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Report on the individual review of the annual submission of Kazakhstan submitted in 2017*

Note by the expert review team

Summary

Each Party included in Annex I to the Convention must submit an annual greenhouse gas (GHG) inventory covering emissions and removals of GHG emissions 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 2017 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 18 to 23 September 2017 in Astana, Kazakhstan.

* In the symbol for this document, 2017 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*
AAU	assigned amount unit
AD	activity data
Annex A sources	source categories included in Annex A to the Kyoto Protocol
Annex I Parties	Parties included in Annex I to the Convention
AR	afforestation and reforestation
ARR	annual review report
Article 8 review guidelines	"Guidelines for review under Article 8 of the Kyoto Protocol"
B_o	maximum methane-producing capacity of the manure
C	carbon
C	confidential
C_2F_6	hexafluorethane
CaC_2	calcium carbide
CaO	calcium oxide
CER	certified emission reduction
CF_4	perfluoromethane
CH_4	methane
CKD	cement kiln dust
CM	cropland management
CO_2	carbon dioxide
CO_2 eq	carbon dioxide equivalent
CP2	second commitment period of the Kyoto Protocol
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
DRI	direct reduced iron
EF	emission factor
EMEP/EEA	European Monitoring and Evaluation Programme/European Environment Agency
ERT	expert review team
ERU	emission reduction unit
FM	forest management
FMRL	forest management reference level
FOD	first-order decay
$Frac_{LEACH}$	fraction of all nitrogen added to/mineralized in managed soils that is lost through leaching and run-off
F_{SOM}	amount of mineralized nitrogen resulting from loss of soil organic carbon stocks in mineral soils through land-use change or management parctices
GCV	gross calorific value
GDP	gross domestic product
GHG	greenhouse gas
GM	grazing land management
HFCs	hydrofluorocarbons
IE	included elsewhere

IEA	International Energy Agency
IEF	implied emission factor
IPCC	Intergovernmental Panel on Climate Change
IPCC good practice guidance	*Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories*
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
KazNIIEK	Kazakh Scientific Research Institute of Ecology and Climate
KP-LULUCF activities	LULUCF emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol
Kyoto Protocol Supplement	*2013 Revised Supplementary Methods and Good Practice Guidance Arising from the Kyoto Protocol*
LPG	liquefied petroleum gas
LULUCF	land use, land-use change and forestry
MSW	municipal solid waste
N	nitrogen
N_2O	nitrous oxide
NA	not applicable
NCV	net calorific value
NE	not estimated
Nex	nitrogen excretion
NF_3	nitrogen trifluoride
NIR	national inventory report
NO	not occurring
ODS	ozone-depleting substances
PFCs	perfluorocarbons
QA/QC	quality assurance/quality control
Revised 1996 IPCC Guidelines	*Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*
RMU	removal unit
RV	revegetation
SEF	standard electronic format
SF_6	sulfur hexafluoride
SIAR	standard independent assessment report
SOC	soil organic carbon
SWDS	solid waste disposal sites
UNFCCC	United Nations Framework Convention on Climate Change
UNFCCC Annex I inventory reporting guidelines	"Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual greenhouse gas inventories"
UNFCCC review guidelines	"Guidelines for the technical review of information reported under the Convention related to greenhouse gas inventories, biennial reports and national communications by Parties included in Annex I to the Convention"
VS	volatile solids
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 2017 annual submission of Kazakhstan organized by the secretariat, in accordance with the Article 8 review guidelines (decision 22/CMP.1, as 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 18 to 23 September 2017 in Astana, Kazakhstan, and was coordinated by Mr. 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	Ms. Olia Glade	New Zealand
Energy	Ms. Rana Humbatova	Azerbaijan
IPPU	Mr. Roman Kazakov	Russian Federation
Agriculture	Ms. Anna Romanovskaya	Russian Federation
LULUCF	Ms. Oksana Butrym	Ukraine
Waste	Ms. Tatiana Tugui	Republic of Moldova
Lead reviewers	Ms. Glade	
	Ms. Tugui	

2. The basis of the findings in this report is the assessment by the ERT of the consistency of Kazakhstan's 2017 annual submission with the Article 8 review guidelines. 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 2017 annual submission (see annex IV below).

3. 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.

4. 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 gas, sector and activity for Kazakhstan.

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

[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. The implementation of the provisions of the Doha Amendment is therefore considered in this report in the context of decision 1/CMP.8, paragraph 6, pending the entry into force of the amendment.

[2] Issues are defined in decision 13/CP.20, annex, paragraph 81.

[3] Problems are defined in decision 22/CMP.1, annex, paragraphs 68 and 69, as revised by decision 4/CMP.11.

II. Summary and general assessment of the 2017 annual submission

6. 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: 4 July and 21 September 2017 (NIR and addendum to the NIR, respectively), 14 April 2017, version 2 (CRF tables). For the SEF tables, see ID# G.14 in table 5		
	Revised submission: 17 November 2017, version 4 (CRF tables) and 26 January 2018, version 6 (CRF tables)		
	Unless otherwise specified, the values from the latest submission are used in this report		
Review format	In-country		
Application of the requirements of the UNFCCC Annex I inventory reporting guidelines and Wetlands Supplement (if applicable)	1. Have any issues been identified in the following areas:		
	(a) Identification of key categories	Yes	KL.5
	(b) Selection and use of methodologies and assumptions	Yes	G.19, I.14, I.25, I.28, I.32, I.43, I.44, I.46, I.47, I.49, A.16, A.17, A.20, L.1, L.2, L.5, L.6, L.8, L.9, L.10, L.12, L.13, L.14, L.17, L.18, L.20, L.21, W.6, W.10, W.16, KL.2, KL.3
	(c) Development and selection of EFs	Yes	E.15, E.16, E.29, E.30, E.35, E.39, E.52, E.53, I.29, I.39, I.48, A.14, A.15, L.13, L.20, W.2
	(d) Collection and selection of AD	Yes	G.16, G.19, E.8, E.9, E.12, E.13, E.34, E.49, E.52, I.16, I.17, I.24, I.28, I.31, I.41, I.45, A.17, A.18, L.1, L.2, L.6, L.8, L.9, L.10, L.11, L.12, L.14, L.18, L.20, L.21, W.1, W.3, W.8, W.10, W.16, W.17, KL.1, KL.2, KL.3, KL.4
	(e) Reporting of recalculations	Yes	G.11, L.16
	(f) Reporting of a consistent time series	Yes	G.19, E.4, E.24, E.39, E.41, E.42, E.53, I.13, I.37, A.12, A.18, L.2, L.6, L.8, L.9, L.10, L.12, L.14, L.18, L.20, L.21, L.22, KL.1, KL.2, KL.3

Assessment			*Issue or problem ID#(s) in table 3 and/or 5[a]*
	(g) Reporting of uncertainties, including methodologies	Yes	G.9
	(h) QA/QC	QA/QC procedures were assessed in the context of the national system (see para. 2 in this table)	
	(i) Missing categories/completeness[b]	Yes	E.34, E.38, E.40, E.43, E.48, E.56, I.18, I.24, I.38, I.50, I.51, I.52, L.1, L.2, L.5, L.6, L.21, W.1, W.4, W.10, W.11, W.12, W.19, KL.2, KL.3, KL.4
	(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	E.32, I.18, I.24, I.35, A.11
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.39, I.11, I.15, I.26
Supplementary information under the Kyoto Protocol	2. Have any issues been identified related to the national system:		
	(a) The overall organization of the national system, including the effectiveness and reliability of the institutional, procedural and legal arrangements	Yes	G.14, G.15, G.16, G.19
	(b) Performance of the national system functions	Yes	G.4, G.14, G.12, G.15, G.16, G.17, G.19, E.38, I.1, L.10, W.2
	3. Have any issues been identified related to the national registry:		
	(a) Overall functioning of the national registry	Yes	G.13
	(b) Performance of the functions of the national registry and the technical standards for data exchange	Yes	G.13
	4. Have any issues been identified related to reporting of information on ERUs, CERs, AAUs and RMUs and on discrepancies reported in accordance with decision 15/CMP.1, annex, chapter I.E, taking into consideration any findings or recommendations contained in the SIAR?	Yes	G.14
	5. 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, including any changes since the previous annual submission?	Yes	G.20
	6. Have any issues been identified related to the reporting of LULUCF activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, as follows:		

Assessment			*Issue or problem ID#(s) in table 3 and/or 5*[a]
	(a) Reporting requirements in decision 2/CMP.8, annex II, paragraphs 1–5	Yes	KL.1, KL.2, KL.3, KL.4
	(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.1, KL.3
	(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	No	
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	See FCCC/IRR/2017/KAZ
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?	NA	The Party does not have a previously applied adjustment
Response from the Party during the review	Has the Party provided the ERT with responses to the questions raised, including the data and information necessary for the assessment of conformity with the UNFCCC Annex I inventory reporting guidelines and any further guidance adopted by the Conference of the Parties?	Partially	E.42, E.43, E.47, E.48, E.49, E.50, I.31, I.37, I.38, I.41, W.17, W.18, W.19
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 questions of implementation?	Yes	See table 7 in section 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 activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol that are not listed in this table but are included in table 3 and/or 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

7. Table 3 compiles all the recommendations made in previous review reports that were included in the previous review report, published on 7 March 2017.[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 2017 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/2016/KAZ.

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]	*Recommendation made in previous review report*	*ERT assessment and rationale*
General			
G.1	Notation keys (G.2, 2016) (table 3, 2013) Adherence to the UNFCCC Annex I inventory reporting guidelines	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 notation keys, in particular "NO" and "IE", in CRF tables across multiple inventory sectors in the 2017 annual submission that is not in line with decision 24/CMP.19, annex I, paragraph 37 (e.g. see ID#s E.21, E.32, E.34, E.45, I.20, I.22, A.10, L.1, W.1, W.11 and W.12 below).
G.2	QA/QC and verification (G.5, 2016) (12, 2013) (21, 2012) Transparency	Provide a clarification in the NIR that the set of QA/QC activities is generally the same each year, but a designated person is responsible for adjusting the time frames for performing them, depending on the progress of the inventory preparation.	Resolved. The required information is presented in section 1.2.3 of the NIR.
G.3	Key category analysis (G.9, 2016) (table 4, 2013) (17, 2012) Adherence to the UNFCCC Annex I inventory reporting guidelines	Ensure consistency of reporting in the NIR and the CRF tables and follow the level of disaggregation described in chapter 5.4 of the IPCC good practice guidance for LULUCF.	Resolved. The list of key categories in the NIR (annex 2) is consistent with CRF table 7, which is in line with the 2006 IPCC Guidelines.
G.4	Inventory management (G.12, 2016) (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 KazNIIEK.	Not resolved. The ERT noted that Kazakhstan included in the NIR (p.36) a high-level outline of the archiving procedures, but did not provide sufficient information on the structure of the existing archiving system and the principles of its operation, especially regarding the organization of data storage, retrieval and security. The ERT noted that the transparency of the archiving system description would be improved by including additional information on: (1) an overview of the security and recovery procedures in place to keep the data safe in case of natural disasters, fire, flood or other major risks; and (2) an overview of the inventory data retrieval process and how it ensures the availability of these data for review purposes.
G.5	NIR (G.16, 2016) Transparency	Provide detailed information on the assessment of completeness (e.g. in an annex) in the NIR.	Not resolved. The ERT noted that no detailed information on the assessment of completeness is provided in the NIR; instead, only a general statement that the inventory is complete is included in section 1.7 of the NIR.

