated direct and indirect N_2O emissions in the NIR (section 5.5, p.230).
A.9	3.D.a.5 Mineralization/ immobilization associated with loss/gain of soil organic matter; 3.D.b Indirect N_2O emissions from managed soils – N_2O (A.18, 2017) Accuracy	Report N_2O emission estimates for 3.D.a.5 mineralization/ immobilization associated with loss/gain of soil organic matter and for relevant indirect N_2O emissions from leaching and run-off in consistency with estimates of carbon mineralized on cropland reported in the LULUCF sector.	Resolved. The AD reported in CRF table 3.D for N mineralization of 1,044,300,000 kg N for 2017 are consistent with the losses of soil carbon on cropland remaining cropland reported in CRF table 4.B (10,443 kt C). The amounts of N mineralized were considered in the calculation of indirect N_2O emissions from leaching and run-off.
A.10	3.D.a.6 Cultivation of organic soils (i.e. histosols) – N_2O (A.19, 2017) Transparency	In the NIR of the next annual submission, provide detailed information on the absence of organic soils in the country.	Not resolved. In the NIR (section 5.5.2, p.233), Kazakhstan noted that its agricultural soils do not meet the criteria for organic soils in terms of humus content. However, no justification or detailed information to underpin this statement was provided in the NIR.
A.11	3.D.b.2 N leaching and run-off – N_2O (A.20, 2017) Transparency	Include in the NIR detailed information on the AD and method used to estimate N_2O emissions from subcategory 3.D.b.2 nitrogen leaching and run-off.	Resolved. Information on the AD and method used to estimate N_2O emissions from N leaching and run-off under subcategory 3.D.b.2 was provided in the NIR (section 5.5.2, pp.236–238).
A.12	3.G Liming – CO_2 (A.21, 2017) Transparency	Provide, in the NIR, detailed justification for reporting CO_2 emissions from liming as "NO".	Not resolved. In the NIR (section 5.7, p.240) Kazakhstan noted that soil is not limed on a large scale in the country and that statistics on agricultural use of lime are not available. However, the ERT noted that no evidence was provided to support this statement. In response to a question raised by the ERT during the review, Kazakhstan explained that it had developed new forms with requests for data on liming to be sent to the relevant authorities (the Agency of Statistics of Kazakhstan and the Ministry of Agriculture). The

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			results of these data requests will be included in the NIR of the next annual submission.
LULUCF			
L.1	4. General (LULUCF) – CO_2, CH_4 and N_2O (L.1, 2017) (L.1, 2016) (L.1, 2015) (table 3, 2013) (114, 2012) (95, 2011) Completeness	Improve completeness by including estimates for all mandatory categories, together with the relevant documentation supporting the estimates: (a) Net CO_2 emissions from forest land remaining forest land – mineral soils; (b) Net CO_2 emissions from grassland converted to forest land – mineral soils; (c) Net CO_2 emissions from wetlands converted to forest land – organic soils; (f) Net CO_2 emissions from forest land converted to grassland – dead organic matter and mineral soils; (g) Net CO_2 emissions from other land converted to wetlands; (h) N_2O emissions from disturbance associated with land-use conversion to cropland, grassland converted to cropland – mineral soils.	Addressing. The ERT noted that Kazakhstan made improvements regarding the completeness of the inventory; however, it remains incomplete. In particular, the ERT noted the following: (a) and (b) Resolved. Kazakhstan reported net CO_2 emissions from mineral soils on forest land remaining forest land and grassland converted to forest land in CRF table 4.A and provided related information in the NIR (section 6.3.2, pp.254–263); (c) Addressing. Kazakhstan reported the notation key "NO" for the AD and CSCs in all pools in CRF table 4.A for wetlands converted to forest land. The ERT noted that in the NIR (table 6.7, p.251), updated information on land-use changes for all IPCC categories was reported and, according to this information, wetlands converted to forest land did not occur in the country. However, the ERT also noted that no transparent information was provided in the NIR justifying how the values in table 6.7 of the NIR correspond to Kazakhstan's national statistics, in order to demonstrate that such conversion did not occur; (f) Not resolved. Kazakhstan reported the notation key "NO" for the AD and CSCs in all pools in CRF table 4.C for forest land converted to grassland. The ERT noted that in the NIR (table 6.7, p.251), updated information on land-use changes for all IPCC categories was reported and, according to this information, forest land converted to grassland did not occur in the country. No transparent information was provided in the NIR justifying how the values in table 6.7 of the NIR correspond to Kazakhstan's national statistics, in order to demonstrate that such conversion did not occur. In addition, the ERT noted that the Party reported an area (mineral soils) of deforestation under KP-LULUCF activities (i.e. 87 kha for 2016) in CRF table 4(KP-I)A.2, which may imply that conversion of forest land to grassland occurred; (g) Resolved. Kazakhstan reported net CO_2 emissions from land converted to wetlands in CRF table 4.D and provided related information in the NIR (section 6.6, p.280); (h) Addressing. Kazakhstan reported the notation key "NO" for the AD and the notation key "NA" for N_2O emissions from land converted to cropland in CRF table 4(III), and reported the notation key "NO" for the AD and CO_2 emissions for all land conversions to cropland, including grassland converted to cropland (mineral soils), in CRF table 4.B. The ERT noted that the use of the notation key "NA" for reporting N_2O emissions in CRF table 4(III) would be incorrect if the activity did not occur. The ERT also noted that in the NIR (table 6.7, p.251), updated information on land-use changes for all IPCC categories was reported and, according to this information, land-use conversion to cropland did not occur in the country. However, the ERT further noted that no transparent information was

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			provided in the NIR justifying how the values in table 6.7 of the NIR correspond to Kazakhstan's national statistics, in order to demonstrate that such conversion did not occur.
L.2	4. General (LULUCF) – CO_2 (L.2, 2017) (L.4, 2016) (L.4, 2015) (76, 2013) Completeness	Report areas of conversion from forest land to other land-use categories in land-use change matrices and provide estimations of GHG net emissions from deforestation in appropriate subcategories.	Not resolved. Kazakhstan did not report the area converted from forest land to other land-use categories in the land-use change matrices (CRF table 4.1) or in table 6.7 of the NIR (p.251). In addition, no estimates of GHG emissions from forest land converted to other land-use categories were provided in the relevant CRF tables or in the NIR. However, the ERT noted that the Party reported in CRF table 4(KP-I)A.2 an area (mineral soils) of deforestation under KP-LULUCF activities of 87 kha for 2016.
L.3	4. General (LULUCF) – CO_2 (L.4, 2017) (L.6, 2016) (L.6, 2015) (78, 2013) (120, 2012) (100, 2011) Convention reporting adherence	Implement the QA/QC plan for the sector.	Addressing. The ERT noted that some QC procedures were implemented by Kazakhstan in order to improve the accuracy and transparency of the GHG inventory for each category of the LULUCF sector, which was reflected in the NIR (sections 6.3.4, 6.4.4 and 6.5.4, p.264, p.267 and p.278, respectively). However, some QC procedures were not performed, such as accuracy checks on data acquisition in cases where the same AD were used for 2016 and 2017 for the calculation of emissions from forest fires. The ERT also noted that no information was provided in the LULUCF chapter of the NIR on how QA procedures were performed. During the review, the Party informed the ERT that information on general QA/QC activities will be included in the next annual submission (see ID# L.6 below).
L.4	4. General (LULUCF) – CO_2, CH_4 and N_2O (L.5, 2017) (L.15, 2016) (L.15, 2015) Completeness	Improve the completeness of the reporting for the sector by providing estimates for all mandatory categories and pools (as listed in ID# L.1 (FCCC/ARR/2017/KAZ) and for the relevant land conversions, currently reported as "NO").	Addressing. Kazakhstan reported estimates for some mandatory categories and pools (see ID# L.1 above). However, the Party did not report estimates for the relevant land conversions reported as "NO" in previous annual submissions and did not provide information on the occurrence or otherwise of those conversions, such as wetlands converted to forest land and forest land converted to grassland (see ID# L.2 above).
L.5	4. General (LULUCF) – CO_2, CH_4 and N_2O (L.6, 2017) (L.17, 2016) (L.17, 2015) Transparency	Improve the methodological information for the estimated categories by including: (b) Definitions of all elements included in the category (e.g. forest is a land that spans for a minimum area of x ha); (c) A description of the methodology applied, which includes: assumptions (and for each assumption, its logical basis and evidence of its reliability with regard to the condition to which it is applied) and the equations applied (noting that when an IPCC method is used, information on assumptions is	Addressing. The ERT noted that Kazakhstan made efforts to improve the methodological information in the NIR of the 2019 annual submission, in particular: (b) Resolved. Kazakhstan reported in the NIR (sections 6.3.1, 6.4.1, 6.5.1, 6.6.1 and 6.7.1, p.252, p.265, p.273, p.279 and p.281, respectively) definitions of all elements of the land-use categories used in the reporting (i.e. the national forest definition is consistent with data from the Food and Agriculture Organization of the United Nations); (c) Addressing. The ERT noted that Kazakhstan made improvements to the description of the methods applied for its estimates in the NIR, such as including a description of the methodology applied for reporting CSCs for all pools in forest land for the first time (section 6.3.2, p.253). The Party also provided references to the equations from the 2006 IPCC Guidelines applied for the calculation of CSCs in the NIR (sections 6.3.2, 6.4.2, 6.5.2, 6.6.2, 6.7.2 and 6.9, p.253, p.266, p.274, p.280, p.282 and p.283,

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		not needed and equations may simply be quoted); (d) A description of the AD and their quality, including information on data collection (methodology and timing), data compilation (methodology) and uncertainties.	respectively). However, some assumptions used for the calculations for some categories are still not transparent. For instance, for the biomass carbon stock calculation for perennial crops on cropland, the Party assumed that this living biomass (standing volume) is similar to the biomass of other trees in the Forest Fund of Kazakhstan (NIR, p.267); (d) Not resolved. The general information on the sources of AD and uncertainties for each land-use category was reported in the NIR (e.g. p.248, p.254, p.263, pp.266–267). However, a description of the quality of the AD was not provided in the NIR. In addition, limited information on data collection (methodology and timing) and compilation (methodology) was reported in the NIR. For instance, Kazakhstan did not provide in the NIR (section 6.3.2, p.263) information on the type of additional data regarding forest lands under the responsibility of different entities that was collected and compiled by the Committee for Land Management. In addition, the ERT noted that the quality of the AD reported is still not sufficient; for example, the information in table 6.17 of the NIR (p.265) was provided up to 2016, and the AD for the calculation of emissions from forest fires for 2017 was simply duplicated from the AD for 2016 in table 6.14 of the NIR (p.262).
L.6	4. General (LULUCF) – CO_2, CH_4 and N_2O (L.7, 2017) (L.18, 2016) (L.18, 2015) Transparency	Include in the NIR a description of any QA/QC checks undertaken, and the results of such checks.	Addressing. The ERT noted that Kazakhstan included specific sections on "QA/QC procedures and review" for each land-use category in the NIR (sections 6.3.4, 6.4.4, 6.5.4, 6.6.4 and 6.7.4, p.264, p.267, p.278, p.280 and p.283, respectively). However, the information reported in those sections is limited (focused mainly on addressing the recommendation from the previous ERT) with regard to the description of any QA/QC checks, who conducted them and the results of such checks. For instance, only information on recommendations from the previous review report was provided in section 6.5.4 of the NIR (p.278). During the review, Kazakhstan informed the ERT that QA and QC procedures were applied for the preparation of the NIR. For instance, QA activities were performed with the help of the Ministry of Agriculture, the Ministry of Internal Affairs and the Agency of Statistics of Kazakhstan. However, this information was not provided in the NIR and the Party informed the ERT that it will be included in the next annual submission.
L.7	4. General (LULUCF) – CO_2, CH_4 and N_2O (L.22, 2017) Accuracy	In the next annual submission, fully resolve the inconsistencies identified in the reporting of land-use areas and report an accurate and consistent land representation used for the estimates in accordance with the 2006 IPCC Guidelines.	Addressing. Kazakhstan reported updated areas of land-use categories/subcategories in accordance with the 2006 IPCC Guidelines in table 6.7 of the NIR (p.251), which are consistent with the areas reported in CRF tables 4.A–4.F. However, Kazakhstan did not report accurate and consistent land representation in accordance with the 2006 IPCC Guidelines (see ID#s L.8, L.9 and L.13 below). During the review, the Party informed the ERT that it will fully resolve the inconsistencies identified in the reporting of land-use areas in the 2020 annual submission.
L.8	Land representation – CO_2 (L.8, 2017) (L.3, 2016)	Make efforts to convert existing statistics into the IPCC land-use categories,	Addressing. The ERT noted that Kazakhstan made efforts to convert existing national statistics into the IPCC land-use categories and provide related

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	(L.3, 2015) (75, 2013) (116, 2012) Transparency	taking into consideration, among other issues, that: (a) Even if land use results in no emissions, it is good practice to report its area and use appropriate notation keys for net emissions and IEFs; (b) Where relevant, forest land, grassland, wetlands and other land should be divided into "managed" and "unmanaged". Although net emissions of unmanaged lands do not need to be reported, reporting the area would allow the consistency of data to be transparently justified; (c) The definitions of land-use categories in the IPCC good practice guidance for LULUCF are rather flexible, and this should facilitate the use of available statistics, with the help of proxy data, expert judgment and justified assumptions, which should be documented in the NIR; (d) Lands that do not change land use should be reported separately from lands with land-use conversion; (e) Party may report aggregated estimates for all land conversions to a particular land use, when data are not available to report them separately. This should be clearly stated in the documentation boxes and documented in the NIR; (f) The category other land remaining other land is intended to allow the total reported land area to match the total area of the country.	information. However, some of the necessary considerations were not fully taken into account, as follows: (a) Addressing. Kazakhstan reported the CSCs for all pools of the land-use categories/subcategories for which the AD were reported in CRF tables 4.A–4.F. However, for cropland converted to grassland, for example, the notation key "NO" was used for reporting the area and net emissions in CRF table 4.C, despite the fact that data were provided in table 6.20 of the NIR (p.269); (b) Resolved. Kazakhstan reported in the NIR (section 6.2, p.246) that all land-use categories are considered as managed in the country except for lakes, rivers, swamps and other lands, which are considered as unmanaged wetlands and were reported in CRF table 4.1; (c) Not resolved. Kazakhstan reported in the NIR a general description of the sources of AD used for the land representation. However, information on how national land-use categories were transformed into IPCC land-use categories was not provided in the NIR (e.g. data in table 6.7, p.251, regarding the methodology used, assumptions applied, etc.); (d) Addressing. Kazakhstan reported land-use conversions separately from the remaining land-use categories for grassland converted to forest land, lands converted to wetlands and grassland converted to settlements (CRF tables 4.A, 4.D and 4.E). However, cropland converted to grassland was reported as "NO" in CRF table 4.C, while this conversion was reported in tables 6.20 and 6.22 of the NIR (p.269 and p.271, respectively); (e) Not resolved. The ERT noted that the CRF tables continued to include information on land categories that do not change and lands under conversion categories. The most significant example is the reporting of cropland remaining cropland, including cropland converted to grassland, in CRF table 4.B. No information on the approach applied was provided in the documentation box of CRF table 4.B or in the NIR. However, the ERT noted that the calculation of GHG emissions from cropland converted to grassland was reported in the NIR (table 6.22, p.271); (f) Addressing. Kazakhstan reported areas of other land remaining other land in CRF table 4.F and in the NIR (section 6.2, pp.246–251) with a description specifying that these areas are considered as unmanaged. The ERT noted that, when taking into account the area of the category other land use, the total area of the country remains constant. However, despite the sizeable area reported for other land remaining other land (23,106.8 kha for 2017), transparent and detailed information on which national land-use categories were considered under other land was not reported in the NIR in order to demonstrate that those areas could not be considered as managed or do not correspond to other land-use categories.

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L.9	Land representation – CO_2 (L.9, 2017) (L.16, 2016) (L.16, 2015) Transparency	Include information on: (a) Ancillary data used for land classification, comprising: timing and methodology of data collection and any further elaboration before their use for land classification; (b) The methodology applied for classifying land under land categories; (c) Explanations on how consistency is maintained when different sources of data and/or different methodologies are used for preparing the land representation.	Not resolved. Kazakhstan did not report in the NIR the required information, as follows: (a) Not resolved. The ERT noted that Kazakhstan reported in the NIR (section 6.2, pp.246–251) only general information on the AD providers involved in the preparation of the land representation. No information on the ancillary data used or further elaboration of the data for the preparation of the land representation was reported in the NIR; (b) Not resolved. The methodology applied for classifying national land-use categories according to the definitions in the 2006 IPCC Guidelines was not reported in the NIR; (c) Not resolved. The ERT noted that no information was reported in the NIR on how consistency was maintained when different sources of data and/or different methodologies were used for preparing the land-use representation. During the review, Kazakhstan informed the ERT that the principle of "advantages of data obtained from the first source" was applied for the preparation of the land representation using data provided by the Committee for Land Management and the State Scientific and Research Centre for Agrochemical Service of the Ministry of Agriculture of Kazakhstan, the state enterprise Forest Management Enterprise of the Committee for Forestry and Wildlife, and the Committee for Water Resources of the Ministry of Ecology, Geology and Natural Resources of Kazakhstan. However, this information did not prove that consistency was maintained in accordance with the UNFCCC Annex I inventory reporting guidelines and the 2006 IPCC Guidelines.
L.10	Land representation – CO_2 (L.10, 2017) (L.19, 2016) (L.19, 2015) Accuracy	Revise the methodology according to good practice provided in the 2006 IPCC Guidelines (vol. 4, chap. 3) in order to build a consistent land representation, and develop and implement QA/QC procedures in order to check the consistency of conversions between land uses, to ensure that total land area is constant over time and to ensure that the GHG inventory estimates are not affected by technical mistakes.	Addressing. The ERT noted that Kazakhstan reported the area of land-use categories, maintaining a constant national total area for the entire time series. However, the Party did not report in the NIR which methodology was applied in order to build a consistent land representation or provide information on the revision of the previous methodology used. During the review, Kazakhstan informed the ERT that approach 1 was used in combination with approach 2 for the preparation of the land representation, in accordance with the 2006 IPCC Guidelines. No information on the QA/QC procedures developed and implemented for checking the consistency of conversions between land uses was reported in the NIR.
L.11	4.A Forest land – CO_2 (L.11, 2017) (L.20, 2016) (L.20, 2015) Transparency	Verify reported values of deadwood and biomass carbon stock of the forest subcategories hardwood and other trees and revise them, as needed, as well as include the relevant explanations on the national circumstances in the NIR.	Addressing. Kazakhstan reported CSCs separately for living biomass and dead organic matter in CRF table 4.A and the NIR (section 6.3, pp.252–265). The revised values of deadwood and biomass carbon stock for all forest subcategories (groups of species), with a detailed separation by age class, were provided in the NIR (table 6.10, p.257). In addition, updated values of forest productivity were applied, taking into account groups of species and age groups (NIR, tables 6.8–6.9, p.256 and p.257, respectively). However, the Party did not provide transparent information in the

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			corresponding section of the NIR on whether the values of deadwood and biomass carbon stock for the forest subcategories hardwood and other trees were verified or include any explanations of the national circumstances related to these values.
L.12	4.A.1 Forest land remaining forest land – CO_2 (L.12, 2017) (L.7, 2016) (L.7, 2015) (80, 2013) (124, 2012) (101 and 105, 2011) Accuracy	Report CSC separately for all the pools; report both biomass gains and biomass losses separately.	Addressing. Kazakhstan reported separately CSCs for all pools in forest land (living biomass, dead organic matter and soils) in CRF table 4.A and the NIR (section 6.3.2, pp.253–263). The stock change method was applied for the calculation of CSCs in living biomass. However, the ERT noted that biomass gains and biomass losses were still not reported separately and the notation key "NO" was used instead of "IE" to report biomass losses in CRF table 4.A, despite the available information provided in the NIR (p.253) referring to the existence of felling activity in the country.
L.13	4.B.1 Cropland remaining cropland – CO_2 (L.14, 2017) (L.8, 2016) (L.8, 2015) (82, 2013) (129, 2012) Comparability	Exclude abandoned lands from cropland and report this category under cropland converted to grassland or cropland converted to other land.	Not resolved. Kazakhstan reported abandoned lands under cropland remaining cropland in CRF table 4.B and the NIR (section 6.4, p.265), which is not in line with the recommendations provided in the 2006 IPCC Guidelines (vol. 4, chap. 3, p.3.7).
L.14	4.B.1 Cropland remaining cropland – CO_2 (L.15, 2017) (L.9, 2016) (L.9, 2015) (83, 2013) (128, 2012) Convention reporting adherence	Apply the necessary procedures for the verification of emissions from soils, including any procedures in accordance with the QA/QC plan, and include these emissions in the CRF tables.	Addressing. Kazakhstan reported in CRF table 4.B the CSCs in mineral soils in cropland remaining cropland using the CSC method and applying the national humus content in soils for the entire time series. The Party reported in the NIR (section 6.4.4, p.267) that additional analyses of independent observations of humus content in soils were performed as QA/QC procedures. However, the NIR did not contain information on how these additional analyses were used to verify data on carbon content and the respective emissions from soils.
L.15	4.B.1 Cropland remaining cropland – CO_2 (L.17, 2017) (L.23, 2016) (L.23, 2015) Accuracy	Estimate carbon stock losses from biomass in cropland and report all information on the method and background data used for calculating the rates used for estimating the CSC.	Not resolved. The ERT noted that carbon stock losses from biomass were reported as "NO" in CRF table 4.B. No information on the non-occurrence of biomass losses was provided in the NIR. According to the NIR (section 6.4.2, p.266), the CSC method was applied for the calculation of CSCs in living biomass, using the value of biomass carbon stock samples for naturally regrown vegetation. In addition, Kazakhstan used the assumption that the value of carbon stock in living biomass of perennial crops is similar to the value of the biomass of trees in forests in the Forest Fund of Kazakhstan, without providing justification for this assumption. No information on the method and background data used for the calculation of the rates used for estimating the CSCs was provided in the NIR. During the review, Kazakhstan indicated that CSCs for fallow lands overgrown with natural vegetation and perennial crops remaining in cropland were estimated using a biomass carbon stock value for restored steppe ecosystems of 5.485 t/ha (dead and living biomass) and the relative stock change factors from the 2006 IPCC Guidelines that apply to the country (vol. 4, chap. 5, table 5.5, p.5.17). The Party also indicated that the carbon stock in biomass of tree stands was

ID#	Issue and/or problem classification[a, b]	Recommendation made in previous review report	ERT assessment and rationale
			estimated using data on the biomass of the "other trees" group of the Forest Fund of Kazakhstan.
L.16	4.C.1 Grassland remaining grassland – CO_2 (L.18, 2017) (L.10, 2016) (L.10, 2015) (84, 2013) (125, 2012) Accuracy	Check the reliability of the AD for the degree of grassland degradation for the entire time series.	Not resolved. The ERT noted that information on the degree of grassland degradation and the areas of different groups of grassland affected by degradation were reported in the NIR (section 6.5, table 6.28, p.278), together with the coefficients used for the AD. The ERT also noted that information on land degradation was taken from the map of vegetation degradation, which is part of the National Atlas of Kazakhstan for 2006. However, the NIR did not contain additional information ensuring the reliability of the AD for the degree of grassland degradation or information on checks conducted on the reliability of the AD. During the review, Kazakhstan informed the ERT that archives of geobotanical surveys of pastures for 1970–1990 were used as additional cartographic information for determining the degree of grassland degradation and that methodological work is ongoing to find additional information on activities on grasslands from recent decades, which will be reported on in the 2020 annual submission.
L.17	4.C.1 Grassland remaining grassland – CO_2 (L.19, 2017) (L.11, 2016) (L.11, 2015) (85, 2013) (126, 2012) (111, 2011) Convention reporting adherence	Implement the procedures included in the QA/QC plan and correct the error leading to inconsistent reporting of areas of grassland.	Addressing. Kazakhstan consistently reported the area of grassland in CRF table 4.C and table 6.25 of the NIR (p.275). However, the ERT noted that the areas reported for grassland remain inconsistent within the NIR (tables 6.6 and 6.25, p.250 and p.275, respectively). No information on the implementation of QA/QC procedures for resolving the inconsistencies was included in the NIR.
L.18	4.C.1 Grassland remaining grassland – CO_2 (L.20, 2017) (L.24, 2016) (L.24, 2015) Transparency	Consistently report grassland area in the submission and report information on the methodology applied for calculating the values contained in NIR table 6.11, as well as on information on the data used to validate them.	Not resolved. The grassland area was consistently reported for the entire time series (see ID# L.17 above). However, the Party did not provide information on the methodology applied for calculating the values of the coefficients of the management regime influencing the CSCs in biomass and soil for grassland in the country, considering their ecological condition and usage regime, which were included in table 6.28 of the NIR (this table corresponds to table 6.11 of the NIR of the 2016 annual submission), nor did it provide information on whether these data were validated.
L.19	4.C.2 Land converted to grassland – CO_2 (L.21, 2017) (L.12, 2016) (L.12, 2015) (86, 2013) (130, 2012) Completeness	Include AD in the CRF tables and estimate CSC in all pools.	Not resolved. The ERT noted that Kazakhstan did not include the AD and CSC estimates for all pools in CRF table 4.C and reported AD and CSC estimates as "NO" and "IE". However, the ERT noted that estimates of CSCs for all pools for cropland converted to grassland were reported in the NIR (table 6.22, p.271).
Waste			
W.1	5. General (waste) – CO_2, CH_4 and N_2O (W.1, 2017) (W.5, 2016) Completeness	Provide estimates for the CH_4 and N_2O emissions from composting, and CO_2, CH_4 and N_2O emissions from waste incineration and biogenic open burning, or report the appropriate notation keys in line with decision	Not resolved. The ERT noted that Kazakhstan reported the notation key "NO" for CH_4 and N_2O emissions from composting under category 5.B biological treatment of solid waste. However, the NIR did not provide any basis (or a reference) for reporting that composting did not occur in Kazakhstan. The ERT noted that the publication *Municipal Solid Waste Management in Kazakhstan: Astana and Almaty Case Studies*

ID#	Issue and/or problem classification[a, b]	Recommendation made in previous review report	ERT assessment and rationale
		24/CP.19, annex I, paragraph 37.	(Inglezakis et al., 2017) states that "the Program of Modernization of Municipal Solid Waste Management for the years 2014–2050 was issued by the Ministry of Environment and Water Resources (2014). The program is based on act 577 of 30 May 2013 entitled 'Concept of transition of Kazakhstan to a Green Economy', and act 750 of 6 August 2013, which is the action plan of the Government of Republic of Kazakhstan to implement this concept". The publication further states that "the plan is to introduce a household waste separation program for consumers, implement the principles of a manufacturer's extended liability to develop a mechanism to attract investments, and update MSW recycling and storage standards using new technologies, such as anaerobic digestion, composting and biogas". This programme is considered one of the priority areas for the implementation of the Green Economy programme in the country. Therefore, by the end of 2017, this programme had probably already been operational for more than three years and, therefore, may have produced some results regarding composting that could have been reported in the 2019 annual submission. The ERT believes that future ERTs should consider this issue further to ensure that there is not an underestimation of CH_4 and N_2O emissions from this category. In addition, for waste incineration, CRF table 5.C contained blank cells for CO_2 emissions and the notation key "NA" for CH_4 and N_2O emissions from this category (blank cells were left for all three gases under biogenic and non-biogenic MSW incinerated). The ERT noted that CO_2 emissions from clinical waste incineration were reported under category 5.E. other instead of category 5.C.1 waste incineration, which means that the use of notation key "IE" accompanied by relevant explanations would be more appropriate for the reporting of CO_2 emissions in the relevant cells (see ID# W.13 below). The ERT believes that future ERTs should consider this issue further to ensure that there is not an underestimation of CO_2 (non-biogenic), CH_4 and N_2O emissions from category 5.C.1 waste incineration.
W.2	5. General (waste) – CO_2, CH_4 and N_2O (W.2, 2017) (W.6, 2016) Convention reporting adherence	Implement a QA/QC check to ensure that data provided in the NIR are consistent with the latest data in the submitted CRF tables.	Not resolved. Kazakhstan reported in the NIR (section 7.1.4, p.296) that QA/QC procedures were implemented for category 5.A solid waste disposal, but the ERT still noted inconsistencies between the NIR and the CRF tables. For example, in the NIR (p.293), the Party stated that "In connection with this, the following values of the correction factors are adopted: Astana – 1.0 controlled-anaerobic; Almaty – 0.5 controlled semi-anaerobic; other cities of Kazakhstan – 0.8 unmanaged deep landfills". However, an MCF value of 0.6 was reported for 2017 in the original submission of CRF table 5.A for unmanaged waste disposal sites. Moreover, the NIR (p.293) indicates that "the fraction of actually decomposed degradable organic carbon (DOC_f) generated in landfills is assumed to be 0.5", which means that the value of DOC_f is 50 per cent; however, the values reported in CRF table 5.A were 13.13 per cent (anaerobic), 15.16 per cent (semi-aerobic) and 18.83 per cent (unmanaged

ID#	Issue and/or problem classification[a, b]	Recommendation made in previous review report	ERT assessment and rationale
			waste disposal sites) for 2017 (see ID#s W.20 and W.21 in table 5).
W.3	5. General (waste) – CO_2, CH_4 and N_2O (W.3, 2017) (W.7, 2016) (W.5, 2015) Transparency	Provide consistent information on the methods applied in the CRF tables and the NIR, as well as detailed information on the tiers used for the estimated categories in the sector and how they are consistent with the IPCC decision trees used for method selection.	Not resolved. The ERT noted that the overview section of the waste sector in the NIR did not provide information on the methodological tiers used by category, as required by the UNFCCC Annex I inventory reporting guidelines. In addition, no information was provided in the solid waste disposal section of the NIR. Further, Kazakhstan did not provide consistent information on the methods applied in the CRF tables and the NIR. For example, the method applied for estimating CH_4 emissions from solid waste disposal reported in CRF table summary 3 was indicated as "M" (model), with "M" and "CS" (country-specific) reported for the EF used; however, according to the information included in the NIR (p.294), the IPCC FOD method was applied, but without clarification of its corresponding tier method. In addition, the NIR did not provide information explaining which model(s) were used and which EFs were "CS" (country-specific) and which were "M" (model).
W.4	5. General (waste) – CO_2, CH_4 and N_2O (W.15, 2017) Transparency	Ensure that in the NIR the contribution of emissions from the categories within the waste sector for the latest reported year is correct and make it consistent with the information reported in the CRF tables.	Not resolved. Kazakhstan did not report in the NIR the share of emission contributions from each of the categories within the waste sector. The ERT noted that the Party reported in the NIR the emission contributions of particular sources to total waste sector emissions in kt CO_2 eq and used particular subdivisions, which do not correspond to the categories or subcategories in the CRF tables, and that this information continued to show small inconsistencies with the data reported in the CRF tables.
W.5	5.A Solid waste disposal on land – CH_4 (W.4, 2017) (W.1, 2016) (W.1, 2015) (90, 2013) Completeness	Provide a justification, based on statistical data, that confirms how industrial waste is treated and disposed, and estimate and report the emissions from industrial waste, if applicable.	Not resolved. Kazakhstan provided in the NIR limited information explaining how industrial waste is treated and disposed of. In the NIR (p.290) the only information provided indicates that 5.9 per cent of waste directed to landfills is industrial. During the review, Kazakhstan informed the ERT that data on industrial waste generated as a result of activities in the food, woodworking and fishing industries are included in the MSW data and, therefore, collecting data on industrial waste as a separate item is very difficult. During the review, the Party also indicated that CH_4 emissions from these types of waste were estimated and reflected in the annual submission in accordance with the 2006 IPCC Guidelines; however, no verifiable information was provided. The ERT believes that future ERTs should consider this issue further to ensure that there is not an underestimation of CH_4 emissions from industrial waste (see ID#s W.11 and W.12 below).
W.6	5.A Solid waste disposal on land – CH_4 (W.5, 2017) (W.2, 2016) (W.2, 2015) (91, 2013) Accuracy	Continue country-specific studies or use relevant DOC values from a country with similar economic and geographical conditions as a reference, and recalculate the emissions based on updated DOC values for 1990–2011	Addressing. During the review, Kazakhstan informed the ERT that DOC values were recalculated in the 2018 annual submission and were updated on the basis of updated data on the morphological composition of waste for every year of the time series. However, the ERT noted that the NIR did not include the necessary information and data that would ascertain the use of updated DOC values in the 2019 annual submission.

ID#	Issue and/or problem classification[a, b]	Recommendation made in previous review report	ERT assessment and rationale
		(instead of the constant value of 0.21 for DOC for the 1990–2011 time series).	Moreover, the NIR (pp.294–296) indicated that the DOC values used were based on default values of DOC content and that recalculations in the 2019 annual submission were only based on changes in per capita waste generation and MCF values.
W.7	5.A Solid waste disposal on land – CH_4 (W.6, 2017) (W.8, 2016) (W.6, 2015) Accuracy	Provide an explanation for the unusual ratio between the IEFs for the managed anaerobic sites and uncategorized disposal sites, and/or recalculate the time series, if necessary.	Resolved. Kazakhstan did not report any emissions from uncategorized disposal sites in its 2019 annual submission. During the review, Kazakhstan informed the ERT that it decided, on the basis of an expert judgment, to consider uncategorized disposal sites as unmanaged (see ID# W.17 in table 5).
W.8	5.A Solid waste disposal on land – CH_4 (W.16, 2017) Accuracy	Obtain good-quality country-specific AD in order to estimate CH_4 emissions for this category using the tier 2 IPCC FOD method.	Not resolved. The ERT noted that Kazakhstan provided very limited information on the AD used for the estimates and did not provide references to the AD sources in the NIR, thereby not allowing the ERT to assess the quality of the AD used for the emission calculations. During the review, Kazakhstan informed the ERT that it used historical data on population from various sources and per capita waste generation, as well as data on generation and disposal of municipal waste in cities available from 2005 onward. Kazakhstan also indicated that it used default parameters and available historical data, together with the IPCC FOD model, for estimating CH_4 emissions from this category, and that it considered the method used as tier 1.
W.9	5.A Solid waste disposal on land – CH_4 (W.17, 2017) Transparency	Provide in the NIR clear and comprehensive descriptions of the AD used for the calculation of annual waste generation for CH_4 emission estimates from category 5.A solid waste disposal, including values for the complete time series on the AD used for the emission estimates, such as per capita waste generation, total population and urban population, as well as collected waste volume and waste density for the years when these AD are used, as appropriate.	Not resolved. The ERT noted that in the NIR, Kazakhstan did not provide clear and comprehensive descriptions of the AD used for the calculation of annual waste generation for CH_4 emission estimates from category 5.A solid waste disposal. Additionally, in general, very limited information was provided in the NIR (section 7.1.1, pp.290–293) on the AD used in the estimates, with no information provided on the AD for the complete time series, such as per capita waste generation, total population and urban population, as well as collected waste volume and waste density for the years when these AD were used. During the review, Kazakhstan informed the ERT that this information will be included in the NIR of the 2020 annual submission.
W.10	5.A Solid waste disposal on land – CH_4 (W.18, 2017) Accuracy	Update DOC values for relevant years of the time series based on representative values of waste composition in the country reflecting changes in the waste management practices over time and ensure that CH_4 emissions from 5.A solid waste disposal are estimated in accordance with the 2006 IPCC Guidelines.	Addressing. During the review, Kazakhstan informed the ERT that DOC values are updated annually and recalculated in accordance with the composition of waste in the country and that they were presented in section 7.1 of the NIR. The Party also informed the ERT that CH_4 emissions were estimated in accordance with the 2006 IPCC Guidelines. However, the ERT noted that necessary information and data supporting these statements were not presented in the NIR (see ID#s W.6 and W.8 above).
W.11	5.A.1 Managed waste disposal sites –	Ensure that CH_4 emissions from industrial waste	Not resolved. There is no verifiable information in the NIR to indicate that CH_4 emissions from industrial

ID#	Issue and/or problem classification[a, b]	Recommendation made in previous review report	ERT assessment and rationale
	CH_4 (W.19, 2017) Completeness	containing DOC (e.g. from food, wood processing and fishing industries) disposed at SWDS are estimated and reported in future annual submissions in accordance with the 2006 IPCC Guidelines.	waste containing DOC (e.g. from the food, wood processing and fishing industries) disposed of at SWDS were estimated and reported by the Party. According to the information provided by Kazakhstan during the review, data on industrial waste generated as a result of the food, woodworking and fishing industries are part of the MSW data, and CH_4 emissions from these types of waste were estimated and reflected in the annual submission in accordance with the 2006 IPCC Guidelines (see ID# W.5 above and ID# W.12 below).
W.12	5.A.1 Managed waste disposal sites – CH_4 (W.19, 2017) Transparency	Provide in the NIR information and verifiable documentation showing the methods of treatment or disposal of industrial waste in the country, including the amount that is not treated and used, and particularly the biodegradable portion of this industrial waste.	Not resolved. There is no information and verifiable documentation in the NIR showing the methods of treatment or disposal of industrial waste, including the amount that is not treated and used, and the biodegradable portion of industrial waste. During the review, Kazakhstan indicated that industrial waste is usually classified as hazardous and that there are three ways to dispose of industrial waste: processing, incineration and burial. The Party also indicated that recycling is the most beneficial form of treating industrial waste. The Party further indicated that according to article 300, paragraph 2, of the Environmental Code of Kazakhstan, hazardous waste should be subject to neutralization, stabilization and other methods to reduce its hazardous properties. According to the Agency of Statistics of Kazakhstan, the total amount of hazardous waste in 2017 amounted to 126,874.3 kt; 190,401.2 kt was processed and reused (i.e. 150.1 per cent), and the amount of neutralized hazardous waste was 295.5 kt. In addition, Kazakhstan informed the ERT that article 302 of the Environmental Code of Kazakhstan states that landfills intended for the disposal of municipal waste are prohibited from disposing of solid and sludge-shaped industrial waste. Lastly, the Party indicated that there is no information on the biodegradable portion of industrial waste owing to the lack of categorization of industrial waste.
W.13	5.C Incineration and open burning of waste – CO_2, CH_4 and N_2O (W.10, 2017) (W.12, 2016) (W.10, 2015) Completeness	Include CO_2, CH_4 and N_2O emissions from the incineration of clinical waste under waste incineration in CRF table 5.C.	Not resolved. The ERT noted that CO_2, CH_4 and N_2O emissions from the incineration of clinical waste under waste incineration were not included in CRF table 5.C. However, the ERT noted that Kazakhstan reported CO_2 emissions from the incineration of clinical waste under category 5.E other, but did not report CH_4 and N_2O emissions. The ERT believes that future ERTs should consider this issue further to ensure that there is not an underestimation of CH_4 and N_2O emissions from this category.
W.14	5.C.1 Waste incineration – CO_2, CH_4 and N_2O (W.11, 2017) (W.14, 2016) (W.12, 2015) Convention reporting adherence	Use the appropriate notation key for waste incineration consistent with decision 24/CP.19, annex I, paragraph 37.	Not resolved. In CRF table 5.C, the Party reported the notation key "NA" for category 5.C.1 waste incineration in a number of cells or left blank cells, instead of reporting AD and emissions or notation keys, as required by decision 24/CP.19, annex I, paragraph 37 (see ID# W.1 above).
W.15	5.C.2 Open burning of waste – CO_2, CH_4 and N_2O (W.12, 2017) (W.13,	Further investigate the potential CO_2, CH_4 and N_2O emissions from open burning in unauthorized SWDS and	Not resolved. The ERT noted that no information on the further investigation of potential CO_2, CH_4 and N_2O emissions from open burning in unauthorized SWDS was presented in the NIR. The ERT also noted

ID#	Issue and/or problem classification[a, b]	Recommendation made in previous review report	ERT assessment and rationale
	2016) (W.11, 2015) Completeness	include the estimates of emissions from open burning, as needed.	that the notation keys "NO" and "NA" were reported in CRF table 5.C for CO_2, CH_4 and N_2O emissions from open burning. During the review, Kazakhstan informed the ERT that the practice of open burning of waste is prohibited by the Environmental Code of Kazakhstan. The Party also informed the ERT that requests to provide data on open burning of waste are sent each year to regional environmental departments, municipal authorities and the Agency of Statistics of Kazakhstan. Data on open burning in unauthorized SWDS have not been provided to date. The ERT further noted that, according to information provided during the review, only 15.0 per cent of SWDS are authorized for operation in the country, meaning that most disposal sites in operation in Kazakhstan are not authorized. According to the 2006 IPCC Guidelines (vol. 5, chap. 5, p.5.5), open burning of waste may occur at unmanaged sites and in rural areas, where waste collection systems do not exist. The ERT considered that CO_2, CH_4 and N_2O emissions from open burning in unauthorized SWDS may occur as a result of poor waste management practices in rural areas of the country and that these emissions were not included in the national inventory, leading to the potential underestimation of CO_2, CH_4 and N_2O emissions from category 5.C.2 open burning of waste for 2013–2017 and all other years of the time series. Therefore, the ERT included this issue in the list of potential problems and further questions raised by the ERT and recommended that Kazakhstan provide formal documentation demonstrating that all waste streams generated by urban and rural populations were included in the calculation of GHG emissions for the waste sector and that emissions from open burning did not occur in the country. If this is not possible, the ERT recommended that Kazakhstan provide emission estimates from open burning of waste for 2017 and all other years of the time series, as recommended in the 2006 IPCC Guidelines (vol. 5, chap. 5.3.2, pp.5.15–5.17), using documented assumptions on waste treatment practices in rural areas, in particular AD (i.e. on open burning of waste). The ERT also recommended that if emissions from open burning are assumed to be insignificant, Kazakhstan should provide relevant justifications and assumptions for considering the category as insignificant, in accordance with decision 24/CP.19, annex I, paragraph 37(b). In response to the list of potential problems and further questions raised by the ERT, Kazakhstan indicated that official data on open burning of waste were not available and therefore estimates of GHG emissions from open burning of waste were not provided in the CRF tables, where emissions and AD were reported as "NO" and "NA". Moreover, Kazakhstan indicated that statistical data on waste accumulation in rural areas were also not available. In addition, the Party confirmed that the Environmental Code of Kazakhstan clearly defines the environmental requirements for the treatment of municipal waste and that the prevention of unauthorized burning of municipal waste is strictly controlled by local authorities, which was supported

ID#	Issue and/or problem classification[a, b]	Recommendation made in previous review report	ERT assessment and rationale
			by two newspaper references (Ismuratova, 2019 and Pedan, 2016); however, the ERT noted from these two references that open burning of waste actually occurred in at least one region of the country. Lastly, Kazakhstan indicated that the total amount of solid waste that is possibly exposed to open burning was estimated in accordance with equation 5.7 of the 2006 IPCC Guidelines (vol. 5, chap. 5, p.5.16) using data for 1990–2017 on population in rural areas and default data, and that more detailed information on open burning of waste will be provided in the NIR of the next annual submission. However, the Party indicated that emissions from open burning of solid waste were insignificant and that the estimated total for CO_2, CH_4 and N_2O emissions was 340,428 kt CO_2 eq. The ERT noted that the information reported by Kazakhstan and used to support its conclusion that emissions from open burning of solid waste were insignificant was neither detailed nor transparent (e.g. regarding the methodological tier, EFs and parameters used) and included some incorrect data. Therefore, the ERT concluded that the explanation provided by Kazakhstan to support its conclusion that emissions from open burning of solid waste were insignificant is not sufficiently substantiated or transparent. Moreover, the ERT noted that the value of 340,428 kt CO_2 eq estimated by Kazakhstan exceeds the significance threshold of 0.05 per cent of the national total (183.09 kt CO_2 eq in 2017), or 500 kt CO_2 eq, according to decision 24/CP.19, annex I, paragraph 37(b), even if the estimated correct value was in fact 340.428 kt CO_2 eq (1,000 times lower). The ERT subsequently concluded that the problem remains unresolved and an adjustment should be applied. Therefore, in accordance with the guidance for adjustments under Article 5, paragraph 2, of the Kyoto Protocol (annex to decision 20/CMP.1, in conjunction with decision 4/CMP.11), the ERT carried out the procedure for the calculation of adjustments for this category for 2016 and 2017 only, because previous adjusted values for 2013–2015 were not recalculated in the 2019 annual submission (see chap. VI below and tables 13–14 of annex IV).
W.16	5.D.2 Industrial wastewater – CH_4 (W.20, 2017) Convention reporting adherence	Correct the identified inconsistency and report in the NIR information on domestic and industrial wastewater, according to the treatment method and in accordance with the 2006 IPCC Guidelines.	Resolved. In the NIR, Kazakhstan corrected the identified inconsistency from chapter 7.3.2.1 of the NIR of the 2017 annual submission and reported information on domestic and industrial wastewater according to the treatment method and in accordance with the 2006 IPCC Guidelines.
KP-LULUCF activities			
KL.1	General (KP-LULUCF activities) – CO_2, CH_4 and N_2O (KL.1, 2017) KP reporting adherence	Provide in the NIR information in accordance with the requirements of decision 2/CMP.8, annex II, paragraphs 2(b) and (d–e), 4(a–b) and 5(a–c) and (e) on KP-LULUCF activities and	No longer relevant. Kazakhstan did not provide in the NIR any of the information required by decision 2/CMP.8, annex II, or a chapter related to the reporting on KP-LULUCF activities. Therefore, the ERT concluded that the specific information requested in the previous review report was not provided. In addition, the ERT noted that this problem was listed as

ID#	Issue and/or problem classification[a, b]	Recommendation made in previous review report	ERT assessment and rationale
		apply, as appropriate, the methodologies provided in the 2006 IPCC Guidelines (vol. 4) and the Kyoto Protocol Supplement for the development of this information.	a question of implementation in the previous review report (FCCC/ARR/2017/KAZ, ID# KL.1). The ERT also noted that the specific information requested in the previous review report is just a part of the mandatory information required by decision 2/CMP.8, annex II, that was not provided in the 2019 annual submission. Therefore, the ERT included this issue in the list of potential problems and further questions raised by the ERT. The issue referred to the absence of all the mandatory information required by decision 2/CMP.8, annex II (see ID# KL.7 in table 5). During the review, the Party informed the ERT that the information required by decision 2/CMP.8, annex II, will be included in the next annual submission.
KL.2	General (KP-LULUCF activities) – CO_2, CH_4 and N_2O (KL.2, 2017) Completeness	Provide CSC estimates and verifiable information on litter and SOC pools for AR, deforestation and FM by using the results of research work (i.e. as described in the NIR, section 6.3.6), which was planned with the aim of using the results for preparing the 2016 annual submission and the methodologies described in the 2006 IPCC Guidelines (vol. 4) and the Kyoto Protocol Supplement, as well as provide disaggregated CSC estimates for the above-ground biomass, below-ground biomass and deadwood pools in future annual submissions.	Addressing. The ERT noted that Kazakhstan reported CSCs for all pools for AR, deforestation and FM for the entire time series, except 2017, in the CRF tables, as follows: (a) Above-ground biomass, litter, deadwood and SOC for AR were reported with numerical values; however, below-ground biomass was reported as "IE"; (b) Above-ground biomass and below-ground biomass for deforestation were reported as "NO", litter and deadwood as "IE", and SOC as "NE"; (c) Above-ground biomass for FM was reported with numerical values, but for 1995–1998 it was reported as "NO", and below-ground biomass for FM was reported as "IE" for 1990 and 2013–2016. Litter, deadwood and SOC for FM were also reported with numerical values. The ERT noted that verifiable information on litter and SOC pools for AR, deforestation and FM together with the entire chapter related to the reporting on KP-LULUCF activities, was not provided in the NIR.
KL.3	General (KP-LULUCF activities) – CO_2, CH_4 and N_2O (KL.3, 2017) KP reporting adherence	Report clear data and information distinguishing lands where AR, deforestation, FM and GM activities occurred and corresponding emissions by sources and removals by sinks resulting from these activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol.	Addressing. The ERT noted that Kazakhstan reported information on emissions and removals from AR, deforestation and FM for the entire time series, except 2017, in the CRF tables (see ID# KL.2 above). In addition, the information on CSCs for all pools for GM was provided for the entire time series, except 2017, in the CRF tables, where above-ground biomass, litter and soils were reported with numerical values, while below-ground biomass was reported as "IE" and deadwood as "NO". However, the ERT also noted that, in the NIR, Kazakhstan did not report any data or information distinguishing lands where AR, deforestation, FM and GM activities occurred and corresponding emissions by sources and removals by sinks resulting from these activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol. During the review, the Party informed the ERT that the information required was included in the NIR of the 2018 annual submission.
KL.4	General (KP-LULUCF activities), (KL.5, 2017) KP reporting adherence	Improve the reporting on KP-LULUCF activities by providing the missing information on key categories in CRF table NIR-3 in line with the UNFCCC Annex I	Not resolved. Kazakhstan did not provide information on key categories either in the NIR or in CRF table NIR-3.

ID#	Issue and/or problem classification[a, b]	Recommendation made in previous review report	ERT assessment and rationale
		inventory reporting guidelines.	
KL.5	FM – CO_2, (KL.4, 2017) KP reporting adherence	Report AD for FM activities under Article 3, paragraph 4, of the Kyoto Protocol, including both subtotals and the components that form the subtotals, for the entire time series, ensuring their completeness as well as the data consistency between the CRF tables and the NIR.	Not resolved. Kazakhstan did not report AD for FM activities under Article 3, paragraph 4, of the Kyoto Protocol in CRF table (KP-I)B.1 for 2017 in the 2019 annual submission. The ERT noted that Kazakhstan reported AD for FM for 1990 and 2013–2016 without providing subtotals and their components, which were reported as "NO", "IE" and "NE" in the CRF tables. The ERT was not able to assess the data consistency between the CRF tables and the NIR as no AD for FM were included in the NIR.

[a] References in parentheses are to the paragraph(s) and the year(s) of the previous review report(s) in which the issue and/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 2018 annual submission of Kazakhstan was not available at the time of the 2019 review. Therefore, the previous recommendations reflected in table 3 are taken from the 2017 annual review report. For the same reason, 2018 is excluded from the list of review years in which the issue could have been identified.

IV. Issues identified in three 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 included in table 4 have been identified in three or more successive reviews, including the review of the 2019 annual submission of Kazakhstan, and have not been addressed by the Party.

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

ID#	Previous recommendation for the issue identified	Number of successive reviews issue not addressed[a]
General		
G.9	Provide, in the NIR, more information on: the archiving system, including the responsibilities of different institutions for the flow of data and archiving; whether the archiving system includes information generated through external and internal reviews, documentation on annual key category analysis, key category identification and planned inventory improvements; and how this system is maintained by the Kazakh Scientific Research Institute of Ecology and Climate	6 (2011–2019)
G.11	Provide detailed information on the assessment of completeness (e.g. in an annex) in the NIR	3 (2015/2016–2019)
G.12	Complete all cells and do not leave blank cells in the CRF tables and ensure the correct use of the notation keys (including "NA") in the CRF tables in line with decision 24/CMP.19, annex I, paragraph 37	3 (2015/2016–2019)
G.13	Provide justification on the use of notation keys, particularly the notation keys "NE" and "IE", in the NIR and in CRF table 9	3 (2015/2016–2019)
G.14	Use the notation key "NO" if the activity is not occurring and "IE" if emissions are included elsewhere	4 (2013–2019)
G.17	Improve on the reporting of uncertainty by including information on the quantitative estimates of the uncertainty of data used for all source and sink categories using the	3 (2015/2016–2019)

ID#	*Previous recommendation for the issue identified*	*Number of successive reviews issue not addressed*[a]
	2006 IPCC Guidelines, and report uncertainties for the base year and the latest inventory year, as well as the methods and underlying assumptions used, and how the analysis helps in prioritizing efforts to improve the accuracy of national inventories in the future, in line with decision 24/CP.19, annex I, paragraph 42	
G.18	Provide summary information on addressing the recommendations raised in previous annual review reports in line with the UNFCCC Annex I inventory reporting guidelines both in the sector-specific sections and in chapter 10 (“Recalculations and improvements”) of the NIR	3 (2015/2016–2019)
Energy		
E.1	Use the notation key “IE” instead of “NO” or “NA” in cases in which emissions are included elsewhere, and include appropriate explanations in CRF table 9 and the NIR	4 (2013–2019)
E.2	Report in the NIR all information regarding the reasons for recalculations and the methodologies used for the recalculated categories	5 (2012–2019)
E.3	Explain the underlying assumptions and the degree of expert judgment used in the applied interpolation methodology to fill in the time series for AD of national statistics and report it in the NIR	6 (2011–2019)
E.4	Ensure the consistency of the entire time series and provide comparisons of AD obtained from different sources	5 (2012–2019)
E.7	Cross-check the AD and provide explanations for the differences in inter-annual changes between the reference and sectoral approaches	6 (2011–2019)
E.8	Carry out the planned improvement to separate coking coal consumption from the total other bituminous coal consumption	4 (2013–2019)
E.9	Reconsider the accuracy of the data concerning the combusted fuels and the fuels used as feedstocks in order to further reduce the level of difference between the sectoral and reference approaches across the time series and include additional information in the NIR explaining the observed differences in the CO_2 emission estimates from the two approaches	3 (2015/2016–2019)
E.10	Improve the accuracy and consistency of the reporting of energy consumption in the reference approach, particularly paying attention to the correct completion of cells for “Apparent consumption (excluding NEU, reductants and feedstocks)” and ensure that the differences between the approaches are reasonable	3 (2015/2016–2019)
E.12	Improve the QA/QC procedures relevant to the estimation of the use of the feedstocks, reductants and NEU of fuels and ensure consistent reporting across CRF table 1.A(b) and table 1.A(d)	3 (2016–2019)
E.13	Ensure consistency between CRF table 1.D (fuel consumption of the international aviation/international bunkers) and CRF table 1.A(b) (reference approach – fuel consumption of the international bunkers)	3 (2016–2019)
E.15	Obtain relevant navigation statistics and use the appropriate EFs for reporting emissions	6 (2011–2019)
E.16	Investigate the possibility of calculating country-specific CO_2 EFs for lignite and sub-bituminous coal as weighted	5 (2012–2019)

ID#	*Previous recommendation for the issue identified*	*Number of successive reviews issue not addressed*[a]
	average values based on information on specific coal production and CO_2 EFs for each mining field, as the majority of coal used in Kazakhstan is from domestic production	
E.17	Include detailed data on energy consumption by fuel for all subcategories in the energy sector	4 (2013–2019)
E.18	Investigate the allocation of AD and emissions from the energy sector to the industrial processes sector and correct any misallocations	6 (2011–2019)
E.22	Include emissions of CH_4 and N_2O from the subcategory 1.A.2.d pulp, paper and print or provide justification to support that these emissions are insignificant and use a notation key in accordance with decision 24/CP.19, annex I, paragraph 37	3 (2015/2016–2019)
E.26	Reallocate AD and emissions from transportation in agriculture/forestry/fishing to the subcategory agriculture/forestry/fishing and emissions from industrial and construction off-road transport to the category manufacturing industries and construction	4 (2013–2019)
E.27	Improve the accuracy of the N_2O emission estimates for gasoline consumption, taking into account the pollution control technologies introduced over time in the vehicle fleet	5 (2012–2019)
E.28	Verify the road transportation related AD for diesel oil consumption with a view to being able to report the emissions for the entire time series, investigate the technology used and the background information on road transportation activities within the country, and justify the EF used or use the default EF suggested by the 2006 IPCC Guidelines	3 (2016–2019)
E.29	Provide in the NIR explanatory information on the trend of the N_2O IEF for diesel oil between 1990 and 2014	3 (2016–2019)
E.30	Verify the road transportation related AD for gasoline consumption, the technology used and the background information about road transportation and justify the relatively high, and increasing, CH_4 IEF	3 (2015/2016–2019)
E.35	Include the background information about the measurements made and time series of the CH_4 concentration in the NIR (underground mines)	5 (2012–2019)
E.36	Include all relevant information about the calculation of the country-specific CH_4 EF for coal mining and handling (surface mines) in the NIR and ensure the consistency of the time series	5 (2012–2019)
E.37	Report the recovery/flaring of CH_4 from underground mines in CRF table 1.B.1 or use the relevant notation key in accordance with decision 24/CP.19, annex I, paragraph 37	3 (2015/2016–2019)
E.38	Investigate and transparently document the use of the country-specific CH_4 EF for the post-mining activities of the underground mines	3 (2015/2016–2019)
E.39	Assess and verify the data provided by the coal mining companies and verify if the conversion between the volume and mass units is properly done, and justify the country-specific CH_4 EF of the surface mining activities in the NIR and the changes in the IEF for the period 1990–2014	3 (2015/2016–2019)

ID#	*Previous recommendation for the issue identified*	*Number of successive reviews issue not addressed*[a]
E.40	Transparently document in each NIR the methodology and the background information used for the estimation of the CO_2 EF from surface mining activities	3 (2015/2016–2019)
E.43	Ensure the correct use of notation keys and report the information in the documentation boxes in the CRF tables	4 (2013–2019)
E.44	Ensure that the description and units regarding the AD for the calculation of fugitive CO_2 and CH_4 emissions are provided in a consistent and complete manner in CRF table 1.B.2	3 (2015/2016–2019)
E.45	Estimate and include emissions from oil exploration or, if data for the estimation of the emissions from this subcategory are not available, use the notation key "NE" with the relevant explanation in the CRF tables and in the NIR	3 (2015/2016–2019)
E.47	Improve the QA/QC procedures to verify the CH_4 EF for oil production and ensure the time-series consistency for the IEF for the whole time series	3 (2016–2019)
E.49	Ensure consistency in the estimation of the CH_4 emissions from transport (1.B.2.a.3), fill the gaps for the period 1990–1996, verify the CH_4 IEF for the year 2014, and ensure consistency in the IEF for the entire time series	3 (2016–2019)
E.51	Verify the CO_2 and CH_4 IEF for the production of natural gas for the years 2013 and 2014, ensure time-series consistency of the EFs, and describe the emission trends in the NIR	3 (2015/2016–2019)
E.52	Provide a complete estimate of the fugitive CH_4 and CO_2 emissions from the processing of natural gas in the country	3 (2015/2016–2019)
E.53	Verify the CH_4 emission estimates for 2014 for the transmission and storage of natural gas, provide a consistent time series for the period 1990–2014, estimate the CO_2 emissions for the same subcategory for the period 1990–2013 and provide a consistent time series for the CO_2 emissions	3 (2016–2019)
E.54	Verify the CH_4 emission estimate for 2014 for the distribution of natural gas, ensure time-series consistency for the period 1990–2014, estimate the CO_2 emissions for the same subcategory for the period 1990–2013 and provide a consistent time series for the CO_2 emissions	3 (2016–2019)
E.55	Review and estimate the CO_2 and CH_4 emissions from the relevant venting and flaring of the liquid and gaseous fuels for the years 2013 and 2014, and provide a complete and consistent estimate of the emissions from this subcategory	3 (2016–2019)
E.56	Estimate CO_2 emissions for this category or ensure the correct use of notation keys in CRF table 1.C, and include a category-specific discussion in the NIR for this activity, in accordance with paragraph 50 of the UNFCCC Annex I inventory reporting guidelines	3 (2016–2019)
IPPU		
I.1	Strengthen the QA/QC processes to ensure correct use of notation keys and consistency of the information provided in the inventory submission. Explain in CRF table 9(a) in which category the emissions reported as "IE" are included	5 (2012–2019)
I.2	Strengthen the QA/QC procedures and update all comments in the CRF tables, and make the reporting consistent	3 (2015/2016–2019)

ID#	*Previous recommendation for the issue identified*	*Number of successive reviews issue not addressed*[a]
	between the NIR and the CRF tables of the same submission	
I.3	Include the relevant AD descriptions in CRF table 2(I).A-H in order to improve the comparability and transparency of reported data	3 (2015/2016–2019)
I.4	Apply the structure and names of the inventory categories in the NIR following the UNFCCC Annex I inventory reporting guidelines, as per decision 24/CP.19	3 (2015/2016–2019)
I.7	Provide the same detailed information about lime content in clinker and the CKD correction factor for all the years in the time series as has been provided in the NIR for 2011	4 (2013–2019)
I.8	Strengthen the QA/QC procedures and correct the value for CKD used to estimate the 2011 emissions, and provide in the NIR the same detailed information as for 2014 for all the years in the time series, in order to explain the large variations in the IEFs across the time series	3 (2015/2016–2019)
I.22	Move to a tier 2 method to calculate CO_2 emissions from ammonia production, based on the amount of natural gas used, and ensure consistent reporting of the category across the time series	3 (2015/2016–2019)
I.25	Explore the use and potential imports or exports of calcium carbide and revise the EF, if necessary	4 (2013–2019)
I.27	Include in the NIR a justification for the decreasing trend of the CO_2 IEF since 2012	3 (2015/2016–2019)
I.28	Investigate the ratio of sinter + pellets to steel + pig iron and describe the reasons for the observed ratio in the NIR, including the possibility of exports of sinter and/or pellets, which could explain the ratio; and review the AD for the whole time series, if found necessary	3 (2015/2016–2019)
I.36	Further improve transparency by providing the AD disaggregated by type of ferroalloy for the entire time series	4 (2013–2019)
I.38	Improve the reporting of information on aluminium technology and parameters provided in the NIR and strengthen the QA/QC procedures in preparing the report with a view to eliminating internal inconsistencies in the NIR	3 (2015/2016–2019)
I.41	Demonstrate in the NIR that complete AD for zinc production are reported in the CRF tables, providing an explanation for any differences between the data in the CRF tables and the data on the website of the only zinc-producing company in the country using CO_2-emitting technology. If an error is identified in the AD reported in the CRF tables, recalculate the AD and update the whole time series for this category, as appropriate	3 (2015/2016–2019)
I.42	Provide estimates for the emissions from the category or evidence to show the insignificance of this category, in accordance with decision 24/CP.19, annex I, paragraph 37(b); and include clear information of the category included under other in CRF table 2(I).A-H	3 (2015/2016–2019)
I.43	Provide a transparent explanation in the NIR to justify the choice of the notation key “NO” for years prior to 2007, or collect AD and estimate emissions of HFC-32, HFC-125 and HFC-143a from refrigeration and air-conditioning equipment for the entire time series	4 (2013–2019)

ID#	*Previous recommendation for the issue identified*	*Number of successive reviews issue not addressed*[a]
I.44	Provide transparent information on methods, AD and EFs for this category, provide information on how time-series consistency is ensured for the category and provide clear information on the recalculations made across the entire time series, as well as correct the reporting of the emissions in the CRF tables by providing data per subcategory, and clearly distinguish emissions from manufacturing, from stocks and from disposal	3 (2015/2016–2019)
Agriculture	No issues identified	
LULUCF		
L.1	Improve completeness by including estimates for all mandatory categories, together with the relevant documentation supporting the estimates: (c) Net CO_2 emissions from wetlands converted to forest land – organic soils; (f) Net CO_2 emissions from forest land converted to grassland – dead organic matter and mineral soils; (h) N_2O emissions from disturbance associated with land-use conversion to cropland, grassland converted to cropland – mineral soils	6 (2011–2019)
L.2	Report areas of conversion from forest land to other land-use categories in land-use change matrices and provide estimations of GHG net emissions from deforestation in appropriate subcategories	4 (2013–2019)
L.3	Implement the QA/QC plan for the sector	6 (2011–2019)
L.4	Improve the completeness of the reporting for the sector by providing estimates for all mandatory categories and pools (as listed in ID# L.1 (FCCC/ARR/2017/KAZ) and for the relevant land conversions, currently reported as "NO")	3 (2015/2016–2019)
L.5	Improve the methodological information for the estimated categories by including: (c) A description of the methodology applied, which includes: assumptions (and for each assumption its logical basis and evidence of its reliability with regard to the condition to which it is applied) and the equations applied (noting that when an IPCC method is used, information on assumptions is not needed and equations may simply be quoted); (d) A description of the AD and their quality, including information on data collection (methodology and timing), data compilation (methodology) and uncertainties	3 (2015/2016–2019)
L.6	Include in the NIR a description of any QA/QC checks undertaken, and the results of such checks	3 (2015/2016–2019)
L.8	Make efforts to convert existing statistics into the IPCC land-use categories, taking into consideration, among other issues, that: (a) Even if land use results in no emissions, it is good practice to report its area and use appropriate notation keys for net emissions and IEFs; (c) The definitions of land-use categories in the IPCC good practice guidance for LULUCF are rather flexible, and this should facilitate the use of available statistics, with the help	5 (2012–2019)

ID#	*Previous recommendation for the issue identified*	*Number of successive reviews issue not addressed*[a]
	of proxy data, expert judgment and justified assumptions, which should be documented in the NIR; (d) Lands that do not change land use should be reported separately from lands with land-use conversion; (e) May report aggregated estimates for all land conversions to a particular land use, when data are not available to report them separately. This should be clearly stated in the documentation boxes and documented in the NIR; (f) The category other land remaining other land is intended to allow the total reported land area to match the total area of the country	
L.9	Include information on: (a) Ancillary data used for land classification, comprising: timing and methodology of data collection and any further elaboration before their use for land classification; (b) The methodology applied for classifying land under land categories; (c) Explanations on how consistency is maintained when different sources of data and/or different methodologies are used for preparing the land representation	3 (2015/2016–2019)
L.10	Revise the methodology according to good practice provided in the 2006 IPCC Guidelines (vol. 4, chap. 3) in order to build a consistent land representation, and develop and implement QA/QC procedures in order to check the consistency of conversions between land uses, to ensure that total land area is constant over time and to ensure that the GHG inventory estimates are not affected by technical mistakes	3 (2015/2016–2019)
L.11	Verify reported values of deadwood and biomass carbon stock of the forest subcategories hardwood and other trees and revise them, as needed, as well as include the relevant explanations on the national circumstances in the NIR	3 (2015/2016–2019)
L.12	Report CSC separately for all the pools; report both biomass gains and biomass losses separately	6 (2011–2019)
L.13	Exclude abandoned lands from cropland and report this category under cropland converted to grassland or cropland converted to other land	5 (2012–2019)
L.14	Apply the necessary procedures for the verification of emissions from soils, including any procedures in accordance with the QA/QC plan, and include these emissions in the CRF tables	5 (2012–2019)
L.15	Estimate carbon stock losses from biomass in cropland and report all information on the method and background data used for calculating the rates used for estimating the CSC	3 (2015/2016–2019)
L.16	Check the reliability of the AD for the degree of grassland degradation for the entire time series	5 (2012–2019)
L.17	Implement the procedures included in the QA/QC plan and correct the error leading to inconsistent reporting of areas of grassland	6 (2011–2019)
L.18	Consistently report grassland area in the submission and report information on the methodology applied for calculating the values contained in NIR table 6.11, as well as on information on the data used to validate them	3 (2015/2016–2019)
L.19	Include AD in the CRF tables and estimate CSC in all pools	5 (2012–2019)

ID#	*Previous recommendation for the issue identified*	*Number of successive reviews issue not addressed*[a]
Waste		
W.1	Provide estimates for the CH_4 and N_2O emissions from composting, and CO_2, CH_4 and N_2O emissions from waste incineration and biogenic open burning, or report the appropriate notation keys in line with decision 24/CP.19, annex I, paragraph 37	3 (2016–2019)
W.2	Implement a QA/QC check to ensure that data provided in the NIR are consistent with the latest data in the submitted CRF tables	3 (2016–2019)
W.3	Provide consistent information on the methods applied in the CRF tables and the NIR, as well as detailed information on the tiers used for the estimated categories in the sector and how they are consistent with the IPCC decision trees used for method selection	3 (2015/2016–2019)
W.5	Provide a justification, based on statistical data, that confirms how industrial waste is treated and disposed, and estimate and report the emissions from industrial waste, if applicable	4 (2013–2019)
W.6	Continue country-specific studies or use relevant DOC values from a country with similar economic and geographical conditions as a reference, and recalculate the emissions based on updated DOC values for 1990–2011 (instead of the constant value of 0.21 for DOC for the 1990–2011 time series)	4 (2013–2019)
W.13	Include CO_2, CH_4 and N_2O emissions from the incineration of clinical waste under waste incineration in CRF table 5.C	3 (2015/2016–2019)
W.14	Use the appropriate notation key for waste incineration consistent with decision 24/CP.19, annex I, paragraph 37	3 (2015/2016–2019)
W.15	Further investigate the potential CO_2, CH_4 and N_2O emissions from open burning in unauthorized SWDS and include the estimates of emissions from open burning, as needed	3 (2015/2016–2019)
KP-LULUCF activities	No issues identified	

[a] The reports on the reviews of the 2014 and 2018 annual submissions of Kazakhstan have not yet been published. Therefore, 2014 and 2018 were not included when counting the number of successive years in table 4. As the reviews of the Party's 2015 and 2016 annual submissions were conducted together, they are not considered successive and 2015/2016 is considered as one year.

V. Additional findings made during the individual review of the 2019 annual submission

10. Table 5 contains findings made by the ERT during the individual review of the 2019 annual submission of Kazakhstan that are additional to those identified in table 3.