ID#	*Issue and/or problem classification*[a]	*Recommendation made in previous review report*	*ERT assessment and rationale*
G.6	CRF tables (G.17, 2016) Adherence to the UNFCCC Annex I inventory reporting guidelines	Complete all cells and 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.	Not resolved. The ERT noted incorrect use of notation keys and blank cells in CRF tables across multiple inventory sectors in the 2017 annual submission that is not in line with decision 24/CMP.19, annex I, paragraph 37 (e.g. see ID#s E.17, E.23, E.28, E.33, E.44, I.18, I.22, L.2, W.1, W.10 and W.11 below).
G.7	Notation keys (G.17, 2016) 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 Kazakhstan did not provide justification for its use of "NE" and "IE" in the NIR and it did not provide comprehensive and correct explanations in CRF table 9.
G.8	QA/QC and verification (G.18, 2016) Adherence to the UNFCCC Annex I inventory reporting guidelines	Provide detailed information in the NIR on the QA/QC arrangements in place in accordance with the UNFCCC Annex I inventory reporting guidelines, including information on the QA/QC plan and on QA/QC procedures already implemented or to be implemented in the future.	Resolved. Kazakhstan provided a detailed description of its QA/QC system in section 1.2.3 of the NIR, including information on the QA/QC plan and on QA/QC procedures.
G.9	Uncertainty analysis (G.19, 2016) Transparency	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.	Not resolved. Information reported in the NIR (pp.37 and 38) on the uncertainty analysis was not sufficient for the ERT to understand how Kazakhstan has conducted the analysis, what assumptions were used and what the sources of uncertainty are. Also, the ERT noted that the uncertainty analysis for the base year (1990) is missing, which means that the 2006 IPCC Guidelines were only partially applied to the uncertainty analysis. The NIR does not provide sufficient information to determine whether the analysis was used in prioritizing efforts to improve accuracy.
G.10	Follow-up to previous reviews (G.20, 2016) Transparency	Provide summary information on addressing the recommendations raised in previous ARRs 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.	Addressing. The ERT noted that some information on the recommendations raised in previous ARRs was included in the sector-specific sections of the NIR. However, the NIR still shows a lack of transparency regarding follow-up actions to recommendations made in previous ARRs, because the relevant recommendations are not properly referenced. In response to a question from the ERT, Kazakhstan did not provide the status of the entire range of recommendations raised in previous ARRs, but suggested that this information will be included in the next annual submission.

ID#	*Issue and/or problem classification*[a]	*Recommendation made in previous review report*	*ERT assessment and rationale*
Energy			
E.1	1. General (energy sector) – all fuels – CO_2, CH_4 and N_2O (E.2, 2016) (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. The ERT noted that CRF table 9 contains insufficient information on the use of the notation key "IE". For example, "IE" was used to report all CO_2, CH_4 and N_2O emissions from other fossil fuels from categories 1.A.1 energy industries and 1.A.2 manufacturing industries and construction for the period 2009–2015; however, no information was provided in CRF table 9 on whether these emissions occurred under these categories or where these emissions were reported. The ERT also noted that a general explanation on the use of the notation key "IE" for other fossil fuels in categories 1.A.1 and 1.A.2 is included in a comment for the cell with AD in CRF table 1.A(a) and that a more detailed explanation is provided in the NIR in section 3.4.7, entitled "Planned Improvements". During the review, Kazakhstan indicated that consumption of other fossil fuels in category 1.A.2 was reallocated to the respective subcategories by fuel types (liquid, gaseous and solid) according to the energy balance. For category 1.A.4 other sectors, Kazakhstan used both the notation keys "NA" and "IE" for reporting CO_2, CH_4 and N_2O emissions from other fossil fuels for the same period. No explanations were provided on the use of notation keys in the NIR or in CRF table 9. However, an unclear explanation on the use of the notation keys "IE" and "NA" for other fossil fuels in category 1.A.4 is included in a comment for the cell with AD in CRF table 1.A(a). Owing to the lack of transparency, it is possible that the notation key "IE" is still being used in place of "NA" or "NO", and that the notation key "NA" is being used in place of "NE" or "IE" for other fossil fuels for 2015 in the 2017 annual submission.
E.2	1. General (energy sector) – all fuels – CO_2, CH_4 and N_2O (E.3, 2016) (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 2017 annual submission for which the justifications and the methodological approach used are not transparently documented. For example, recalculations for the entire time series performed for CO_2, CH_4 and N_2O emissions from road transportation and the stationary subcategory under agriculture/forestry/fishing and CO_2 and CH_4 emissions from oil and natural gas were not explained or documented in the NIR.
E.3	1. General (energy sector) – all fuels – CO_2, CH_4 and	Explain the underlying assumptions and the degree of expert judgment used in the	Not resolved. The methodology/procedure used for deriving AD to fill the gaps in the time series of national statistics, in particular

ID#	*Issue and/or problem classification*[a]	*Recommendation made in previous review report*	*ERT assessment and rationale*
	N_2O (E.4, 2016) (28, 2013) (42, 2012) (49, 2011) Transparency	applied interpolation methodology to fill in the time series for AD of national statistics and report it in the NIR.	the assumptions and the level to which expert judgment was involved, were not transparently documented in the NIR.
E.4	1. General (energy sector) – all fuels – CO_2, CH_4 and N_2O (E.5, 2016) (28, 2013) (42, 2012) Consistency	Ensure the consistency of the entire time series and provide comparisons of AD obtained from different sources.	Not resolved. The ERT noted that the NIR (table 3.14) contains AD on fuel consumption for all subcategories under manufacturing industries and construction. Nevertheless, the NIR (note to table 3.14) indicated erroneously that certain types of fuel used were not included in the calculations, because their used amount was negligible, showing that an issue of consistency of the AD persists. No comparisons of data sets from different sources were provided for the period 1991–1998 in the NIR, because the data sets for the periods 1991–1998 and 1999–2015 are not comparable owing to the lack of an energy balance in Kazakhstan and use of other less reliable data sources for the period 1991–1998, indicating that issues of consistency of the AD in the time series persist.
E.5	1. General (energy sector) – all fuels – CO_2, CH_4 and N_2O (E.6, 2016) (29, 2013) Transparency	Include the description of QA/QC procedures applied for transport and fugitive emissions.	Addressing. The ERT noted that the NIR does not contain information on QA/QC procedures for the category transport; only general information on QA/QC procedures for CO_2 emissions from subcategory 1.A.3.b road transportation was provided (NIR, section 3.5.4). For category 1.B fugitive emissions from fuels, only general information on QA/QC was provided (NIR, sections 3.6.1.4 and 3.6.2.8), and the NIR does not contain detailed descriptions of QA/QC procedures and checks applied for each subcategory.
E.6	Fuel combustion – reference approach – all fuels – CO_2 (E.7, 2016) (31, 2013) Transparency	Include information on apparent energy consumption (excluding non-energy use and feedstocks) in CRF table 1.A(c).	Resolved. In the 2017 annual submission, the apparent energy consumption (excluding non-energy use and feedstocks) was reported in CRF table 1.A(c) for the period 1990–2015.
E.7	Fuel combustion – reference approach – all fuels – CO_2 (E.8, 2016) (33, 2013) (46, 2012) (44, 2011) Transparency	Cross-check the AD and provide explanations for the differences in inter-annual changes between the reference and sectoral approaches.	Not resolved. The ERT noted that the difference in CO_2 emissions between the reference and sectoral approaches at the total level varied, ranging from 26.7 per cent in 1992 to –0.3 per cent in 2005. According to the NIR, the reason for such inter-annual differences is the absence of a national fuel balance for the period 1991–1999. For 2015, the difference in CO_2 emissions reported is 1.47 per cent. However, that figure resulted from compensating for the large negative and positive differences between the sectoral and reference approaches in 2015

ID#	*Issue and/or problem classification*[a]	*Recommendation made in previous review report*	*ERT assessment and rationale*
			for liquid fuels (–17.4 per cent), gaseous fuels (23.4 per cent) and other fossil fuels (–100.0 per cent), with the latter not reported in the reference approach but reported in the sectoral approach. The NIR does not explain the reasons for the large differences between the reference and sectoral approaches by fuel type, which affected the differences in the total CO_2 emissions between the two approaches.
E.8	Fuel combustion – reference approach – solid fuels – CO_2 (E.9, 2016) (34, 2013) Comparability	Carry out the planned improvement to separate coking coal consumption from the total other bituminous coal consumption.	Addressing. The issue is only partially addressed because, in the 2017 annual submission, the consumption of coking coal and other bituminous coal are separately reported only for 2014 and 2015, while the notation keys "NA", "IE" and "NO" are used to report apparent consumption for the period 1990–2013. The NIR indicated that, in the reference approach for 2014, consumption of coking coal, lignite and sub-bituminous coal was reported separately, and that consumption of coal with high ash content and coal with a calorific value higher than 23.865 MJ/kg was included under other bituminous coal. No information is provided on distribution of coal by type for the reference approach in 2015.
E.9	International navigation – liquid fuels – CO_2, CH_4 and N_2O (E.11, 2016) (37, 2013) (50, 2012) (46, 2011) Accuracy	Obtain relevant navigation statistics and use the appropriate EFs for reporting emissions.	Not resolved. The notation key "NA" was used to report consumption and emissions of all types of fuels used in international navigation for the period 1990–2015. The NIR (section 3.5.9) indicates that AD on separate consumption of fuels for international and domestic navigation are not available (see ID# E.53 in table 5 and ID# 20 in FCCC/IRR/2017/KAZ).
E.10	1.A. Fuel combustion – sectoral approach – solid fuels – CO_2 (E.14, 2016) (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.	Addressing. The NIR (table 3.8) provided plant-specific EFs obtained from the individual mining fields for coking coal and coal with high ash content. Nevertheless, no documented information on the source of these EFs or on how they were derived was provided in the NIR. For other types of coal, default values of EFs from the 2006 IPCC Guidelines were applied.
E.11	1.A. Fuel combustion – sectoral approach – all fuels – CO_2, CH_4 and N_2O (E.16, 2016) (26, 2013) Transparency	Include detailed data on energy consumption by fuel for all subcategories in the energy sector.	Addressing. The NIR provided detailed information on energy consumption data by fuel type and category for 2015, but not for the period 1990–2014. Separate data sets are available only for categories 1.A.1 energy industries, 1.A.2 manufacturing industries and construction, 1.A.4 other sectors and 1.A.5 other. Although CRF table 1.A(b) contains information on apparent

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			consumption of several types of fuel, for example anthracite and coal tar, the ERT noted that AD on consumption by categories are not included under the respective tables of the NIR.
E.12	1.A. Fuel combustion – sectoral approach – all fuels – CO_2 (E.18, 2016) (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.	Not resolved. The allocation of AD and emissions between the energy and the IPPU sectors is limited and not transparently explained in the NIR. Among the few explanations provided, the NIR indicates that to avoid double counting, coal concentrate was accounted for in the IPPU sector in the category iron and steel production but, for example, there is no information on the allocation of AD for lubricants used for non-energy purposes for the period 2009–2013 (NIR, table 3.7), which indicates a possible issue of misallocation. In addition, the ERT identified some issues regarding the allocation of AD and emissions between the energy and the IPPU sectors (see ID#s I.45, I.46 and I.47 in table 5).
E.13	1.A.3.b Road transportation – liquid fuels – CO_2, CH_4 and N_2O (E.21, 2016) (42, 2013) Comparability	Reallocate AD and emissions from transportation in agriculture/forestry/fisheries to the subcategory agriculture/forestry/fisheries and emissions from industrial and construction off-road transport to the category manufacturing industries and construction.	Addressing. In its 2017 annual submission, Kazakhstan reallocated emissions related to mobile sources from subcategory 1.A.4.c.i stationary under agriculture/forestry/fishing to 1.A.4.c.ii off-road vehicles and other machinery, for the entire time series. However, emissions and AD under this latter subcategory from all fuels, namely gasoline, diesel oil and LPG, were reported aggregate under other liquid fuels, which limits both transparency and comparability. According to the NIR (p.109) emissions from industrial and construction off-road transport were included under subcategory 1.A.3.e.ii other, which is still not correct as they should be reported under the category manufacturing industries and construction.
E.14	1.A.3.b Road transportation – liquid fuels – N_2O (E.22, 2016) (43, 2013) (60, 2012) Accuracy	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.	Not resolved. The ERT noted that the 2017 annual submission used a default N_2O EF (3.20 kg/TJ) for uncontrolled vehicles to estimate emissions from gasoline (all vehicles in the fleet) for the entire time series. The NIR (p.107) indicated that it is not possible to assess the amount of vehicles that have oxidation catalysts. The ERT believes that future ERTs should consider this issue further to ensure that there is not an underestimate of emissions from this activity.
E.15	1.B.1.a Coal mining and handling – solid fuels – CH_4 (E.23, 2016) (44, 2013)	Include the background information about the measurements made and time	Not resolved. The NIR did not provide data on measurements or a time series of CH_4 concentration. The ERT noted that the country-specific CH_4 EF reported for mining