Table 5
Additional findings made during the individual review of the 2019 annual submission of Kazakhstan

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*	*Is finding an issue and/or a problem?*[a]
General			
G.19	National system	The ERT noted that the NIR does not include information on changes to the national system, even though several recommendations regarding the national system were included in the previous review report (FCCC/ARR/2017/KAZ, ID#s G.4, E.38, I.1, L.10 and W.2 in table 3 and ID#s G.12, G.14, G.15, G.16, G.17 and G.19 in table 5). In section 1.2.4 of the NIR (p.24), Kazakhstan stated that there were no changes to the national system in 2017. The ERT also noted that, according to decision 15/CMP.1, annex, paragraph 21, in conjunction with decision 3/CMP.11, each Party included in Annex I shall include in its NIR information on any changes that have occurred in its national system compared with the information reported in its last submission in accordance with decision 15/CMP.1, annex, paragraphs 30–31. During the review, Kazakhstan informed the ERT that there were no significant changes to the national system in 2017. Firstly, Order No. 214 of the Minister of Energy of Kazakhstan dated 18 March 2015 on the "Rules of control of completeness, transparency and reliability of the state inventory of emissions and removals of greenhouse gases", which determines the mechanism of preparation of the annual national GHG inventory, has not been amended. Secondly, on 17 June 2019 changes were made to the structure of the State Government, and environmental issues, including climate change, were included within the remit of the newly established Ministry of Ecology, Geology and Natural Resources, which is planning to amend the existing legislation on the national system. Kazakhstan also indicated that significant changes are planned for 2020, as transferring the functions of maintaining the national system and the GHG inventory to the newly formed Ministry of Ecology, Geology and Natural Resources will allow improvements to be made to the national system as a whole. The ERT recommends that Kazakhstan include detailed information on changes to its national system in the NIR of the next annual submission in accordance with decision 15/CMP.1, annex, paragraphs 21, 30 and 31, in conjunction with decision 3/CMP.11.	Yes. KP reporting adherence
G.20	National system	(a) The ERT noted that Kazakhstan provided feedback on the list of provisional main findings sent to the Party at the end of the review week. In its feedback, Kazakhstan described the obstacles that it needs to overcome to implement some of the recommendations made by the ERT across all GHG inventory sectors and stated that most of the recommendations will be implemented in the 2020 annual submission. The ERT noted that the implementation of the recommendations in the 2020 annual submission will be reviewed by a subsequent ERT. The ERT welcomes the feedback from the Party, notes Kazakhstan's plans to address the recommendations and encourages the Party to implement all the recommendations, as indicated in its comments on the list of provisional main findings.	Not an issue/problem
G.21	CPR	The ERT noted that Kazakhstan did not include in the NIR the calculation of its CPR based on 90 per cent of the Party's assigned amount or 100 per cent of eight times the most recently reviewed inventory. According to decision 15/CMP.1, annex, paragraph 18, in conjunction with decision 3/CMP.11, for the purpose of the second commitment period, each Party included in Annex I shall report the calculation of its CPR in accordance with decisions 18/CP.7 and 11/CMP.1, and paragraph 18 of decision 1/CMP.8. The ERT also noted that in response	Yes. KP reporting adherence

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue and/or a problem?[a]
		to the list of potential problems and further questions raised by the ERT, Kazakhstan indicated that the CPR will be recalculated and reported in the next annual submission. The ERT further noted that it had proceeded with the calculation of adjustments for some categories and subcategories where it had disagreed with the response provided by Kazakhstan to the potential problems and further questions raised by the ERT in relation to those categories and subcategories (see chap. VI below and annex IV). Taking into account the adjusted 2017 estimates of the national total and the assigned amount of the Party, the ERT calculated the CPR and determined it to be 2,539,658,574 t CO_2 eq. The ERT recommends that Kazakhstan report the calculation of its CPR based on 90 per cent of the Party's assigned amount or 100 per cent of eight times the most recently reviewed inventory, whichever is lowest, in accordance with decisions 18/CP.7 and 11/CMP.1 and paragraph 18 of decision 1/CMP.8 in the next annual submission.	
G.22	Inventory management	(b) The ERT noted that, during the review, Kazakhstan's responses to the requests made by the ERT for clarifying inventory information were not provided in a timely manner. Specifically, by the end of the review week, 15 questions with requests for clarifying inventory information regarding general aspects and the energy, IPPU and waste sectors remained unanswered. These questions remained unanswered in subsequent stages of the review process. The ERT further noted that, according to decision 19/CMP.1, annex, paragraph 16(c), in conjunction with decisions 3/CMP.11 and 4/CMP.11, as part of its inventory management, each Party included in Annex I shall "respond to requests for clarifying inventory information resulting from the different stages of the review process of the inventory information, and information on the national system, in a timely manner in accordance with Article 8". The ERT concluded that the above-mentioned specific inventory management function of the national system is not fully implemented and needs to be fully functional in accordance with decision 19/CMP.1, annex, paragraph 16(c), in conjunction with decisions 3/CMP.11 and 4/CMP.11. The ERT included this issue in the list of potential problems and further questions raised by the ERT and recommended that Kazakhstan provide a communication plan to ensure that (1) requests made by the ERT for clarifying inventory information are actioned and communicated in a timely manner; (2) an approval mechanism for the responses (where required) is clearly described, including associated roles and responsibilities; and (3) the timeline for responses is agreed between the approving agencies and organizations involved. (c) In response to the list of potential problems and further questions raised by the ERT, Kazakhstan indicated that a communication plan will be developed and will include ways of clarifying all inventory information, as well as an approval mechanism for the responses to the ERT with a clear description of the roles and responsibilities. In addition, the plan will provide information on agreed timelines for responses between approving agencies and organizations involved. The ERT considered the Party's response and found that Kazakhstan has not satisfactorily resolved the problem, as the response did not contain the requested communication plan and any description of the specific actions and steps (including time frames, deliverables and responsibilities) that would lead to implementing the plan and making fully functional the related inventory management function in accordance with decision 19/CMP.1, annex, paragraph 16(c), in conjunction with decisions 3/CMP.11 and 4/CMP.11. Therefore, the ERT has identified this problem, which pertains to language of a mandatory nature and influences the fulfilment of commitments, as a question of implementation in accordance with decision 22/CMP.1 in conjunction with decision 4/CMP.11 (see chap. VIII below).	Yes. KP reporting adherence

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*	*Is finding an issue and/or a problem?*[a]
		The ERT recommends that Kazakhstan make fully functional the inventory management function described in decision 19/CMP.1, annex, paragraph 16(c), in conjunction with decisions 3/CMP.11 and 4/CMP.11, and provide information and a detailed description of a communication plan (or a reference thereto), including specific actions and steps (time frames, deliverables and responsibilities), which ensures that (1) requests made by the ERT for clarifying inventory information are actioned and communicated in a timely manner; (2) an approval mechanism for the responses (where required) is clearly described, including the associated roles and responsibilities; and (3) the timeline for responses is agreed between the approving agencies and organizations involved. The ERT also recommends that Kazakhstan provide an update on its progress with regard to the implementation of the communication plan in the NIR of the next annual submission.	
Energy			
E.57	1. General (energy sector) – all fuels – CO_2, CH_4 and N_2O	The ERT noted that Kazakhstan did not use the notation keys in the CRF tables consistently in accordance with the definitions provided in paragraph 37 of the UNFCCC Annex I inventory reporting guidelines. For example, the notation key "NA" was frequently used to report AD or emissions that do not occur in the country (e.g. for category 1.C CO_2 transport and storage) or AD or emissions that do occur, but are not estimated (e.g. AD and CO_2 and CH_4 emissions from venting under subcategory 1.B.2.c venting and flaring). During the review, Kazakhstan clarified the actual occurrence or situation of activities and emissions related to some of the categories reported using notation keys (e.g. for category 1.C CO_2 transport and storage activities, emissions do not occur in the country, and for venting under subcategory 1.B.2.c venting and flaring, no reliable AD were collected). The ERT recommends that Kazakhstan use the notation keys in its next annual submissions in strict accordance with the definitions provided in paragraph 37 of the UNFCCC Annex I inventory reporting guidelines.	Yes. Comparability
E.58	1. General (energy sector) – all fuels – CO_2, CH_4 and N_2O	The ERT noted that in many instances, Kazakhstan inconsistently reported AD and the associated units in the NIR and CRF tables. For example, the ERT noted that for 2017, crude oil production was reported as 72,900.00 t in CRF table 1.B.2, while in CRF table 1.A(b) the same crude oil production was reported as 86,194,400.00 t, and in the NIR (table 3.27, p.129) the reported value was 72.90 Mt. Similarly, the ERT identified discrepancies for crude oil production between CRF tables 1.B.2 and 1.A(b) and the NIR for some years of the time series (e.g. 2013, 2014, 2015 and 2016). The ERT also noted significant differences between the volume and corresponding units of natural gas production reported in CRF tables 1.B.2 and 1.A(b) and in the NIR. In CRF table 1.B.2 (in the original 2019 annual submission), natural gas production for 2017 was reported as $12{,}623.00 \times 10^9$ m^3, while this production was reported as $42{,}675.00 \times 10^6$ m^3 in CRF table 1.A(b), and as $12{,}623.00 \times 10^6$ m^3 in the NIR (table 3.29, p.132). In addition, the ERT noted that the total quantity of coal produced in Kazakhstan in 2017 was 107.891 Mt according to CRF table 1.A(b), but the total coal mined for the same year was reported in CRF table 1.B.1 as 101.7 Mt. During the review, Kazakhstan indicated that the correct value for the production of crude oil was reported in CRF table 1.A(b), which is 86,194,400.00 t. Regarding natural gas production, Kazakhstan indicated that the units should be in billions of m^3, but the Party did not specify whether the correct quantity was reported in CRF table 1.B.2 or CRF table 1.A(b). For coal production, Kazakhstan indicated that the reported value of 101.7 Mt was incorrect and has already been corrected (see ID#s E.67, E.69 and E.72 below). The ERT recommends that Kazakhstan include in the NIR and CRF tables (e.g. CRF tables 1.A(b), 1.B.1 and 1.B.2) of its next annual submissions correct and consistent values of AD and associated units, including the	Yes. Convention reporting adherence

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*	*Is finding an issue and/or a problem?*[a]
		description of the AD, in particular for crude oil production, natural gas production and coal production, and ensure that the necessary QC activities are implemented for this purpose.	
E.59	Fuel combustion – reference approach – liquid fuels – CO_2, CH_4 and N_2O	The ERT noted that Kazakhstan reported AD for jet kerosene under aviation bunkers and AD for gas/diesel oil under marine bunkers in CRF table 1.D. Nevertheless, the notation key "NO" was used for reporting these AD in CRF table 1.A(b) for both international bunkers of these two fuels. The ERT noted that this inconsistency and incorrect data could contribute to the large differences reported by Kazakhstan between the reference and sectoral approaches for liquid fuels. During the review, Kazakhstan explained that in its next annual submission it will change the use of notation key "NO" in CRF table 1.A(b). The ERT recommends that Kazakhstan report in CRF table 1.A(b) of its future annual submissions correct AD for international bunkers that is consistent with the data reported for the international aviation and international navigation categories in CRF table1.D.	Yes. Convention reporting adherence
E.60	Fuel combustion – reference approach – liquid fuels – CO_2	The ERT noted that in the IEA energy balance for Kazakhstan, production of NGLs is reported separately from crude oil from 2001 onward and that the IEA figures for crude oil production (in physical units) match those reported in CRF table 1.A(b), even where production of NGLs was reported separately by the IEA. For 2017, CRF table 1.A(b) and the IEA figures report the production of crude oil as 86,194.40 kt; however, production of NGLs for the same year was reported as 1,327 kt by the IEA energy balance, but reported as "IE" in CRF table 1.A(b), with an explanation indicating that the production values were included under crude oil. During the review, the Party did not clarify why NGLs were not reported separately from crude oil in CRF table 1.A(b) or whether production of NGLs was in fact missing from the reporting of the reference approach. The ERT recommends that Kazakhstan use authoritative available data, either national or international (e.g. the IEA energy balance for Kazakhstan), report production of NGLs and other AD separately from crude oil in CRF table 1.A(b) for the years when data are available, extrapolate production of NGLs and other AD for the rest of the time series and report corresponding CO_2 emissions from the use of NGLs and the corresponding NEU of this fuel.	Yes. Comparability
E.61	International bunkers and multilateral operations – liquid fuels – CO_2, CH_4 and N_2O	The ERT noted that Kazakhstan, in its 2017 annual submission, reported residual fuel oil consumption under international navigation, but in the 2018 and 2019 annual submissions, residual fuel oil was reported as "NO". Kazakhstan did not explain in the NIR of the 2018 or 2019 annual submission the reasons for the recalculation of residual fuel oil consumption under international navigation, which had resulted in the use of the notation key "NO". During the review, the Party informed the ERT that all fuels used in international bunkers were considered in the 2019 annual submissions and that possible corrections will be performed for the next annual submission. The ERT recommends that Kazakhstan provide GHG emission estimates for the use of residual fuel oil under international navigation, or include in the NIR of its next annual submission an appropriate explanation for changing the previous reporting of residual fuel oil consumption under international navigation to "NO".	Yes. Transparency
E.62	1.A Fuel combustion – sectoral approach	The ERT noted that, as reported in the NIR of the 2018 annual submission (sections 3.4.6 and 3.5.1.5, p.66 and p.78, respectively), the Party recalculated the CO_2, CH_4 and N_2O emission estimates for coking coal for 2014 and 2015 using the default NCV (28.2 TJ/kt) and default EFs for all gases. The ERT also noted that in the NIR of the 2018 annual submission (p.78), the Party indicated that the consumption of coking coal had been recalculated for	Yes. Accuracy

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	– solid fuels – CO_2, CH_4 and N_2O	2014 and 2015 on the basis of adjusted data received from the Agency of Statistics of Kazakhstan and explained in section 3.4.2.5 of the NIR of the 2019 annual submission that coking coal in Kazakhstan is mainly used for producing coke oven coke for the iron and steel industry, which is excluded from the energy sector (note 3 to NIR table 3.14, p.74). Nevertheless, the ERT noted that in CRF table 1.A(d), the NEU of coking coal was reported for ferroalloys production only. The ERT further noted that for 1990–2013, Kazakhstan continued to report the consumption of coking coal under sub-bituminous coal and lignite in CRF table 1.A(b) and that for 2017, the apparent consumption of coking coal was reported as 291.08 PJ. According to CRF table 1.A(d), only 2.90 PJ of coking coal was used for NEU in ferroalloys production. The ERT also noted that the NIR contained data on coking coal use in different categories for the calculations under the sectoral approach. For 2017, total coking coal use in the sectoral approach amounted to 165.65 PJ. However, it was not clear from the information provided in the CRF tables or the NIR whether the difference in 2017 between the apparent consumption of coking coal reported in the reference approach, excluding NEU, and the total coking coal use reported in the sectoral approach, which amounted to 122.53 PJ (42.5 per cent of apparent consumption, excluding NEU), represents coking coal that was consumed for NEU or combusted, or whether the associated emissions were reported in the inventory. During the review, Kazakhstan did not provide additional information to clarify this issue. The same problem was detected for 2014, 2015 and 2016, while for 1990–2013, as consumption of coking coal was reported under other bituminous coal and lignite, it was not possible to assess the magnitude of this issue for those years. The ERT concluded that not all coking coal was accounted for in combustion activities under the sectoral approach emission estimates or reported as NEU in the IPPU sector of the inventory and that, therefore, this issue may lead to a potential underestimation of CO_2, CH_4 and N_2O emissions from coking coal use under category 1.A fuel combustion for 2017 and all other years of the time series. The ERT included this issue in the list of potential problems and further questions raised by the ERT and recommended that Kazakhstan: (1) provide verifiable information (i.e. AD and background information) on the total energy consumption of coking coal in the country included under the sectoral approach for the entire time series, focusing on the years under the second commitment period of the Kyoto Protocol; (2) provide data on coking coal consumption for NEU as a raw material in the national iron and steel industry or for other NEUs in the IPPU sector; (3) demonstrate that the total coking coal consumption reported as apparent consumption in CRF table 1.A(b) was accounted for in the GHG inventory (e.g. in the energy and IPPU sectors); and (4) provide, for consistency, the information requested in points (1–3) for all years of the second commitment period (2013–2017). If this is not possible, the ERT recommended that Kazakhstan use the default methodology provided in the 2006 IPCC Guidelines to calculate additional emissions of CO_2, CH_4 and N_2O from category 1.A fuel combustion using 122.53 PJ as AD for coking coal for 2017 and include the resulting CO_2, CH_4 and N_2O emission estimates for combustion of coking coal under subcategory 1.A.5.a stationary for 2017. Following the principle of consistency, the ERT also recommended that Kazakhstan estimate emissions of CO_2, CH_4 and N_2O from category 1.A fuel combustion using a similar approach for the AD of coking coal for all other years of the second commitment period (2013–2016) and report these emissions under subcategory 1.A.5.a stationary. In response to the list of potential problems and further questions raised by the ERT, Kazakhstan resubmitted a complete set of CRF tables for 1990–2017 with revised CO_2, CH_4 and N_2O emission estimates for coking coal consumption and allocated these estimates under subcategory 1.A.5.a stationary for 2014–2017 following the recommendation of the ERT. The Party did not provide revised estimates for 2013 and for the rest of the time	

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		series as data were not available. In its response, Kazakhstan indicated that it took into account data on the "energy consumption of coke oven gas in the production of coke from coking coal" (19.91 PJ for 2017) taken from the national energy balance and deducted this amount of energy consumption from the resulting difference between the estimates of coking coal consumption in the reference approach, excluding NEU, and the estimates of coking coal consumption in the sectoral approach, and used this value as AD for the emission estimates (102.62 PJ in 2017). Kazakhstan also indicated that it used the "energy consumption of coke oven gas" in order to estimate the resulting CO_2 and CH_4 fugitive emissions from the processing of coking coal into coke and reported them under subcategory 1.B.1.c other, instead of under subcategory 1.B.1.b solid fuel transformation. However, no information was provided on the method and EFs used for these estimates. The ERT noted that, according to the 2006 IPCC Guidelines, GHG emissions from fuel combustion for the production of coke, including combustion of by-products such as coke oven gas in the process of coking coal transformation (tier 1), should be reported in the energy sector under subcategory 1.A.1.c manufacture of solid fuels and other energy industries (2006 IPCC Guidelines, vol. 3, chap. 4, figure 4.2, p.4.13 and vol. 3, chap. 4, p.4.17). Also, according to the 2006 IPCC Guidelines, there are no methods for estimating fugitive emissions from coke oven gas flaring or venting, which, if calculated, may be reported in subcategory 1.B.1.b solid fuel transformation. Therefore, the ERT concluded that the approach followed by Kazakhstan of deducting the energy consumption of coke oven gas in the production of coke is not in accordance with the 2006 IPCC Guidelines, as the resulting emissions should be reported in the sectoral approach in subcategory 1.A.1.c manufacture of solid fuels and other energy industries. In addition, in its response, Kazakhstan provided data on large quantities of coking coal used by JSC ArcelorMittal to produce coke for 2014–2017. For example, for 2017, a quantity of 9,306.361 kt of coking coal (correcting an apparent typographical error in the reported value in the Party's response) was used by JSC ArcelorMittal to produce coke. Using this value and a default NCV of 28.2 TJ/kt, the ERT calculated that 262.44 PJ of coking coal was used by JSC ArcelorMittal to produce coke for its industrial processes. It is unclear how the Party accounted for this NEU of coking coal and how it was subtracted from the estimates under the reference approach. Nevertheless, the value obtained is much higher than the value of 2.90 PJ reported in CRF table 1.A(d) for 2017, and if this value is subtracted from the value of apparent consumption of coking coal reported in the reference approach excluding NEU (288.18 PJ), the resulting amount of 25.74 PJ, which would correspond to the use of coking coal in combustion activities in the reference approach, is much lower than the value of 165.65 PJ reported as the total coking coal use for combustion activities in the sectoral approach. Therefore, the ERT considered that the value of coking coal used by JSC ArcelorMittal to produce coke in 2017 (and possibly in 2014–2016) reported by Kazakhstan in its response is very high and unreliable. The ERT considered that this issue is associated with incorrect coking coal consumption values and the lack of an accurate and comprehensive national carbon balance for coking coal and its uses, including by-products. The ERT noted that, in its response, Kazakhstan used the value resulting from the difference between the estimates of coking coal consumption in the reference approach (excluding NEU and energy consumption of coke oven gas) and the estimates of coking coal consumption in the sectoral approach as the AD for the CO_2, CH_4 and N_2O emission estimates, and reported these estimates under subcategory 1.A.5.a stationary for 2014–2017 following the recommendation of the ERT. Therefore, the ERT considered that Kazakhstan took a conservative approach, thus	

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		solving the potential problem. Therefore, the ERT concluded that emissions from the energy consumption of coking coal were not underestimated for 2017, or for 2014–2016. In addition, as indicated above, the ERT noted that the Party did not provide revised emission estimates for energy consumption of coking coal for 2013 and has not performed recalculations of these estimates since the 2017 annual submission. The ERT further noted that in the 2017 annual review report, the previous ERT applied an adjustment for coking coal consumption for 2013 (FCCC/ARR/2017/KAZ, ID# E.48). Therefore, in accordance with paragraph 12 of the guidance for adjustments under Article 5, paragraph 2, of the Kyoto Protocol (annex to decision 20/CMP.1, in conjunction with decision 4/CMP.11), the ERT did not carry out the procedure for the calculation of adjustments of emissions from coking coal consumption for 2013. As a result of the revision, the estimated emissions from coking coal consumption increased by 4,852.53 kt CO_2 eq (1.5 per cent of the national total and 1.8 per cent of total emissions from the energy sector) for 2014; by 10,377.76 kt CO_2 eq (3.1 per cent of the national total and 3.8 per cent of total emissions from the energy sector) for 2015; by 6,608.32 kt CO_2 eq (2.0 per cent of the national total and 2.4 per cent of total emissions from the energy sector) for 2016; and by 9,782.30 kt CO_2 eq (2.8 per cent of the national total and 3.4 per cent of total emissions from the energy sector) for 2017. In accordance with the recommendation included in ID# E.19 in table 3, the ERT recommends that Kazakhstan provide verifiable and documented information in the NIR on consumption of coking coal in the country by category and subcategory; provide an accurate and comprehensive carbon balance of coking coal, including by-products, used in the calculations (available resources versus energy use and NEU of the fuel) developed with close collaboration between energy and IPPU experts; and, if possible, compare the carbon balance with the IEA data on consumption of coking coal and by-products for different uses, and report on the results in the NIR. The ERT also recommends that Kazakhstan, while avoiding double counting, revise and report in the respective CRF tables for the energy and IPPU sectors the CO_2, CH_4 and N_2O emission estimates calculated strictly in accordance with the 2006 IPCC Guidelines, at a minimum for 2013–2017 and subsequent years as a first and immediate step, but with the aim of covering the complete time series, in addition to providing information on the source and method of calculation used for the emission estimates, including the NCVs and EFs for coking coal and other fuels used. The ERT further recommends that Kazakhstan, if estimating other emissions such as those from coke oven gas flaring or venting, report those emissions under subcategory 1.B.1.b solid fuel transformation and include in the NIR clear and detailed information on the method, AD and EFs used.	
E.63	1.A.3.b Road transportation – liquid fuels – N_2O	The ERT noted that Kazakhstan did not report in the NIR the composition of the vehicle fleet and information on the number of vehicles with oxidation catalysts in the country. The Party explained in its NIR (section 3.5.2.2, p.105) and during the review that only an evaluation of the number of vehicles with oxidation catalysts was possible and, for this reason, it used the default EFs for uncontrolled technologies in its estimates, given that the number of vehicles with oxidation catalysts is relatively small and did not have a significant influence on total CH_4 or N_2O emissions. Kazakhstan also explained that a study is needed to determine the ratio between controlled and uncontrolled technologies in the vehicle fleet, but organizing such a study is difficult. The ERT noted that N_2O emissions from road transportation can be underestimated if vehicles with oxidation catalysts are not considered using the appropriate N_2O EFs. During the review, the Party explained that the share of new cars that are possibly equipped with pollution control technologies is less than 5–6 per cent of the entire fleet and that	Yes. Transparency

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		this number does not significantly affect the N_2O emission estimates for the subcategory (see ID# E.27 in table 3). The ERT recommends that Kazakhstan provide in its NIR information on the composition of the vehicle fleet, including the number of cars with pollution control technologies, and justify the share of 5–6 per cent of these vehicle types in the fleet, as indicated by the Party, and the evolution of the share over the years, taking into account the fact that these data are very important for the accurate estimation of N_2O (and CH_4) emissions for this subcategory.	
E.64	1.A.3.d Domestic navigation – liquid fuels – CO_2, CH_4 and N_2O	The ERT noted that Kazakhstan reported significant recalculations in its 2018 and 2019 annual submissions of gas/diesel oil consumption in subcategory 1.A.3.d domestic navigation for 2001–2015 compared with the data reported in its 2017 annual submission. The reported decrease in gas/diesel oil consumption ranged from 84 per cent in 2001 to 86 per cent in 2015, with a peak reduction of 93 per cent in 2014, compared with the levels reported in the 2017 annual submission. The ERT also noted that the explanations provided in the NIR for the recalculations for this subcategory were very general and limited. Kazakhstan explained during the review that the consumption of this fuel was split between domestic and international navigation using indicators derived from data on the transportation of goods on international and domestic waters. The ERT considered that the total gas/diesel oil used in the two types of navigation should be the same as that reported in the 2017 annual submission (see ID# E.2 in table 3) and that any modification should be documented accordingly in the NIR. The ERT noted that the IEA energy balance reported gas/diesel oil consumption in domestic navigation as 256 TJ for Kazakhstan for 2017, which is 135.7 per cent higher than the value of 108.61 TJ reported in CRF table 1.A(a) (sheet 3) for consumption of gas/diesel oil in the subcategory 1.A.3.d domestic navigation. The ERT performed a rough preliminary estimate of emissions from gas/diesel oil using the AD reported by IEA for subcategory 1.A.3.d domestic navigation for 2017. The results showed that the emissions for 2017 would increase by 11.03 kt CO_2 eq, or 0.003 per cent of the national total; thus, the likely level of underestimation of emissions for subcategory 1.A.3.d domestic navigation does not exceed the significance threshold of 0.05 per cent of the national total (183.09 kt CO_2 eq), or 500 kt CO_2 eq. Therefore, this issue was not included in the list of potential problems and further questions raised by the ERT. The ERT believes that future ERTs should consider this issue further to ensure that there is not an underestimation of emissions from this subcategory. The ERT recommends that Kazakhstan include in the NIR of its future annual submissions a well-documented justification for the decrease in the gas/diesel oil consumption in subcategory 1.A.3.d domestic navigation since the 2017 annual submission and ensure the consistency of the emission estimates for the complete time series. The ERT encourages Kazakhstan to explain the difference between the AD on gas/diesel oil consumption used in this subcategory and the IEA data.	Yes. Transparency
E.65	1.A.3.d Domestic navigation – liquid fuels – CO_2, CH_4 and N_2O	The ERT noted that Kazakhstan reported significant recalculations in its 2018 and 2019 annual submissions of gasoline consumption for subcategory 1.A.3.d domestic navigation for 2001–2015 compared with the data reported in its 2017 annual submission. The reported decrease in gasoline consumption ranged from 80 per cent in 2001 to 91 per cent in 2015 compared with the levels reported in the 2017 annual submission. The ERT also noted that the explanations provided in the NIR for recalculations for this subcategory were very general and limited. During the review, the Party did not explain the reason for the significant decrease in gasoline	Yes. Transparency

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		consumption for this subcategory in the 2019 annual submission. The ERT believes that future ERTs should consider this issue further to ensure that there is not an underestimation of emissions from this subcategory. The ERT recommends that Kazakhstan include in the NIR of its next annual submission a well-documented justification for the decrease in gasoline consumption in subcategory 1.A.3.d domestic navigation and ensure the consistency of the emission estimates for the complete time series.	
E.66	1.A.5.a Stationary – all fuels – CO_2, CH_4 and N_2O	The ERT noted that Kazakhstan reported in the NIR data on consumption of fuels and CO_2 emissions by fuel type for category 1.A.5 other (table 3.20, p.89, and table 3.22, p.91). However, in CRF table 1.A(a) (sheet 4), the AD and GHG emissions for category 1.A.5 other were reported in an aggregated manner under subcategory 1.A.5.a stationary, without specifying these data by type of fuel (e.g. liquid, solid, gaseous and other fossil fuels). During the review, the Party did not clarify why the consumption of different fuels in subcategory 1.A.5.a stationary was not reported in CRF table 1.A(a) (sheet 4) by type of fuel. The ERT recommends that Kazakhstan report in CRF table 1.A(a) (sheet 4) of its next annual submissions the fuel consumption and corresponding GHG emissions for subcategory 1.A.5.a stationary by type of fuel.	Yes. Comparability
E.67	1.B.1.a Coal mining and handling – solid fuels – CO_2 and CH_4	The ERT noted that Kazakhstan reported different quantities of coal production for a single year in the CRF tables. For example, for 2017, total coal production was reported as 107.89 Mt in CRF table 1.A(b), but as 101.7 Mt in CRF table 1.B.1. During the review, Kazakhstan explained that the coal production quantity reported in CRF table 1.A(b) was correct and that an error had occurred in CRF table 1.B.1, which will be corrected in the next annual submission. The ERT believes that future ERTs should consider this issue further to ensure that there is not an underestimation of emissions from this subcategory. The ERT recommends that Kazakhstan provide in the next annual submission consistent and accurate information on the quantity of coal produced in the country in CRF table 1.B.1 and the NIR, estimate CO_2 and CH_4 fugitive emissions from this activity accordingly and report the corresponding AD used for the emission estimates for the entire time series consistently across the sectoral and reference approaches.	Yes. Accuracy
E.68	1.B.2 Oil, natural gas and other emissions from energy production – liquid and gaseous fuels – CO_2, CH_4 and N_2O	The ERT noted that Kazakhstan reported an inconsistent time series of IEFs for a number of categories and subcategories of fugitive emissions from oil and natural gas operations because the Party used default CO_2, CH_4 and N_2O EFs from the 2006 IPCC Guidelines for developing countries for 1990–2000 and for developed countries for 2001–2017. The ERT also noted that the NIR did not contain transparent documentation on the reasons for using different EFs in two periods of the time series. During the review, the Party provided a list of regulatory acts on the operations of the oil and gas industry, including the introduction of the most advanced environmental standards and technologies and the associated training requirements of administrative staff. The regulatory acts have been in force since 1999 and, as the Party informed the ERT, have had a positive impact on the environment and increased efficiency in the oil and gas industry. The new and modern technologies in place have had an impact on reducing emissions and therefore justify the use by the Party of the default EFs for fugitive emissions for developed countries. Nevertheless, the list of documents provided by the Party did not prove that the infrastructure for oil operations was modernized immediately after 2001 and that the default EFs for developed countries could be used by the Party in its estimates from that year onward. Moreover, there was no justification for introducing a sudden step change in the CO_2, CH_4 and N_2O EFs used for 2001 following a	Yes. Accuracy

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		sudden change in technologies and the modernization of oil and natural gas operations and infrastructure in that year, which the ERT believes is unlikely to have happened. The ERT recommends that Kazakhstan include in the NIR of its next annual submission detailed information on the regulatory acts certifying the introduction of new technologies and the modernization of oil and natural gas operations and infrastructure, including clear information on the timeline for the introduction of these new technologies and intended changes, and on the target year for finalizing the modernization of oil and natural gas operations, together with documented information on the status of progress towards the modernization of the oil and natural gas industry in the country and an analysis of the similarity of such operations with those in developed countries. Recognizing that fugitive CH_4 emissions from subcategory 1.B.2.a oil is a key category (and that CH_4 emissions from subcategory 1.B.2.b natural gas is also likely to be a key category), and that for this key category (and probably also for CH_4 emissions from subcategory 1.B.2.b natural gas), the ERT noted that it is good practice to apply a tier 2 method for estimating CH_4 emissions; therefore, the ERT also recommends that Kazakhstan, taking into account the information collected on the status of progress towards the modernization of the oil and natural gas industry in the country, and if it is not possible to use a tier 2 method for the estimates, provide revised CO_2, CH_4 and N_2O emission estimates using a gradual linear introduction across the time series, starting in 2001 or later, of the default CO_2, CH_4 and N_2O EFs for developing countries provided in table 4.2.5 of the 2006 IPCC Guidelines (vol. 2, chap. 4, p.4.55).	
E.69	1.B.2.a Oil – liquid fuels – CO_2 and CH_4	The ERT noted that for 2017, Kazakhstan reported crude oil production as 72,900.00 t in CRF table 1.B.2, while in CRF table 1.A(b), it reported crude oil production for the same year as 86,194,400.00 t, which is much higher than the AD reported in CRF table 1.B.2. In the NIR (table 3.27, p.129) the Party provided a different value for crude oil production for 2017 (72.90 Mt). Similarly, the ERT identified discrepancies between CRF tables 1.B.2 and 1.A(b) and the NIR for 2013, 2014, 2015 and 2016 (see ID# E.44 in table 3 and ID# E.58 above). During the review, Kazakhstan informed the ERT that the correct value for crude oil production for 2017 is 86,194,400.00 t, as reported in CRF table 1.A(b). The ERT concluded that the AD for subcategory 1.B.2.a.2 oil – production used by the Party to calculate CO_2 and CH_4 emissions may lead to a potential underestimation of emissions from this subcategory for 2017 and all other years of the time series. The ERT included this issue in the list of potential problems and further questions raised by the ERT and recommended that Kazakhstan use the AD for crude oil production reported in CRF table 1.A(b) (86,194,400.00 t) to calculate CO_2 and CH_4 emissions from subcategory 1.B.2.a.2 oil – production for 2017. Following the principle of consistency, the ERT also recommended that Kazakhstan check the correctness of the values of crude oil production reported in CRF table 1.B.2 for the entire time series and provide revised GHG emission estimates accordingly. In response to the list of potential problems and further questions raised by the ERT, Kazakhstan resubmitted a complete set of CRF tables for 1990–2017, but did not revise the CO_2 and CH_4 emission estimates for subcategory 1.B.2.a.2 oil – production. The ERT noted that, in its response, Kazakhstan indicated that after consulting with the Agency of Statistics of Kazakhstan, it was concluded that the correct value of crude oil production is 72,924,900 t and that the data inconsistency identified in CRF table 1.A(b) will be corrected in the next annual submission. However, the resubmitted CRF table 1.B.2 showed an oil production value of 72,900.00 t, which was significantly lower than the value included in Kazakhstan's response. The ERT also noted that the IEA energy balance for Kazakhstan contained a value for the quantity of crude oil production (not including NGLs) similar to that reported in CRF table 1.A(b) for 2017 (86,194,400.00 t). Therefore, the total production of	Yes. Accuracy

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		crude oil reported in CRF table 1.A(b) appears to be correct and the AD value for subcategory 1.B.2.a.2 oil – production used for the estimates was not consistent with this value and was lower by three orders of magnitude in the resubmitted CRF tables for 2017. As this significant inconsistency is not justified, and the IEA energy balance for Kazakhstan contained a figure for crude oil that was similar to the value reported in CRF table 1.A(b), the ERT concluded that the CO_2 and CH_4 emissions from subcategory 1.B.2.a.2 oil – production were underestimated for 2017 and for the entire time series and, thus, the problem remained unresolved and an adjustment should be applied. Therefore, in accordance with the guidance for adjustments under Article 5, paragraph 2, of the Kyoto Protocol (annex to decision 20/CMP.1, in conjunction with decision 4/CMP.11), the ERT carried out the procedure for the calculation of adjustments for this subcategory for 2013–2017 (see chap. VI below and tables 3–4 of annex IV). The ERT recommends that Kazakhstan report and use well-documented and revised AD for crude oil production that are consistent with the values reported in CRF table 1.A(b) and the NIR to calculate emissions of CO_2 and CH_4 from subcategory 1.B.2.a.2 oil – production for 2013–2017 and subsequent years, using the appropriate default CO_2 and CH_4 EFs provided in tables 4.2.4–4.2.5 of the 2006 IPCC Guidelines (vol. 2, chap. 4, p.4.48 and p.4.55, respectively). Following the principle of consistency, the ERT also recommends that Kazakhstan check the correctness, accuracy and consistency of the crude oil production value reported in CRF table 1.B.2 for the entire time series and report revised CO_2 and CH_4 emission estimates for subcategory 1.B.2.a.2 oil – production accordingly, using the corresponding default EFs from tables 4.2.4–4.2.5 of the 2006 IPCC Guidelines (vol. 2, chap. 4, p.4.48 and p.4.55, respectively).	
E.70	1.B.2.a Oil – liquid fuels – CO_2, CH_4 and N_2O	The ERT noted that Kazakhstan used the notation key "NA" to report the CO_2, CH_4 and N_2O emission estimates and AD for subcategory 1.B.2.a.4 oil – refining/storage for the entire time series. The ERT also noted that crude oil refining/storage activity exists in Kazakhstan because there are at least three refineries that are currently operating in the country. The ERT further noted that the Party reported AD and CH_4 emissions from this subcategory in its 2017 annual submission (see ID# E.48 in table 3) and that AD were reported in the national energy balance (15,890 kt oil refined for 2017). During the review, Kazakhstan explained that relevant institutions were asked to provide information on the volume of oil refined for the entire time series for subcategory 1.B.2.a.4. oil – refining/storage, but the responses received were uncertain; therefore, Kazakhstan decided to use the notation key "NA" for the AD and CO_2, CH_4 and N_2O emissions. In addition, the Party informed the ERT that possible improvements to the reporting of the subcategory will be presented in the next annual submission. The ERT concluded that the missing CH_4 emissions from subcategory 1.B.2.a.4 oil – refining/storage led to an underestimation of GHG emissions for 2017 and for the entire time series. Therefore, the ERT included this issue in the list of potential problems and further questions raised by the ERT and recommended that Kazakhstan provide the AD from the national energy balance used for the calculations for subcategory 1.B.2.a.4 oil – refining/storage for 2017 and calculate CH_4 emissions from subcategory 1.B.2.a.4 oil – refining/storage, using the default CH_4 EF from table 4.2.4 of the 2006 IPCC Guidelines (vol. 2, chap. 4, pp.4.48–4.54), for 2017. Following the principle of consistency, the ERT also recommended that Kazakhstan calculate CH_4 emissions for the entire time series using the corresponding default CH_4 EFs from tables 4.2.4–4.2.5 of the 2006 IPCC Guidelines (vol. 2, chap. 4, p.4.48 and p.4.55, respectively). In response to the list of potential problems and further questions raised by the ERT, Kazakhstan resubmitted a complete set of CRF tables for 1990–2017. The ERT noted that Kazakhstan used the EFs (in $t/10^3$ m^3 oil refined)	Yes. Accuracy

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue and/or a problem?[a]
		provided in the *2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories* to estimate CO_2, CH_4 and N_2O emissions from subcategory 1.B.2.a.4 oil – refining/storage for 2010–2017, indicating that it used AD from the national energy balance and that it was not possible to reconstruct the time series for 1990–2009. The ERT also noted that, in its response, Kazakhstan did not clearly state which units were used to report the quantities of oil refined. In table 1 of its response, the Party provided AD in m^3 (15,890,000 m^3 for 2017), but did not specify the oil density used in the calculations or provide a description of these AD. In the resubmitted CRF table 1.B.2, the Party reported t as the unit for the AD, but did not include a description of the AD (15,890.00 t for 2017). The ERT further noted that the CO_2 emissions reported in the revised CRF table 1.B.2 were 1,000 times lower than the value reported in the Party's response for the same year (e.g. for 2017, 111.99 t reported in the revised CRF table 1.B.2 and 111,995.78 t in the Party's response). Assuming that the units of AD were in t in Kazakhstan's response, the ERT also noted that the Party reported as AD the same quantity of oil refined as the quantity provided in the IEA energy balance for 2017 (15,890,000 t). For 2010–2016, the amounts of oil refined reported in the Party's response were different from the values reported in the IEA energy balance. In addition, the ERT further noted that for estimating the revised CH_4 emissions from subcategory 1.B.2.a.4 oil – refining/storage for 2017, Kazakhstan used the EF provided in the *2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories*, which is higher than the one provided in the 2006 IPCC Guidelines. This led to a higher level of CH_4 emissions (0.57 kt CH_4) for 2017 in the revised CRF table 1.B.2 for subcategory 1.B.2.a.4 oil – refining/storage compared with the estimate calculated by the ERT (0.42 kt CH_4) using the average EF from table 4.2.4 of the 2006 IPCC Guidelines, the same AD (15,890,000 t) and an oil density of 0.83 t/m^3. Therefore, the ERT concluded that the emissions from subcategory 1.B.2.a.4 oil – refining/storage for 2017 reported in the revised CRF tables were not underestimated. The ERT reached the same conclusion regarding the CH_4 emissions from subcategory 1.B.2.a.4 oil – refining/storage for 2013–2016. In addition, Kazakhstan reported CO_2 and N_2O emission estimates for 2013–2017. The ERT therefore considered that Kazakhstan had resolved the potential problem. As a result of the revision, the estimated emissions from subcategory 1.B.2.a.4 oil – refining/storage increased by 14.23 kt CO_2 eq (0.0046 per cent of the national total and 0.0056 per cent of total emissions from the energy sector) for 2013; by 14.97 kt CO_2 eq (0.0046 per cent of the national total and 0.0056 per cent of total emissions from the energy sector) for 2014; by 14.09 kt CO_2 eq (0.0043 per cent of the national total and 0.0052 per cent of total emissions from the energy sector) for 2015; by 11.56 kt CO_2 eq (0.0034 per cent of the national total and 0.0042 per cent of total emissions from the energy sector) for 2016; and by 14.97 kt CO_2 eq (0.0042 per cent of the national total and 0.0052 per cent of total emissions from the energy sector) for 2017. The ERT recommends that Kazakhstan report in the NIR and CRF table 1.B.2 accurate, consistent and documented AD from the national energy balance or from recognized international sources, including units and a description of the AD for subcategory 1.B.2.a.4 oil – refining/storage for the entire time series, particularly for 2013–2017 and subsequent years of the second commitment period of the Kyoto Protocol. The ERT also recommends that Kazakhstan revise, as necessary, its estimates of CO_2, CH_4 and N_2O emissions from subcategory 1.B.2.a.4 oil – refining/storage using the identified accurate AD and appropriate default EFs from tables 4.2.4–4.2.5 of the 2006 IPCC Guidelines (vol. 2, chap. 4, p.4.48 and p.4.55, respectively) or recognized international methodological sources for the entire time series, particularly for 2013–2017 and subsequent years of the second commitment period of the Kyoto Protocol, and document the EFs and method used in the NIR.	

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*	*Is finding an issue and/or a problem?*[a]
E.71	1.B.2.b Natural gas – gaseous fuels – CO_2 and CH_4	The ERT noted that Kazakhstan used the notation key "NE" to report CO_2 and CH_4 emissions and AD from subcategory 1.B.2.b.1 natural gas – exploration for the entire time series in CRF table 1.B.2. The ERT also noted that Kazakhstan reported the quantity of natural gas produced for the entire time series and that, according to the methodology provided in the 2006 IPCC Guidelines, GHG emissions from natural gas exploration are included in subcategory 1.B.2.a.1 oil – exploration (vol. 2, chap. 4, tables 4.2.4–4.2.5, p.4.48 and p.4.55, respectively). The ERT noted that the Party reported in the NIR (section 3.6.3.6, p.131) that it plans to obtain data on well drilling in the near future. During the review, Kazakhstan indicated that AD related to natural gas and oil exploration are requested from companies annually, but these AD were not provided by the companies contacted owing to the commercial character of the data. Further, and despite the fact that the Party reported values for oil and natural gas production for the entire time series, Kazakhstan used the notation key "NE" for subcategories 1.B.2.a.1 oil – exploration and 1.B.2.b.1 natural gas – exploration in its original 2019 annual submission (see ID# E.45 in table 3). Kazakhstan informed the ERT that it expects that under the new institutional arrangements for the Ministry of Ecology, Geology and Natural Resources, this information will be provided in the next annual submission. The ERT recommends that Kazakhstan report CO_2 and CH_4 emission estimates for subcategory 1.B.2.b.1 natural gas – exploration using, if available, a well-documented method and country-specific EFs, together with accurate, complete and documented AD obtained from national companies, and document in detail in the NIR the AD, method and parameters used in the estimates and explain how the double counting of emissions was avoided from subcategory 1.B.2.a.1 oil – exploration. If this is not possible, and if Kazakhstan estimates emissions from subcategory 1.B.2.a.1 oil – exploration using the default EFs provided in tables 4.2.4–4.2.5 of the 2006 IPCC Guidelines for well drilling, testing and servicing (vol. 2, chap. 4, p.4.48 and p.4.55, respectively) and the corresponding AD required, the ERT recommends that Kazakhstan report emissions from subcategory 1.B.2.b.1 natural gas – exploration using the notation key "IE" and include relevant explanations in the NIR and CRF tables.	Yes. Transparency
E.72	1.B.2.b Natural gas – gaseous fuels – CO_2 and CH_4	The ERT noted significant differences between the volume of natural gas production reported in CRF table 1.A(b) (reference approach) and in CRF table 1.B.2 (sectoral approach). For 2017, natural gas production was reported as $42{,}675.00 \times 10^6$ m^3 in CRF table 1.A(b), $12{,}623.00 \times 10^9$ m^3 in CRF table 1.B.2 and $12{,}623.00 \times 10^6$ m^3 in the NIR (table 3.29, p.132). The ERT also noted that the reported volume of gas distribution was the same as the value reported for volume of gas production in CRF table 1.B.2, which is unlikely to be correct, since the country is a major exporter of natural gas. During the review, Kazakhstan informed the ERT that the correct unit of measurement for natural gas production reported in CRF table 1.A(b) is billion m^3 (10^9 m^3). However, Kazakhstan did not clarify whether the volume of natural gas production reported in CRF table 1.A(b) or CRF table 1.B.2 was correct. Taking this into account, the ERT concluded that the AD reported in CRF table 1.B.2 ($12{,}623.00 \times 10^9$ m^3) may be lower than the actual natural gas production value and, therefore, the CH_4 and CO_2 emission estimates for subcategory 1.B.2.b.2 natural gas – production may be underestimated for 2017. The ERT included this issue in the list of potential problems and further questions raised by the ERT and recommended that the Party provide the correct volume of natural gas production in Kazakhstan for 2017 and for other years of the time series, which must be the same volumes reported under subcategory 1.B.2.b.2 natural gas – production, in CRF tables 1.B.2 and 1.A(b), as well as in the NIR. The ERT also recommended that Kazakhstan provide revised CH_4 and CO_2 emission estimates for 2017 using the correct volume of natural gas production and the	Yes. Accuracy

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue and/or a problem?[a]
		appropriate default CH_4 and CO_2 EFs provided in table 4.2.4 of the 2006 IPCC Guidelines (vol. 2, chap. 4, p.4.48) for subcategory 1.B.2.b.2 natural gas – production. Following the principle of consistency, the ERT further recommended that Kazakhstan provide revised CH_4 and CO_2 emission estimates for the entire time series using the corresponding default CH_4 and CO_2 EFs from tables 4.2.4–4.2.5 of the 2006 IPCC Guidelines (vol. 2, chap. 4, p.4.48 and p.4.55, respectively). In response to the list of potential problems and further questions raised by the ERT, Kazakhstan resubmitted a complete set of CRF tables for 1990–2017. In its response, Kazakhstan indicated that in the original calculation tables, the units were correctly accounted for, but an error was made during data archiving. The Party also indicated that in the resubmitted CRF tables, "formats are synchronized" with the data presented in CRF table 1.A(b). The ERT concluded that the data presented in CRF table 1.A(b) for natural gas production may have been correct as indicated by the Party in its response. However, the ERT noted that the Party did not report the indicated volume of natural gas production in Kazakhstan ($42{,}675.00 \times 10^6$ m^3) in the revised CRF table 1.B.2 for subcategory 1.B.2.b.2 natural gas – production for 2017 or for the entire time series, nor did it explicitly indicate the correct value for natural gas production. In addition, Kazakhstan did not revise the CH_4 and CO_2 emission estimates for 2017 using the indicated volume of natural gas production and the appropriate CH_4 and CO_2 EFs or for the entire time series. For 2017, the ERT determined that the reported revised emission estimates were lower by 1,207.94 kt CO_2 eq using the indicated AD and, for example, averages of the CH_4 and CO_2 EFs for developed countries from table 4.2.4 of the 2006 IPCC Guidelines (vol. 2, chap. 4, p.4.48). The ERT concluded that the emissions reported in the revised CRF tables for subcategory 1.B.2.b.2 natural gas – production were underestimated for 2017 and the entire time series and, therefore, the problem remained unresolved and an adjustment should be applied. Therefore, in accordance with the guidance for adjustments under Article 5, paragraph 2, of the Kyoto Protocol (annex to decision 20/CMP.1, in conjunction with decision 4/CMP.11), the ERT carried out the procedure for the calculation of adjustments for this subcategory for 2013–2017 (see chap. VI below and tables 5–6 of annex IV). The ERT recommends that Kazakhstan report and use well-documented and revised AD for the volume of natural gas production that are consistent with the reported values in CRF table 1.A(b) and the NIR to calculate emissions of CH_4 and CO_2 from subcategory 1.B.2.b.2 natural gas – production for 2013–2017 and subsequent years, using the appropriate default CH_4 and CO_2 EFs provided in tables 4.2.4–4.2.5 of the 2006 IPCC Guidelines (vol. 2, chap. 4, p.4.48 and p.4.55, respectively). Following the principle of consistency, the ERT also recommends that Kazakhstan check the correctness, accuracy and consistency of the natural gas production volume reported in CRF table 1.B.2 for 1990–2012, and report revised CH_4 and CO_2 emission estimates for subcategory 1.B.2.b.2 natural gas – production, accordingly, using the corresponding default EFs from tables 4.2.4–4.2.5 of the 2006 IPCC Guidelines (vol. 2, chap. 4, p.4.48 and p.4.55, respectively).	
E.73	1.B.2.c Venting and flaring – oil and natural gas – CO_2 and CH_4	The ERT noted that Kazakhstan reported AD and CO_2, CH_4 and N_2O emissions from flaring of oil and natural gas for subcategory 1.B.2.c.2.iii flaring – combined. However, the ERT was not able to identify in the NIR or in CRF table 1.B.2 the description of the AD and EFs, including the conversion factors (e.g. calorific values and density of the oil and natural gas) used by the Party to estimate GHG emissions from this subcategory. During the review, in response to a question about the difference between the AD used by the previous ERT to apply the adjustment and the AD used for this subcategory for the 2019 annual submission, Kazakhstan indicated that there are differences in AD collection between the IEA and the Party's national statistics, and that the inventory	Yes. Transparency

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue and/or a problem?[a]
		experts disagree with the approach used in the IEA energy balance. The Party explained that it used the default EFs provided in table 4.2.5 of the 2006 IPCC Guidelines (vol. 2, chap. 4, p.4.55) and average values of CO_2, CH_4 and N_2O default EFs (onshore and offshore operations) for a 50 per cent ratio between onshore and offshore flaring AD, but did not explain whether the AD were related to the production of oil and/or natural gas. Kazakhstan further indicated that the calorific value used for natural gas was the default value provided in table 3.8 of the NIR (p.59) of the 2019 annual submission. Nevertheless, the Party did not provide the density of the oil and natural gas or the EFs resulting from the methodology used to estimate GHG emissions from flaring of oil and natural gas for subcategory 1.B.2.c.2.iii flaring – combined. Taking into consideration the fact that, during the review, Kazakhstan indicated that it used a ratio of 50 per cent between onshore and offshore oil and gas operations because the actual share was not known, the ERT concluded that Kazakhstan might not have used the correct methodology to determine the AD used to estimate GHG emissions from flaring in oil and gas operations, and that the methodology used is not transparently explained in the NIRs of the 2018 or 2019 annual submissions, which did not allow the ERT to assess the correctness of such method. The ERT believes that future ERTs should consider this issue further to ensure that there is not an underestimation of emissions from this subcategory. The ERT recommends that Kazakhstan include in the NIR of the next annual submission a transparent and detailed explanation of the methodology used to determine the AD and EFs for the estimates and provide the conversion factors used to estimate emissions of CO_2, CH_4 and N_2O from flaring of oil and natural gas for subcategory 1.B.2.c.2.iii flaring – combined.	
IPPU			
I.50	2.A.1 Cement production – CO_2	The ERT noted that despite a constant CaO content in clinker value and CKD value reported in the NIR (table 4.2, p.141), the CO_2 IEF showed variations from 0.534 to 0.522 t/t for 2000–2017. From the calculation spreadsheet provided by the Party during the review, the ERT identified that for the estimates for 2000–2017, different CaO content in clinker values obtained from individual cement companies were used, rather than a constant value of 65.72 per cent, as reported in table 4.2 of the NIR (p.141). The ERT recommends that Kazakhstan correct the discrepancy in the CaO content in clinker values in the NIR of the next annual submission. The ERT also recommends that the Party include in the NIR of the next annual submission an explanation for the large variations in the CO_2 IEFs across the time series.	Yes. Transparency
I.51	2.A.4 Other process uses of carbonates – CO_2	The ERT noted that the CO_2 IEFs for subcategory 2.A.4.a ceramics (0.01 t CO_2/t production for 2017) were among the lowest among reporting Annex I Parties (ranging from 0.00005 to 1.56 t CO_2/t production for 2017). The ERT also noted that according to the description provided in the NIR, Kazakhstan assumed that carbonate content in clay is 1 per cent. The ERT noted that the 2006 IPCC Guidelines (vol. 3, chap. 2, p.2.34) suggest the use of 10 per cent as the default carbonate content in clay if no other information is available. In response to a question raised by the ERT during the review, Kazakhstan acknowledged that there was an error in the calculations and that the CO_2 emission estimates will be revised in the next annual submission. The ERT performed rough preliminary estimates of CO_2 emissions from subcategory 2.A.4.a ceramics using the AD provided in the NIR and the default value for carbonate content in clay from the 2006 IPCC Guidelines, and concluded that the reported emissions were underestimated for 2017. The results showed that emissions in 2017 would increase by 51 kt CO_2 eq, or 0.014 per cent of the national total; however, this likely level of	Yes. Accuracy

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		underestimation of emissions does not exceed the significance threshold of 0.05 per cent of the national total (183.09 kt CO_2 eq), or 500 kt CO_2 eq. Therefore, this issue was not included in the list of potential problems and further questions raised by the ERT. The ERT recommends that Kazakhstan revise the estimates of CO_2 emissions from subcategory 2.A.4.a ceramics using the default value for carbonate content in clay (10 per cent) provided in the 2006 IPCC Guidelines (vol. 3, chap. 2, p.2.34) in the next annual submission.	
I.52	2.B.2 Nitric acid production – N_2O	The ERT noted a significant increase in N_2O emissions from category 2.B.2 nitric acid production in 2015 (1.43 kt) compared with other years of the time series. The ERT also noted that according to the data provided on the website of JSC KazAzot, the only nitric acid production company in Kazakhstan (http://www.kazazot.kz), nitric acid production in 2015 (261.68 kt) was much lower than the value reported by the Party in CRF table 2(II).B-H (sheet 1) (621.68 kt). In response to a question raised by the ERT during the review, Kazakhstan indicated that the data on nitric acid production reported in the NIR were officially provided by JSC KazAzot and that for the next annual submission, this discrepancy will be clarified with JSC KazAzot. The ERT recommends that Kazakhstan clarify with the nitric acid production company the actual data on nitric acid production for 2015 and, if necessary, recalculate N_2O emissions from category 2.B.2 nitric acid production using correct AD for the next annual submission.	Yes. Consistency
I.53	2.D.2 Paraffin wax use – CO_2	The ERT noted that Kazakhstan did not estimate CO_2 emissions from category 2.D.2 paraffin wax use and reported these emissions as "NA" in CRF table 2(I).A-H (sheet 2). The ERT noted that the 2006 IPCC Guidelines provide an estimation method for this category (vol. 3, chap. 5, p.5.11). In response to a question raised by the ERT during the review, the Party indicated that emissions from the use of paraffin wax in Kazakhstan were tentatively assessed as insignificant. The Party also informed the ERT that for the next annual submission, it is planning to conduct additional studies on the use of paraffin wax in the country. The ERT performed rough preliminary estimates of CO_2 emissions using the per capita average emission rate from a cluster of countries with similar conditions (Russian Federation and Ukraine) and concluded that the reported emissions were underestimated for 2017. The results showed that emissions for 2017 would increase by 10 kt CO_2 eq, or 0.003 per cent of the national total; however, this likely level of underestimation of emissions does not exceed the significance threshold of 0.05 per cent of the national total (183.09 kt CO_2 eq), or 500 kt CO_2 eq. Therefore, this issue was not included in the list of potential problems and further questions raised by the ERT. The ERT recommends that Kazakhstan collect AD and estimate CO_2 emissions from category 2.D.2 paraffin wax use using the default methodology provided in the 2006 IPCC Guidelines (vol. 3, chap. 5, p.5.11) or clearly demonstrate in the NIR that emissions from this category are insignificant according to paragraph 37(b) of the UNFCCC Annex I inventory reporting guidelines in the next annual submission.	Yes. Completeness
I.54	2.D.3 Other (non-energy products from fuels and solvent use) – CO_2	The ERT noted that CO_2 emissions from urea-based catalytic converters were not reported in the inventory, although the 2006 IPCC Guidelines (vol. 2, chap. 3, p.3.12) provide an estimation method for this subcategory. During the review, the Party indicated that there are currently no plans to estimate emissions from urea-based catalytic converters, as the number of vehicles with urea-based catalytic converters in Kazakhstan is quite small. The ERT performed rough preliminary estimates of CO_2 emissions using the data on diesel consumption by vehicle provided in the CRF tables for the energy sector and using the default methodology from the 2006 IPCC Guidelines, and concluded that the reported emissions were underestimated for 2017. The results showed that	Yes. Completeness

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*	*Is finding an issue and/or a problem?*[a]
		emissions for 2017 would increase by 13 kt CO_2 eq, or 0.004 per cent of the national total; however, this likely level of underestimation of emissions does not exceed the significance threshold of 0.05 per cent of the national total (183.09 kt CO_2 eq), or 500 kt CO_2 eq. Therefore, this issue was not included in the list of potential problems and further questions raised by the ERT. The ERT recommends that Kazakhstan collect AD and estimate CO_2 emissions from urea-based catalytic converters using the default methodology provided in the 2006 IPCC Guidelines (vol. 2, chap. 3, p.3.12) or clearly demonstrate in the NIR that emissions from this subcategory are insignificant according to paragraph 37(b) of the UNFCCC Annex I inventory reporting guidelines in the next annual submission.	
I.55	2.F.1 Refrigeration and air conditioning – HFCs	The ERT noted that Kazakhstan reported the notation key "NO" for HFC emissions from subcategory 2.F.1.c industrial refrigeration for the entire time series in the CRF tables. During the review, Kazakhstan informed the ERT that based on available data from plant operators, the most common refrigerant used in industrial refrigeration applications is ammonia, and that refrigerant R-22 is still widely used in old refrigeration equipment. The ERT noted that most Annex I Parties report HFC emissions from industrial refrigeration and it is unlikely that Kazakhstan is using only ammonia and ODS compounds such as blend R-22 in its industrial refrigeration applications, given that ODS compounds are being phased out in line with decisions under the Montreal Protocol. The ERT concluded that the response provided by Kazakhstan during the review was not sufficient to justify that HFC emissions under subcategory 2.F.1.c industrial refrigeration are not occurring in the country and that this may lead to a potential underestimation of HFC emissions for 2017. Therefore, the ERT included this issue in the list of potential problems and further questions raised by the ERT and recommended that Kazakhstan provide documented justification that HFC emissions from subcategory 2.F.1.c industrial refrigeration did not occur in Kazakhstan (e.g. a study/analysis on the current structure of refrigerants used in the industrial refrigeration sector or any formal documentation from government institutions/authorities, etc.). If this is not possible, the ERT recommended that Kazakhstan collect relevant AD for industrial refrigeration equipment and estimate HFC emissions from subcategory 2.F.1.c industrial refrigeration for 2017 using the default methodology provided in the 2006 IPCC Guidelines (vol. 2, chap. 7.5, pp.7.43–7.60), providing transparent information on the method, AD and other parameters used for the emission estimates. Following the principle of consistency, the ERT also recommended that Kazakhstan apply the same approach to estimate HFC emissions from subcategory 2.F.1.c industrial refrigeration for other years of the second commitment period (2013–2016). In response to the list of potential problems and further questions raised by the ERT, Kazakhstan reported HFC emission estimates from subcategory 2.F.1.c industrial refrigeration for 1998–2018, considering HFC-125, HFC-134a and HFC-143a. The Party indicated that it had developed a survey questionnaire in consultation with the Agency of Statistics of Kazakhstan and the Kazakh Refrigeration Association, which was provided to large service-provider companies providing refrigeration equipment maintenance in Kazakhstan in order to obtain reliable information, as those companies not only provide after-sales services, but also sell refrigerants on the domestic market. Kazakhstan also indicated that it is not yet possible to use information from the Agency of Statistics of Kazakhstan owing to the significant aggregation of data on imported HFCs in the country. In addition, the Party reported that the main refrigerant agent used in Kazakhstan is R-404a, which is a blend of R-125 (44 per cent), R-134a (4 per cent) and R-143a (52 per cent) and was introduced to the country in 1998. The ERT agreed with the Party's response and considered that the HFC emission estimates for 2013–2017 from the refrigerant blend R-404a (HFC-125, HFC-134a and HFC-143a) used in industrial refrigeration provided by	Yes. Transparency

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue and/or a problem?[a]
		Kazakhstan in its response resolved the identified underestimation of emissions for this subcategory. Therefore, the ERT concluded that Kazakhstan had resolved the potential problem. As a result of the revision, the estimated emissions from subcategory 2.F.1.c industrial refrigeration increased by 317.65 kt CO_2 eq (0.1 per cent of the national total and 1.4 per cent of total emissions from the IPPU sector) for 2013; by 347.06 kt CO_2 eq (0.1 per cent of the national total and 1.5 per cent of total emissions from the IPPU sector) for 2014; by 354.71 kt CO_2 eq (0.1 per cent of the national total and 1.5 per cent of total emissions from the IPPU sector) for 2015; by 355.77 kt CO_2 eq (0.1 per cent of the national total and 1.4 per cent of total emissions from the IPPU sector) for 2016; and by 356.59 kt CO_2 eq (0.1 per cent of the national total and 1.4 per cent of total emissions from the IPPU sector) for 2017. The ERT recommends that Kazakhstan continue its efforts to collect accurate AD and report HFC emissions from subcategory 2.F.1.c industrial refrigeration and include in the NIR clear descriptions of the method, AD and EFs used in the emission estimates for this subcategory, in accordance with paragraph 50(a–b) of the UNFCCC Annex I inventory reporting guidelines.	
I.56	2.F.1 Refrigeration and air conditioning – HFCs	The ERT noted that according to the information provided in the NIR (section 4.4.5.4, p.183), Kazakhstan estimated HFC-134a emissions from subcategory 2.F.1.e mobile air conditioning, assuming that the loss of HFC amounts to 5 per cent/year of the total bank of refrigerants contained in mobile air-conditioning units. The ERT also noted that the 2006 IPCC Guidelines provide a default EF for operation emissions from mobile air conditioning in the range of 10–20 per cent of the initial charge (vol. 3, chap. 7, table 7.9, p.7.52). The ERT further noted that, during the review, in its response to a question raised by the ERT, Kazakhstan did not provide justification for the use of a mobile air-conditioning operation loss factor of HFCs lower than the default values provided in the 2006 IPCC Guidelines. The ERT concluded that this may lead to a potential underestimation of HFC-134a emissions from subcategory 2.F.1.e mobile air conditioning for 2017. Therefore, the ERT included this issue in the list of potential problems and further questions raised by the ERT and recommended that Kazakhstan provide revised estimates for subcategory 2.F.1.e mobile air conditioning for 2017 using the default methodology provided in the 2006 IPCC Guidelines (the EF for operation emissions from mobile air conditioning taken from the default range of 10–20 per cent) and provide transparent information on the method, AD and other parameters used in the calculations (e.g. assumptions on the percentage of vehicles sold with air conditioning among the total number of vehicle registrations and the average HFC charge of mobile air-conditioning units or other relevant documentation). Following the principle of consistency, the ERT also recommended that Kazakhstan apply the same approach to estimate HFC emissions from subcategory 2.F.1.e mobile air conditioning for other years of the second commitment period (2013–2016). In response to the list of potential problems and further questions raised by the ERT, Kazakhstan stated that, following the recommendations of the ERT, it had included estimates for mobile air conditioning using the methodology provided in the 2006 IPCC Guidelines (the EF for operation emissions from mobile air conditioning taken from the default range). In addition, the Party provided a detailed historical description of the introduction of cars and trucks with air conditioning from 1990 onward and provided estimates in tabular format of HFC-134a emissions from air conditioning in cars for 1995–2017. However, the ERT was not able to understand exactly from Kazakhstan's response how the methodology provided in the 2006 IPCC Guidelines was applied in the calculation of HFC-134a emissions from mobile air conditioning. The ERT noted that the Party did not provide the value of the EF for operation emissions from mobile air conditioning and the average value used	Yes. Accuracy

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*	*Is finding an issue and/or a problem?*[a]
		in the calculations of HFC charge of mobile air-conditioning units, also noting that CRF table 2(II)B-H (sheet 2) provided only HFC-134a emissions from stocks, while the AD and IEFs were reported using the notation key "NO". As the information on the revised HFC-134a estimates was not transparent and was not prepared in line with the 2006 IPCC Guidelines and the UNFCCC Annex I inventory reporting guidelines, the ERT was not able to assess whether this revision was performed correctly, and therefore disagreed with the Party's response and considered that the potential problem remained unresolved. Therefore, in accordance with the guidance for adjustments under Article 5, paragraph 2, of the Kyoto Protocol (annex to decision 20/CMP.1, in conjunction with decision 4/CMP.11), the ERT carried out the procedure for the calculation of adjustments for this subcategory. The ERT used the method of estimating the average emission rate from a cluster of countries (using the Russian Federation and Ukraine for the cluster) to calculate the adjustments for 2013–2017, with population and HFC-134a emissions per capita as drivers. The adjusted estimates of HFC-134a emissions for this subcategory were 291.79 kt CO_2 eq for 2013; 296.12 kt CO_2 eq for 2014; 300.48 kt CO_2 eq for 2015; 304.78 kt CO_2 eq for 2016; and 308.96 kt CO_2 eq for 2017. As the adjusted emission values calculated by the ERT are lower than the revised HFC-134a emission estimates submitted by Kazakhstan, the calculated adjustment should not be applied. The ERT recommends that Kazakhstan calculate HFC emission estimates for subcategory 2.F.1.e mobile air conditioning using the default methodology provided in the 2006 IPCC Guidelines, with the EF for operation emissions from mobile air conditioning taken from the default range (2006 IPCC Guidelines, vol. 3, chap. 7, table 7.9, p.7.52), and accurate AD, including HFC emissions from disposal (end-of-life) if relevant, and provide transparent and detailed information in the NIR on the method, AD and other parameters used in the calculations (e.g. assumptions on the percentage of vehicles sold with air conditioning among the total number of vehicle registrations and the average HFC charge of mobile air conditioners or other relevant documentation), in addition to reporting relevant AD and IEF values in CRF table 2(II)B-H.	
I.57	2.F.1 Refrigeration and air conditioning – HFCs	The ERT noted that in the NIR (p.182), the Party stated that HFC emissions from refrigerant blends were estimated taking into account the shares of different refrigerants in these blends. According to the NIR, blends of refrigerants used in Kazakhstan are R-404, R-407, R-410 and R-507. The ERT also noted that all these blends contain HFC-125; however, Kazakhstan reported HFC-125 emissions as "NO" for category 2.F.1 refrigeration and air conditioning for the entire time series in the CRF tables. The ERT further noted that from the information provided in the CRF tables and the NIR, it was not possible to assess which specific refrigerant blends were used under different subcategories of category 2.F.1 refrigeration and air conditioning. During the review, Kazakhstan did not clarify in which types of refrigeration or air-conditioning applications (commercial refrigeration, domestic refrigeration, transport refrigeration and stationary air conditioning) the refrigerant blends R-404, R-407, R-410 and R-507 were used. The ERT concluded that this may lead to a potential underestimation of HFC emissions from category 2.F.1 refrigeration and air conditioning for 2013–2017 and all other years of the time series. Therefore, the ERT included this issue in the list of potential problems and further questions raised by the ERT and recommended that Kazakhstan provide revised estimates for category 2.F.1 refrigeration and air conditioning, ensuring that HFC emission estimates by gas for the refrigerant blends used in Kazakhstan are included for 2017 and, following the principle of consistency, for the other years of the second commitment period (2013–2016). The ERT also recommended that Kazakhstan provide a description of the methods, AD and other parameters used for the emission estimates, including transparent information on the types of refrigeration	Yes. Accuracy

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue and/or a problem?[a]
		and/or air-conditioning applications (commercial refrigeration, domestic refrigeration, transport refrigeration or stationary air conditioning) in which the specific refrigerant blends were used. In response to the list of potential problems and further questions raised by the ERT, Kazakhstan reported revised HFC emissions for category 2.F.1 refrigeration and air conditioning, including HFC-32, HFC-125, HFC-143 and HFC-143a, for 1995–2017 and allocated these emissions to subcategory 2.F.1.a commercial refrigeration in the description of the revision. The ERT considered the Party's response and noted that the information provided was very limited and still did not allow the ERT to assess which specific refrigerant blends were used under the different subcategories of category 2.F.1 refrigeration and air conditioning. In addition, Kazakhstan did not provide a transparent explanation of the types of refrigeration or air-conditioning applications (commercial refrigeration, domestic refrigeration, transport refrigeration and stationary air conditioning) in which the refrigerant blends R-404, R-407, R-410 and R-507 were used. Furthermore, the ERT noted that, according to Kazakhstan's response, the HFC emission estimates for subcategory 2.F.1.a commercial refrigeration were revised; however, in the resubmitted CRF tables, only revised estimates for subcategory 2.F.1.b domestic refrigeration were reported, while emissions under subcategory 2.F.1.a commercial refrigeration remained the same as those reported in the original 2019 annual submission. The ERT also noted that the HFC emission estimates reported in the CRF tables and those provided in the description of the revision did not match: in Kazakhstan's response, 338.9 t HFC-125 were reported under subcategory 2.F.1.a commercial refrigeration for 2017, but in the CRF tables these emissions were reported as "NO" and only 40.01 t HFC-125 were reported under subcategory 2.F.1.b domestic refrigeration for 2017. As the information on the revised HFC emission estimates was incomplete, not transparent and had not been prepared in line with the 2006 IPCC Guidelines and the UNFCCC Annex I inventory reporting guidelines, the ERT was not able to assess whether this revision was performed correctly, and therefore disagreed with the Party's response and considered that the potential problem remained unresolved. Therefore, in accordance with the guidance for adjustments under Article 5, paragraph 2, of the Kyoto Protocol (annex to decision 20/CMP.1, in conjunction with decision 4/CMP.11), the ERT carried out the procedure for the calculation of adjustments for category 2.F.1 refrigeration and air conditioning. For the calculations, the ERT noted that according to the 2006 IPCC Guidelines (vol. 3, chap. 7, section 7.5.1, p.7.43), blends of HFCs such as R-407C (HFC-32, HFC-125 and HFC-134a) and R-410A (HFC-32 and HFC-125) are replacing HCFC-22, mainly in stationary air conditioning, and blends of HFCs such as R-404A (HFC-125, HFC-134a and HFC-143a) and R-507A (HFC-125 and HFC-143a) have replaced R-502 and HCFC-22 in commercial refrigeration. Therefore, the adjustments should be applied only for subcategories 2.F.1.a commercial refrigeration and 2.F.1.f stationary air conditioning for 2013–2017 (see chap. VI below and tables 11–12 of annex IV). Further, for subcategory 2.F.1.a commercial refrigeration, the ERT used the method of estimating the average emission rate from a cluster of countries (using the Russian Federation and Ukraine for the cluster) to calculate the adjustments for 2013–2017, with population and HFC emissions per capita as drivers. The adjusted estimates of HFC emissions for subcategory 2.F.1.a commercial refrigeration were 29.63 kt CO_2 eq for 2013; 30.07 kt CO_2 eq for 2014; 30.52 kt CO_2 eq for 2015; 30.95 kt CO_2 eq for 2016; and 31.38 kt CO_2 eq for 2017. These adjusted emission values are lower than the revised HFC emission estimates submitted by Kazakhstan; therefore, the calculated adjustment for subcategory 2.F.1.a commercial refrigeration should not be applied.	