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	(56, 2012) Transparency	series of the CH_4 concentration in the NIR (underground mines).	activities (underground mines) in 2015 is 25.60 kg/t, which is higher than the upper default value (16.75 kg/t) provided in the 2006 IPCC Guidelines. No additional information on this country-specific CH_4 EF was reported in the NIR. The ERT believes that future ERTs should consider this issue further to ensure that there is not an overestimate of emissions from this activity.
E.16	1.B.1.a Coal mining and handling – solid fuels – CH_4 (E.24, 2016) (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 NIR does not contain information on the CH_4 content of the coal provided by mining companies, the calculation of the country-specific CH_4 EF or any additional information on this country-specific CH_4 EF. The CH_4 EF used for calculations for mining activities (surface mines) in 2015 is 7.16 kg/t, which is much higher than the upper value of 1.34 kg/t provided in the 2006 IPCC Guidelines. The ERT noted that the inconsistency of the IEFs continues in the period 1990–2015 (stable values for 1990–1999 (8.30 kg/t) and 2000 and 2002–2012 (7.16 kg/t), a value of 5.88 kg/t for 2001, a value of 7.64 kg/t for 2013 and a value of 7.60 kg/t for 2014). The ERT believes that future ERTs should consider this issue further to ensure that there is not an overestimate of emissions from this activity.
E.17	1.B.1.b Solid fuel transformation – solid fuels – CH_4 (E.26, 2016) (46, 2013) Transparency	Ensure the correct use of notation keys and report the information in the documentation boxes in the CRF tables.	Not resolved. Kazakhstan continued to use the inappropriate notation key "NA" to report emissions from this category in CRF table 1.B.1. The ERT noted that, because CRF table 1.A(d) contains information on use of coking coal for production of coke used in iron and steel production, emissions from solid fuel transformation probably do occur in the country (see ID# E.50 in table 5).
E.18	Fuel combustion – reference approach – all fuels – CO_2 (E.27, 2016) 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. The ERT noted that in 2015 the difference in the total CO_2 emissions reported in the reference and sectoral approaches was 1.5 per cent. However, the difference in the CO_2 emissions varied in the range from 26.7 per cent in 1992 to –0.3 per cent in 2005. In addition, large differences of CO_2 emissions (and apparent consumption) are reported between the reference and sectoral approaches at the level of fuel type, in particular for liquid fuels, gaseous fuels and other fossil fuels (see ID# E.7 above). The NIR does not contain sufficient explanations of the reasons for such differences by type of fuels, which certainly influence the differences in the CO_2 emission totals.

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E.19	Fuel combustion – reference approach – all fuels – CO_2 (E.28, 2016) Accuracy	Improve the accuracy and consistency of its reporting of energy consumption in the reference approach, particularly paying attention to the correct completion of cells for "Apparent consumption (excluding non-energy use, reductants and feedstocks)" and ensure that the differences between the approaches are reasonable.	Addressing. In the 2017 annual submission, Kazakhstan reported values of "Apparent energy consumption (excluding non-energy use, reductants and feedstocks)" in CRF table 1.A(c) in PJ and the amounts of non-energy use of fuels, reductants and feedstocks were excluded from apparent energy consumption and presented in the respective column of CRF table 1.A(c). However, for example, in 2015 the value for solid fuel consumption excluding non-energy use in CRF table 1.A(c) is incorrect, as it is higher than the apparent consumption of solid fuels reported in CRF table 1.A(b) (not excluding non-energy use) and it does not match the likely value to be obtained if excluding the non-energy use value reported in CRF table 1.A(d) from the apparent consumption of solid fuels reported in CRF table 1.A(b). In addition, CRF table 1.A(c) shows that, although the total difference between the sectoral and reference approaches regarding the total CO_2 emissions is relatively small (e.g. in 2015 it is 1.47 per cent), the differences for individual fuel types are significantly large (see ID# E.7 above).
E.20	Fuel combustion – reference approach – all fuels – CO_2 (E.28, 2016) Consistency	Ensure consistent reporting of the comparison of the reference and sectoral approaches in annex II to the NIR and in the CRF tables.	Resolved. In the 2017 annual submission the information reported by Kazakhstan on the differences between the sectoral and reference approaches in CRF table 1.A(c) and in the NIR (section 3.3, table 3.3) is consistent. Annex II to the previous NIR on differences between the sectoral and reference approaches has been removed in the current annual submission.
E.21	Feedstocks, reductants and other non-energy use of fuels – all fuels – CO_2 (E.30, 2016) Adherence to the UNFCCC Annex I inventory reporting guidelines	Improve the QA/QC procedures relevant to the estimation of the use of the feedstocks, reductants and non-energy use of fuels and ensure consistent reporting across CRF table 1.A(b) and table 1.A(d).	Addressing. The ERT noted that the reported values for carbon excluded from the reference approach for fuels in CRF tables 1.A(b) and 1.A(c) were consistently reported. Nevertheless, the ERT noted that: in CRF table 1.A(b) carbon excluded for natural gas liquids was reported as "NE", while in CRF table 1.A(d) carbon excluded was reported as "IE"; and in CRF table 1.A(b) carbon excluded for crude oil was reported as "NE", while in CRF table 1.A(d) carbon excluded was reported as "NO".
E.22	1.A. Fuel combustion – sectoral approach – other fuels – CO_2, CH_4 and N_2O (E.31, 2016) Transparency	Explain the fuels covered under "other fuels" and the changes in their contributions that may affect the IEF; investigate the data gap regarding the consumption of other fuels for the period 2009–2013 and describe in the NIR the appropriateness of any notation	No longer relevant. On the basis of investigations made by the Agency of Statistics of the Republic of Kazakhstan, the consumption of fuels previously reported under "other fuels" was distributed into liquid, gaseous and solid fuels and included from 2009 onwards under respective categories (see ID# E.49 in table 5).

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		keys applied during this period; and ensure the consistency of the time series of reported estimates from other fuels.	
E.23	1.A.2.d Pulp, paper and print – all fuels – CH_4 and N_2O (E.32, 2016) Completeness	Include emissions of CH_4 and N_2O from the category 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. In its 2017 annual submission, Kazakhstan provided CH_4 and N_2O emission estimates from liquid and solid fuels for the entire time series. However, CH_4 emissions from gaseous fuels were reported only for 2001–2015 and N_2O emissions only for 2002–2015. For the remaining years "NA" was used, which the ERT considers incorrect as it should be reported as "NE" or "NO". In addition, CH_4 and N_2O emissions from biomass were reported for the period 1992–2008, but for 1990, 1991 and 2009–2015 the notation key "NA" was used, which the ERT considers incorrect as it should be reported as "NE" or "NO". The ERT believes that future ERTs should consider this issue further to ensure that there is not an underestimate of emissions from this activity.
E.24	1.A.3.a Domestic aviation – liquid fuels – CH_4 and N_2O (E.34, 2016) 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).	Addressing. The CH_4 EF for aviation gasoline was not corrected for 1993. As a result, the CRF tables still show an IEF value of 5 kg/TJ for 1.A.3.a domestic aviation for 1993. The ERT noted that the CH_4 emissions from aviation gasoline remain inconsistent within the time series, showing a 10-fold increase from 0.0000112 kt in 1992 to 0.000112 kt in 1993. The N_2O IEFs for the entire time series are reported correctly (2 kg/TJ).
E.25	1.A.3.b Road transportation – liquid fuels – CO_2 (E.35, 2016) Completeness	Verify the road transport-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 transport activities within the country, and justify the EF used or use the default EF suggested by the 2006 IPCC Guidelines.	Addressing. Kazakhstan provided CO_2 emission estimates for diesel oil consumption from road transportation for the entire time series using a default CO_2 EF value of 74.10 t/TJ from the 2006 IPCC Guidelines. No background information on road transport activities within the country or on technology used were provided in the NIR. During the review, Kazakhstan indicated that diesel-fuelled cars were available in countries of the former Soviet Union in the early 1990s, but no supporting documentation was presented.
E.26	1.A.3.b Road transportation – liquid fuels – N_2O (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 an N_2O EF for diesel oil of 3.16 kg/TJ for 2008 and the default EF of 3.9 kg/TJ (2006 IPCC Guidelines, vol.2, table 3.2.2) to calculate N_2O emissions for the rest of the time series. The NIR does not include an explanation for the use of different EFs.
E.27	1.A.3.b.i Cars – liquid fuels – CH_4	Verify the road transport-related AD for gasoline consumption,	Not resolved. Kazakhstan continues to use the default CH_4 EF (33.00 kg/TJ) for

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	(E.37, 2016) Accuracy	the technology used and the background information about road transport and justify the relatively high, and increasing, CH_4 IEF.	uncontrolled motor gasoline (2006 IPCC Guidelines, vol.2, table 3.2.2) for the entire time series, except for 2010 (30.12 kg/TJ). No information on the use of a different CH_4 EF in 2010 was provided in the NIR. Moreover, no documentation on the quality of gasoline used in Kazakhstan was provided to justify the use of a relatively high CH_4 EF when compared with other Annex I Parties (e.g. 16.04 kg/TJ for the Russian Federation and 18.40 kg/TJ for Ukraine in 2015); and no information was provided on the verification of AD for gasoline consumption and the technology used in road transportation. The ERT believes that future ERTs should consider this issue further to ensure that there is not an overestimate of emissions for the complete time series from this activity (see ID# E.52 in table 5).
E.28	1.B.1.a Coal mining and handling – solid fuels – CH_4 (E.38, 2016) 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. The notation key "NA" is used to report recovery/flaring for the period 1990–2015. The ERT noted that in the NIR (p.137) it is indicated that 3–5 per cent of CH_4 is recovered and used for heat production. The ERT believes that future ERTs should consider this issue further to ensure that there is not an overestimate of emissions from this activity.
E.29	1.B.1.a Coal mining and handling – solid fuels – CH_4 (E.39, 2016) Transparency	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 reported CH_4 IEFs vary significantly between 0.80 kg/t in 1995 and 0.31 kg/t in 2000. In 2015, the reported value for this CH_4 IEF is 0.67 kg/t, which is lower than the default average value of 1.675 kg/t (range of 0.603–2.680 kg/t) provided in the 2006 IPCC Guidelines (vol.2, p.4.12). No relevant justifications were provided in the NIR for the choice of the country-specific CH_4 EFs or information on the calculation method used to derive the CH_4 EFs. The ERT concluded that the use of low CH_4 EFs (0.65 kg/t, 0.65 kg/t and 0.67 kg/t for 2013, 2014 and 2015, respectively) leads to a potential underestimation of CH_4 emissions from post-mining activities in subcategory 1.B.1.a.i. underground mines for 2013, 2014 and 2015. The ERT therefore included this issue in the list of potential problems and further questions raised by the ERT. The ERT recommended that Kazakhstan provide reliable background information on the use of country-specific CH_4 EFs or, if this is not possible, provide revised CH_4 emission estimates for post-mining activities under 1.B.1.a.i. underground mines using the default CH_4 EF from the 2006 IPCC Guidelines (vol. 2, chapter 4, "Fugitive

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			emissions", p.4.12) for 2013, 2014 and 2015. In response to the list of potential problems and further questions raised by the ERT, Kazakhstan resubmitted a complete set of CRF tables for 1990–2015 with revised CH_4 estimates for this subcategory using a CH_4 EF value of 0.41 kg/t for 1990 and a value of 0.67 kg/t for the period 2011–2015. However, Kazakhstan did not provide justifications on the method used or justification of the low country-specific CH_4 EF for post-mining activities in underground mines. The ERT disagreed with the Party's response and considers that Kazakhstan has not satisfactorily resolved the potential problem. This is because, although Kazakhstan provided emission estimates for the category, the CH_4 EF used for estimating the emissions in the resubmitted CRF tables was below the default value provided in the 2006 IPCC Guidelines and no justification for the use of the low EF value has been provided. Therefore, in accordance with the guidance for adjustments under Article 5, paragraph 2, of the Kyoto Protocol (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 (see section VI and annex IV below).
E.30	1.B.1.a Coal mining and handling – liquid fuels – CH_4 (E.40, 2016) 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 its NIR and the changes in the IEF for the period 1990–2014.	Not resolved. For 2015, a value of 7.16 kg/t for the CH_4 IEF was reported for surface mining activities, which is much higher than the upper default value of 1.34 kg/t provided in the 2006 IPCC Guidelines (vol. 2, p.4.18). The NIR did not provide information on the CH_4 content of national coals, the calculation method of the CH_4 EFs or on verification of data provided by the coal mining companies or implemented QA/QC procedures to verify the conversion between volume and mass; and the NIR did not provide explanations on the changes in the IEF for the entire time series.
E.31	1.B.1.a Coal mining and handling – solid fuels – CO_2 (E.41, 2016) 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 NIR does not contain information on the methodology and background information used for the estimation of the country-specific CO_2 EFs (for example 2.04 kg/t in 1990 and 1.80 kg/t in 2015) or for the estimation of emissions from surface mining activities, for which no methodology is included in the 2006 IPCC Guidelines. The ERT believes that future ERTs should consider this issue further to

ID#	Issue and/or problem classification[a]	Recommendation made in previous review report	ERT assessment and rationale
			ensure that there is not an overestimate of CO_2 emissions from this activity.
E.32	1.B.1.a Coal mining and handling – solid fuels – CH_4 (E.42, 2016) 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.	Not resolved. Kazakhstan reported "NO" for emissions from post-mining activities from surface mines in CRF table 1.B.1. In the NIR (p.139), Kazakhstan indicated that emissions from this category are not estimated because, according to the IPCC good practice guidance, emissions from post-mining activities in surface mines are accounted under mining activities. The ERT noted that the 2006 IPCC Guidelines provide default EFs and a tier 1 method for estimating emissions from post-mining activities in surface mines, and also noted that no estimates of the level of CH_4 emissions that would meet the definition of "insignificant" as contained in decision 24/CP.19, annex I, paragraph 37(b), were provided in the NIR. The ERT concluded that the omission of CH_4 emissions from subcategory 1.B.1.a.ii surface mines – post-mining activities may lead to a potential underestimation of emissions for 2013, 2014 and 2015. The ERT therefore included this issue in the list of potential problems and further questions raised by the ERT. The ERT recommended that Kazakhstan provide relevant information on the non-occurrence or insignificance of these emissions in the country in accordance with paragraph 37(b) of the UNFCCC Annex I inventory reporting guidelines or, if this is not possible, use surface coal production data and the default methodology from the 2006 IPCC Guidelines to calculate emissions of CH_4 from post-mining activities in surface mines using default EFs (vol. 2, chapter 4, p.4.19) for 2013, 2014 and 2015. In response to the list of potential problems and further questions raised by the ERT, Kazakhstan resubmitted a complete set of CRF tables for 1990–2015 with CH_4 estimates for this subcategory (0.004 kt CH_4 in 2015) using a country-specific EF for CH_4 (0.045 g/t), which is substantially lower than the default CH_4 EF (67 g/t) provided in the 2006 IPCC Guidelines (vol. 2, chapter 4, p.4.19). The ERT disagreed with the Party's response because it has not provided a justification for the use of an extremely low EF. Therefore, the ERT concluded that the CH_4 emissions from subcategory 1.B.1.a.ii surface mines – post-mining activities for 2013, 2014 and 2015 were underestimated. Therefore, in accordance with the guidance for adjustments under Article 5, paragraph

ID#	*Issue and/or problem classification*[a]	*Recommendation made in previous review report*	*ERT assessment and rationale*
			2, of the Kyoto Protocol (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 (see section VI and annex IV below).
E.33	1.B.2 Oil and natural gas and other – liquid and gaseous fuels – CO_2, CH_4 and N_2O (E.44, 2016) 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.	Not resolved. The ERT noted that Kazakhstan continued to use "NA" and "D" (according to the explanation provided by the Party, "D" means "default") to report the units of AD in categories 1.B.2.a oil and 1.B.2.b natural gas in the CRF tables. For category 1.B.2.c venting and flaring, all entries relating to AD values, units and unit description are left blank. The ERT further noted that emission values are reported for categories 1.B.2.a, 1.B.2.b and 1.B.2.c, which shows that activities occur in each of these categories and therefore units and description of AD should be reported.
E.34	1.B.2.a Oil – liquid fuels – CO_2, CH_4 and N_2O (E.45, 2016) Completeness	Estimate and include emissions from oil exploration or, if data for the estimation of the emissions from this category are not available, use the notation key "NE" with the relevant explanation in the CRF tables and in the NIR.	Not resolved. Kazakhstan continued to use "NO" to report emissions from oil exploration in CRF table 1.B.2. The ERT noted that the NIR indicated that around 100 international and national companies are involved in oil production in Kazakhstan, nevertheless only 40 per cent of them are able to provide the relevant information, therefore Kazakhstan did not deem it possible to perform estimates, while the issue of data collection remains unresolved. The ERT concluded that the omission of CO_2, CH_4 and N_2O emissions from this subcategory leads to potential emission underestimates for 2013, 2014 and 2015. The ERT therefore included this issue in the list of potential problems and further questions raised by the ERT. The ERT recommended that Kazakhstan use AD on the volume of total oil production and the methodology provided in the 2006 IPCC Guidelines (default EFs are provided in vol. 2, chapter 4, table 4.2.5) to estimate CO_2, CH_4 and N_2O emissions from activities under 1.B.2.a.1 exploration for 2013, 2014 and 2015. In response to the list of potential problems and further questions raised by the ERT, Kazakhstan resubmitted a complete set of CRF tables for 1990–2015 using the notation key "C" (confidential) for emissions from 1.B.2.a.1 exploration. The ERT disagreed with the Party's response because the 2006 IPCC Guidelines provide a methodology to estimate emissions from this subcategory using AD on total oil production and default CO_2, CH_4 and N_2O

ID#	Issue and/or problem classification[a]	Recommendation made in previous review report	ERT assessment and rationale
			EFs. The AD on total oil production are not confidential and are already used by Kazakhstan in relevant CRF tables and the NIR. Therefore, in accordance with the guidance for adjustments under Article 5, paragraph 2, of the Kyoto Protocol (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 (see section VI and annex IV below).
E.35	1.B.2.a Oil – liquid fuels – CO_2 (E.46, 2016) Completeness	Estimate the fugitive emissions of CO_2 from the oil production and oil transport processes for the period 1990–2014 (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 and 4.2.5) for oil production and oil transport processes.	Not resolved. Kazakhstan reported CO_2 emissions from oil transport only for 2014 and 2015, using default CO_2 EFs from the 2006 IPCC Guidelines (vol. 2, chapter 4, table 4.2.5). The ERT noted that it is difficult to assess the accuracy of the CO_2 emission estimates from oil transport because no information is provided on units of AD or their description in CRF table 1.B.2. The ERT noted that Kazakhstan continued to use "NA" to report CO_2 emissions from oil production; however, it reported an amount of CO_2 captured for 2014 and 2015. The ERT concluded that the omission of CO_2 emissions from oil production leads to a potential underestimation of emissions for 2013, 2014 and 2015 and that the omission of CO_2 emissions from oil transport leads to a potential underestimation of emissions for 2013. The ERT therefore included these issues in the list of potential problems and further questions raised by the ERT. The ERT recommended that Kazakhstan use the default CO_2 EF provided in the 2006 IPCC Guidelines (vol. 2, chapter 4, table 4.2.5) to calculate emissions of CO_2 from subcategory 1.B.2.a.2 production for 2013, 2014 and 2015, and use the default CO_2 EF provided in the 2006 IPCC Guidelines (vol. 2, chapter 4, table 4.2.5) to estimate CO_2 emissions from the subcategory 1.B.2.a.3 transport for 2013. In response to the list of potential problems and further questions raised by the ERT, Kazakhstan resubmitted a complete set of CRF tables for 1990–2015 with CO_2 estimates (and CH_4 estimates) for these subcategories. The ERT noted that it is difficult to assess the correctness of the revised CO_2 emission estimates (and CH_4 estimates), because for oil production the Party did not report the value and units of the default EF used from the 2006 IPCC Guidelines (the Party reported an IEF of 259.02 kg/unit), the type of oil produced and the unit of AD, which are necessary to

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			assess the correctness of choice of the CO_2 EF according to the 2006 IPCC Guidelines. For oil transport, Kazakhstan used a CO_2 EF (0.59–0.60 kg/unit) to calculate CO_2 emissions for the entire time series, which is substantially lower than the CO_2 EF (4.9 kg/unit) used by Kazakhstan in the original 2017 annual submission, which the ERT considers to be significantly different from the IPCC default value for pipeline transport of 0.49 kg/1,000 m^3; in addition, no description and units for AD have been reported for this subcategory. The ERT also noted that CO_2 emissions from 2014 and 2015 decreased in comparison with the original submission for oil transport. Therefore, the ERT concluded that Kazakhstan has not satisfactorily resolved the potential problem for these two subcategories. In accordance with the guidance for adjustments under Article 5, paragraph 2, of the Kyoto Protocol (decision 20/CMP.1, in conjunction with decision 4/CMP.11), the ERT carried out the procedure for the calculation of adjustments for these subcategories using the tier 1 method and in the case of 1.B.2.a.3 transport using AD from IEA. The impact of the revised estimates in 2015 for 1.B.2.a.3 transport is an increase of 8.885 kt CO_2 eq or 0.003 per cent of the national total (8.475 kt CO_2 eq or 0.003 per cent in 2013 and 8.541 kt CO_2 eq or 0.003 per cent in 2014). These adjusted values do not exceed the threshold provided in decision 24/CP.19, annex I, paragraph 37(b) (500 kt CO_2 eq or 0.05 per cent of the national total), therefore the calculated adjustments should not be applied. In the case of 1.B.2.a.2 production the adjusted values exceed the threshold indicated above (see section VI and annex IV below).
E.36	1.B.2.a Oil – liquid fuels – CH_4 (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 used CH_4 EFs of 106.32 kg/unit for the periods 1990–2012 and 2014–2015. In 2013, the CH_4 EF was 105.22 kg/unit. Moreover, Kazakhstan used a notation key "D" to describe the units of AD used in the CRF tables, which, according to the explanation provided, means "default". The ERT noted that according to the 2006 IPCC Guidelines (vol.2, table 4.2.5), the default CH_4 EF is 0.02 Gg/1,000 m^3 of oil produced, which the ERT noted is fairly different from the value used by Kazakhstan. Kazakhstan did not describe any QA/QC procedures applied for this particular category or provide any explanation on the choice of CH_4 EF used.