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*	*Is finding an issue and/or a problem?*[a]
		The ERT recommends that Kazakhstan calculate HFC emission estimates for category 2.F.1 refrigeration and air conditioning using the methodology provided in the 2006 IPCC Guidelines, in particular for subcategories 2.F.1.a commercial refrigeration and 2.F.1.f stationary air conditioning, ensuring the use of accurate AD, and include HFC emission estimates by gas for the refrigerant blends used in Kazakhstan, ensuring, in particular, that HFC-125 is included. The ERT also recommends that Kazakhstan provide transparent and detailed information in the NIR on the method, AD and other parameters used for the emission estimates, including transparent information on the types of refrigeration and/or air-conditioning applications (commercial refrigeration, domestic refrigeration, transport refrigeration or stationary air conditioning) in which the specific refrigerant blends are used.	
I.58	2.F.4 Aerosols – HFCs	The ERT noted that HFC emissions from subcategory 2.F.4.a metered dose inhalers were reported as "NO" in the CRF tables, although the 2006 IPCC Guidelines (vol. 2, chap. 7, pp.7.28–7.29) provide an estimation method for this subcategory and Kazakhstan was the only Annex I Party to report these emissions as "NO" for the whole time series. The ERT noted that metered dose inhalers containing HFCs as propellant are quite common in asthma treatments and it is unlikely that such products are not used in Kazakhstan. During the review, the Party indicated that there are currently no reliable data to estimate the number of metered dose inhalers used for the entire time series from 1990, but efforts are being made to obtain this information. The ERT performed rough preliminary estimates of HFC emissions using the per capita average emission rate from a cluster of countries with similar conditions (Russian Federation and Ukraine) and concluded that the reported emissions were underestimated for 2017. The results showed that emissions for 2017 would increase by 32 kt CO_2 eq, or 0.009 per cent of the national total; however, this likely level of underestimation of emissions does not exceed the significance threshold of 0.05 per cent of the national total (183.09 kt CO_2 eq), or 500 kt CO_2 eq. Therefore, this issue was not included in the list of potential problems and further questions raised by the ERT.	Yes. Completeness
		The ERT recommends that, for the next annual submission, Kazakhstan collect AD and estimate CO_2 emissions from subcategory 2.F.4.a metered dose inhalers using the default methodology provided in the 2006 IPCC Guidelines (vol. 2, chap. 7, pp.7.28–7.29) or clearly demonstrate in the NIR that emissions from this subcategory are insignificant in accordance with paragraph 37(b) of the UNFCCC Annex I inventory reporting guidelines.	
Agriculture			
A.13	3.B Manure management – CH_4 and N_2O	The ERT noted that Kazakhstan provided information on the fractions of different manure management systems used per animal species in table 5.21 of the NIR (p.227). The information is based on an analysis of scientific literature, local meteorological conditions and the distribution of animal populations by province. However, the values are fixed for the entire time series. In the NIR (section 5.1, p.207) Kazakhstan explained that animal husbandry has changed since 1990 as a result of serious economic crises in 1990–1998 and the subsequent improvement in the Party's economic situation. The ERT concluded that this indicates that the structure of farms and management practices have also changed. In response to a question raised by the ERT during the review, Kazakhstan explained that since the 1990s, the number of livestock, distribution by species and productivity have changed significantly, but the weather conditions have remained the same (i.e. the grazing period is approximately the same from year to year). Kazakhstan further stated that the practice of dry storage of manure when kept in a stall has also remained the same and that the distribution of animals by region has not changed significantly either.	Yes. Accuracy

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*	*Is finding an issue and/or a problem?*[a]
		The ERT recommends that Kazakhstan collect robust information on manure management systems used for all animal species for the whole time series, ensuring the representation, at a minimum, of the current and 1990 distribution of manure management systems, taking into account changes and progress in agriculture production systems, and that the Party use this information in the emission calculations of future annual submissions.	
A.14	3.B.1 Cattle – N_2O	The ERT noted that Nex values for non-dairy cattle vary from 44.97 kg N/head (1990) to 34.11 kg N/head (1996) and 42.29 kg N/head (2017). The values are below the IPCC default value for Eastern Europe of 49.95 kg N excreted per year, derived from the IPCC default value for the Nex rate for other cattle in Eastern Europe (2006 IPCC Guidelines, vol. 4, chap. 10, table 10.19, p.10.59) and the IPCC default weight of 391 kg for other cattle for Eastern Europe (2006 IPCC Guidelines, vol. 4, annex 10A.2, table 10.A-5, p.10.78). In its response to a question raised by the ERT during the review, Kazakhstan explained that the low values result from the fact that in Kazakhstan, non-dairy cattle are usually slaughtered early when the cattle are two–three years old. Data on live weight before slaughter were obtained from the Agency of Statistics of Kazakhstan and provided in the NIR (section 5.2.2, table 5.6). Inter-annual changes were explained by the collapse of the former Soviet Union, the breakdown in the economy and the serious economic crisis which caused a drop in livestock productivity, including animal weights.	Yes. Transparency
		To increase the transparency of the estimates, the ERT recommends that Kazakhstan provide more disaggregated information regarding the contribution of different species according to age, type of production and sex (e.g. calves, bulls, heifers) in the NIR of the next annual submission and include, if available, animal numbers of different animal species considered in the non-dairy subcategory.	
A.15	3.B.3 Swine – CH_4	The ERT noted that CH_4 emissions from manure management systems for swine, as a significant species in 1990–1995 and 1998–2008, accounted for about 35.2 and 14.0 per cent of total CH_4 emissions from manure management systems for 1990 and 2017, respectively. However, Kazakhstan applied the tier 1 methodology to calculate the emission estimates.	Not an issue/problem
		The ERT reiterates the encouragement from the 2016 and 2017 annual review reports (FCCC/ARR/2016/KAZ, ID# A.17 and FCCC/ARR/2017/KAZ, ID# A.13, respectively) for Kazakhstan to make efforts to apply a tier 2 approach for the estimation of CH_4 emissions from manure management systems for swine. Default values for maximum methane-producing capacity of manure (known as "B_O") and volatile solids (known as "VS") from the 2006 IPCC Guidelines (vol. 4, chap. 10, annex 10A.2, table 10.A-7, p.10.81) could be applied.	
A.16	3.B.4 Other livestock – CH_4	Kazakhstan reported in the NIR for subcategory 3.B.4 other livestock – buffalo that it used the default tier 1 EF of 5 kg CH_4/head/year for cool Eastern Europe from the 2006 IPCC Guidelines (vol. 4, chap. 10, table 10.14, p.10.38). The ERT noted that the CH_4 IEFs changed from 5 kg CH_4/head/year in 1990 to 5.56 kg CH_4/head/year in 2000 and to 4.82 kg CH_4/head/year in 2017. In response to a question raised by the ERT during the review, Kazakhstan explained that the default tier 1 EF of 5 kg CH_4/head/year for cool Eastern Europe was used for the calculations and that deviations from that figure in the CRF tables are related to rounding errors, as rounded emission values were entered in the CRF tables and the emissions from buffalos are small.	Yes. Accuracy
		The ERT recommends that Kazakhstan report unrounded emission data for subcategory 3.B.4 other livestock – buffalo in the CRF tables of its next annual submission and ensure that no rounding errors are reflected in the CRF tables.	

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*	*Is finding an issue and/or a problem?*[a]
A.17	3.D Direct and indirect N_2O emissions from agricultural soils – N_2O	The ERT noted that Kazakhstan performed significant recalculations of N_2O emissions from agricultural soils in the 2019 annual submission compared with the 2018 annual submission (+2.8 per cent for 1990, –36.09 per cent for 1995, –8.10 per cent for 2000, +12.64 per cent for 2005, +22.26 per cent for 2010, +3.11 per cent for 2015 and +0.45 per cent for 2016). In the NIR (section 5.5.5, p.239), Kazakhstan explained that the recalculations were a result of the use of corrected population numbers for sheep and goats, a corrected calculation of N_2O emissions from mineralization and the use of improved data on crop yields. However, Kazakhstan did not include detailed data at the subcategory level in the NIR, which would have enabled an assessment of the changes. In response to a question raised by the ERT during the review, Kazakhstan explained that the main contributing factor to the changes was the recalculations of mineralization of organic matter on the basis of data used in the LULUCF sector. Kazakhstan provided a table that included the changes of AD at the subcategory level. The ERT agreed with the explanations provided. The ERT recommends that Kazakhstan provide detailed information on the reasons for recalculations of emissions from category 3.D agricultural soils, including, when relevant, information at the subcategory level, in the recalculation sections of the NIR, and tables showing the resulting differences among annual submissions.	Yes. Transparency
A.18	3.D.a.1 Inorganic N fertilizers – N_2O	The ERT noted that for the calculation of N_2O emissions from inorganic N fertilizers, Kazakhstan used the default EF for N amounts applied to arable land of 0.01 and the default EF for N amounts applied to rice fields of 0.003 from the 2006 IPCC Guidelines (vol. 4, chap. 11, table 11.1, p.11.11). Weighted annual average EFs vary from year to year depending on the ratio of the application of N to cropland and rice fields. The ERT also noted that the N_2O IEF decreased from 0.010 in 1990 to 0.009 in 2017. However, the ERT could not assess the variations in the IEF as the NIR did not include specific disaggregated AD (amounts of mineral fertilizer applied to arable land and rice fields). In its response to a question raised by the ERT during the review, Kazakhstan provided official data on fertilizer application from the Agency of Statistics of Kazakhstan for arable land and rice fields, which explained the variations in the IEF. The ERT recommends that Kazakhstan include disaggregated AD on fertilizer application for arable land and rice fields in the NIR of the next annual submission, as indicated in its response to the ERT.	Yes. Transparency
A.19	3.D.a.2.b Sewage sludge applied to soils – N_2O	The ERT noted that Kazakhstan reported the notation key "NO" for subcategory 3.D.a.2.b sewage sludge applied to soils. In the NIR (p.234), Kazakhstan explained that wastewater is not discharged into soils owing to the high toxicity of residues and their contamination with heavy metals and helminths. However, no further explanation of how sewage sludge is processed in Kazakhstan, either in the urban environment or in the countryside, was included in the NIR to underpin this statement. During the review, the ERT asked Kazakhstan to justify its assumption that no sewage sludge is applied to soils or to provide an estimate of the associated emissions from sewage sludge applied to soils, as the reporting using the notation key "NO" may result in a potential underestimation of emissions. In its response to the ERT, Kazakhstan explained that it "mainly uses technology for storing sewage sludge in special areas" and that it is not applied to the soil owing to its toxicity. Kazakhstan also provided a reference to national legislation regarding the collection of wastewater in the sewage systems of settlements, but explained that the use of sewage sludge is not regulated by this legislation. In addition, Kazakhstan did not provide the required estimate of emissions from sewage sludge applied to soils. Therefore, the ERT estimated the potential emissions for this subcategory using the default tier 1 assumption of 0.05 kg sewage sludge N applied to soils per capita and per year obtained from the *EMEP/EEA Air Pollutant Emission*	Yes. Completeness

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue and/or a problem?[a]
		Inventory Guidebook 2016 (EEA, 2016) and the population of Kazakhstan in 2017, obtained from table 7.4 of the NIR (p.302). The calculation made using the default N_2O EF (EF_1 = 0.01) from the 2006 IPCC Guidelines (vol. 4, chap. 11, table 11.1, p.11.11) resulted in an estimate of 4.25 kt CO_2 eq for 2017. The ERT noted that the resulting emission estimate was below the threshold provided in paragraph 37(b) of the UNFCCC Annex I inventory reporting guidelines, which in the case of Kazakhstan is 183.09 kt CO_2 eq. The ERT recommends that Kazakhstan estimate N_2O emissions from subcategory 3.D.a.2.b sewage sludge applied to soils and report emission values in the next annual submission or use the notation key "NE" and provide evidence that N_2O emissions from this subcategory are below the significance threshold provided in paragraph 37(b) of the UNFCCC Annex I inventory reporting guidelines.	
A.20	3.D.a.2.c Other organic fertilizers applied to soils – N_2O	The ERT noted that Kazakhstan reported the notation key "NO" for subcategory 3.D.a.2.c other organic fertilizers applied to soils. However, no explanation for reporting the subcategory as "NO" was provided in the NIR. In its response to a question raised by the ERT during the review, the Party explained that the application of compost N on agricultural soils is not practised in Kazakhstan and that this is confirmed by an analysis of scientific literature. Noting that Kazakhstan also reported the notation key "NO" for composting in the waste sector, the ERT agreed with the explanation. The ERT recommends that Kazakhstan include, in the agriculture chapter of the NIR of the next annual submission, an explanation of the non-occurrence of the application of other organic fertilizers to soils based on analyses of scientific literature or any other documented source of information.	Yes. Transparency
A.21	3.D.a.6 Cultivation of organic soils (i.e. histosols) – N_2O	The ERT noted that in the NIR (section 5.5.2, p.236), Kazakhstan stated that its agricultural lands do not meet the criteria of the *World Reference Base for Soil Resources* (Food and Agriculture Organization of the United Nations, 1998) in terms of humus content. However, no further documentation to justify this statement was included in the NIR. In response to a question raised by the ERT during the review, Kazakhstan explained that this assessment is based on scientific works of Kazakhstani scientists and provided references to scientific works regarding soils in the country (Borovsky and Uspanov, 1971; Faizov, Urazaliev and Iorgansky, 2001). The ERT noted that the reporting of the notation key "NO" in CRF table 3.D for cultivation of organic soils is consistent with the reporting in CRF table 4(II). However, the ERT recommends that Kazakhstan provide references to scientific works regarding the characteristics of agricultural soils in Kazakhstan, such as Borovsky and Uspanov (1971) and Faizov, Urazaliev and Iorgansky (2001), including accompanying explanations in the NIR (section 5.5.2) of the next annual submission.	Yes. Transparency
A.22	3.D.b.2 Nitrogen leaching and run-off	The ERT noted inconsistencies between the NIR and the CRF tables; for example, on page 238 of the NIR the Party explained that "for the conditions of Kazakhstan, the $Frac_{LEACH}$ coefficient was changed to 0.1". However, a value of 0.01 for $Frac_{LEACH}$ was reported for 2017 in CRF table 3.D. In response to a question raised by the ERT during the review, Kazakhstan explained that it used the correct value in line with the description in the NIR and that it will include the correct value of $Frac_{LEACH}$ in CRF table 3.D in its next annual submission. Kazakhstan further explained that it will implement appropriate QC procedures to ensure consistent reporting in the NIR and CRF tables. The ERT also noted that in the NIR (section 5.5.4, p.238), the Party only indicated that QA/QC procedures were carried out by specialists from JSC "Zhasyl Damu" and experts from other agencies in Kazakhstan, without providing further information on the specific activities performed.	Yes. Convention reporting adherence

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*	*Is finding an issue and/or a problem?*[a]
		The ERT recommends that Kazakhstan correct the identified inconsistency between the $Frac_{LEACH}$ values reported in the NIR and CRF table 3.D, improve its QC procedures for ensuring complete consistency of the reporting of the agriculture sector in the NIR and CRF tables, and describe the specific QA/QC activities performed for the agriculture sector in the NIR of its next annual submission.	
A.23	3.H Urea application – CO_2	The ERT noted that Kazakhstan reported CO_2 emissions from urea application for 1996 onward. For 1990–1995, Kazakhstan reported the notation key "NE". In its NIR, Kazakhstan explained that data for 1990–1995 were not available from the Agency of Statistics of Kazakhstan and therefore the emissions were not estimated. However, the ERT noted that total mineral fertilizer application data were available for 1990 onward and urea was also very likely to have been used in those years. In response to a question raised by the ERT during the review, Kazakhstan explained that there was no strong correlation between the use of urea and other types of inorganic fertilizers that allowed the calculations to be performed; however, the Party stated that it would try to estimate CO_2 emissions for 1990–1995 using the 2006 IPCC Guidelines and implement this improvement in the next annual submission.	Yes. Completeness
		The ERT recommends that Kazakhstan provide a complete time series of CO_2 emission estimates for urea application in the next annual submission, using the recommendations provided in the 2006 IPCC Guidelines on data gathering (vol. 1, chap. 2) or splicing techniques (vol. 1, chap. 5.3, pp.5.8–5.14) if data are not available for the early years of the time series.	
LULUCF			
L.20	Land representation – CO_2	The ERT noted that Kazakhstan reported the notation key "NA" in CRF table 4.1 for all cells that do not contain values. During the review, Kazakhstan informed the ERT that the notation key "NA" was used for all cells without values in order to reflect the fact that new technologies for land use were not applied for cases without land conversion. The ERT concluded that this explanation did not justify the use of the notation key "NA" in CRF table 4.1 and that this use of the notation key is not in accordance with footnote 1 to that table.	Yes. Convention reporting adherence
		The ERT recommends that, in the next annual submission, Kazakhstan revise the application of notation keys in CRF table 4.1 in accordance with paragraph 37 of the UNFCCC Annex I inventory reporting guidelines and footnote 1 to the above-mentioned table, taking into consideration that some land-use changes have occurred and/or may occur within the country.	
L.21	4.E.2 Land converted to settlements – CO_2	The ERT noted that Kazakhstan reported in the NIR (section 6.7.2, p.282) that for the calculation of CSCs in living biomass and soils on land converted to settlements, it used equations 8.1 and 8.2 and the default factor of 2.9 t C/ha crown cover/year from the 2006 IPCC Guidelines (vol. 4, chap. 8, section 8.2, pp.8.6–8.9). The ERT also noted that these equations are part of the tier 2a method (crown cover area method) from the 2006 IPCC Guidelines for settlements remaining settlements. During the review, Kazakhstan did not justify the application of the tier 2a method for the calculation of CSCs in living biomass for land converted to settlements, which is provided in the 2006 IPCC Guidelines (vol. 4, chap. 8, section 8.3.1, pp.8.18–8.20).	Yes. Accuracy
		The ERT recommends that Kazakhstan report CSCs and corresponding CO_2 emissions/removals for land converted to settlements in line with the 2006 IPCC Guidelines (vol. 4, chap. 8, section 8.3, pp.8.17–8.25) in the next annual submission.	

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*	*Is finding an issue and/or a problem?*[a]
L.22	4(I) Direct N_2O emissions from nitrogen inputs to managed soils – N_2O	The ERT noted that Kazakhstan reported the notation key "NO" for the AD for forest land, wetlands and settlements in CRF table 4(I) for direct N_2O emissions from N inputs to managed soils. The ERT also noted that no information justifying the non-occurrence of such emissions was reported in the documentation box of CRF table 4(I) or in the NIR. During the review, in response to a question raised by the ERT, Kazakhstan explained that the application of mineral and organic fertilizers to soils of forest lands, wetlands and in places of settlement did not occur in 1990–2017. However, no additional information (i.e. documentation) was provided to justify its statement that mineral and organic fertilizer application to soils of forest lands, wetlands and in places of settlements did not occur in Kazakhstan. The ERT recommends that Kazakhstan provide transparent and documented information in the NIR justifying that there is no N fertilization activity on forest land, wetlands and settlements, as reported in CRF table 4(I). If this is not possible, the ERT recommends that Kazakhstan report N_2O emissions in the next annual submission in accordance with the recommendations of the 2006 IPCC Guidelines (vol. 4, chap. 11, section 11.2.1, pp.11.6–11.14).	Yes. Transparency
L.23	4(III) Direct N_2O emissions from N mineralization/ immobilization – N_2O	The ERT noted that Kazakhstan reported the notation key "NO" for the AD and N_2O emissions for all land-use categories in CRF table 4(III), except for lands converted to cropland, for which the notation key "NA" was reported for N_2O emissions. No information justifying the use of the notation keys "NO" and "NA" in CRF table 4(III) was provided by Kazakhstan either in the documentation box of CRF table 4(III) or in the NIR. The ERT also noted that Kazakhstan calculated and reported in CRF tables 4.A–4.F and in its NIR the area and CO_2 emissions and removals for forest land remaining forest land, lands converted to forest land, grassland remaining grassland, lands converted to grassland (reported only in the NIR), wetlands remaining wetlands, lands converted to wetlands and lands converted to settlements. Considering that organic carbon and nitrogen are closely linked in soil organic matter, if the Party reports CSCs in soils for a land-use category or subcategory, it should also consider and report direct N_2O emissions from N mineralization/immobilization associated with loss/gain of soil organic matter resulting from the change of land use or management, according to the 2006 IPCC Guidelines. During the review, Kazakhstan did not provide information justifying the use of the notation keys "NO" and "NA" for the AD and N_2O emissions in CRF table 4(III). The ERT recommends that Kazakhstan calculate direct N_2O emissions from N mineralization associated with loss/gain of soil organic matter resulting from a change of land use or management of mineral soils for each land-use category present in the country using the methodology provided in the 2006 IPCC Guidelines (vol. 4, chap. 11, section 11.2.1, pp.11.6–11.16) and report them in CRF table 4(III) and the NIR, including a description of the methodology applied, in the next annual submission.	Yes. Completeness
L.24	4(V) Biomass burning – CO_2, CH_4 and N_2O	The ERT noted that for the calculation of GHG emissions from wildfires, Kazakhstan reported in its NIR for some land-use categories the same area affected by wildfires for both 2016 and 2017, namely 275 ha of forest land (table 6.14, p.262) and 38,645 ha of grassland (table 6.27, p.277). In addition, the area of grassland reported in the NIR was not consistent with the area reported in CRF table 4(V) of 35,645 ha. During the review, Kazakhstan informed the ERT that the AD used for the calculation of GHG emissions from wildfires on forest land and grassland for 2017 were not received in time for the preparation of the 2019 annual submission and therefore values from the previous year were used. In addition, the Party provided the ERT with updated values of the area affected by wildfires for 2017 obtained from the responsible entities: 13,369 ha of forest land	Yes. Accuracy

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*	*Is finding an issue and/or a problem?*[a]
		(provided by the Agency of Statistics of Kazakhstan) and 848,783 ha of grassland (provided by the Committee on Emergency Situations of the Ministry of Internal Affairs). Taking into account this information, the ERT concluded that Kazakhstan underestimated GHG emissions from wildfires on forest land and grassland for 2017. The ERT recommends that Kazakhstan report in its next annual submission GHG emissions from wildfires for forest land and grassland using actual AD for 2017 and onward and provide transparent information in the NIR on improvements performed, including on the collection of relevant data.	
Waste			
W.17	5.A Solid waste disposal on land – CH_4	The ERT noted that in the original 2019 annual submission, the reported CH_4 IEF for managed waste disposal sites – anaerobic for 2017 was 0.03 t/t waste and the reported CH_4 IEF for unmanaged waste disposal sites was 0.05 t/t waste. The ERT raised a question regarding the accuracy of the CH_4 emission estimates, given that CH_4 generation is usually higher in anaerobic conditions. During the review, in response to a question raised by the ERT, Kazakhstan did not provide a relevant explanation for the reported values for the CH_4 IEF. The ERT also noted that in the revised 2019 annual submission, the reported value for the CH_4 IEF for managed waste disposal sites – anaerobic for 2017 decreased to 0.02 t/t waste, while the CH_4 IEF for unmanaged waste disposal sites generally remained at 0.05 t/t waste for the whole time series, with a marginal decrease (see ID# W.18 below). The ERT believes that future ERTs should consider this issue further to ensure that there is not an underestimation of CH_4 emissions from this category. The ERT recommends that Kazakhstan provide an explanation for the unusual ratio between the IEFs for managed anaerobic and unmanaged waste disposal sites, and/or revise the corresponding CH_4 emission estimates for the complete time series, if necessary.	Yes. Accuracy
W.18	5.A Solid waste disposal on land – CH_4	The ERT noted that the NIR did not contain a clear description of the AD used for the calculation of annual waste generation for estimating CH_4 emissions from category 5.A solid waste disposal. The ERT also noted that according to the information presented in the NIR (p.291), the volume of generated municipal waste per capita in 2017 amounted to 165.4 kg; however, no other value for this parameter for other years of the time series was reported. The ERT noted that national statistics show an urban population of 10,423,569 inhabitants in 2017 (NIR, table 7.4, p.302) and municipal waste collected and transported to landfills amounting to 3,414,975 t in 2017 (NIR, p.288), which corresponds to the data of the Agency of Statistics of Kazakhstan (https://stat.gov.kz/official/industry/157/statistic/5). Therefore, the waste generated per capita of the urban population calculated by the ERT amounts to 327.62 kg for 2017. The ERT further noted that the value of 165.4 kg/capita is very low compared with similar or neighbouring countries. For example, for the Russian Federation this value is 340 kg/capita in 2017. The value reported by Kazakhstan is among the lowest values presented in table 2A.1 of the 2006 IPCC Guidelines (vol. 5, chap. 2, annex 2A.1, pp.2.17–2.19). In addition, the ERT noted that the value of annual waste at SWDS reported in CRF table 5.A of the 2019 annual submission is about two times lower than the value reported in the 2017 annual submission. During the review, Kazakhstan provided the ERT with the values of waste generated per capita for 2005–2017 without an explanation of how these values were calculated. The presented values vary from 138.1 to 244.1 kg/capita, which again demonstrated the unreliability of the data. Taking this into account, the ERT concluded that the data on waste generation per capita for 2017 could be underestimated and, therefore, the annual waste generation values used by Kazakhstan may lead to a potential underestimation of CH_4 emissions from category	Yes. Transparency

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*	*Is finding an issue and/or a problem?*[a]
		5.A solid waste disposal for 2017 and for the whole time series. Therefore, the ERT included this issue in the list of potential problems and further questions raised by the ERT and recommended that Kazakhstan explain the differences between the value of waste generation per capita reported in the NIR and the value obtained using publicly available national statistics on the country's national urban population and on collected and transported municipal waste for 2017 (http://stat.gov.kz/faces/wcnav_externalId). If it is not possible to justify the low value of waste generation per capita used in the CH_4 emission calculations for this category in the 2019 annual submission, the ERT recommended that Kazakhstan revise the CH_4 emission estimates for category 5.A solid waste disposal for 2017 using the national statistics on the country's urban population and the collected and transported municipal waste. Following the principle of consistency, the ERT also recommended that Kazakhstan revise the CH_4 emission estimates for category 5.A solid waste disposal for the other years of the second commitment period (2013–2016) and, if possible, for the entire time series. In response to the list of potential problems and further questions raised by the ERT, Kazakhstan indicated that the municipal waste generation per capita of 165.4 kg for 2017 provided in the reference book of the Agency of Statistics of Kazakhstan was based on the entire population of Kazakhstan rather than its urban population, which led to an error in the calculations. Therefore, to correct this error, the Party revised the waste generation per capita values and the estimates of CH_4 emissions from category 5.A solid waste disposal for the entire time series. The ERT noted that the revised CH_4 emissions from category 5.A solid waste disposal for the entire time series were reported in the resubmitted CRF tables. The ERT agreed with Kazakhstan's revised estimates and therefore concluded that the problem is resolved. As a result of the revision, the CH_4 emissions from category 5.A solid waste disposal increased by 2,071.60 kt CO_2 eq (0.7 per cent of the national total and 54.8 per cent of total emissions from the waste sector) for 2013; by 2,127.85 kt CO_2 eq (0.7 per cent of the national total and 54.4 per cent of total emissions from the waste sector) for 2014; by 2,180.05 kt CO_2 eq (0.7 per cent of the national total and 54.3 per cent of total emissions from the waste sector) for 2015; by 2,222.85 kt CO_2 eq (0.7 per cent of the national total and 54.3 per cent of total emissions from the waste sector) for 2016; and by 2,257.95 kt CO_2 eq (0.6 per cent of the national total and 55.7 per cent of total emissions from the waste sector) for 2017. The ERT recommends that Kazakhstan provide in the NIR clear, comprehensive and documented descriptions of the AD used for the calculation of annual waste generation for estimating CH_4 emissions from category 5.A solid waste disposal, including values for the complete time series of the AD used for the emission estimates, such as per capita waste generation values, total population and urban population of the country served by waste collection systems, as well as collected waste volume and waste density for the years for which these AD were used, as appropriate. The ERT also recommends that Kazakhstan justify the unexpected low per capita waste generation values compared with values reported by similar or neighbouring countries and with the values presented in table 2A.1 of the 2006 IPCC Guidelines (vol. 5, chap. 2, annex 2A.1, pp.2.17–2.19), or, if this is not possible, revise the CH_4 emission estimates for category 5.A solid waste disposal for the whole time series using revised data for per capita waste generation of the urban population.	
W.19	5.A Solid waste disposal on land – CH_4	The ERT noted that, owing to recalculations performed in the 2019 annual submission, total emissions from the waste sector decreased significantly for all years of the time series (by 19–31 per cent) compared with the emissions reported in the previous annual submission, in particular for category 5.A solid waste disposal (by 41–49 per cent); however, the NIR did not provide sufficient explanations for the rationale behind the changes in the	Yes. Transparency

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*	*Is finding an issue and/or a problem?*[a]
		waste generation per capita and the MCF used for these recalculations (section 7.1.5, p.296). During the review, Kazakhstan explained that because official data on the amount of MSW in Kazakhstan from 2005 to 2017 were provided on the website of the Agency of Statistics of Kazakhstan (https://www.stat.gov.kz/), emissions were recalculated for all years in the time series using the extrapolation method and, therefore, the emissions decreased as reported. The ERT noted that this explanation did not fully clarify or provide verifiable information on the reasons for this decrease. The ERT recommends that Kazakhstan provide, in accordance with the UNFCCC Annex I inventory reporting guidelines, comprehensive, verifiable and documented information explaining significant changes caused by recalculations in the NIR of its future annual submissions, in particular when key parameters such as waste generation per capita and the MCF are revised.	
W.20	5.A Solid waste disposal on land – CH_4	The ERT noted that in the NIR (p.293), Kazakhstan reported that "the fraction of actually decomposed degradable organic carbon (DOC_f) generated in landfills is assumed to be 0.5". This means that the value of DOC_f is 50 per cent. However, the values reported in CRF table 5.A were 13.13 per cent (anaerobic), 15.16 per cent (semi-aerobic) and 18.83 per cent (unmanaged waste disposal sites) for 2017. During the review, Kazakhstan explained that the reported DOC_f values in CRF table 5.A differ from 0.5, as the values change, when evaluating data depending on the composition of waste, which is based on modelling. The ERT noted that this explanation did not clarify the issue raised by the ERT and that the NIR did not contain the necessary information to allow for replication of the DOC_f estimates. Moreover, this information was not provided during the review. The ERT concluded that the reported country-specific DOC_f values were not justified or documented and, therefore, their use may not be in accordance with the good practice recommendations of the 2006 IPCC Guidelines (vol. 5, chap. 3, p.3.14). Consequently, the CH_4 emission estimates for category 5.A solid waste disposal as reported by Kazakhstan may also not be in line with the 2006 IPCC Guidelines. The ERT believes that future ERTs should consider this issue further to ensure that there is not an underestimation of CH_4 emissions from category 5.A solid waste disposal. The ERT recommends that Kazakhstan provide comprehensive, verifiable and documented information on the reported country-specific DOC_f values. If this is not possible, the ERT recommends that Kazakhstan use the default value of DOC_f (0.5) for revising its CH_4 emission estimates for category 5.A solid waste disposal.	Yes. Transparency
W.21	5.A Solid waste disposal on land – CH_4	The ERT noted that in the NIR (p.293), Kazakhstan reported that the following MCF values were used for the CH_4 emission estimates: 1.0 for controlled anaerobic SWDS for Astana; 0.5 for controlled semi-anaerobic SWDS for Almaty; and 0.8 for unmanaged deep landfills for other cities of Kazakhstan. However, the ERT also noted that a value of 0.6 was reported for 2017 in the original submission of CRF table 5.A for unmanaged waste disposal sites, but the correct value of 0.8 was reported for 1990–2016. During the review, Kazakhstan explained that an error had occurred in the use of this value and that it will be corrected in the future. The ERT concluded that the use of an MCF value of 0.6 for unmanaged waste disposal sites for the CH_4 emission estimates for category 5.A solid waste disposal for 2017 was not in line with the default MCF value recommended by the 2006 IPCC Guidelines (vol. 5, chap. 3, table 3.1, p.3.14), taking into account the fact that Kazakhstan reported in the NIR that this is the value used for estimating CH_4 emissions for unmanaged deep landfills for other cities of Kazakhstan. Lastly, the ERT noted that in the resubmission of the CRF tables made in response to the list of potential problems and further questions raised by the ERT, Kazakhstan corrected the MCF value used for 2017	Yes. Convention reporting adherence