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			The ERT believes that future ERTs should consider this issue further to ensure that there is not an underestimate of emissions from this activity.
E.37	1.B.2.a Oil – liquid fuels – CH_4 (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.	Addressing. Kazakhstan reported a CH_4 IEF in the range of 3.53–3.55 kg/unit for its emission estimates from refining/storage for the entire time series. Nevertheless, the ERT noted that the AD used for the 2012 and 2013 emission estimates are kept constant (140,000 units) and that the AD for 1999 (5,177 units) are significantly lower compared with the level of AD for other years of the time series. Moreover, the notation key "NA" was used to describe units of AD, which is not in line with the 2006 IPCC Guidelines. No information on verification of the time-series consistency of the CH_4 estimates and the EFs was provided in the NIR. The ERT believes that future ERTs should consider this issue further to ensure that there is not an underestimate of CH_4 emissions from this activity.
E.38	1.B.2.a Oil – liquid fuels – CH_4 (E.49, 2016) Completeness	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.	Not resolved. Kazakhstan reported AD for subcategory 1.B.2.a.3 transport for the entire time series. Nevertheless, the notation key "NA" was used to report CH_4 emissions for the period 1990–1996; thus, the CRF tables show the IEF as "NA". For the period 1997–2015, the CRF tables report the CH_4 IEF as 29.89 kg/unit. The letter "D" was used to describe units of AD in the CRF tables, which, according to explanations provided by Kazakhstan, means "default". This is not in line with the 2006 IPCC Guidelines. CH_4 emissions for the period 1997–2015 vary between 0.14 and 0.49 kt. No explanations on these inconsistencies or information on QA/QC procedures for this particular category were provided in the NIR. The ERT believes that future ERTs should consider this issue further to ensure that there is not an underestimate of emissions from this activity.
E.39	1.B.2.b Natural gas – gaseous fuels – CO_2 and CH_4 (E.52, 2016) 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.	Not resolved. Kazakhstan did not provide information in the NIR on verification of the CO_2 and CH_4 EFs, and did not describe the related emission trends. The ERT noted that in order to estimate CO_2 emissions from 1.B.2.b.2 production Kazakhstan used a CO_2 EF of 16.00 kg/unit for the entire time series, with the exception of the 1990 value (16.23 kg/unit). The notation key "NA" is used to describe units of AD and no information on units was provided during the review in response to a request from the ERT. The ERT believes that future ERTs

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			should consider this issue further to ensure that there is not an overestimation of emissions from this activity in 1990. The ERT also noted that the CRF tables show a CH_4 IEF of 2.90 kg/unit to report emissions from this subcategory for the period 2013–2015, which is substantially lower than the IEF value (2,100 kg/unit) for 1990–2012. The ERT further noted that the NIR reported that Kazakhstan used a default CH_4 EF (2.9 t/million m^3 or 2.9 kg/thousand m^3) from the IPCC good practice guidance to calculate CH_4 emissions from this subcategory. During the review, Kazakhstan did not provide an explanation of the change in the EF values after 2012, or an explanation on the source of the EF of 2.9 kg/unit, or justification for the use of a different EF for for 2013–2015. Kazakhstan also did not explain why, if there were reasons for the change in the EF, the entire time series has not been recalculated to maintain time-series consistency. The ERT concluded that the use of a low CH_4 EF (2.90 kg/unit) leads to a potential underestimation of CH_4 emissions from natural gas production in subcategory 1.B.2.b.2 production for 2013, 2014 and 2015. The ERT also concluded that if the use of this low EF is justified, it means that the EF (2,100 kg/unit) used for 1990–2012 is extremely high and the CH_4 emissions from 1990 could be overestimated. The ERT therefore included this issue in the list of potential problems and further questions raised by the ERT. The ERT recommended that Kazakhstan provide a clear justification for the use of the EF (2.90 kg/unit), indicating the relevant units, for estimating CH_4 emissions from subcategory 1.B.2.b.2 production, revise the CH_4 emission estimates for 1990 and, following the consistency principle, use this justified EF for the entire time series or, if it is impossible to provide a justification for the use of this EF, provide revised CH_4 emission estimates for 1990 and for 2013–2015 using the most appropriate default EF from the 2006 IPCC Guidelines (vol. 2, chapter 4, table 4.2.5) and follow the consistency principle 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 1990–2015 with revised CH_4 estimates for this subcategory using a CH_4 EF of 2,099.93 kg/unit for 1990. For the period 2013–2015, CH_4 EFs vary from 2,100 to 2,099.75 kg/unit. A notation key

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			"D" was used to describe units of AD in the CRF tables, which, according to Kazakhstan's explanation, means default, which in turn is not in line with the UNFCCC Annex I inventory reporting guidelines. The ERT disagreed with the Party's response because although Kazakhstan recalculated CO_2 and CH_4 emission estimates from the subcategory 1.B.2.b.2 production it is difficult to assess the correctness of the EFs applied because no justification for the use of country-specific EFs was provided and no information on units of AD was available, which is necessary to assess the correctness of the choice of the EFs according to the 2006 IPCC Guidelines and represents an issue regarding the reliability of these AD. Therefore, in accordance with the guidance for adjustments under Article 5, paragraph 2, of the Kyoto Protocol (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 (see section VI and annex IV below). In its comments on the draft review report, Kazakhstan explained that the revised emission estimates for this subcategory provided in response to the list of potential problems and further questions raised by the ERT were calculated using methodological guidance and national EFs from the Ministry of Environmental Protection, available at the website of the Ministry of Energy (Department of Climate Change).
E.40	1.B.2.b Natural gas – gaseous fuels – CO_2 and CH_4 (E.53, 2016) Completeness	Provide a complete estimate of the fugitive CH_4 and CO_2 emissions from the processing of natural gas in the country.	Not resolved. Kazakhstan used the notation key "NA" to report CO_2 and CH_4 emissions and AD from natural gas processing for the entire time series. The ERT noted that the NIR did not include any information on gas processing activities, although Kazakhstan has several gas processing plants, for example the Bolashak oil and gas processing plant in the Atyrau region with processing capacity of 8.8 million m^3 of gas per day (https://www.hydrocarbons-technology.com/projects/bolashak-oil-gas-processing-plant-atyrau-kazakhstan/), and the Kazakh gas refinery, which confirms that natural gas processing activities occur in the country. The ERT further noted that data on gas production in Kazakhstan are available in CRF table 1.B.2. The ERT concluded that omitting CO_2 and CH_4 emissions from subcategory 1.B.2.b.3 processing leads to an underestimation of

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			emissions of CO_2 and CH_4 for 2013, 2014 and 2015. The ERT included this issue in the list of potential problems and further questions raised by the ERT and recommended that Kazakhstan provide emission estimates using the amount of gas feed in gas plants and default CO_2 and CH_4 EFs provided in the 2006 IPCC Guidelines (vol. 2, chapter 4, table 4.2.5) for subcategory 1.B.2.b.3 processing for 2013, 2014 and 2015 and follow the principle of consistency 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 1990–2015 using "NA" for the CO_2 and CH_4 emission estimates, AD and IEFs. The ERT disagreed with the Party's response, because the 2006 IPCC Guidelines provide a methodology and default EFs to calculate emissions from this category and because of the existence of the relevant activity in the country provided in publicly available sources, mentioned above. Therefore, in accordance with the guidance for adjustments under Article 5, paragraph 2, of the Kyoto Protocol (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 (see section VI and annex IV below).
E.41	1.B.2.b Natural gas – gaseous fuels – CO_2 and CH_4 (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 category for the period 1990–2013 and provide a consistent time series for the CO_2 emissions.	Not resolved. The ERT noted that Kazakhstan did not provide information in the NIR on verification of the CH_4 emission estimates for the transmission and storage of natural gas. Kazakhstan reported CH_4 emission estimates from subcategory 1.B.2.b.4 transmission and storage for 2015 with a CH_4 IEF of 552.76 kg/unit and for 2014 with a CH_4 IEF of 0.88 kg/unit, which led to considerably lower CH_4 emissions in 2014 compared with other years of the time series (the range of the CH_4 IEFs for the remaining years lies between 383.02 kg/unit and 588.42 kg/unit). Kazakhstan did not provide a justification for this lower IEF. The ERT also noted that Kazakhstan reported CO_2 emission estimates for this subcategory with a very low value (0.0004 kt) for 2014 and 2015 and a CO_2 IEF of 0.0046 kg/unit and 0.0045 kg/unit, respectively, while "NA" is reported for 1990–2013. The NIR did not provide

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			explanations for the missing CO_2 emission estimates in the time series. The ERT concluded that the use of a very low CH_4 EF leads to an underestimation of CH_4 emissions from subcategory 1.B.2.b.4 transmission and storage for 2014. The ERT also concluded that omitting CO_2 emissions from subcategory 1.B.2.b.4 transmission and storage leads to an underestimation of CO_2 emissions for 2013. The ERT included these issues in the list of potential problems and further questions raised by the ERT and recommended that Kazakhstan provide, for subcategory 1.B.2.b.4 transmission and storage, revised CH_4 emission estimates for 2014, ensuring a consistent time series, and the missing CO_2 emission estimates for 2013, using the default EFs provided in the 2006 IPCC Guidelines (vol. 2, chapter 4, table 4.2.5) and, following the principle of consistency, provide estimations of CO_2 emissions 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 1990–2015 with CO_2 and CH_4 estimates for this subcategory using a CO_2 EF of 0.00144 kg/unit and a CH_4 EF of 0.04150 kg/unit. The notation key "NA" was used to describe units of AD. The ERT disagreed with the Party's response, because although Kazakhstan recalculated CO_2 and CH_4 emission estimates from the category values, it is difficult to assess the correctness of the estimations because information on units of AD is missing and no justification for the use of country-specific EFs was provided. The ERT considers that Kazakhstan has not satisfactorily resolved the potential problem. Therefore, in accordance with the guidance for adjustments under Article 5, paragraph 2, of the Kyoto Protocol (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 (see section VI and annex IV below).
E.42	1.B.2.b Natural gas – gaseous fuels – CO_2 and CH_4 (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	Not resolved. The ERT noted that no information on verification of the CH_4 or CO_2 emissions and time-series consistency was provided in the NIR. Kazakhstan reported CH_4 emissions with CH_4 IEFs of 18,000.00 kg/unit and 18,000.02 kg/unit for

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		the same category for the period 1990–2013 and provide a consistent time series for the CO_2 emissions.	2014 and 2015, respectively. These CH_4 IEFs were the lowest in the time series, with the exception of the 1997 value (16,760.57 kg/unit) and were 42.8 per cent lower than the 1990 value (31,471.65 kg/unit). The ERT also noted that very low values of CO_2 emission estimates were reported for 2014 and 2015 (0.0003 and 0.0004 kt, respectively), while "NA" was used to report CO_2 emissions for the period 1990–2013. Kazakhstan used "NA" to report units of AD and did not provide any background information on AD. The ERT concluded that omitting CO_2 emissions from subcategory 1.B.2.b.5 distribution led to an underestimation of CO_2 emissions for 2013. The ERT included this issue in the list of potential problems and further questions raised by the ERT and recommended that Kazakhstan provide CO_2 emission estimates from subcategory 1.B.2.b.5 distribution for 2013, using default EFs from the 2006 IPCC Guidelines (vol. 2, chapter 4, table 4.2.5) and, following the principle of consistency, 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 1990–2015 with CO_2 and CH_4 estimates for this subcategory using a CO_2 EF of 0.95 kg/unit and a CH_4 EF of 18.0 kg/unit. The notation key "D" was used to describe the units of AD in the CRF tables, which, according to Kazakhstan's explanations, means default, which is not in line with the UNFCCC Annex I inventory reporting guidelines. The ERT disagreed with the Party's response and considers that Kazakhstan has not satisfactorily resolved the potential problem. This is because although Kazakhstan revised the CO_2 and CH_4 emission estimates from the subcategory, it is difficult to assess the correctness of the estimations because information on units of AD is missing and no justification for the use of country-specific EFs was provided. Therefore, in accordance with the guidance for adjustments under Article 5, paragraph 2, of the Kyoto Protocol (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 (see section VI and annex IV below).
E.43	1.B.2.c Venting and flaring –	Review and estimate the CO_2 and CH_4 emissions from the	Not resolved. Kazakhstan reported "NA" for all AD for the venting and flaring

liquid and gaseous fuels – CO_2 and CH_4 (E.56, 2016) Completeness	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 category.		subcategories. Nevertheless, Kazakhstan reported CO_2 and CH_4 emission estimates for subcategory 1.B.2.c.iii venting – combined for the entire time series, resulting in, for 2014 and 2015, the lowest emission levels of the whole reporting period, and reported "NA" for venting – oil and venting – gas. The ERT noted that CO_2 emissions from venting – combined are much higher than CH_4 emissions, which is unlikely to be the case in practice. During the review, Kazakhstan informed the ERT that this issue was due to a technical error, but it did not provide any information on the AD or CO_2 and CH_4 EFs used to calculate emissions from this category. The ERT noted that the CO_2 emission estimates from 1.B.2.c.iii venting – combined vary significantly between 7,112.6 kt in 1999 and 2,020.25 kt in 2015. The same situation was observed with the CH_4 emission estimates for this subcategory (varying between 2.47 kt in 1999 and 0.70 kt in 2015). The ERT concluded that the time series for both gases CO_2 and CH_4 are inconsistent. In addition, Kazakhstan continued to use "NA" for reporting CO_2 emissions (as well as N_2O emissions) from flaring of oil, gas and combined and CH_4 emissions from flaring of oil and combined, but reported CH_4 emissions for flaring of natural gas for the entire time series. The ERT also noted that the NIR did not provide information on flaring activities in the country, which certainly occur in the oil and gas industry. Therefore, the ERT concluded that CO_2 (and N_2O) emissions from flaring of oil, gas and combined subcategories exist, but are omitted from the CRF tables and this led to a potential underestimation of CO_2 (and N_2O) emissions from flaring under the subcategory 1.B.2.c venting and flaring for 2013, 2014 and 2015. The ERT included this issue in the list of potential problems and further questions raised by the ERT and recommended that Kazakhstan provide CO_2 emission estimates (and N_2O) from flaring under the subcategory 1.B.2.c venting and flaring, using default EFs provided in the 2006 IPCC Guidelines (vol. 2, chapter 4, table 4.2.5) for 2013, 2014 and 2015 and, following the principle of consistency, 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 1990–2015 for flaring using the notation key "NA" for CO_2 emissions,