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*	*Is finding an issue and/or a problem?*[a]
		to 0.8 for unmanaged waste disposal sites reported under category 5.A solid waste disposal (see ID# W.18 above). The ERT recommends that Kazakhstan ensure the consistency of the information reported in the CRF tables and the NIR on the MCF values used for unmanaged deep SWDS in accordance with the 2006 IPCC Guidelines (vol. 5, chap. 3, table 3.1, p.3.14) for the complete time series, and implement QC checks to ensure the consistency of the data used and reported.	
KP-LULUCF activities			
KL.6	General (KP-LULUCF activities) – CO_2, CH_4 and N_2O	The ERT noted that, according to decision 2/CMP.7, annex, paragraph 25, "national inventory systems established under Article 5, paragraph 1, shall ensure that areas of land subject to land use, land-use change and forestry activities under Article 3, paragraphs 3 and 4, are identifiable, and information on these areas shall be provided by each Party included in Annex I in their national inventories in accordance with Article 7". The ERT also noted that Kazakhstan considered the reporting of KP-LULUCF activities with reference to lands at the national level (citing the map with the national land cover) rather than at the level of geographical boundary that encompasses units of land subject to KP-LULUCF activities. The ERT further noted that the Party did not provide any information in the NIR demonstrating that the national inventory system ensures that areas of land subject to KP-LULUCF activities are identifiable, or any information on these areas or on KP-LULUCF activities (see ID# G.6 in table 3 and ID# KL.7 below). During the review, Kazakhstan indicated to the ERT that a detailed and transparent description of the process established by the national system for the identification of land areas on which activities are carried out in accordance with Article 3, paragraphs 3 and 4, of the Kyoto Protocol will be provided in the future. Kazakhstan also stated that within the framework of the national GHG inventory system, additional information on activities carried out in accordance with Article 3, paragraphs 3 and 4, of the Kyoto Protocol can only be submitted at the national level. In addition, Kazakhstan indicated that to represent areas of mandatory and selected activities, namely AR, FM and GM, in the 2018 annual submission, the Party used the method of identifying a wide area on which various land use related activities are carried out (in accordance with the Kyoto Protocol Supplement, chap. 4). The ERT included this issue in the list of potential problems and further questions raised by the ERT and recommended that Kazakhstan provide information in accordance with the requirements of decision 2/CMP.7, annex, paragraph 25, demonstrating that the national inventory system established under Article 5, paragraph 1, of the Kyoto Protocol ensures that areas of land subject to KP-LULUCF activities are identifiable and that information on these areas is provided in accordance with Article 7 of the Kyoto Protocol. In response to the list of potential problems and further questions raised by the ERT, Kazakhstan indicated that in accordance with paragraph 2 of the draft action plan of Kazakhstan to exit the non-compliance regime under the Kyoto Protocol, it will make amendments and additions, including specific ones, to the functions of the national system by 15 March 2020, which will guarantee the possibility of identifying land plots with land uses selected for reporting under the Kyoto Protocol, in accordance with Article 3, paragraphs 3 and 4, of the Kyoto Protocol.	Yes. KP reporting adherence

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*	*Is finding an issue and/or a problem?*[a]
		The ERT considered that the Party's response did not resolve the potential problem because the Party did not provide the required information to demonstrate that the national inventory system of Kazakhstan established under Article 5, paragraph 1, of the Kyoto Protocol ensures that areas of land subject to KP-LULUCF activities are identifiable, in accordance with decision 2/CMP.7, annex, paragraph 25, and that information on these areas subject to KP-LULUCF activities is provided, in accordance with Article 7 of the Kyoto Protocol. Taking into account the lack of provision of the mandatory information required by decision 2/CMP.7, annex, paragraph 25, as recommended by the ERT, the ERT has identified this problem, which pertains to language of a mandatory nature and influences the fulfilment of commitments, as a question of implementation in accordance with decision 22/CMP.1 in conjunction with decision 4/CMP.11 (see chap. VIII below). The ERT recommends that the Party provide information demonstrating that the national inventory system of Kazakhstan established under Article 5, paragraph 1, of the Kyoto Protocol ensures that areas of land subject to KP-LULUCF activities are identifiable and provide information on these areas in accordance with the requirements of decision 2/CMP.7, annex, paragraph 25, in the next annual submission.	
KL.7	General (KP-LULUCF activities) – CO_2, CH_4 and N_2O	The ERT noted that Kazakhstan did not provide a chapter or section related to the reporting of KP-LULUCF activities in the NIR, and therefore did not report any of the required information related to KP-LULUCF activities in its 2019 annual submission. The ERT also noted that in its 2017 annual submission, Kazakhstan did not provide the mandatory information on KP-LULUCF activities in accordance with decision 2/CMP.8, annex II, paragraphs 2(b) and (d–e), 4(a–b) and 5(a–c) and (e) (see ID# KL.1 in table 3). The ERT further noted that the Party did not provide the mandatory information for AR and deforestation under Article 3, paragraph 3, of the Kyoto Protocol and for FM and GM under Article 3, paragraph 4, of the Kyoto Protocol, as required by decision 2/CMP.8, annex II, paragraphs 2(a–e) and (g), 3(a–c), 4(a–b) and 5(a–c) and (e), on KP-LULUCF activities. During the review, Kazakhstan informed the ERT that the information required by decision 2/CMP.8, annex II, will be included in the next annual submission. The ERT included this issue in the list of potential problems and further questions raised by the ERT and recommended that Kazakhstan provide the required information on KP-LULUCF activities in accordance with decision 2/CMP.8, annex II, paragraphs 2(a–e) and (g), 3(a–c), 4(a–b) and 5(a–c) and (e). The ERT further recommended that Kazakhstan apply, as appropriate, the methodologies provided in the 2006 IPCC Guidelines (vol. 4) and the Kyoto Protocol Supplement for the development of the requested information. In response to the list of potential problems and further questions raised by the ERT, Kazakhstan indicated that the information in accordance with decision 2/CMP.8, annex II, paragraphs 2(a–e) and (g), 3(a–c), 4(a–b) and 5(a–c) and (e), on KP-LULUCF activities will be provided in the 2021 annual submission for 2013–2019, in accordance with paragraph 4 of the draft action plan of Kazakhstan to exit the non-compliance regime under the Kyoto Protocol, which refers to the planned changes in the national system established under Article 5, paragraph 1, of the Kyoto Protocol, in line with the requirements of decision 2/CMP.7, annex, paragraph 25. In addition, Kazakhstan indicated that to develop this information, it will apply the 2006 IPCC Guidelines (vol. 4) and the Kyoto Protocol Supplement. The ERT considered that the Party's response did not resolve the potential problem. The ERT noted that Kazakhstan did not provide any of the required information in accordance with decision 2/CMP.8, annex II, on KP-LULUCF activities, as recommended by the ERT, and therefore the ERT has identified this problem, which pertains to language of a mandatory nature and influences the fulfilment of commitments, as a question of	Yes. KP reporting adherence

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue and/or a problem?[a]
		implementation in accordance with decision 22/CMP.1 in conjunction with decision 4/CMP.11 (see chap. VIII below).	
		The ERT recommends that Kazakhstan provide the required information on KP-LULUCF activities in accordance with decision 2/CMP.8, annex II, paragraphs 2(a–e) and (g), 3(a–c), 4(a–b) and 5(a–c) and (e), in the next annual submission, and apply, as appropriate, the methodologies provided in the 2006 IPCC Guidelines (vol. 4) and the Kyoto Protocol Supplement for the development of the requested information.	
KL.8	AR – CO_2, CH_4 and N_2O	The ERT noted that Kazakhstan reported the notation key "NE" for the AD and CO_2, CH_4 and N_2O emissions in CRF table 4(KP-I)A.1.1 for natural disturbances on lands under AR for the entire time series (except 2017). During the review, Kazakhstan informed the ERT that the addendum to the report to facilitate the calculation of the assigned amount of Kazakhstan will be corrected for the next annual submission in order to reflect how natural disturbances will be treated by the Party. The ERT further noted that 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 Kazakhstan (FCCC/IRR/2017/KAZ, ID# 14), it is stated that on 5 December 2017, Kazakhstan formally notified the ERT conducting the review that it does not intend to apply the provisions to exclude emissions from natural disturbances for the accounting for AR and FM during the second commitment period of the Kyoto Protocol and that it intends to notify the secretariat that it will not apply the provisions to exclude emissions from natural disturbances in accordance with decision 2/CMP.7, annex, paragraph 33.	Yes. Transparency
		The ERT recommends that Kazakhstan report the appropriate notation key ("NA") for the AD and CO_2, CH_4 and N_2O emissions from natural disturbances on lands under AR in CRF table 4(KP-I)A.1.1 or the corresponding AD and emissions, as appropriate, according to any corrections to be made to the addendum to the report to facilitate the calculation of the assigned amount of Kazakhstan and provide transparent information thereon in the next annual submission.	
KL.9	Deforestation – CO_2	The ERT noted that Kazakhstan reported the notation key "NE" for CSCs in mineral soils under deforestation in CRF table 4(KP-I)A.2 for the entire time series (except 2017). The ERT also noted that the AD for land under deforestation were reported in CRF table 4(KP-I)A.2 for the entire time series (except 2017). During the review, Kazakhstan informed the ERT that the results of the calculation of CSCs in mineral soils on lands under deforestation were presented in table 8.3 of the NIR of the 2018 annual submission (section 8, p.349). However, information reported by the Party in table 8.3 of the NIR of the 2018 annual submission relates to the CSCs in living biomass and not in mineral soils on land under deforestation.	Yes. Completeness
		The ERT recommends that Kazakhstan report CSCs in mineral soils on land under deforestation for the entire time series in the next annual submission.	
KL.10	FM – CO_2, CH_4 and N_2O	The ERT noted that Kazakhstan reported the notation key "NE" for the AD and CO_2, CH_4 and N_2O emissions in CRF table 4(KP-I)B.1.3 for natural disturbances on lands under FM for the entire time series (except 2017). During the review, Kazakhstan informed the ERT that the addendum to the report to facilitate the calculation of the assigned amount of Kazakhstan will be corrected for the next annual submission in order to reflect how natural disturbances will be treated by the Party. The ERT further noted that 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 Kazakhstan (FCCC/IRR/2017/KAZ, ID# 14), it is stated that on 5 December 2017, Kazakhstan formally notified the ERT conducting the review that it does not intend to apply the provisions to exclude	Yes. Transparency

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*	*Is finding an issue and/or a problem?*[a]
		emissions from natural disturbances for the accounting for AR and FM during the second commitment period of the Kyoto Protocol and that it intends to notify the secretariat that it will not apply the provisions to exclude emissions from natural disturbances in accordance with decision 2/CMP.7, annex, paragraph 33. The ERT recommends that Kazakhstan report the appropriate notation key ("NA") for the AD and CO_2, CH_4 and N_2O emissions from natural disturbances on lands under FM in CRF table 4(KP-I)B.1.3 or the corresponding AD and emissions, as appropriate, according to any corrections to be made in the addendum to the report to facilitate the calculation of the assigned amount of Kazakhstan and provide transparent information thereon in the next annual submission.	
KL.11	FM – CO_2, CH_4 and N_2O	The ERT noted that, in its report to facilitate the calculation of the assigned amount, Kazakhstan did not provide the mandatory information on the FMRL as inscribed in the appendix to the annex to decision 2/CMP.7, and any technical corrections as contained in the inventory report for the first year of the second commitment period. The ERT also noted that the reason for this is that in the appendix to the annex to decision 2/CMP.7, there is no FMRL value inscribed for Kazakhstan, as the Party did not submit information to the secretariat on the FMRL in accordance with decision 2/CMP.6, paragraph 4, and, therefore, no submission on the FMRL from Kazakhstan was subject to a technical assessment by a review team in accordance with decision 2/CMP.6, paragraph 5. Consequently, the CMP did not consider the outcomes of a technical assessment of a submission on the FMRL from Kazakhstan and did not adopt an FMRL value for Kazakhstan for inclusion in the appendix to the annex to decision 2/CMP.7. The ERT encourages Kazakhstan to consider submitting to the secretariat information on its FMRL and to start the process for its technical assessment with the aim of providing in its next annual submission the required information to be reported in accordance with decision 2/CMP.8, annex I, paragraph 1(i), and other relevant reporting requirements under annex II to decision 2/CMP.8, in particular paragraph 5(f).	Not a problem

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

VI. Application of adjustments

11. The ERT identified underestimations in emission estimates for Annex A sources for 2013–2017 in the 2019 annual submission and recommended seven adjustments for the energy, IPPU and waste sectors.

12. In accordance with the guidance for adjustments under Article 5, paragraph 2, of the Kyoto Protocol (annex to decision 20/CMP.1 in conjunction with decision 4/CMP.11), the adjustments for the energy, IPPU and waste sectors were prepared by the ERT in consultation with Kazakhstan. In addition, in accordance with the Article 8 review guidelines, the ERT officially notified Kazakhstan of the calculated adjustments.

13. The ERT noted that adjusted subcategories 1.B.2.a.1 oil – exploration – CH_4 and 1.B.2.a.2 oil – production – CH_4 are part of the key subcategory 1.B.2.a oil – CH_4 (accounting for 1.09 per cent of the total aggregated GHG emissions in 2017) and that both subcategories were adjusted during the review of the 2017 annual submission (FCCC/ARR/2017/KAZ, table 6). Likewise, the adjusted subcategory 2.F.1.f stationary air conditioning – HFCs is part of the key category 2.F.1 refrigeration and air conditioning – HFCs (accounting for 0.42 per cent of the total aggregated GHG emissions in

2017), which was adjusted during the review of the 2017 annual submission (FCCC/ARR/2017/KAZ, table 6). A summary of the adjustments is presented in table 6.

14. The Party and the ERT agreed on the adjustments estimated for subcategory 1.B.2.a.1 oil – exploration, subcategory 1.B.2.a.2 oil – production, subcategory 1.B.2.b.2 natural gas – production, subcategory 1.B.2.b.3 natural gas – processing, subcategory 1.B.2.c venting and flaring – venting, subcategory 2.F.1.f stationary air conditioning, and category 5.C.2 open burning of waste presented in table 6.

Table 6
Summary information on adjustments for Kazakhstan

	2013		*2014*		*2015*		*2016*		*2017*		
	As reported (kt CO_2 eq)	*Calculated by the ERT (kt CO_2 eq)*	*As reported (kt CO_2 eq)*	*Calculated by the ERT (kt CO_2 eq)*	*As reported (kt CO_2 eq)*	*Calculated by the ERT (kt CO_2 eq)*	*As reported (kt CO_2 eq)*	*Calculated by the ERT (kt CO_2 eq)*	*As reported (kt CO_2 eq)*	*Calculated by the ERT (kt CO_2 eq)*	*Reference*
Annex A source											
1.B.2.a.1 oil – exploration – CO_2, CH_4 and N_2O	0.101	12 376.817	0.093	12 231.354	0.091	12 024.112	0.089	11 808.543	0.099	13 043.788	For further details, see annex IV
1.B.2.a.2 oil – production – CO_2 and CH_4	4 609.528	49 499.838	3 694.042	48 918.074	3 617.344	48 089.231	3 562.948	47 227.083	3 965.479	52 167.322	For further details, see annex IV
1.B.2.b.2 natural gas – production – CO_2 and CH_4	378.187	11 686.869	392.445	11 904.382	402.844	12 698.525	423.175	13 345.084	423.476	15 120.983	For further details, see annex IV
1.B.2.b.3 natural gas – processing – CO_2 and CH_4	0.492	2 828.108	0.501	2 880.744	0.534	3 072.919	0.562	3 229.380	0.637	3 659.130	For further details, see annex IV
1.B.2.c venting and flaring – venting – CO_2 and CH_4	IE, NA	26 598.783	IE, NA	26 297.586	IE, NA	25 884.044	IE, NA	25 448.111	IE, NA	28 122.358	For further details, see annex IV
2.F.1.f stationary air conditioning – HFCs	83.818	261.102	81.249	264.976	86.827	268.877	84.028	272.728	88.033	276.463	For further details, see annex IV
5.C.2 open burning of waste – CO_2, CH_4 and N_2O	NO, NA	–	NO, NA	–	NO, NA	–	NO, NA	513.707	NO, NA	525.101	For further details, see annex IV
Total Annex A sources	**5 072.125**	**103 251.517**	**4 168.329**	**102 497.116**	**4 107.640**	**102 037.709**	**4 070.801**	**101 844.635**	**4 477.725**	**112 915.146**	
Total per cent value of the difference between the original and adjusted total aggregated GHG emissions		**31.392**		**29.486**		**28.402**		**28.278**		**29.614**	

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

15. Kazakhstan has elected commitment period accounting and therefore the issuance and cancellation of units for KP-LULUCF activities is not applicable to the 2019 review.

VIII. Questions of implementation

16. The ERT considers that the Party has not satisfactorily resolved during the review the potential problems included in table 7, which pertain to language of a mandatory nature and influence the fulfilment of commitments. Therefore, the ERT has identified these problems as questions of implementation in accordance with decision 22/CMP.1 in conjunction with decision 4/CMP.11.

Table 7
Questions of implementation for Kazakhstan

Unresolved problem of a mandatory nature	*Reference to relevant decision*	*Description of the problem*
National registry	Decision 13/CMP.1, annex, chapter II, in conjunction with decision 3/CMP.11 and the annex to decision 5/CMP.1	For the full description of the problem, see ID# G.1 in table 3
Information on accounting of Kyoto Protocol units	Decision 3/CMP.11, paragraph 13, and decision 15/CMP.1, annex, chapter I.E, paragraphs 12–18, in conjunction with decision 3/CMP.11	For the full description of the problem, see ID# G.2 in table 3
National system – general and inventory planning functions	Decision 19/CMP.1, annex, chapter V, paragraphs 10(a–b) and (d) and chapter VI, paragraphs 12(c–e), in conjunction with decisions 3/CMP.11 and 4/CMP.11	For the full description of the problem, see ID# G.3 in table 3
National system – general and inventory planning functions	Decision 19/CMP.1, annex, chapter V, paragraphs 10(b) and (d) and chapter VI, paragraph 12(c), in conjunction with decisions 3/CMP.11 and 4/CMP.11	For the full description of the problem, see ID# G.4 in table 3
National system – inventory preparation functions – inventory uncertainty	Decision 19/CMP.1, annex, chapter VI, paragraph 14(d), in conjunction with decisions 3/CMP.11 and 4/CMP.11	For the full description of the problem, see ID# G.17 in table 3
National system – inventory preparation functions – recalculations	Decision 19/CMP.1, annex, chapter VI, paragraph 14(e), in conjunction with decisions 3/CMP.11 and 4/CMP.11	For the full description of the problem, see ID# G.15 in table 3
National system – inventory management functions	Decision 19/CMP.1, annex, chapter VI, paragraphs 16(a–b), in	For the full description of the problem, see ID# G.8 in table 3

Unresolved problem of a mandatory nature	*Reference to relevant decision*	*Description of the problem*
	conjunction with decisions 3/CMP.11 and 4/CMP.11	
National system – inventory management functions	Decision 19/CMP.1, annex, chapter VI, paragraph 16(c), in conjunction with decisions 3/CMP.11 and 4/CMP.11	For the full description of the problem, see ID# G.22 in table 5
National system – areas of land subject to activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol	Decision 2/CMP.7, annex, paragraph 25	For the full description of the problem, see ID# KL.6 in table 5
LULUCF activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol	Decision 2/CMP.8, annex II, paragraphs 2(a–e) and (g), 3(a–c), 4(a–b) and 5(a–c) and (e)	For the full description of the problem, see ID# KL.7 in table 5
Article 3, paragraph 14, of the Kyoto Protocol	Decision 15/CMP.1, annex, chapter I.H, in conjunction with decision 3/CMP.11	For the full description of the problem, see ID# G.10 in table 3

Annex I

Overview of greenhouse gas emissions and removals for Kazakhstan for submission year 2019 and data and information on activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, as submitted by Kazakhstan in its 2019 annual submission

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

Table 1
Total greenhouse gas emissions for Kazakhstan, base year[a]–2017
(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 activities (Article 3.3 of the Kyoto Protocol)[d]*	*KP-LULUCF activities (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								–
Base year	371 157.01	386 908.37	NA	NA	NA		3 409.27	
1990	371 156.63	386 908.00	NA	NA				
1995	210 849.47	237 753.51	NA	NA				
2000	187 540.28	214 269.26	NA	NA				
2010	299 502.82	306 787.43	NA	NA				
2011	289 868.31	298 394.12	NA	NA				
2012	296 304.16	305 171.07	NA	NA				
2013	301 380.25	312 753.59	NA	NA		–2 948.37	–8 531.23	–9 054.21
2014	324 029.71	333 480.17	NA	NA		–2 969.63	–8 439.20	–8 209.35
2015	333 180.14	344 801.35	NA	NA		–2 999.33	–8 347.90	–7 349.24
2016	337 777.92	345 758.53	NA	NA		–3 029.40	–8 256.60	–6 516.95
2017	359 095.16	366 174.10	NA	NA		–	–	–

Notes: (1) Emissions/removals reported in the sector other (sector 6) are not included in the total GHG emissions; (2) values in this table do not reflect the adjustments calculated by the ERT for CO_2, CH_4, N_2O and HFCs. For further information, refer to annex IV.

[a] "Base year" refers to the base year under the Kyoto Protocol, which is 1990 for CO_2, CH_4 and N_2O, 1995 for HFCs, PFCs and SF_6 and 2000 for NF_3. The base year for GM under Article 3, para. 4, of the Kyoto Protocol is 1990 for Kazakhstan. 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 refers to 1990.

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

Table 2
Greenhouse gas emissions by gas for Kazakhstan, excluding land use, land-use change and forestry, 1990–2017
(kt CO_2 eq)

	CO_2[a]	*CH_4*	*N_2O*	*HFCs*	*PFCs*	*Unspecified mix of HFCs and PFCs*	*SF_6*	*NF_3*
1990	266 608.35	102 900.41	17 399.24	NO, NA	NA, NO	NO, NA	NA, NO	NO, NA
1995	162 799.72	64 767.97	10 185.44	0.38	NA, NO	NO, NA	NA, NO	NO, NA
2000	133 407.19	71 051.55	9 467.43	343.09	NA, NO	NO, NA	NA, NO	NO, NA
2010	236 261.71	52 489.33	16 203.67	1 260.36	570.63	NO, NA	1.73	NO, NA
2011	226 771.76	53 445.35	16 243.43	1 307.33	624.50	NO, NA	1.75	NO, NA
2012	233 695.67	53 606.87	15 796.71	1 445.04	624.95	NO, NA	1.83	NO, NA
2013	240 136.30	54 910.19	15 614.43	1 461.46	629.28	NO, NA	1.93	NO, NA
2014	261 488.23	54 206.44	15 767.96	1 489.56	525.97	NO, NA	2.01	NO, NA
2015	273 890.81	52 697.68	16 111.97	1 542.59	556.28	NO, NA	2.01	NO, NA
2016	274 252.23	53 617.94	15 763.31	1 531.63	591.36	NO, NA	2.06	NO, NA
2017	292 999.29	54 969.48	16 014.21	1 548.90	640.13	NO, NA	2.10	NO, NA
Per cent change 1990–2017	**9.9**	**–46.6**	**–8.0**	**NA**	**NA**	**NA**	**NA**	**NA**

Notes: (1) Emissions/removals reported in the sector other (sector 6) are not included in the total GHG emissions; (2) Values in this table do not reflect the adjustments calculated by the ERT for CO_2, CH_4, N_2O and HFCs. For further information, refer to annex IV.
[a] Kazakhstan did not report indirect CO_2 emissions in CRF table 6.

Table 3
Greenhouse gas emissions by sector for Kazakhstan, 1990–2017
(kt CO_2 eq)

	Energy	*IPPU*	*Agriculture*	*LULUCF*	*Waste*	*Other*
1990	317 113.58	21 012.38	44 083.46	–15 751.37	4 698.58	NO
1995	197 258.32	9 135.57	27 050.61	–26 904.04	4 309.01	NO
2000	176 988.72	12 876.93	20 159.86	–26 728.99	4 243.75	NO
2010	248 744.56	20 629.32	32 094.01	–7 284.61	5 319.54	NO
2011	239 739.83	21 957.15	31 158.02	–8 525.81	5 539.12	NO
2012	247 259.86	21 414.27	30 787.06	–8 866.92	5 709.88	NO
2013	252 160.09	23 590.99	31 150.49	–11 373.34	5 852.02	NO
2014	271 820.80	23 709.48	31 907.08	–9 450.46	6 042.82	NO
2015	280 891.03	25 164.78	32 548.79	–11 621.21	6 196.75	NO
2016	279 947.45	26 337.83	33 159.60	–7 980.61	6 313.65	NO

	Energy	*IPPU*	*Agriculture*	*LULUCF*	*Waste*	*Other*
2017	298 611.09	26 985.49	34 268.39	–7 078.94	6 309.13	–
Per cent change 1990–2017	**–5.8**	**28.4**	**–22.3**	**–55.1**	**34.3**	**NA**

Notes: (1) Emissions/removals reported in the sector other (sector 6) are not included in the total GHG emissions; (2) Values in this table do not reflect the adjustments calculated by the ERT for CO_2, CH_4, N_2O and HFCs in the energy, IPPU and waste sectors. For further information, refer to annex IV; (3) Kazakhstan did not report indirect CO_2 emissions in CRF table 6.

Table 4

Greenhouse gas emissions/removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol by activity, base year[a]–2017, for Kazakhstan

(kt CO_2 eq)

	Article 3.7 bis as contained in the Doha Amendment[b]	*Activities under Article 3, paragraph 3, of the Kyoto Protocol*		*FM and elected activities under Article 3, paragraph 4, of the Kyoto Protocol*				
	Land-use change	*AR*	*Deforestation*	*FM*	*CM*	*GM*	*RV*	*WDR*
FMRL				–				
Technical correction				NA				
Base year	NA				NO	3 409.27	NO	NO
2013		–2 977.70	29.33	–9 054.21	NO	–8 531.23	NO	NO
2014		–2 991.63	22.00	–8 209.35	NO	–8 439.20	NO	NO
2015		–3 010.33	11.00	–7 349.24	NO	–8 347.90	NO	NO
2016		–3 030.50	1.10	–6 516.95	NO	–8 256.60	NO	NO
2017[c]		–	–	–	–	–	–	–
Per cent change base year–2017					**NA**	**NA**	**NA**	**NA**

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

[a] The base year for GM under Article 3, para. 4, of the Kyoto Protocol is 1990 for Kazakhstan. 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 refers to 1990.

[c] Kazakhstan did not report GHG emissions/removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol for 2017.

1.

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

Table 5
Key relevant data for Kazakhstan under Article 3, paragraphs 3 and 4, of the Kyoto Protocol in the 2019 annual submission

Key parameters	*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: commitment period accounting (f) RV: not elected (g) WDR: not elected
Election of activities under Article 3, paragraph 4	GM
Election of application of provisions for natural disturbances	No
3.5% of total base-year GHG emissions, excluding LULUCF	12 995.329 kt CO_2 eq (103 962.632 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
4. GM	NA

Annex II

Information to be included in the compilation and accounting database

Tables 1–5 include the information to be included in the compilation and accounting database for Kazakhstan. Data shown are from the original annual submission of the Party, including the latest revised estimates submitted, adjustments (if applicable) and the final data to be included in the compilation and accounting database.

Table 1
Information to be included in the compilation and accounting database for 2017, including on the commitment period reserve, for Kazakhstan
(t CO_2 eq)

	Original submission	*Revised estimate*	*Adjustment*	*Final*
CPR	–	–	–	2 539 658 574
Annex A emissions for 2017				
CO_2[a]	283 291 052	292 999 293	12 680 642	305 679 934
CH_4	52 670 209	54 969 475	95 517 097	150 486 572
N_2O	15 965 757	16 014 209	51 253	16 065 462
HFCs	664 563	1 548 896	188 430	1 737 326
PFCs	640 128	–	–	640 128
Unspecified mix of HFCs and PFCs	NO, NA	–	–	NO, NA
SF_6	2 097	–	–	2 097
NF_3	NO, NA	–	–	NO, NA
Total Annex A sources	**353 233 804**	**366 174 097**	**108 437 422**	**474 611 519**
Activities under Article 3, paragraph 3, of the Kyoto Protocol for 2017[b]				
AR	–	–	–	–
Deforestation	–	–	–	–
FM and elected activities under Article 3, paragraph 4, of the Kyoto Protocol for 2017[b]				
FM	–	–	–	–
GM	–	–	–	–
GM for the base year	–	–	–	–

[a] The Party did not report indirect CO_2 emissions in CRF table 6.
[b] The Party did not report emission or removal estimates for KP-LULUCF activities for 2017 in its 2019 annual submission.

Table 2
Information to be included in the compilation and accounting database for 2016 for Kazakhstan
(t CO_2 eq)

	Original submission	*Revised estimate*	*Adjustment*	*Final*
Annex A emissions for 2016				
CO_2[a]	267 692 884	274 252 231	11 427 519	285 679 750
CH_4	51 366 123	53 617 939	86 108 821	139 726 760
N_2O	15 731 088	15 763 310	48 795	15 812 105
HFCs	651 845	1 531 633	188 700	1 720 332
PFCs	591 360	–	–	591 360
Unspecified mix of HFCs and PFCs	NO, NA	–	–	NO, NA
SF_6	2 062	–	–	2 062
NF_3	NO, NA	–	–	–

	Original submission	*Revised estimate*	*Adjustment*	*Final*
Total Annex A sources	**336 035 362**	**345 758 534**	**97 773 834**	**443 532 368**
Activities under Article 3, paragraph 3, of the Kyoto Protocol for 2016				
AR	–3 030 500	–	–	–3 030 500
Deforestation	1 100	–	–	1 100
FM and elected activities under Article 3, paragraph 4, of the Kyoto Protocol for 2016				
FM	–6 516 955	–	–	–6 516 955
GM	–8 256 600	–	–	–8 256 600
GM for the base year	3 409 267	–	–	3 409 267

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

Table 3
Information to be included in the compilation and accounting database for 2015 for Kazakhstan
(t CO_2 eq)

	Original submission	*Revised estimate*	*Adjustment*	*Final*
Annex A emissions for 2015				
CO_2[a]	263 589 539	273 890 815	11 111 163	285 001 978
CH_4	50 476 266	52 697 675	86 619 864	139 317 539
N_2O	16 062 142	16 111 973	16 992	16 128 966
HFCs	664 918	1 542 589	182 050	1 724 639
PFCs	556 283	–	–	556 283
Unspecified mix of HFCs and PFCs	NO, NA	–	–	NO, NA
SF_6	2 013	–	–	2 013
NF_3	NO, NA	–	–	NO, NA
Total Annex A sources	**331 351 160**	**344 801 348**	**97 930 069**	**442 731 417**
Activities under Article 3, paragraph 3, of the Kyoto Protocol for 2015				
AR	–3 010 333	–	–	–3 010 333
Deforestation	11 000	–	–	11 000
FM and elected activities under Article 3, paragraph 4, of the Kyoto Protocol for 2015				
FM	–7 349 241	–	–	–7 349 241
GM	–8 347 900	–	–	–8 347 900
GM for the base year	3 409 267	–	–	3 409 267

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

Table 4
Information to be included in the compilation and accounting database for 2014 for Kazakhstan
(t CO_2 eq)

	Original submission	*Revised estimate*	*Adjustment*	*Final*
Annex A emissions for 2014				
CO_2[a]	256 671 768	261 488 231	11 077 944	272 566 176
CH_4	52 050 910	54 206 438	87 049 832	141 256 269
N_2O	15 744 005	15 767 958	17 285	15 785 243
HFCs	634 563	1 489 561	183 726	1 673 287
PFCs	525 973	–	–	525 973
Unspecified mix of HFCs and PFCs	NA, NO	–	–	NA, NO
SF_6	2 009	–	–	2 009
NF_3	NA, NO	–	–	NA, NO
Total Annex A sources	**325 629 227**	**333 480 170**	**98 328 787**	**431 808 957**

	Original submission	*Revised estimate*	*Adjustment*	*Final*
Activities under Article 3, paragraph 3, of the Kyoto Protocol for 2014				
AR	–2 991 633	–	–	–2 991 633
Deforestation	22 000	–	–	22 000
FM and elected activities under Article 3, paragraph 4, of the Kyoto Protocol for 2014				
FM	–8 209 348	–	–	–8 209 348
GM	–8 439 200	–	–	–8 439 200
GM for the base year	3 409 267	–	–	3 409 267

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

Table 5

Information to be included in the compilation and accounting database for 2013 for Kazakhstan

($t\ CO_2\ eq$)

	Original submission	*Revised estimate*	*Adjustment*	*Final*
Annex A emissions for 2013				
CO_2[a]	240 136 127	240 136 304	11 127 548	251 263 852
CH_4	52 824 431	54 910 194	86 857 069	141 767 263
N_2O	15 613 954	15 614 432	17 490	15 631 923
HFCs	638 686	1 461 458	177 285	1 638 743
PFCs	629 278	–	–	629 278
Unspecified mix of HFCs and PFCs	NO, NA	–	–	NO, NA
SF_6	1 925	–	–	1 925
NF_3	NO, NA	–	–	NO, NA
Total Annex A sources	**309 844 402**	**312 753 592**	**98 179 392**	**410 932 984**
Activities under Article 3, paragraph 3, of the Kyoto Protocol for 2013				
AR	–2 977 700	–	–	–2 977 700
Deforestation	29 333	–	–	29 333
FM and elected activities under Article 3, paragraph 4, of the Kyoto Protocol for 2013				
FM	–9 054 213	–	–	–9 054 213
GM	–8 531 233	–	–	–8 531 233
GM for the base year	3 409 267	–	–	3 409 267

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

Annex III

Additional information to support findings in table 2 in this report

A. Missing categories that may affect completeness

1. The categories for which 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 reporting in the Party's inventory are the following:

(a) 1.A.2.d pulp, paper and print (CH_4 and N_2O) (see ID# E.22 in table 3 in this report);

(b) 1.B.1.a coal mining and handling – underground mines – abandoned underground mines (CO_2 and CH_4) (see ID# E.42 in table 3 in this report);

(c) 1.B.2.c venting and flaring – venting (CO_2 and CH_4) (see ID# E.55 in table 3 in this report);

(d) 2.C.3 aluminium production (CO_2) (see ID# I.39 in table 3 in this report);

(e) 2.D.2 paraffin wax use (CO_2) (see ID# I.53 in table 5 in this report);

(f) 2.D.3 other (non-energy products from fuels and solvent use) – urea-based catalytic converters (CO_2) (see ID# I.54 in table 5 in this report);

(g) 2.F.1 refrigeration and air conditioning (HFCs) (see ID# I.45 in table 3 in this report);

(h) 2.F.4 aerosols – metered dose inhalers (HFCs) (see ID# I.58 in table 5 in this report);

(i) 3.H urea application (CO_2) (see ID# A.23 in table 5 in this report);

(j) 3.D.a.2.b sewage sludge applied to soils (N_2O) (see ID# A.19 in table 5 in this report);

(k) 4.A.2.3 wetlands converted to forest land – organic soils (CO_2) (see ID# L.1 in table 3 in this report);

(l) 4.B.2.1–4.E.2.1 forest land converted to other land-use categories (CO_2, CH_4 and N_2O) (see ID# L.2 in table 3 in this report);

(m) 4.C.2 land converted to grassland (CO_2) (see ID# L.19 in table 3 in this report);

(n) 4.C.2.1 forest land converted to grassland (CO_2) (see ID# L.1 in table 3 in this report);

(o) 4(III) direct N_2O emissions from nitrogen mineralization/immobilization – forest land remaining forest land, lands converted to forest land, grassland remaining grassland, lands converted to grassland, wetlands remaining wetlands, lands converted to wetlands, settlements remaining settlements and lands converted to settlements (N_2O) (see ID# L.23 in table 5 in this report);

(p) 4(III).B.2 N_2O emissions from disturbance associated with land-use conversion to cropland – grassland converted to cropland – mineral soils (N_2O) (see ID# L.1 in table 3 in this report);

(q) 5.A solid waste disposal (industrial waste) (CH_4) (see ID#s W.5 and W.11 in table 3 in this report);

(r) 5.B.1 composting (CH_4 and N_2O) (see ID# W.1 in table 3 in this report);

(s) 5.C.1 waste incineration (CO_2 (non-biogenic), CH_4 and N_2O) (see ID#s W.1 and W.13 in table 3 in this report);

(t) 5.C.2 open burning of waste (CO_2 (non-biogenic), CH_4 and N_2O) (see ID# W.15 in table 3 in this report);

(u) 4(KP) AR, deforestation and FM – litter and SOC (CO_2) (see ID# KL.2 in table 3 in this report);

(v) 4(KP-I)A.2 deforestation – mineral soils (CO_2) (see ID# KL.9 in table 5 in this report).