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			while the CH_4 emissions associated with flaring – gas were reported, which means that the gas flaring process occurred in Kazakhstan. The ERT noted that the notation key "NA" was used for the CO_2 and CH_4 IEFs in the CRF tables and for subcategory 1.B.2.c.ii flaring – gas, the cells which should contain a value, a description and information on units of AD were left blank. Blank cells were also reported for the flaring – oil and flaring – combined subcategories. The ERT disagreed with the Party's response because the 2006 IPCC Guidelines provide a methodology and default EFs to estimate emissions from flaring. Therefore, in accordance with the guidance for adjustments under Article 5, paragraph 2, of the Kyoto Protocol (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 (see section VI and annex IV below).
E.44	1.C CO_2 transport and storage – CO_2 (E.57, 2016) Transparency	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 used the notation key "NA" to report emissions of CO_2 for the subcategory 1.C.2 injection and storage and left blank cells for the subcategory 1.C.1 transport of CO_2. The NIR did not contain any information or category-specific discussion for this activity. No information on non-occurrence of the emissions was provided.
E.45	International aviation – liquid fuels – CO_2, CH_4 and N_2O (E.59, 2016) Adherence to the UNFCCC Annex I inventory reporting guidelines	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 were reported as a bunker fuel in aviation in CRF table 1.D. For aviation gasoline, different notation keys are used in these CRF tables ("NO" and "NA", respectively).
IPPU			
I.1	2. General (IPPU) – CO_2 (I.1, 2016) (49, 2013) (69, 2012) Transparency	Strengthen its 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. The ERT noted that the notation key "IE" was not used for category 2.A.4.d in the 2017 annual submission, as it was in previous annual submissions, because emissions from this category were reported in CRF table 2(I).A-H. The QA/QC processes described in the NIR (section 1.2.3) did not include the procedures to ensure correct use of notation keys and consistency of the information submitted.
I.2	2. General (IPPU) – CO_2, HFCs	Strengthen its QA/QC procedures and update all	Not resolved. The comments in CRF table 2(I).A-H were not updated. The data on

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	(I.10, 2016) Adherence to the UNFCCC Annex I inventory reporting guidelines	comments in the CRF tables, and make the reporting consistent between the NIR and the CRF tables of the same submission.	HFC emissions reported in CRF table 2(II) and the NIR (table 4.16) do not correspond and are inconsistent.
I.3	2. General (IPPU) – CO_2, CH_4 and N_2O (I.11, 2016) Transparency	Include the relevant AD descriptions in CRF table 2(I).A-H in order to improve the comparability and transparency of reported data.	Not resolved. The ERT noted that descriptions of the AD are not included in CRF table 2(I).A-H.
I.4	2. General (IPPU) (I.12, 2016) Adherence to the UNFCCC Annex I inventory reporting guidelines	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.	Not resolved. The ERT noted that information relating to categories 2.G.1. electrical equipment and 2.F. product uses as substitutes for ODS is included under the headings "Use of SF_6" (NIR, section 4.4.4) and "Use of HFCs" (NIR, section 4.4.5) respectively, and these categories are not identified in the NIR with their correct names, but reported under chapter 4 "Metal production". The incorrect category names were used elsewhere; for example, 2.D solvent and other product use is used in annex III to the NIR instead of 2.D non-energy products from fuels and solvent use.
I.5	2.A.1 Cement production – CO_2 (I.2, 2016) (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.	Not resolved. Section 4.2.1 of the NIR on cement production did not contain detailed information about lime content in clinker and did not include the CKD correction factor for all the years in the time series (see ID#s I.27, I.28, I.29 and I.30 in table 5).
I.6	2.A.1 Cement production – CO_2 (I.13, 2016) Accuracy	Strengthen its 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 Kazakhstan recalculated CO_2 emissions from 2.A.1 cement production in its 2017 annual submission. There were no significant deviations in IEFs through the whole inventory years (0.526–0.530 t CO_2/t clinker). The ERT also noted that the value of CKD for 2011 was corrected. However, the NIR did not include the available data on the CKD correction factor, the CaO content in the clinker for 2000–2015 and the average value for the previous period (see ID#s I.27, I.28, I.29 and I.30 in table 5).
I.7	2.A.2 Lime production – CO_2 (I.14, 2016) Consistency	Report the correct value for CO_2 emissions for 2010 in the NIR, consistent with the value reported in the CRF tables.	Resolved. The ERT noted that consistent data on CO_2 emissions from lime production were provided in CRF table 2(I).A-H and in the NIR (table 4.2) (see ID#s I.31, I.32 and I.33 in table 5).
I.8	2.A.4 Other process uses of carbonates – CO_2 (I.15, 2016) Transparency	Provide in the NIR a clear explanation on how limestone and dolomite use, and the related CO_2 emissions from the use of those carbonates, have been	Not resolved. The ERT noted that the allocation of CO_2 emissions from the use of limestone and dolomite is not clarified in the NIR (section 4.2.3.2, "Limestone and dolomite use"). In the 2013 inventory submission, under the subcategory 2.A.3 limestone and dolomite use, emissions of

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		allocated in the new CRF structure.	1,997.2 t CO_2 were reported for 2011; however, in the current submission under subcategory 2.A.4 other process uses of carbonates only 595.6 t CO_2 were reported for 2011. During the review, Kazakhstan did not provide an explanation on how the carbonates are used or on the balance between production of carbonates and use of carbonates (see ID# I.36 in table 5).
I.9	2.B.1 Ammonia production – CO_2 (I.16, 2016) 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. The ERT noted that the tier 1 method and the default EF for natural gas are still used for the estimation of CO_2 emissions from 2.B.1 ammonia production. Kazakhstan clarified during the review that transition to a tier 2 method is not possible because the AD on natural gas consumption provided by the plant are not available for the whole time series and those available AD are inconsistent. However, the ERT noted that this information was not included in the NIR (see ID# I.37 in table 5).
I.10	2.B.5 Carbide production – CO_2 (I.4, 2016) (52, 2013) Accuracy	Explore the use and potential imports or exports of calcium carbide and revise the EF, if necessary.	Not resolved. Kazakhstan revised the methods used for the estimation of CO_2 emissions from calcium carbide production according to the 2006 IPCC Guidelines (see ID# I.39 in table 5). Kazakhstan confirmed during the review that calcium carbide is not used on site to produce acetylene. Therefore, emissions from calcium carbide use were not reported under subcategory 2.B.5. The ERT noted that Kazakhstan could not clarify how the calcium carbide is used within the country and if the emissions occur from its use, and that exports and imports of calcium carbide were not identified. During the review, Kazakhstan clarified that it is expected to finalize the research of information on imports and exports of calcium carbide as well the intended use of calcium carbide for the next annual submission. The emissions from calcium carbide use are to be reported under the category where they occur. The ERT believes that future ERTs should consider this issue further to ensure that there is not an underestimate of emissions from this activity.
I.11	2.C.1 Iron and steel production – CO_2 (I.17, 2016) 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 CO_2 IEFs for pig iron decreased from 2.14 t/t in 2012 to 1.77 t/t in 2015. The ERT noted that the description of CO_2 IEF trends since 2012 by analysing the initial data (e.g. coke consumption) was not included in the NIR. In its response to a question of the ERT during the review, Kazakhstan did not justify the relationship between the decrease

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			in CO_2 IEF values and the decrease in production data.
I.12	2.C.1 Iron and steel production – CH_4 (I.18, 2016) Comparability	Report CH_4 emissions where they are expected for the reason of comparability, or change the notation key in subcategory 2.C.1.b to "IE" (with a relevant explanation) and specify the AD under subcategory 2.C.1.f as coke use in pig iron production.	Resolved. The ERT noted that CH_4 emissions from pig iron production are still reported under 2.C.1.b. The ERT also noted that CH_4 emissions as well as AD are not reported under 2.C.1.f in the latest submission of the CRF tables. However, CH_4 emissions associated with coke production were reallocated to the energy sector where these emissions are expected to be reported. The ERT concluded that the issue on comparability of CH_4 emissions is resolved. However, the ERT noted an issue on methods applied by Kazakhstan for estimation of CH_4 emissions from pig iron production (see ID# I.43 in table 5).
I.13	2.C.1 Iron and steel production – CO_2 and CH_4 (I.19, 2016) 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. The ERT noted that the AD ratio of sinter+pellets to steel+pig iron (e.g. 117.9 per cent in 2015) was not analysed by Kazakhstan, quantitative data and explanations on the observed ratio were not provided in the NIR and AD were not reviewed.
I.14	2.C.2 Ferroalloys production – CO_2 (I.5, 2016) (53, 2013) Transparency	Further improve transparency by providing the AD disaggregated by type of ferroalloy for the entire time series.	Not resolved. The NIR (table 4.12), and as stated in the Party's response to a question of the ERT, did not contain AD disaggregated by type of ferroalloy for the entire time series. Only total production of ferroalloys is included in the NIR, without specification of the AD by each type of ferroalloy.
I.15	2.C.2 Ferroalloys production – CH_4 (I.20, 2016) Completeness	Estimate CH_4 emissions from this category or, if they are insignificant, use the notation key "NE" and provide evidence in the NIR to show the insignificance of this category, in line with decision 24/CP.19, annex I, paragraph 37(b).	Resolved. The CH_4 emissions from ferroalloys production were estimated using the tier 1 method from the 2006 IPCC Guidelines for ferrosilicon production. CH_4 emissions from ferroalloys production were reported in the NIR and the CRF tables.
I.16	2.C.3 Aluminium production – CO_2 (I.21, 2016) Transparency	Improve its reporting of information on aluminium technology and parameters provided in the NIR and strengthen its QA/QC procedures in preparing the report with a view to eliminating internal inconsistencies in the NIR.	Not resolved. Section 4.4.3.3 of the NIR contains the reference to the Soderberg technology; however, this technology is not used in Kazakhstan. The actual data on prebake anode consumption are available in Kazakhstan; however, the NIR (table 4.14) is still reporting the range of default values of prebake anode consumption.
I.17	2.C.6 Zinc production – CO_2	Demonstrate in the NIR that complete AD for zinc production are reported in the CRF tables, providing an	Addressing. The ERT noted that Kazakhstan clarified in the NIR that only the AD on zinc production in the Waelz process are taken into account and non-CO_2-emitting

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	(I.22, 2016) Transparency	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.	technologies are not considered. During the review, Kazakhstan provided a detailed description of the technologies used for zinc production, which was prepared by the only zinc-producing company in the country. The provided information confirmed that non-emitting technologies are used for zinc production, which explains the difference between data on zinc production from different sources. However, the NIR did not provide explanations or a quantitative analysis about differences between the data in CRF table 2(I).A-H (e.g. 148.12 kt zinc in 2015) and the official data on the website of the only zinc-producing company in the country (e.g. 304.5 kt zinc in 2015).
I.18	2.D Non-energy products from fuels and solvent use – CO_2 and N_2O (I.23, 2016) 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 subcategory included under other in CRF table 2(I).A-H.	Not resolved. Kazakhstan reported under category 2.D only CO_2 emissions from 2.D.1 lubricant use. The ERT noted that Kazakhstan reported CO_2 emissions from 2.D.2 paraffin wax use as "NA" without any explanation in the NIR and CRF tables; however, the ERT also noted that methods for the estimation of CO_2 emissions from 2.D.2 paraffin wax use are provided in the 2006 IPCC Guidelines. The ERT further noted that CO_2, CH_4 and N_2O emissions under 2.D.3 other were reported as "NO" without any explanations. The ERT also noted that there are no estimation methods for this subcategory in the 2006 IPCC Guidelines. The ERT further identified an issue on N_2O emissions from N_2O use in medical activities (anaesthesia), which were previously reported as "NE" under 2.D.3 other (see ID# I.52 in table 5).
I.19	2.D.1 Lubricant use – CO_2 (I.24, 2016) Completeness	Include in category 2.D.1 the CO_2 emissions related to the use of lubricants, consistent with the allocation of these emissions in the 2006 IPCC Guidelines. If the emissions from lubricants cannot be separately reported under category 2.D.1 and are reported under the energy sector, report the notation key "IE" for category 2.D.1 with the relevant explanations in the NIR and CRF table 9, and report consistently the allocation of emissions in table 1.A(d).	Resolved. The ERT noted that CO_2 emissions from lubricant use were estimated and reported under category 2.D.1.
I.20	2.F.1 Refrigeration and air conditioning – HFCs (I.7, 2016) (55, 2013)	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	Not resolved. The ERT noted that emissions of HFC-32, HFC-125 and HFC-143a from 2.F.1 refrigeration and air conditioning are still reported in the CRF tables as "NO" for the years prior to 2007 and an explanation is

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	(81, 2012) Transparency	and HFC-143a from refrigeration and air-conditioning equipment for the entire time series.	not included in the NIR (section 4.4.5) where HFC emissions are discussed.
I.21	2.F.1 Refrigeration and air conditioning – HFCs (I.25, 2016) 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.	Not resolved. The description of the methods, AD and EFs for this category has not been changed since the previous annual submission and lacks transparency. Also, no information on how time-series consistency is ensured and on recalculations has been provided in the NIR. The ERT noted that HFC emissions were not distinguished by different stages of use of HFCs (e.g. from manufacturing, from stocks, from disposal and recovery) (see ID# I.51 in table 5).
I.22	2.F.3 Fire protection – HFCs, PFCs and SF_6 (I.8, 2016) (56, 2013) Transparency	Use the notation key "NO" for HFC, PFC and SF_6 emissions from fire extinguishers if this activity does not occur.	Addressing. Although information that there is no occurrence of HFCs, PFCs and SF_6 in fire protection equipment in Kazakhstan was provided in the NIR (section 4.4.5) and "NO" was used in CRF table 2(II).B-H for HFC, PFC, SF_6 and NF_3 emissions, the ERT noted that notation keys were still not used for all species of HFCs and PFCs under this category in CRF table 2(II), where blank cells were left. During the review, Kazakhstan stated that the main agents used in fire protection systems are water, carbon monoxide, ammonia and other gases (non-GHGs). The ERT agreed that GHGs from 2.F.3 fire protection are likely not occurring within the country. However, additional evidence and explanations are expected to be included in the NIR. The ERT believes that future ERTs should consider this issue further to ensure that there is not an underestimate of emissions from this activity.
I.23	2.G.1 Electrical equipment – SF_6 (I.9, 2016) (57, 2013) (87, 2012) Completeness	Choose the appropriate method to estimate SF_6 emissions from electrical equipment and estimate the emissions.	Addressing. The method for estimating emissions from charging of electrical equipment was reported in section 4.4.4.1 of the NIR and emissions were partially reported in CRF tables 2(I) and 2.(II).B-H. However, the ERT noted that the methods applied for operation and disposal of equipment were not described in the NIR and SF_6 emissions were not estimated for several years (e.g. 2011, 2013 and 2014) (see ID# I.24 below).
I.24	2.G.1 Electrical equipment – SF_6 (I.26, 2016) 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	Not resolved. The ERT noted that SF_6 emissions from electrical equipment charging in operating systems are estimated and reported for most years of the period 2004–2015 in the NIR (section 4.4.4, table

	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).	4.15), but are not reported in the CRF tables. In addition, annual emissions from leakage are assessed, but not reported in the CRF tables, because they are not higher than 0.5 per cent from the total charging amount of electrical equipment (NIR, section 4.4.4.1). The ERT also noted that a very small amount of SF_6 emissions (from disposal only) was reported in CRF table 2.(II).B-H, which did not correspond to the information in the NIR, while AD were only reported for operating systems (stocks). The ERT further noted that SF_6 emission estimates in the NIR are based on partial information on SF_6 injection in electrical equipment and that the time series may not be consistent (e.g. SF_6 emissions are reported for 2004–2010, 2012 and 2015 in section 4.4.4 of the NIR). Therefore, the ERT concluded that SF_6 emissions from category 2.G.1 electrical equipment were potentially underestimated for 2013–2015. The ERT included this issue in the list of potential problems and further questions raised by the ERT and recommended that Kazakhstan collect information on the total charge in electrical equipment using SF_6 in the country and estimate SF_6 emissions from manufacturing, operation and disposal of electrical equipment for 2013–2015 according to the 2006 IPCC Guidelines. If this is not possible, the ERT recommended that Kazakhstan justify that the likely level of emissions from 2.G.1 electrical equipment would meet the definition of "insignificant" as contained in 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 resubmitted a complete set of CRF tables with revised estimates of SF_6 emissions for this subcategory in 2004–2015 using new data received from the equipment operator about the total volume of the stuffed agent, as well as the dynamics of commissioning of the stations for the entire period of their use. Kazakhstan used the EF of 0.002 per cent of the total gas loss for the revised emission estimations. As a result, the revised data for SF_6 emissions accounted for 0.019 kt CO_2 eq (2013), 0.020 kt CO_2 eq (2014) and 0.029 kt CO_2 eq (2015). The ERT disagreed with the revised estimates of SF_6 emissions from 2.G.1 electrical equipment because the incorrect EF was chosen for the estimations. According to the 2006 IPCC Guidelines the default EFs lie in the range from 0.2 to 0.7 per cent (vol. 2, chapter 8, table 8.2). Therefore, the ERT concluded that SF_6

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			emissions from electrical equipment were underestimated for 2013–2015. Therefore, in accordance with the guidance for adjustments under Article 5, paragraph 2, of the Kyoto Protocol (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. The ERT used the method of estimating the average emissions rate from a cluster of countries (using Belarus, the Russian Federation and Ukraine for the cluster) to calculate the adjustments, with population and GDP per capita as drivers. The adjusted estimates of SF_6 emissions for this category were 22.90 kt CO_2 eq (2013), 23.24 kt CO_2 eq (2014) and 23.58 kt CO_2 eq (2015). These adjusted emissions are significantly higher than the revised estimates submitted by Kazakhstan; however, the changes resulting from the adjusted values and the submitted revised estimates (22.88 kt CO_2 eq or 0.007 per cent of the national total in 2013, 23.22 kt CO_2 eq or 0.007 per cent of the national total in 2014, and 23.55 kt CO_2 eq or 0.008 per cent of the national total in 2015) are below the threshold given in decision 24/CP.19, annex I, paragraph 37(b) (500 kt CO_2 eq or 0.05 per cent of the national total), and therefore the calculated adjustment should not be applied.
Agriculture			
A.1	3. General (agriculture) – CO_2, CH_4 and N_2O (A.3, 2016) (62, 2013) (95, 2012) (83, 2011) Transparency	Provide the sources and references for the uncertainty values used in the analysis of the agriculture sector.	Resolved. The references provided in the NIR (e.g. sections 5.3.1.3, 5.3.2.3 and 5.4.3) indicate the use of default uncertainty values from the 2006 IPCC Guidelines.
A.2	3. General (agriculture) – CH_4 and N_2O (A.14, 2016) Adherence to the UNFCCC Annex I inventory reporting guidelines	Implement a specific QC procedure to correct the allocation of manure to different manure management systems, the units for gross energy intake and the AD in CRF table 3.D (3.D.b.2).	Addressing. The allocation of manure to different manure management systems and units for gross energy intake are correctly reported in the CRF tables. However, the AD in CRF table 3.D are not correct and do not reflect the actual activity, besides that the description of these data is not reported (e.g. 3.D.b.1 atmospheric deposition and 3.D.b.2 nitrogen leaching and run-off for 2015).
A.3	3.A.1 Cattle – CH_4 and N_2O (A.15, 2016) Accuracy	Investigate the housing and grazing period for all cattle in detail and include information on which different manure management types are occurring in Kazakhstan. If the analysis shows a different picture of manure management practices	Resolved. The distribution of types of manure management systems was investigated and described in detail in the NIR (section 5.2.2). Gross energy values for cattle were recalculated, which led to recalculations of CH_4 emissions from enteric

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		than is currently reported, recalculate the emission estimates for both CH_4 and N_2O emissions from manure management for all relevant cattle groups.	fermentation and CH_4 and N_2O emissions from manure management of cattle.
A.4	3.A.2 Sheep – CH_4 (A.16, 2016) Accuracy	Develop a tier 2 methodology where the emission estimate is based on a subdivision of the sheep population into mature sheep and lambs where actual growth rates and slaughter weights of the lambs are taken into account.	Resolved. A tier 2 methodology was used to estimate CH_4 emissions from sheep in accordance with the 2006 IPCC Guidelines. The method and parameters used were described in the NIR (section 5.2.2).
A.5	3.B.3 Swine – CH_4 (A.17, 2016) Accuracy	Investigate the manure management systems and justify the EF used.	Resolved. The ERT noted that use of liquid manure management systems for swine is described in the NIR (section 5.3.2.2) and corresponding emission calculations were reported in CRF table 3.B(b).
A.6	3.B Manure management – N_2O (A.18, 2016) Accuracy	Update Nex according to the newest knowledge in Kazakhstan, either by using equations 10.30 to 10.32 in the 2006 IPCC Guidelines where national data on crude protein content in the feed is used or by using the methodology in the EMEP/EEA Guidebook, if coordination with the Convention on Long-range Transboundary Air Pollution reporting is taking place, or apply the Nex factors described in table 10.19 of the 2006 IPCC Guidelines.	Resolved. Default Nex rates described in the 2006 IPCC Guidelines (vol.4, table 10.19) were used for the estimates.
A.7	3.B Manure management – N_2O (A.19, 2016) Adherence to the UNFCCC Annex I inventory reporting guidelines	Check the use of the notation key "NA" in CRF table 3.B(b) and make use of the notation key consistent with decision 24/CP.19, annex I, paragraph 37.	Resolved. The notation key "NO" was used in CRF table 3.B(b) for manure management practices that do not occur in the country.
A.8	3.D.a.2.a Animal manure applied to soils – N_2O (A.21, 2016) 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.	Not resolved. The ERT noted that the amount of N in animal manure applied to agricultural soils amounted to about 2.2 per cent of the total N available for application to soils from manure management systems. No explanation for this very low amount of N in animal manure applied to agricultural soils was provided in the NIR, and no recalculations of emission estimates have been provided in the 2017 annual submission (see ID# A.17 in table 5).