B. Recommendation for an in-country review: list of issues

2. The ERT recommends that the next review for Kazakhstan be conducted as an in-country review. The ERT noted that a number of issues associated with the national system and the national registry remained unresolved at the end of the 2019 review cycle, in addition to a number of issues of a quantitative character in the GHG inventory calculations that are mainly related to the methodological choice and availability of robust AD. During the review, Kazakhstan stated that it is planning to resolve most of these issues in the period 2019–2020 and reflect the changes in the 2020 annual submission. However, a comprehensive assessment of progress in resolving these issues is only possible if the ERT can assess in person the functionality of general and specific functions of the national system, access the relevant documents, check and test the functions of the archiving system and discuss the improvement plan and other requested plans and their implementation with the personnel involved in Kazakhstan, which requires an in-country review, as opposed to a centralized review.

3. In accordance with decision 13/CP.20, annex, paragraph 64, the ERT has set out below the list of questions and issues additional to the issues identified in tables 3 and 5 in this report that is to be addressed during the in-country review.

4. Issue: Inventory arrangements under the national system (adherence to the UNFCCC Annex I inventory reporting guidelines). The ERT noted that several issues (see ID#s G.2, G.3, G.4, G.5, G.6, G.7, G.8, G.9, G.18, G.19, G.21 and G.22 in table 3 in this report) reflect the fact that the functions pertaining to the national inventory arrangements are not fully implemented in Kazakhstan. The recommended in-country review should comprehensively address the issues related to inventory planning, preparation and management, in addition to those related to enhancing the inventory capacity and technical competence of the inventory staff. The ERT also noted that the performance of recalculations (see ID# G.15 in table 3 in this report) and the uncertainty analysis (see ID# G.17 in table 3 in this report) require attention from the ERT given that, as part of the inventory preparation functions, they are strongly related to the improvement of the accuracy, completeness and consistency of the inventory. Key areas that the next ERT conducting the in-country review should consider are:

(a) Inventory planning functions of the national system. The ERT noted that the roles and responsibilities for the inventory preparation process among different institutions were not clearly defined and identified, and were not fully implemented within the current institutional arrangements, thereby not allowing for the proper planning, management and performance of the compilation of the inventory. As a result, the inventory components have been submitted after the deadline several years in a row owing to problems in launching the inventory compilation process and delays in providing inventory information and data in a timely manner to the inventory agency by the institutions compiling and processing data, as well as to a lack of clarity in relation to prioritizing inventory tasks within the institutional arrangements (e.g. timely sign-offs) (see ID# G.4 in table 3 in this report);

(b) Inventory capacity and technical competence of staff in terms of understanding and implementing both the UNFCCC Annex I inventory reporting guidelines and the 2006 IPCC Guidelines. The ERT noted that there is a significant problem related to the implementation of good practice procedures and to the continuity and enhancement of expertise (see ID# G.4 in table 3 in this report);

(c) Archiving of inventory information and data, and the ability to make these data available to the ERT. The ERT noted that Kazakhstan did not provide answers to several questions raised by the ERT during the review week, which could be associated with

problems related to organizing the inventory information or information gaps in the national inventory archive (see ID#s G.8 and G.9 in table 3 in this report, and ID#s G.21 and G.22 in table 5 in this report).

5. Issue: National registry. The ERT noted that Kazakhstan did not establish a national registry with functionality for the second commitment period of the Kyoto Protocol, in accordance with the requirements set out in decision 13/CMP.1, annex, chapter II, in conjunction with decision 3/CMP.11 and the annex to decision 5/CMP.1 (see ID# G.1 in table 3 in this report). Key areas that the next ERT conducting the in-country review should consider are:

(a) The status of development and establishment of Kazakhstan's national registry;

(b) Whether the detailed plan for the design, development and implementation of the national registry is in place, including allocated roles and responsibilities and timelines regarding the implementation of this project.

(a)

Annex IV

Additional information on adjustments

As required by paragraph 83(b) of the Article 8 review guidelines, this annex provides information on the adjustments applied to the 2019 annual submission of Kazakhstan. Quantitative information used in the calculation of each adjustment is presented in tables 1–14.

Table 1

Background information to support the calculation of adjustments for subcategory 1.B.2.a.1 oil – exploration – CH_4, CO_2 and N_2O for Kazakhstan

Element	*Description*
Underlying problem and rationale for adjustment	The ERT noted that Kazakhstan used the notation key "NE" to report CO_2, CH_4 and N_2O emissions and AD from oil exploration for the entire time series in CRF table 1.B.2 in its original 2019 annual submission. The ERT noted that according to the 2006 IPCC Guidelines, the AD for oil production volume could be used to estimate emissions from this subcategory and that these data were included in CRF tables 1.B.2 and 1.A(b). The ERT concluded that omitting emission estimates from this subcategory led to a potential underestimation of CO_2, CH_4 and N_2O emissions from subcategory 1.B.2.a.1 oil – exploration for 2017. In its revised CRF tables, Kazakhstan submitted revised estimates of CO_2, CH_4 and N_2O emissions from oil exploration for the entire time series. Nevertheless, it did not follow the recommendations of the ERT and indicated in the textual part of its response that AD represented by the number of drilled wells were used for the estimates. However, the unit of AD reported in the revised CRF tables did not reflect either the number of wells or the volume of oil produced, which made it unclear as to which specific AD had been used for the calculations. In addition, the Party did not provide information on the methodology, EFs and other parameters used to estimate the revised CO_2, CH_4 and N_2O emissions. The ERT noted that, when applying, for example, the default EFs for well drilling, testing and servicing for developed countries provided in table 4.2.4 of the 2006 IPCC Guidelines (vol. 2, chap. 4, p.4.48) to estimate CO_2, CH_4 and N_2O emissions, and using the volume of oil production reported in CRF table 1.A(b) as AD, the resulting emission estimates (1,450.98 kt CO_2 eq) for 2017 were well above the 65.48 kt CO_2 eq reported by Kazakhstan in table 1 of its response and the estimate of 0.099 kt CO_2 eq reported in the revised CRF table 1.B.2 for subcategory 1.B.2.a.1 oil – exploration. The ERT concluded that Kazakhstan underestimated the CO_2, CH_4 and N_2O emissions from subcategory1.B.2.a.1 oil – exploration and has not satisfactorily resolved the problem for subcategory 1.B.2.a.1 oil – exploration for 2017 and 2013–2016.

Element	*Description*
Recommendation to the Party to address the underlying problem, as contained in the list of potential problems and further questions raised by the ERT	Use the AD for crude oil production reported in CRF table 1.A(b) (86,194,400.00 t) and the default CO_2, CH_4 and N_2O EFs for well drilling, testing and servicing provided in the 2006 IPCC Guidelines (vol. 2, chap. 4, table 4.2.4, p.4.48) to calculate emissions of CO_2, CH_4 and N_2O from subcategory 1.B.2.a.1 oil – exploration for 2017 and using the corresponding AD for crude oil production reported in CRF table 1.A(b) and the default CO_2, CH_4 and N_2O EFs from tables 4.2.4–4.2.5 of the 2006 IPCC Guidelines (vol. 2, chap. 4, p.4.48 and p.4.55, respectively) for all other years of the time series.
Assumptions, data and methodology used to calculate the adjustment	CO_2, CH_4 and N_2O emissions were estimated for subcategory 1.B.2.a.1 oil – exploration using: (a) A tier 1 method with equation 4.2.1 from the 2006 IPCC Guidelines (vol. 2, chap. 4, p.4.41) and average values from the range of IPCC default CO_2, CH_4 and N_2O EFs for well drilling (0.0009 Gg $CO_2/10^3$ m^3 oil production and 0.000297 Gg $CH_4/10^3$ m^3 oil production), well testing (0.0795 Gg $CO_2/10^3$ m^3 oil production, 0.000451 Gg $CH_4/10^3$ m^3 oil production and 0.00000058 Gg $N_2O/10^3$ m^3 oil production) and well servicing (0.000017 Gg $CO_2/10^3$ m^3 oil production and 0.000955 Gg $CH_4/10^3$ m^3 oil production) from the 2006 IPCC Guidelines (vol. 2, table 4.2.5, p.4.55) in accordance with paragraph 9 of decision 20/CMP.1, in conjunction with decision 4/CMP.11; (b) AD for oil production taken from CRF table 1.A(b); (c) Density of crude oil (0.83 t/m^3) provided by Kazakhstan in response to a request for information for the application of adjustments in 2017 (FCCC/ARR/2017/KAZ, table 22).
Description of how the adjustment is conservative	In line with paragraph 5 of decision 20/CMP.1, in conjunction with decision 4/CMP.11, conservativeness was ensured by applying the conservativeness factor of 1.02 for AD (fugitive emissions from fuels, oil and natural gas) from table 2 of appendix III to the technical guidance on methodologies for adjustments under Article 5, paragraph 2, of the Kyoto Protocol (annex to decision 20/CMP.1 in conjunction with decision 4/CMP.11). The ERT therefore considers that the resulting adjusted values are conservative.

Table 2

Description of the calculation of adjustments for subcategory 1.B.2.a.1 oil – exploration – CH_4, CO_2 and N_2O included in Annex A to the Kyoto Protocol for Kazakhstan

Parameter/estimate	*Value or assessment*	*Unit*	*Reference*
Category: 1.B.2.a.1 oil – exploration – CO_2, CH_4 and N_2O			
Party's estimate of AD (oil exploration)	7 146.747 (2013)	$10\ m^3$	CRF table 1.B.2
	6 545.542 (2014)	$10\ m^3$	
	6 409.639 (2015)	NE	
	6 313.235 (2016)	$10\ m^3$	

Parameter/estimate	*Value or assessment*	*Unit*	*Reference*
	7 028.434 (2017)	10 m^3	
Party's emission estimate from subcategory 1.B.2.a.1 oil – exploration	0.101 (2013) 0.093 (2014) 0.091 (2015) 0.089 (2016) 0.099 (2017)	kt CO_2 eq	CRF table 1.B.2, ERT calculation
Input data/parameter for calculation of adjustment			
Calculated estimate for AD for oil – exploration (oil production)	98 538.554 (2013) 97 380.446 (2014) 95 730.482 (2015) 94 014.217 (2016) 103 848.675 (2017)	10^3 m^3	CRF table 1.A(b), ERT calculation
Conservativeness factor	1.02		Table 2 in appendix III to the annex to decision 20/CMP.1 in conjunction with decision 4/CMP.11
Adjusted conservative estimate for AD for oil – exploration (oil production)	100 509.325 (2013) 99 328.055 (2014) 97 645.092 (2015) 95 894.501 (2016) 105 925.648 (2017)	10^3 m^3	ERT calculation
Adjusted conservative estimate for subcategory 1.B.2.a.1 oil – exploration	12 376.817 (2013) 12 231.354 (2014) 12 024.112 (2015) 11 808.543 (2016) 13 043.788 (2017)	kt CO_2 eq	ERT calculation
Total aggregated GHG emissions (excluding LULUCF and including indirect CO_2 emissions) as reported by the Party	312 753.592 (2013) 333 480.170 (2014) 344 801.348 (2015) 345 758.534 (2016) 366 174.097 (2017)	kt CO_2 eq	CRF table Summary 2
Total aggregated GHG emissions (excluding LULUCF and including indirect CO_2 emissions) after application of adjustment	325 130.307 (2013) 345 711.431 (2014) 356 825.370 (2015) 357 566.988 (2016) 379 217.786 (2017)	kt CO_2 eq	ERT calculation
Difference between original and adjusted total aggregated GHG emissions	12 376.716 (2013) 12 231.262 (2014) 12 024.022 (2015) 11 808.454 (2016) 13 043.689 (2017)	kt CO_2 eq	ERT calculation
	3.957 (2013) 3.668 (2014) 3.487 (2015) 3.415 (2016) 3.562 (2017)	%	ERT calculation
The ERT estimates that the change resulting from the adjustment is above the threshold given in decision 24/CP.19, annex I, paragraph 37(b)	Yes	The change resulting from the adjusted value for the category is greater than 500 kt CO_2 eq and 0.05% of national emissions	ERT calculation

Table 3
Background information to support the calculation of adjustments for subcategory 1.B.2.a.2 oil – production – CO_2 and CH_4 for Kazakhstan

Element	*Description*
Underlying problem and rationale for adjustment	The ERT noted that for 2017, Kazakhstan reported crude oil production as 72,900.00 t in CRF table 1.B.2, while in CRF table 1.A(b), it reported crude oil production for the same year as 86,194,400.00 t, which is much higher than the AD presented in CRF table 1.B.2. In the NIR (table 3.27, p.129), the Party provided a different value for crude oil production for 2017 (72.90 Mt). Similarly, the ERT identified discrepancies between CRF tables 1.B.2 and 1.A(b) and the NIR for 2013, 2014, 2015 and 2016. During the review, Kazakhstan informed the ERT that the correct value for crude oil production for 2017 is 86,194,400.00 t, as reported in CRF table 1.A(b). The ERT concluded that the AD for subcategory 1.B.2.a.2 oil – production used by the Party to calculate CO_2 and CH_4 emissions may lead to a potential underestimation of emissions from this subcategory for 2017 and all other years of the time series. In response to the list of potential problems and further questions raised by the ERT, Kazakhstan resubmitted a complete set of CRF tables for 1990–2017 but did not revise the CO_2 and CH_4 emission estimates for this subcategory. The ERT noted that in its response, Kazakhstan indicated that after consulting with the Agency of Statistics of Kazakhstan, it was concluded that the correct value of crude oil production is 72,924,900 t and that the data inconsistency identified in CRF table 1.A(b) will be corrected in the next annual submission. However, the resubmitted CRF table 1.B.2 showed an oil production value of 72,900.00 t, which was significantly lower than the value included in Kazakhstan's response. The ERT also noted that the IEA energy balance for Kazakhstan contained a value for the quantity of crude oil production (not including NGLs) similar to that reported by the Party in CRF table 1.A(b) for 2017 (86,194,400.00 t). Therefore, the total production of crude oil reported in CRF table 1.A(b) appears to be correct and the AD value for subcategory 1.B.2.a.2 oil – production used for the estimates was not consistent with this value and was lower by three orders of magnitude in the resubmitted CRF tables for 2017. As this significant inconsistency is not justified, and the IEA energy balance for Kazakhstan contained a figure for crude oil that was similar to the value reported in CRF table 1.A(b), the ERT concluded that the CO_2 and CH_4 emissions from subcategory 1.B.2.a.2 oil – production were underestimated for 2017 and for the entire time series and, thus, the Party has not satisfactorily resolved the problem.
Recommendation to the Party to address the underlying problem, as contained in the list of potential problems and further questions raised by the ERT	Use the AD for crude oil production (86,194,400.00 t) reported in CRF table 1.A(b) to calculate emissions of CO_2 and CH_4 from subcategory 1.B.2.a.2 oil – production for 2017. Following the principle of consistency, check the

Element	*Description*
	correctness of crude oil production reported in CRF table 1.B.2 for the entire time series, and provide revised GHG emission estimates accordingly.
Assumptions, data and methodology used to calculate the adjustment	CO_2 and CH_4 emissions were estimated for subcategory 1.B.2.a.2 oil – production using: (a) A tier 1 method with equation 4.2.1 from the 2006 IPCC Guidelines (vol. 2, chap. 4, p.4.41) and average values from the range of IPCC default EFs for CO_2 (0.0025 $Gg/10^3$ m^3) and CH_4 (0.0196 $Gg/10^3$ m^3) for oil production (default weighted total) from the 2006 IPCC Guidelines (vol. 2, table 4.2.5, p.4.60) in accordance with paragraph 9 of decision 20/CMP.1, in conjunction with decision 4/CMP.11; (b) AD for oil production taken from CRF table 1.A(b); (c) Density of crude oil (0.83 t/m^3) provided by Kazakhstan in response to a request for information for the application of adjustments in 2017 (FCCC/ARR/2017/KAZ, table 22).
Description of how the adjustment is conservative	In line with paragraph 5 of decision 20/CMP.1, in conjunction with decision 4/CMP.11, conservativeness was ensured by applying the conservativeness factor of 1.02 for AD (fugitive emissions from fuels, oil and natural gas) from table 2 of appendix III to the technical guidance on methodologies for adjustments under Article 5, paragraph 2, of the Kyoto Protocol (annex to decision 20/CMP.1 in conjunction with decision 4/CMP.11). The ERT therefore considers that the resulting adjusted values are conservative.

Table 4
Description of the calculation of adjustments for subcategory 1.B.2.a.2 oil – production – CO_2 and CH_4 included in Annex A to the Kyoto Protocol for Kazakhstan

Parameter/estimate	*Value or assessment*	*Unit*	*Reference*
Category: 1.B.2.a.2 oil – production – CO_2 and CH_4			
Party's estimate of AD (oil production)	8 474.000 (2013) 67 908.000 (2014) 66 520.600 (2015) 65 510.300 (2016) 72 900.000 (2017)	t	CRF table 1.B.2
Party's emission estimate from subcategory 1.B.2.a.2 oil – production	4 609.528 (2013) 3 694.042 (2014) 3 617.344 (2015) 3 562.948 (2016) 3 965.479 (2017)	kt CO_2 eq	CRF table 1.B.2, ERT calculation
Input data/parameter for calculation of adjustment			
Calculated estimate for AD for oil production	98 538.554 (2013) 97 380.446 (2014) 95 730.482 (2015) 94 014.217 (2016) 103 848.675 (2017)	10^3 m^3	CRF table 1.A(b), ERT calculation

Parameter/estimate	*Value or assessment*	*Unit*	*Reference*
Conservativeness factor	1.02		Table 2 in appendix III to the annex to decision 20/CMP.1 in conjunction with decision 4/CMP.11
Adjusted conservative estimate for AD for oil production	100 509.325 (2013) 99 328.055 (2014) 97 645.092 (2015) 95 894.501 (2016) 105 925.648 (2017)	10^3 m^3	ERT calculation
Adjusted conservative estimate for subcategory 1.B.2.a.2 oil – production	49 499.838 (2013) 48 918.074 (2014) 48 089.231 (2015) 47 227.083 (2016) 52 167.322 (2017)	kt CO_2 eq	ERT calculation
Total aggregated GHG emissions (excluding LULUCF and including indirect CO_2 emissions) as reported by the Party	312 753.592 (2013) 333 480.170 (2014) 344 801.348 (2015) 345 758.534 (2016) 366 174.097 (2017)	kt CO_2 eq	CRF table Summary 2
Total aggregated GHG emissions (excluding LULUCF and including indirect CO_2 emissions) after application of adjustment	357 643.901 (2013) 378 704.202 (2014) 389 273.235 (2015) 389 422.669 (2016) 414 375.940 (2017)	kt CO_2 eq	ERT calculation
Difference between original and adjusted total aggregated GHG emissions	44 890.309 (2013) 45 224.032 (2014) 44 471.887 (2015) 43 664.135 (2016) 48 201.843 (2017)	kt CO_2 eq	ERT calculation
	14.353 (2013) 13.561 (2014) 12.898 (2015) 12.629 (2016) 13.164 (2017)	%	ERT calculation
The ERT estimates that the change resulting from the adjustment is above the threshold given in decision 24/CP.19, annex I, paragraph 37(b)	Yes	The change resulting from the adjusted value for the category is greater than 500 kt CO_2 eq and 0.05% of national emissions	ERT calculation

Table 5

Background information to support the calculation of adjustments for subcategory 1.B.2.b.2 natural gas – production – CO_2 and CH_4 for Kazakhstan

Element	*Description*
Underlying problem and rationale for adjustment	The ERT noted significant differences between the volume of natural gas production reported in CRF table 1.A(b) (reference approach) and in CRF table 1.B.2 (sectoral approach). For 2017, natural gas production was reported as 42,675.00 × 10^6 m^3 in CRF table 1.A(b), 12,623.00 × 10^9 m^3 in CRF table 1.B.2 and 12,623.00 × 10^6 m^3 in the NIR (table 3.29, p.132). The ERT also noted that the value reported for the volume of gas production was the same as the value reported for the volume of gas distribution in CRF table 1.B.2, which is

Element	*Description*
	unlikely to be correct, since the country is a major exporter of natural gas. During the review, Kazakhstan informed the ERT that the correct unit of measurement for natural gas production reported in CRF table 1.A(b) is billion m^3 (10^9 m^3). However, Kazakhstan did not clarify whether the volume of natural gas production reported in CRF table 1.A(b) or CRF table 1.B.2 was correct. The ERT concluded that the AD reported in CRF table 1.B.2 (12,623.00 × 10^9 m^3) may be incorrect and lower than the actual natural gas production value and, therefore, the GHG emission estimates for subcategory 1.B.2.b.2 natural gas – production may also be incorrect, and that this may lead to a potential underestimation of CH_4 and CO_2 emissions from subcategory 1.B.2.b.2 natural gas – production for 2017.
	In response to the list of potential problems and further questions raised by the ERT, Kazakhstan resubmitted a complete set of CRF tables for 1990–2017. In its response, Kazakhstan indicated that in the original calculation tables, the units were correctly accounted for but an error was made during data archiving. The Party also indicated that in the resubmitted CRF tables, "formats are synchronized" with the data presented in CRF table 1.A(b). The ERT concluded that the data presented in CRF table 1.A(b) for natural gas production may have been correct. However, the ERT noted that the Party did not report the indicated volume of natural gas production in Kazakhstan (42,675.00 × 10^6 m^3) in the revised CRF table 1.B.2 for subcategory 1.B.2.b.2 natural gas – production for 2017 or for the entire time series, nor did it explicitly indicate the correct value for natural gas production. In addition, Kazakhstan did not revise the CH_4 and CO_2 emission estimates for 2017 using the indicated volume of natural gas production and the appropriate CH_4 and CO_2 EFs or for the entire time series. For 2017, the ERT determined that the reported revised emission estimates were lower by 1,207.94 kt CO_2 eq using the indicated AD from CRF table 1.A(b) and, for example, averages of the CH_4 and CO_2 EFs for developed countries from table 4.2.4 of the 2006 IPCC Guidelines (vol. 2, chap. 4, p.4.48). The ERT concluded that the emissions reported in the revised CRF tables for subcategory 1.B.2.b.2 natural gas – production were underestimated for 2017 and the entire time series and, therefore, the Party has not satisfactorily resolved the problem.
Recommendation to the Party to address the underlying problem, as contained in the list of potential problems and further questions raised by the ERT	Provide the correct volume of natural gas production in Kazakhstan for 2017 and for other years of the time series, which must be the same volumes reported under subcategory 1.B.2.b.2 natural gas – production, in CRF tables 1.B.2 and 1.A(b), as well as in the NIR. Provide revised CH_4 and CO_2 emission estimates for 2017 using the correct volume of natural gas production and the appropriate default CH_4 and CO_2 EFs provided in table 4.2.4 of the 2006 IPCC Guidelines (vol. 2,

Element	*Description*
	chap. 4, p.4.48) for subcategory 1.B.2.b.2 natural gas – production. Following the principle of consistency, provide revised CH_4 and CO_2 emission estimates for the entire time series using the corresponding default CH_4 and CO_2 EFs from tables 4.2.4–4.2.5 of the 2006 IPCC Guidelines (vol. 2, chap. 4, p.4.48 and p.4.55, respectively).
Assumptions, data and methodology used to calculate the adjustment	CO_2 and CH_4 emissions were estimated for subcategory 1.B.2.b.2 natural gas – production using: (a) A tier 1 method with equation 4.2.1 from the 2006 IPCC Guidelines (vol. 2, chap. 4, p.4.41) and average values from the range of IPCC default EFs for CO_2 (0.000097 $Gg/10^6$ m^3 gas production) and CH_4 (0.012190 $Gg/10^6$ m^3 gas production) from the 2006 IPCC Guidelines (vol. 2, table 4.2.5, p.4.55) in accordance with paragraph 9 of decision 20/CMP.1, in conjunction with decision 4/CMP.11; (b) AD on natural gas production from the IEA energy balance for Kazakhstan (GCV basis); (c) GCV conversion factor of 0.038 $TJ/10^3$ m^3 from the IEA data (IEA, 2005).
Description of how the adjustment is conservative	In line with paragraph 5 of decision 20/CMP.1, in conjunction with decision 4/CMP.11, conservativeness was ensured by applying the conservativeness factor of 1.02 for AD (fugitive emissions from fuels, oil and natural gas) from table 2 of appendix III to the technical guidance on methodologies for adjustments under Article 5, paragraph 2, of the Kyoto Protocol (annex to decision 20/CMP.1 in conjunction with decision 4/CMP.11).

Table 6

Description of the calculation of adjustments for subcategory 1.B.2.b.2 natural gas – production – CO_2 and CH_4 included in Annex A to the Kyoto Protocol for Kazakhstan

Parameter/estimate	*Value or assessment*	*Unit*	*Reference*
Category: 1.B.2.b.2 natural gas – production – CO_2 and CH_4			
Party's estimate of AD (natural gas production)	11 273.000 (2013) 11 698.000 (2014) 12 008.000 (2015) 12 614.000 (2016) 12 623.000 (2017)	10^6 m^3	CRF table 1.B.2
Party's emission estimate from subcategory 1.B.2.b.2 natural gas – production	378.187 (2013) 392.445 (2014) 402.844 (2015) 423.175 (2016) 423.476 (2017)	kt CO_2 eq	CRF table 1.B.2, ERT calculation
Input data/parameter for calculation of adjustment			
Calculated estimate for AD for natural gas production	37 585.132 (2013) 38 284.658 (2014) 40 838.632 (2015) 42 917.974 (2016)	10^6 m^3	IEA energy balance, ERT calculation

Parameter/estimate	*Value or assessment*	*Unit*	*Reference*
	48 629.289 (2017)		
Conservativeness factor	1.02		Table 2 in appendix III to the annex to decision 20/CMP.1 in conjunction with decision 4/CMP.11
Adjusted conservative estimate for AD for natural gas production	38 336.834 (2013) 39 050.351 (2014) 41 655.404 (2015) 43 776.333 (2016) 49 601.875 (2017)	10^6 m^3	ERT calculation
Adjusted conservative estimate for subcategory 1.B.2.b.2 natural gas – production	11 686.869 (2013) 11 904.382 (2014) 12 698.525 (2015) 13 345.084 (2016) 15 120.983 (2017)	kt CO_2 eq	ERT calculation
Total aggregated GHG emissions (excluding LULUCF and including indirect CO_2 emissions) as reported by the Party	312 753.592 (2013) 333 480.170 (2014) 344 801.348 (2015) 345 758.534 (2016) 366 174.097 (2017)	kt CO_2 eq	CRF table Summary 2
Total aggregated GHG emissions (excluding LULUCF and including indirect CO_2 emissions) after application of adjustment	324 062.274 (2013) 344 992.108 (2014) 357 097.029 (2015) 358 680.443 (2016) 380 871.603 (2017)	kt CO_2 eq	ERT calculation
Difference between original and adjusted total aggregated GHG emissions	11 308.682 (2013) 11 511.938 (2014) 12 295.681 (2015) 12 921.909 (2016) 14 697.506 (2017)	kt CO_2 eq	ERT calculation
	3.616 (2013) 3.452 (2014) 3.566 (2015) 3.737 (2016) 4.014 (2017)	%	ERT calculation
The ERT estimates that the change resulting from the adjustment is above the threshold given in decision 24/CP.19, annex I, paragraph 37(b)	Yes	The change resulting from the adjusted value for the category is greater than 500 kt CO_2 eq and 0.05% of national emissions	ERT calculation

Table 7

Background information to support the calculation of adjustments for subcategory 1.B.2.b.3 natural gas – processing – CO_2 and CH_4 for Kazakhstan

Element	*Description*
Underlying problem and rationale for adjustment	The ERT noted that Kazakhstan used the notation key "NE" to report CH_4 and CO_2 emission estimates and AD for subcategory 1.B.2.b.3 natural gas – processing for the entire time series. The ERT also noted that the NIR did not contain information on natural gas processing activities in the country, even though Kazakhstan has several gas processing plants, for example, the Bolashak oil and gas processing plant in the Atyrau region

Element	*Description*
	and the Kazakh gas refinery, which confirms that natural gas processing activities occur in Kazakhstan. The ERT further noted that data on natural gas production in Kazakhstan required for performing calculations of emissions for this subcategory were available in CRF table 1.B.2 for the entire time series. During the review, the Party explained that Kazakhstan is an important producer of natural gas and therefore AD for natural gas production were reported in its 2019 annual submission. However, data on the amount of gas processed have not yet been provided by the natural gas processing facilities and these data have not yet been reflected in the Party's national statistics. Kazakhstan indicated that it has requested the AD related to subcategory 1.B.2.b.3 natural gas – processing and that it expects to receive these data from the Agency of Statistics of Kazakhstan for use in future annual submissions. The ERT concluded that emission estimates from subcategory 1.B.2.b.3 natural gas – processing were omitted, which could lead to a potential underestimation of CH_4 and CO_2 emissions for 2017. In response to the list of potential problems and further questions raised by the ERT, Kazakhstan resubmitted a complete set of CRF tables for 1990–2017. In its response, Kazakhstan indicated that the AD values for natural gas production presented in CRF table 1.A(b) with default EFs for developed countries were used to calculate the GHG emissions from subcategory 1.B.2.b.3 natural gas – processing. For 2017, Kazakhstan reported a revised value of 0.637 kt CO_2 eq for subcategory 1.B.2.b.3 natural gas – processing (0.025 kt CH_4 and 0.007 kt CO_2) in CRF table 1.B.2. The ERT noted that Kazakhstan did not report which values of the default EFs for developed countries it used or to which subcategory of type of processing plant they belong. The Party reported a CH_4 IEF of 0.59 kg/unit and a CO_2 IEF of 0.166 kg/unit. To assess and compare the revised emission estimates for subcategory 1.B.2.b.3 natural gas – processing submitted by Kazakhstan, the ERT calculated these emissions using the AD from CRF table 1.A(b) (42,675 million m^3) and the averages of the default EFs for developed countries (default weighted total for fugitives) from table 4.2.4 of the 2006 IPCC Guidelines (vol. 2, chap. 4, p.4.49). The ERT noted a significant difference between the emissions from gas processing calculated from its assessment and the estimates resubmitted by Kazakhstan for 2017. The ERT estimated 2,343.54 kt CO_2 eq including raw CO_2 venting and 636.54 kt CO_2 eq excluding raw CO_2 venting, while Kazakhstan reported a total value of 0.64 kt CO_2 eq. These significant differences were observed for all years of the time series. The ERT disagreed with the Party's response and concluded that emissions from subcategory 1.B.2.b.3 natural gas – processing, as reported in CRF table 1.B.2, were underestimated for 2017 (and for all other years of the second commitment period of the Kyoto

Element	*Description*
	Protocol) and, therefore, that the Party has not satisfactorily resolved the problem.
Recommendation to the Party to address the underlying problem, as contained in the list of potential problems and further questions raised by the ERT	Use the AD for natural gas production reported in CRF table 1.A(b) to report revised emission estimates for subcategory 1.B.2.b.3 natural gas – processing for 2017 using default CH_4 and CO_2 EFs provided in table 4.2.4 of the 2006 IPCC Guidelines (vol. 2, chap. 4, p.4.48). In addition, and following the principle of consistency, use the corresponding default CH_4 and CO_2 EFs from tables 4.2.4–4.2.5 of the 2006 IPCC Guidelines (vol. 2, chap. 4, p.4.48 and p.4.55, respectively) to estimate emissions from subcategory 1.B.2.b.3 natural gas – processing for the entire time series.
Assumptions, data and methodology used to calculate the adjustment	CO_2 and CH_4 emissions were estimated for subcategory 1.B.2.b.3 natural gas – processing using: (a) A tier 1 method with equation 4.2.1 from the 2006 IPCC Guidelines (vol. 2, chap. 4, p.4.41) and average values from the range of IPCC default EFs (default weighted total subcategory – fugitives) for CO_2 (2.00×10^{-5} Gg/10^6 m^3 gas production) and CH_4 (2.50×10^{-4} Gg/10^6 m^3 gas production), and for raw CO_2 venting (6.75×10^{-2} Gg/10^6 m^3 gas production) from the 2006 IPCC Guidelines (vol. 2, table 4.2.5, p.4.56) in accordance with paragraph 9 of decision 20/CMP.1, in conjunction with decision 4/CMP.11; (b) AD on natural gas production from the IEA energy balance for Kazakhstan (GCV basis); (c) GCV conversion factor of 0.038 TJ/10^3 m^3 from the IEA data (IEA, 2005).
Description of how the adjustment is conservative	In line with paragraph 5 of decision 20/CMP.1, in conjunction with decision 4/CMP.11, conservativeness was ensured by applying the conservativeness factor of 1.02 for AD (fugitive emissions from fuels, oil and natural gas) from table 2 of appendix III to the technical guidance on methodologies for adjustments under Article 5, paragraph 2, of the Kyoto Protocol (annex to decision 20/CMP.1 in conjunction with decision 4/CMP.11). The ERT therefore considers that the resulting adjusted values are conservative.

Table 8
Description of the calculation of adjustments for subcategory 1.B.2.b.3 natural gas – processing – CO_2 and CH_4 included in Annex A to the Kyoto Protocol for Kazakhstan

Parameter/estimate	*Value or assessment*	*Unit*	*Reference*
Category: 1.B.2.b.3 natural gas – processing – CO_2 and CH_4			
Party's estimate of AD (natural gas production)	32 952.410 (2013) 33 569.700 (2014) 35 770.200 (2015) 37 663.300 (2016) 42 675.000 (2017)	10^6 m^3	CRF table 1.B.2
Party's emission estimate from subcategory 1.B.2.b.3 natural gas – processing	0.492 (2013) 0.501 (2014)	kt CO_2 eq	CRF table 1.B.2, ERT calculation

Parameter/estimate	*Value or assessment*	*Unit*	*Reference*
	0.534 (2015) 0.562 (2016) 0.637 (2017)		
Input data/parameter for calculation of adjustment			
Calculated estimate for AD for natural gas – processing (natural gas production)	37 585.132 (2013) 38 284.658 (2014) 40 838.632 (2015) 42 917.974 (2016) 48 629.289 (2017)	10^6 m^3	IEA energy balance, ERT calculation
Conservativeness factor	1.02		Table 2 in appendix III to the annex to decision 20/CMP.1 in conjunction with decision 4/CMP.11
Adjusted conservative estimate for AD for natural gas – processing (natural gas production)	38 336.834 (2013) 39 050.351 (2014) 41 655.404 (2015) 43 776.333 (2016) 49 601.875 (2017)	10^6 m^3	ERT calculation
Adjusted conservative estimate for subcategory 1.B.2.b.3 natural gas – processing	2 828.108 (2013) 2 880.744 (2014) 3 072.919 (2015) 3 229.380 (2016) 3 659.130 (2017)	kt CO_2 eq	ERT calculation
Total aggregated GHG emissions (excluding LULUCF and including indirect CO_2 emissions) as reported by the Party	312 753.592 (2013) 333 480.170 (2014) 344 801.348 (2015) 345 758.534 (2016) 366 174.097 (2017)	kt CO_2 eq	CRF table Summary 2
Total aggregated GHG emissions (excluding LULUCF and including indirect CO_2 emissions) after application of adjustment	315 581.208 (2013) 336 360.413 (2014) 347 873.734 (2015) 348 987.352 (2016) 369 832.591 (2017)	kt CO_2 eq	ERT calculation
Difference between original and adjusted total aggregated GHG emissions	2 827.617 (2013) 2 880.244 (2014) 3 072.386 (2015) 3 228.818 (2016) 3 658.494 (2017)	kt CO_2 eq	ERT calculation
	0.904 (2013) 0.864 (2014) 0.891 (2015) 0.934 (2016) 0.999 (2017)	%	ERT calculation
The ERT estimates that the change resulting from the adjustment is above the threshold given in decision 24/CP.19, annex I, paragraph 37(b)	Yes	The change resulting from the adjusted value for the category is greater than 500 kt CO_2 eq and 0.05% of national emissions	ERT calculation

Table 9
Background information to support the calculation of adjustments for subcategory 1.B.2.c venting and flaring – venting – CO_2 and CH_4 for Kazakhstan

Element	*Description*
Underlying problem and rationale for adjustment	The ERT noted that Kazakhstan used the notation key "NA" to report AD and CO_2 and CH_4 emission estimates for venting of oil, gas and combined under subcategory 1.B.2.c venting and flaring for the entire time series. In the NIR (section 3.6.3.1, p.127), Kazakhstan did not provide information on venting activities, which commonly occur in the oil and gas industry, but reported that associated operations for both oil and natural gas occur in the country. The Party reported CO_2, CH_4 and N_2O emissions from flaring of combined oil and gas for the entire time series in CRF table 1.B.2. During the review, Kazakhstan explained that it used the notation key "NA" because no data were available to estimate GHG emissions from venting of natural gas and oil operations, although they had been requested from the oil and gas companies. Given that oil and gas production activities occurred in the country, and emissions of CO_2 and CH_4 from flaring were reported, the ERT concluded that CO_2 and CH_4 emissions from venting occurred but were not reported by Kazakhstan in the 2019 annual submission. This led to a potential underestimation of CO_2 and CH_4 emissions from venting under subcategory 1.B.2.c venting and flaring for 2017. In response to the list of potential problems and further questions raised by the ERT, Kazakhstan resubmitted a complete set of CRF tables for 1990–2017. The ERT noted that Kazakhstan continued to use the notation key "NA" to report CO_2 and CH_4 emission estimates, AD and units of AD in CRF table 1.B.2 for venting of oil and natural gas under subcategory 1.B.2.c venting and flaring, and the notation key "IE" for the CO_2 and CH_4 emissions, AD and units of AD for combined venting for the entire time series. In addition, Kazakhstan left blank cells for the description of the AD. In its response, Kazakhstan explained that to avoid double counting in subcategory 1.B.2.c venting and flaring, it included venting emissions in subcategory 1.B.2.a.1 oil – exploration. However, the ERT also noted that the reported revised emissions from subcategory 1.B.2.a.1 oil – exploration were unrealistically low. The ERT further noted that according to the 2006 IPCC Guidelines, venting and flaring subcategories are related to activities in different industry segments of oil and natural gas operations, for which Kazakhstan did not estimate and report complete emissions in its resubmission. Namely, for venting, Kazakhstan did not report emissions from gas processing, gas transmission, oil production and oil transport activities that may produce CO_2 and CH_4 emissions. The ERT concluded that CO_2 and CH_4 emissions from subcategory 1.B.2.c flaring and venting – venting were underestimated for 2017 (and for all other years of the second commitment period of the Kyoto Protocol) and, therefore, that

Element	*Description*
	the Party has not satisfactorily resolved the problem.
Recommendation to the Party to address the underlying problem, as contained in the list of potential problems and further questions raised by the ERT	Provide AD for venting under subcategory 1.B.2.c venting and flaring for 2017, which correspond to production of natural gas and production of oil, and estimate CO_2 and CH_4 emissions for 2017 from venting under subcategory 1.B.2.c venting and flaring using default CO_2 and CH_4 EFs provided in table 4.2.4 of the 2006 IPCC Guidelines (vol. 2, chap. 4, p.4.48). In addition, and following the principle of consistency, use the corresponding default CO_2 and CH_4 EFs from tables 4.2.4–4.2.5 of the 2006 IPCC Guidelines (vol. 2, chap. 4, p.4.48 and p.4.55, respectively) to estimate emissions from venting under subcategory 1.B.2.c venting and flaring for the entire time series.
Assumptions, data and methodology used to calculate the adjustment	CO_2 and CH_4 emissions were estimated for subcategory 1.B.2.c venting and flaring – venting using: (a) A tier 1 method with equation 4.2.1 from the 2006 IPCC Guidelines (vol. 2, chap. 4, p.4.41); (b) Average values from the range of IPCC default CO_2 and CH_4 EFs for venting in gas transmission (5.20×10^{-6} Gg $CO_2/10^6$ m^3 marketable gas and 3.92×10^{-4} Gg CH_4 $/10^6$ m^3 marketable gas) and oil production (default weighted total) (2.15×10^{-3} Gg $CO_2/10^3$ m^3 oil production and 1.04×10^{-2} Gg $CH_4/10^3$ m^3 oil production) from the 2006 IPCC Guidelines (vol. 2, table 4.2.5, p.4.56) in accordance with paragraph 9 of decision 20/CMP.1, in conjunction with decision 4/CMP.11; (c) AD on oil production taken from CRF table 1.A(b) and AD on natural gas production taken from the IEA energy balance for Kazakhstan (GCV basis), which was assumed as the volume of marketable gas; (d) Density of crude oil (0.83 t/m^3) provided by Kazakhstan in response to a request for information for the application of adjustments in 2017 (FCCC/ARR/2017/KAZ, table 22); (e) GCV conversion factor of 0.038 TJ/10^3 m^3 from the IEA data (IEA, 2005).
Description of how the adjustment is conservative	In line with paragraph 5 of decision 20/CMP.1, in conjunction with decision 4/CMP.11, conservativeness was ensured by applying the conservativeness factor of 1.02 for AD (fugitive emissions from fuels, oil and natural gas) from table 2 of appendix III to the technical guidance on methodologies for adjustments under Article 5, paragraph 2, of the Kyoto Protocol (annex to decision 20/CMP.1 in conjunction with decision 4/CMP.11). The ERT therefore considers that the resulting adjusted values are conservative.

Table 10
Description of the calculation of adjustments for subcategory 1.B.2.c venting and flaring – venting – CO_2 and CH_4 included in Annex A to the Kyoto Protocol for Kazakhstan

Parameter/estimate	*Value or assessment*	*Unit*	*Reference*
Category: 1.B.2.c venting and flaring – venting – CO_2 and CH_4			
Party's estimate of AD (venting – oil, gas and combined)	IE, NA (2013) IE, NA (2014) IE, NA (2015) IE, NA (2016) IE, NA (2017)	–	CRF table 1.B.2
Party's emission estimate from subcategory 1.B.2.c venting and flaring – venting – CO_2 and CH_4	IE, NA (2013) IE, NA (2014) IE, NA (2015) IE, NA (2016) IE, NA (2017)	kt CO_2 eq	CRF table 1.B.2
Input data/parameter for calculation of adjustment			
Calculated estimate for AD for oil production	98 538.554 (2013) 97 380.446 (2014) 95 730.482 (2015) 94 014.217 (2016) 103 848.675 (2017)	10^3 m^3	CRF table 1.A(b), ERT calculation
Calculated estimate for AD for natural gas transmission (natural gas production assumed as marketable gas)	37 585.132 (2013) 38 284.658 (2014) 40 838.632 (2015) 42 917.974 (2016) 48 629.289 (2017)	10^6 m^3	IEA energy balance, ERT calculation
Conservativeness factor	1.02		Table 2 in appendix III to the annex to decision 20/CMP.1 in conjunction with decision 4/CMP.11
Adjusted conservative estimate for AD for oil production	100 509.325 (2013) 99 328.055 (2014) 97 645.092 (2015) 95 894.501 (2016) 105 925.648 (2017)	10^3 m^3	ERT calculation
Adjusted conservative estimate for AD for natural gas transmission (natural gas production assumed as marketable gas)	38 336.834 (2013) 39 050.351 (2014) 41 655.404 (2015) 43 776.333 (2016) 49 601.875 (2017)	10^6 m^3	ERT calculation
Adjusted conservative estimate for oil production, venting	26 222.883 (2013) 25 914.689 (2014) 25 475.604 (2015) 25 018.875 (2016) 27 636.002 (2017)	kt CO_2 eq	ERT calculation
Adjusted conservative estimate for natural gas transmission, venting	375.900 (2013) 382.897 (2014) 408.440 (2015) 429.236 (2016) 486.356 (2017)	kt CO_2 eq	ERT calculation
Adjusted conservative estimate for subcategory 1.B.2.c venting and flaring – venting – CO_2 and CH_4 (oil, gas and combined)	26 598.783 (2013) 26 297.586 (2014) 25 884.044 (2015) 25 448.111 (2016)	kt CO_2 eq	ERT calculation

Parameter/estimate	*Value or assessment*	*Unit*	*Reference*
	28 122.358 (2017)		
Total aggregated GHG emissions (excluding LULUCF and including indirect CO_2 emissions) as reported by the Party	312 753.592 (2013) 333 480.170 (2014) 344 801.348 (2015) 345 758.534 (2016) 366 174.097 (2017)	kt CO_2 eq	CRF table Summary 2
Total aggregated GHG emissions (excluding LULUCF and including indirect CO_2 emissions) after application of adjustment	339 352.375 (2013) 359 777.756 (2014) 370 685.392 (2015) 371 206.645 (2016) 394 296.455 (2017)	kt CO_2 eq	ERT calculation
Difference between original and adjusted total aggregated GHG emissions	26 598.783 (2013) 26 297.586 (2014) 25 884.044 (2015) 25 448.111 (2016) 28 122.358 (2017)	kt CO_2 eq	ERT calculation
	8.505 (2013) 7.886 (2014) 7.507 (2015) 7.360 (2016) 7.680 (2017)	%	ERT calculation
The ERT estimates that the change resulting from the adjustment is above the threshold given in decision 24/CP.19, annex I, paragraph 37(b)	Yes	The change resulting from the adjusted value for the category is greater than 500 kt CO_2 eq and 0.05% of national emissions	ERT calculation

Table 11
Background information to support the calculation of adjustments for subcategory 2.F.1.f stationary air conditioning – HFCs for Kazakhstan

Element	*Description*
Underlying problem and rationale for adjustment	The ERT noted that in the NIR (p.182), the Party stated that HFC emissions from refrigerant blends were estimated taking into account the shares of different refrigerants in these blends. According to the NIR, blends of refrigerants used in Kazakhstan are R-404, R-407, R-410 and R-507. The ERT also noted that all these blends contain HFC-125; however, Kazakhstan reported HFC-125 emissions as "NO" for category 2.F.1 refrigeration and air conditioning for the entire time series in the CRF tables. The ERT further noted that from the information provided in the CRF tables and the NIR, it was not possible to assess which specific refrigerant blends were used under different subcategories of category 2.F.1 refrigeration and air conditioning. During the review, Kazakhstan did not clarify in which types of refrigeration or air-conditioning applications (commercial refrigeration, domestic refrigeration, transport refrigeration and stationary air conditioning) the refrigerant blends R-404, R-407, R-410 and R-507 were used. The ERT concluded that this may lead to a potential underestimation of HFC emissions from category 2.F.1 refrigeration and air conditioning for 2013–2017 and all other years of the time series.

Element	*Description*
	In response to the list of potential problems and further questions raised by the ERT, Kazakhstan reported revised HFC emissions for category 2.F.1 refrigeration and air conditioning, including HFC-32, HFC-125, HFC-143 and HFC-143a for 1995–2017, and allocated these emissions to subcategory 2.F.1.a commercial refrigeration in the description of the revision. The ERT considered the Party's response and noted that the information provided was very limited and still did not allow the ERT to assess which specific refrigerant blends were used under the different subcategories of category 2.F.1 refrigeration and air conditioning. In addition, Kazakhstan did not provide a transparent explanation of the types of refrigeration or air-conditioning applications (commercial refrigeration, domestic refrigeration, transport refrigeration and stationary air conditioning) in which the refrigerant blends R-404, R-407, R-410 and R-507 were used. Furthermore, the ERT noted that, according to Kazakhstan's response, the HFC emission estimates for subcategory 2.F.1.a commercial refrigeration were revised; however, in the resubmitted CRF tables, only revised estimates for subcategory 2.F.1.b domestic refrigeration were reported, while emissions from subcategory 2.F.1.a commercial refrigeration remained the same as in the original 2019 annual submission. The ERT also noted that the HFC emission estimates reported in the CRF tables and those provided in the description of the revision did not match: in Kazakhstan's response, 338.9 t HFC-125 were reported under subcategory 2.F.1.a commercial refrigeration for 2017, but in the CRF tables these emissions were reported as "NO" and only 40.01 t HFC-125 were reported under subcategory 2.F.1.b domestic refrigeration for 2017. As the information on the revised HFC emission estimates was incomplete, not transparent and had not been prepared in line with the 2006 IPCC Guidelines and the UNFCCC Annex I inventory reporting guidelines, the ERT was not able to assess whether this revision was correctly performed, and therefore disagreed with the Party's response and considered that the Party has not satisfactorily resolved the problem. In addition, the ERT noted that according to the 2006 IPCC Guidelines (vol. 3, chap. 7, section 7.5.1, p.7.43), blends of HFCs such as R-407C (HFC-32, HFC-125 and HFC-134a) and R-410A (HFC-32 and HFC-125) are replacing HCFC-22, mainly in stationary air conditioning; and blends of HFCs such as R-404A (HFC-125, HFC-134a and HFC-143a) and R-507A (HFC-125 and HFC-143a) have replaced R-502 and HCFC-22 in commercial refrigeration. Therefore, the adjustments should be applied only for subcategories 2.F.1.a commercial refrigeration and 2.F.1.f stationary air conditioning for 2013–2017. The ERT calculated adjustments of HFC emissions from subcategory 2.F.1.a commercial refrigeration for 2013–2017 using the average emission rate

Element	*Description*
	(HFC emissions per capita) from a cluster of countries (Russian Federation and Ukraine), with population as a driver. The adjusted emission estimates resulted in lower values than Kazakhstan's revised estimates; therefore, the calculated adjustments for subcategory 2.F.1.a commercial refrigeration should not be applied.
Recommendation to the Party to address the underlying problem, as contained in the list of potential problems and further questions raised by the ERT	Provide revised estimates for category 2.F.1 refrigeration and air conditioning, ensuring that HFC emission estimates by gas from the refrigerant blends used in Kazakhstan are included for 2017 and, following the principle of consistency, for the other years of the second commitment period (2013–2016). Provide a description of the methods, AD and other parameters used for the emission estimates, including transparent information on the types of refrigeration and/or air-conditioning applications (commercial refrigeration, domestic refrigeration, transport refrigeration or stationary air conditioning) in which the specific refrigerant blends were used.
Assumptions, data and methodology used to calculate the adjustment	HFC emissions from subcategory 2.F.1.f stationary air conditioning were estimated using: (a) The average emission rate (HFC emissions per capita) for 2013–2017 from a cluster of countries with similar geographic and economic conditions (Russian Federation and Ukraine), with the population of these countries as a driver; (b) Data on population for 2013–2017 in Kazakhstan and the countries in the cluster (Russian Federation and Ukraine) taken from the World Bank (https://data.worldbank.org/indicator/SP.POP.TOTL); (c) HFC emissions from subcategory 2.F.1.f stationary air conditioning for 2013–2016 for the Russian Federation, which were taken from CRF table 2(II)B-H (sheet 2) of the 2018 annual submission of the Russian Federation, which was the latest reviewed inventory submission, and HFC emissions for 2017, which were calculated using linear extrapolation of the trend of HFC emissions for 2013–2016; (d) HFC emissions from subcategory 2.F.1.f stationary air conditioning for 2013–2015 for Ukraine, which were taken from CRF table 2(II)B-H (sheet 2) of the 2017 annual submission of Ukraine, which was the latest reviewed inventory submission, and HFC emissions for 2016 and 2017, which were calculated using linear extrapolation of the trend of HFC emissions for 2013–2015; (e) The calculated average rate of HFC emissions from subcategory 2.F.1.f stationary air conditioning for the cluster of countries (Russian Federation and Ukraine), which amounted to 0.0127 t CO_2 eq/person. This value was multiplied by the population data in Kazakhstan for the

Element	*Description*
	corresponding years (2013–2017) to calculate the adjusted HFC emission estimates.
Description of how the adjustment is conservative	In line with paragraph 5 of decision 20/CMP.1, in conjunction with decision 4/CMP.11, conservativeness was ensured by applying the conservativeness factor of 1.21 for emission estimates (consumption of halocarbons and SF_6) from table 2 of appendix III to the technical guidance on methodologies for adjustments under Article 5, paragraph 2, of the Kyoto Protocol (annex to decision 20/CMP.1 in conjunction with decision 4/CMP.11). The ERT therefore considers that the resulting adjusted values are conservative.

Table 12
Description of the calculation of adjustments for subcategory 2.F.1.f stationary air conditioning – HFCs included in Annex A to the Kyoto Protocol for Kazakhstan

Parameter/estimate	*Value or assessment*	*Unit*	*Reference*
Category: 2.F.1.f stationary air conditioning – HFCs			
Party's emission estimate from subcategory 2.F.1.f stationary air conditioning – HFCs	83.818 (2013) 81.249 (2014) 86.827 (2015) 84.028 (2016) 88.033 (2017)	kt CO_2 eq	CRF table 2(II)B-H (sheet 2), ERT calculation
Input data/parameter for calculation of adjustment			
Calculated estimate for emissions from 2.F.1.f stationary air conditioning – HFCs	215.787 (2013) 218.988 (2014) 222.212 (2015) 225.395 (2016) 228.482 (2017)	kt CO_2 eq	ERT calculation
Conservativeness factor	1.21		Table 2 in appendix III to the annex to decision 20/CMP.1 in conjunction with decision 4/CMP.11
Adjusted conservative estimate for HFC emissions from 2.F.1.f stationary air conditioning	261.102 (2013) 264.976 (2014) 268.877 (2015) 272.728 (2016) 276.463 (2017)	kt CO_2 eq	ERT calculation
Total aggregated GHG emissions (excluding LULUCF and including indirect CO_2 emissions) as reported by the Party	312 753.592 (2013) 333 480.170 (2014) 344 801.348 (2015) 345 758.534 (2016) 366 174.097 (2017)	kt CO_2 eq	CRF table Summary 2
Total aggregated GHG emissions (excluding LULUCF and including indirect CO_2 emissions) after application of adjustment	312 930.876 (2013) 333 663.896 (2014) 344 983.398 (2015) 345 947.234 (2016) 366 362.527 (2017)	kt CO_2 eq	ERT calculation
Difference between original and adjusted total aggregated GHG emissions	177.285 (2013) 183.726 (2014)	kt CO_2 eq	ERT calculation

Parameter/estimate	*Value or assessment*	*Unit*	*Reference*
	182.050 (2015) 188.700 (2016) 188.430 (2017)		
	0.057 (2013) 0.055 (2014) 0.053 (2015) 0.055 (2016) 0.051 (2017)	%	ERT calculation
The ERT estimates that the change resulting from the adjustment is above the threshold given in decision 24/CP.19, annex I, paragraph 37(b)	Yes	The change resulting from the adjusted value for the category is greater than 0.05% of national emissions	ERT calculation

Table 13
Background information to support the calculation of adjustments for category 5.C.2 open burning of waste – CO_2, CH_4 and N_2O for Kazakhstan

Element	*Description*
Underlying problem and rationale for adjustment	The ERT noted that no information on potential CO_2, CH_4 and N_2O emissions from open burning in unauthorized SWDS was presented in the NIR. The ERT also noted that the notation keys "NO" and "NA" were reported in CRF table 5.C for CO_2, CH_4 and N_2O emissions from open burning. During the review, Kazakhstan informed the ERT that the practice of open burning of waste is prohibited by the Environmental Code of Kazakhstan. Kazakhstan also informed the ERT that requests to provide data on open burning of waste are sent each year to regional environmental departments, municipal authorities and the Agency of Statistics of Kazakhstan. Data on open burning in unauthorized SWDS have not been provided to date. The ERT further noted that according to information provided during the review, only 15.0 per cent of SWDS are authorized for operation in the country, meaning that most disposal sites in operation in Kazakhstan are not authorized. According to the 2006 IPCC Guidelines (vol. 5, chap. 5, p.5.5), open burning of waste may occur at unmanaged sites and in rural areas, where waste collection systems do not exist. The ERT considered that CO_2, CH_4 and N_2O emissions from open burning in unauthorized SWDS may occur as a result of poor waste management practices in rural areas of the country and that these emissions were not included in the national inventory, leading to the potential underestimation of CO_2, CH_4 and N_2O emissions from category 5.C.2 open burning of waste for 2013–2017 and all other years of the time series. In response to the list of potential problems and further questions raised by the ERT, Kazakhstan indicated that official data on open burning of waste were not available and therefore GHG emission estimates for open burning of waste were not provided in the CRF tables (the emissions and AD were reported as "NO" and "NA"). In addition, Kazakhstan indicated that statistical data on waste accumulation in rural areas were also not available.

Element	*Description*
	Further, the Party confirmed that the Environmental Code of Kazakhstan clearly defines the environmental requirements for the treatment of municipal waste and that the prevention of unauthorized burning of municipal waste is strictly controlled by local authorities, which was supported by two newspaper references; however, the ERT noted from these two references that open burning of waste actually occurred in at least one region of the country. Lastly, Kazakhstan indicated that emissions from open burning of solid waste were insignificant and that the estimated total value of CO_2, CH_4 and N_2O emissions was 340,428 kt CO_2 eq. The ERT noted that the information reported by Kazakhstan used to support its conclusion that emissions from open burning of solid waste were insignificant was neither detailed nor transparent (e.g. regarding the methodological tier, EFs and parameters used) and included some incorrect data. Therefore, the ERT concluded that the explanation provided by Kazakhstan to support its conclusion that emissions from open burning of solid waste were insignificant is not sufficiently substantiated or transparent, and that the value of 340,428 kt CO_2 eq estimated by Kazakhstan exceeds the significance threshold of 0.05 per cent of the national total (183.09 kt CO_2 eq in 2017), or 500 kt CO_2 eq, according to decision 24/CP.19, annex I, paragraph 37(b), even if the correct value was in fact 340.428 kt CO_2 eq. Therefore, the ERT considers that the Party has not satisfactorily resolved the problem.
Recommendation to the Party to address the underlying problem, as contained in the list of potential problems and further questions raised by the ERT	Provide formal documentation demonstrating that all waste streams generated by urban and rural populations were included in the calculation of GHG emissions for the waste sector and that emissions from open burning did not occur in the country. If this is not possible, provide emission estimates for open burning of waste for 2017 and all other years of the time series, as recommended in the 2006 IPCC Guidelines (vol. 5, chap. 5.3.2, pp.5.15–5.17), using documented assumptions on waste treatment practices in rural areas, in particular, AD (i.e. on open burning of waste). If emissions from open burning are assumed to be insignificant, Kazakhstan should provide relevant justifications and assumptions for considering the category as insignificant in accordance with decision 24/CP.19, annex I, paragraph 37(b).
Assumptions, data and methodology used to calculate the adjustment	CO_2, CH_4 and N_2O emissions were estimated for category 5.C.2 open burning of waste using: (a) A tier 1 method with equations 5.1 for CO_2, 5.4 for CH_4 and 5.5 for N_2O from the 2006 IPCC Guidelines (vol. 5, chap. 5, p.5.7, p.5.12 and p.5.14, respectively); (b) For CO_2 emissions, default parameters for estimating total dry matter content (0.73), fraction of C in dry matter (0.54), fraction of fossil C in total C (0.39) and an oxidation factor (0.58) from the 2006 IPCC Guidelines (vol. 5, chap. 2, table

Element	*Description*
	2.3, p.2.12, and table 2.4, p.2.14; and vol. 5, chap. 5, table 5.2, p.5.18); for CH_4 emissions, a default EF (6,500 g/t MSW) from the 2006 IPCC Guidelines (vol. 5, chap. 5, p.5.20); and for N_2O emissions, a default EF (0.15 g/kg waste dry weight (dry matter)) and value for total dry matter content (0.73) from the 2006 IPCC Guidelines (vol. 5, chap. 5, table 5.6, p.5.22; and chap. 2, table 2.3, p.2.12, and table 2.4, p.2.14); (c) AD (MSW burned), which were calculated using the estimated annual waste generation rate and the assumption that 15 per cent of the population not covered by waste collection systems burns waste and 20 per cent of this population sends waste to open dumps where burning occurs. A default fraction of 0.6 was considered to be the waste that is burned relative to the total amount of waste disposed of at open dumps; (d) The population not covered by waste collection systems, which was assumed to be equal to the rural population provided by Kazakhstan in table 7.4 of the NIR; (e) The annual waste generation rate, which was calculated using data provided by Kazakhstan in its calculation spreadsheets for category 5.A.1 solid waste disposal (for 1990–2015) contained in the response to a request for information for the application of adjustments in 2017 (FCCC/ARR/2017/KAZ, table 42); linear extrapolation was used to estimate the annual waste generation rate for 2016 and 2017; The ERT carried out the procedure for the calculation of adjustments for this category only for 2016 and 2017 because previous adjusted values for 2013–2015 were not recalculated in the 2019 annual submission.
Description of how the adjustment is conservative	In line with paragraph 5 of decision 20/CMP.1, in conjunction with decision 4/CMP.11, conservativeness was ensured by applying the conservativeness factor of 1.21 for AD (waste incineration) from table 2 of appendix III to the technical guidance on methodologies for adjustments under Article 5, paragraph 2, of the Kyoto Protocol (annex to decision 20/CMP.1 in conjunction with decision 4/CMP.11). The ERT therefore considers that the resulting adjusted values are conservative.

Table 14

Description of the calculation of adjustments for category 5.C.2 open burning of waste – CO_2, CH_4 and N_2O included in Annex A to the Kyoto Protocol for Kazakhstan

Parameter/estimate	*Value or assessment*	*Unit*	*Reference*
Category: 5.C.2 open burning of waste – CO_2, CH_4 and N_2O			
Party's estimate of AD (amount of open burned waste)	NO, NA (2016) NO, NA (2017)	kt	CRF table 5.C
Party's emission estimate from category 5.C.2 open burning of waste	NO, NA (2016) NO, NA (2017)	kt CO_2 eq	CRF table 5.C

Parameter/estimate	*Value or assessment*	*Unit*	*Reference*
Input data/parameter for calculation of adjustment			
Calculated estimate for AD for amount of open burned waste	813.391 (2016) 831.228 (2017)	kt	ERT calculation
Conservativeness factor	1.21		Table 2 in appendix III to the annex to decision 20/CMP.1 in conjunction with decision 4/CMP.11
Adjusted conservative estimate for amount of open burned waste	983.961 (2016) 1 005.786 (2017)	kt	ERT calculation
Adjusted conservative estimate for emissions from category 5.C.2 open burning of waste	513.707 (2016) 525.101 (2017)	kt CO_2 eq	ERT calculation
Total aggregated GHG emissions (excluding LULUCF and including indirect CO_2 emissions) as reported by the Party	345 758.534 (2016) 366 174.097 (2017)	kt CO_2 eq	CRF table Summary 2
Total aggregated GHG emissions (excluding LULUCF and including indirect CO_2 emissions) after application of adjustment	346 272.241 (2016) 366 699.198 (2017)	kt CO_2 eq	ERT calculation
Difference between original and adjusted total aggregated GHG emissions	513.707 (2016) 525.101 (2017)	kt CO_2 eq	ERT calculation
	0.149 (2016) 0.143 (2017)	%	ERT calculation
The ERT estimates that the change resulting from the adjustment is above the threshold given in decision 24/CP.19, annex I, paragraph 37(b)	Yes	The change resulting from the adjusted value for the category is greater than 500 kt CO_2 eq and 0.05% of national emissions	ERT calculation

Annex V

Reference documents

A. Reports of the Intergovernmental Panel on Climate Change

IPCC. 2003. *Good Practice Guidance for Land Use, Land-Use Change and Forestry*. J Penman, M Gytarsky, T Hiraishi, et al. (eds.). Hayama, Japan: Institute for Global Environmental Strategies. Available at https://www.ipcc.ch/publication/good-practice-guidance-for-land-use-land-use-change-and-forestry/.

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 http://www.ipcc-nggip.iges.or.jp/public/kpsg.

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 http://www.ipcc-nggip.iges.or.jp/public/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, 2015, 2016 and 2017 annual submissions of Kazakhstan, contained in documents FCCC/ARR/2013/KAZ, FCCC/ARR/2015/KAZ, FCCC/ARR/2016/KAZ and FCCC/ARR/2017/KAZ, respectively.

Initial review report

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 Kazakhstan, contained in document FCCC/IRR/2017/KAZ.

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%202019.pdf.

Annual status report for Kazakhstan for 2019. Available at https://unfccc.int/sites/default/files/resource/asr2019_KAZ.pdf.

C. Other documents used during the review

Responses to questions during the review were received from Gulmira Sergazina (JSC "Zhasyl Damu"), including additional material on the methodology and assumptions used. The references in the list below that were received from the Party are reproduced as received:

Borovsky V.M., Uspanov U.U (1971): Soils of Kazakhstan and ways of their national economic use.

EMEP/EEA Air Pollutant Emission Inventory Guidebook 2016. Available at https://www.eea.europa.eu/publications/emep-eea-guidebook-2016.

Faizov K.Sh., Urazaliev R.A., Iorgansky A.I. (2001): Soils of the Republic of Kazakhstan.

IEA. 2005. *Energy Statistics Manual*. Paris: IEA. Available at https://www.iea.org/reports/energy-statistics-manual.

Inglezakis VJ, Moustakas K, Khamitovac G, et al. 2017. Municipal Solid Waste Management in Kazakhstan: Astana and Almaty Case Studies. *Chemical Engineering Transactions*. 56: pp.565–570. Available at https://www.cetjournal.it/index.php/cet/article/view/CET1756095.

Ismuratova A. 2019. Штраф в 7,5 тысячи тенге грозит дачникам Костанайской области, бесконтрольно сжигающим мусор | Газета Наш Костанай [A fine of 7.5 thousand tenge threatens summer residents of Kostanay region who burn garbage uncontrollably]. *Our Kostanay*. 23 May. Available at https://top-news.kz/shtraf-v-7-5-tysjachi-tenge-grozit-dachnikam-kostanajskoj-oblasti-beskontrolno-szhigajushhim-musor/.

Methodological instructions for estimation of greenhouse gas emissions from coal mining and handling operations, surface mining. Astana, 2010. Guiding regulation document, approved by the Minister of Environmental Protection, Republic of Kazakhstan, 5 November 2010, No. 280-ө. (Available at https://www.egfntd.kz/upload/NTD/MERK/5.pdf).

Methodological instructions for estimation of greenhouse gas emissions from coal mining and handling operations, underground mining. Astana 2010. Guiding regulation document approved by Minister of Environmental Protection, Republic of Kazakhstan, 5 November 2010, No. 280-ө (Available at https://www.egfntd.kz/upload/NTD/MERK4).

Pedan I. 2016. Штраф более шести тысяч тенге могут заплатить дачники за сжигание мусора на участках [Summer residents can pay a fine of more than six thousand tenge for burning garbage on the sites]. *Kostanay News*. 26 April. Available at http://kstnews.kz/news/society/item-29760.

World Reference Base for Soil Resources. Rome. 1998. Food and Agriculture Organization of the United Nations. Available at http://www.fao.org/3/W8594E/W8594E00.htm.