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A.9	3.D.a.5 Mineralization/immobilization associated with loss/gain of soil organic matter – N_2O (A.13, 2016) (73, 2013) (109, 2012) Accuracy	Conduct further research to obtain verifiable data for the estimation of N_2O emissions from the mineralization of soils and report these emissions in the land converted to cropland category in the LULUCF sector.	Resolved. The issue is no longer relevant because N_2O emissions from the mineralization of soil organic matter in soils of cropland and grassland should be reported under CRF table 3.D in the agriculture sector. The ERT noted that Kazakhstan allocated those emissions correctly (see ID# A.18 in table 5).
A.10	3.H Urea application – CO_2 (A.22, 2016) Completeness	Investigate further the use of mineral fertilizer in order to verify if some part of the reported consumption of mineral fertilizer is urea and include any potential emissions.	Resolved. The ERT noted that Kazakhstan did not provide in the NIR any further data on the use of urea as a fertilizer in the country and associated CO_2 emissions. The ERT also noted that CO_2 emissions from urea application were reported as "NO" in CRF table 3.G-I in the original 2017 annual submission. However, the NIR stated that AD were not available and, therefore, the estimations were not performed. The ERT further noted that there is no urea production in Kazakhstan. The ERT noted that this led to a potential underestimation of emissions in category 3.H urea application for the latest inventory years (2013, 2014 and 2015) and included this issue in the list of potential problems and further questions raised by the ERT. The ERT recommended that Kazakhstan investigate whether urea is used as fertilizer in the country and, if yes, further investigate possible rates of urea application into soils and report respective CO_2 emissions for the complete time series; but if application of urea data is not available, import values could be used for the estimates. Otherwise, the ERT recommended that Kazakhstan provide evidence of non-occurrence of this activity and for reporting "NO" for this category in CRF table 3.G-I. In response to the list of potential problems and further questions raised by the ERT, Kazakhstan submitted a complete set of CRF tables for the period 1990–2015 with CO_2 emission estimates for the category 3.H urea application. The revised estimates were calculated using AD calculated as 10.0 per cent from the total import of urea in the country for each year and the default EF (0.2 t C/t urea) from the 2006 IPCC Guidelines. The ERT agreed with the Party's estimates. The impact of the revised estimates in 2015 is an increase by 253.75 kt CO_2 eq or 0.88 per cent of the agriculture sector or 0.08 per cent of the national total; in 2014 the impact is an increase by 550.81 kt CO_2 eq or 1.98 per cent of the agriculture sector or 0.17 per cent of the national total; and in 2013 the impact is an increase by

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			197.07 kt CO_2 eq or 0.74 per cent of the agriculture sector or 0.06 per cent of the national total. The ERT is of the view that the NIR of Kazakhstan's next annual submission would benefit from including information on the AD and method used to estimate CO_2 emissions from 3.H urea application.
LULUCF			
L.1	4. General (LULUCF) – CO_2, CH_4 and N_2O (L.1, 2016) (table 3, 2013) (113, 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; (d) Net CO_2 emissions from cropland remaining cropland – soils; (e) Net CO_2 emissions from grassland remaining grassland – mineral 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; (i) CO_2, CH_4 and N_2O emissions from biomass burning – grassland remaining grassland – wildfires.	Addressing. The ERT noted that the reporting for the sector continues to be incomplete; in particular: (a) Not resolved. Net CO_2 emissions/removals were reported as not estimated ("NE") and the NIR (para. 6.3.2) included information on the assumption about balanced CSC in mineral soils pool. During the review, Kazakhstan provided the ERT with an expert evaluation demonstrating that this pool was not a source of GHG emissions and informed the ERT of its plans to conduct a special research study to complete the assessment on mineral soil emissions/removals. In the ERT's view, this expert evaluation did not demonstrate that the mineral soil pool is not net source of emissions in the forest of the national territory of Kazakhstan, because it did not consider the effects of harvesting at the end of a production cycle and during the following years in lands with a low level of biomass, so the emissions for this pool may occur; (b) Not resolved. Net CO_2 emissions were reported as "NO". Kazakhstan stated that grassland conversion to forest land occurs in the country (NIR, section 6.3.1), but it did not provide further information; (c) Not resolved. Net CO_2 emissions were reported as "NO". During the review, Kazakhstan confirmed to the ERT that conversion from wetlands to forest land and organic soils does not occur in the country, but no documentation to support this was provided to the ERT; (d) and (e) Resolved. Net CO_2 emissions were reported for cropland remaining cropland (CRF table 4.B) and net CO_2 removals were reported for grassland remaining grassland (CRF table 4.C); (f) Not resolved. Net CO_2 emissions were reported as "NO". During the review, Kazakhstan informed the ERT that the activity of conversion from forest land to grassland does not occur in the country, but

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			the ERT noted that table 6.4.2 of the NIR provided information about conversion of areas from forest land to grassland (e.g. 701.8 thousand ha for 1990–2000) that contradicts Kazakhstan's statement; (g) Not resolved. Net CO_2 emissions/removals were reported as "NO", while the land transition matrices showed "NA" for this conversion for all years. During the review, Kazakhstan informed the ERT that conversion of other land to wetlands does not occur in the country, but the ERT noted that table 6.4.3 of the NIR provided information about conversion of areas from other land to wetlands (31.7 thousand ha for 2000–2010) that contradicts this statement; (h) Not resolved. In the NIR (table 6.4.2 and section 6.4.1) it was indicated that conversion from grassland to cropland occurs in the country. CRF table 4(III) reported an area value and "IE" for N_2O emissions from lands converted to cropland (included in the agriculture sector, according to the NIR, section 6.4.2), but in CRF table 4.B the land conversions to cropland were reported as "NO" with no further information provided; (i) Resolved. CH_4 and N_2O emissions from biomass burning – grassland remaining grassland – wildfires were reported in CRF table 4(V). The ERT noted that CO_2 emissions from biomass burning were included under the CSC for living biomass (CRF table 4.C); however, in CRF table 4(V) they were reported as "NO" when they should be reported as "IE".
L.2	4. General (LULUCF) – CO_2 (L.4, 2016) (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. The ERT noted that areas of conversion from forest land to other land-use categories were reported as "NA" in CRF table 4.1. During the review, Kazakhstan informed the ERT that conversion from forest land to other land-use categories does not occur in the country; however, the Party did not provide any documentation to confirm this information. The ERT also noted that in the NIR (tables 6.4.2–6.4.4) the information provided indicated the contrary and the ERT considers that information on areas of conversion from forest land is available in the country and CSCs should be assessed for these conversions.
L.3	4. General (LULUCF) (L.5, 2016) (77, 2013) (119, 2012) (99, 2011)	Provide a complete set of uncertainty estimates for CSCs and other emissions covering all	Resolved. All sections in the NIR for different land-use categories included

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	Adherence to the UNFCCC Annex I inventory reporting guidelines	mandatory categories, using country-specific values, where possible.	descriptions of values, methodologies and AD for calculations of uncertainty.
L.4	4. General (LULUCF) (L.6, 2016) (78, 2013) (120, 2012) (100, 2011) Adherence to the UNFCCC Annex I inventory reporting guidelines	Implement the QA/QC plan for the sector.	Not resolved. The ERT noted that the NIR included a QA/QC plan common for all sectors of the inventory. However, a number of issues related to QC still remain in the LULUCF sector in the 2017 annual submission, suggesting that the specific measures for the LULUCF sector were not implemented.
L.5	4. General (LULUCF) – CO_2, CH_4 and N_2O (L.15, 2016) Completeness	Improve the completeness of its reporting for the sector by providing estimates for all mandatory categories and pools (as listed in ID# L.1 and for the relevant land conversions, currently reported as "NO").	Not resolved. The ERT noted that estimates for a number of conversions of land-use categories to another land use are reported, but not all mandatory categories are covered (see ID# L.1 above) and in general estimates of GHG emissions and CSCs for the dead organic matter (deadwood and litter) and soils pools were not reported. The NIR did not provide information or enough evidence to demonstrate that these pools are not sources or removals of CO_2.
L.6	4. General (LULUCF) – CO_2, CH_4 and N_2O (L.17, 2016) Transparency	Improve the methodological information for the estimated categories by including: (a) The definition of the "boundaries" of the category, which elements are included and which are not (e.g. forest land includes all lands that meet the forest definition of the country); (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); 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	Addressing. The ERT noted that the reporting for the sector continues to be incomplete, in particular: (a) Resolved. All chapters of the NIR for different land-use categories included the broad definitions for each land-use category (e.g. section 6.3.1 of the NIR included the type of forest areas which were included for consideration); (b) Not resolved. The broad definitions of land-use categories were used with descriptions of their elements, but the NIR (section 6.3.1) included the broad definition of the 'Forest land' from the national Forest Code with description of the elements, but did not include the metric parameters of forest, which were only described in section 9.3.1 of the NIR for purposes of accounting under the Kyoto Protocol; (c) Not resolved. The methodologies used for the calculations were described (equations, assumptions). However, the ERT noted that the NIR (section 6.3.2) included the assumption about balanced CSCs in mineral soils pool of forest without the necessary evidence to demonstrate that this pool is not a source or sink of GHG emissions; also, there was no evidence provided in the NIR to demonstrate that organic soils do not exist in the country; (d) Not resolved. All chapters of the NIR on different land-use categories included all of

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		compilation (methodology) and uncertainties; (e) A description of EFs and of CSC factors, parameters and other ancillary data applied.	the elements mentioned in the recommendation with descriptions of the data-collection process (methodology and timing), data compilation (methodology) and uncertainties, but the ERT noted that the quality of the AD reported is not good, because data in the different tables included different total values. Also, these values often were different from the AD in the CRF tables; (e) Resolved. All chapters of the NIR on different land-use categories included the necessary parameters with the description of EFs and of CSC factors, parameters and other ancillary data applied.
L.7	4. General (LULUCF) – CO_2, CH_4 and N_2O (L.18, 2016) Transparency	Include in the NIR a description of any QA/QC checks undertaken, and the results of such checks.	Not resolved. The NIR included information only on the common QA/QC plan for the entire GHG inventory, including descriptions of its implementation and checks, but for the LULUCF sector, the checks and their results were not described.
L.8	Land representation – CO_2 (L.3, 2016) (75, 2013) (116, 2012) Transparency	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; (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	Addressing. The ERT noted that Kazakhstan made efforts to convert existing national statistics into the IPCC land-use categories; however, the ERT noted outstanding issues, as follows: (a) Addressing. The relevant CRF tables did not contain blank cells for AD. However, some notation keys were not used correctly, in particular in CRF table 4.1, and including notation keys used for emissions/removals and IEFs; (b) Not resolved. Information about managed and unmanaged areas under different land-use categories was provided in the NIR, based on aggregated national statistics for land remaining under the same category and for land conversions. However, the total area reported in the NIR (table 6.4) for land-use categories is often different from the total area in the corresponding CRF tables (e.g. for 2000, 2010, 2013 and 2015). NIR tables 6.4.1–6.4.4, which include matrices of land-use changes, provide separate information on the area of the land use and the area under conversion, which often were not consistent with CRF tables; (c) Not resolved. The NIR included information about area and land-use categories with descriptions of sources (with references) of AD and timing, but the description on how AD have been developed for reporting in the CRF tables is not sufficiently clear and total values in the NIR and in the CRF tables often differed.

ID#	*Issue and/or problem classification*[a]	*Recommendation made in previous review report*	*ERT assessment and rationale*
		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.	According to the NIR, information was gathered from the official national statistics. Proxy data and expert judgment were not used. The ERT noted that Kazakhstan made a non-justified assumption that the soil pool in forest land remaining forest land is not a source of emissions and on the lack of organic soils in the country; (d), (e) and (f) Not resolved. The CRF tables included information on land categories that do not change and lands under conversion categories. In addition, the NIR included tables 6.4.1–6.4.4, with land-use change matrices for 1980–2015; however, values in those tables differ from the values in the CRF tables, which did not include any information in the documentation boxes, as they were left empty.
L.9	Land representation – CO_2 (L.16, 2016) 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. The ERT noted that Kazakhstan included in the NIR information to demonstrate consistent land representation; however, the following issues remain: (a) Not resolved. Sources of statistical data were described in the NIR with references and information on the development of AD for land classification. However, information on timings and methodology of data collection was not provided; (b) Not resolved. Definitions of land-use categories were provided in the NIR, but information on the methodology used for classifying land under the various land-use categories was not provided (e.g. in the form of instructions or a manual for the preparation of data from the Agency of Statistics of the Republic of Kazakhstan); (c) Not resolved. The NIR included descriptions of the process of calculation and development of AD for land classification and presented land-use matrices in tables 6.4.1–6.4.4, with separation of constant areas under the land-use categories from the areas under conversion. However, the ERT noted that explanations and documentation on how consistency is maintained when different sources of data are used for preparing the land representation were not provided in the NIR.
L.10	Land representation – CO_2 (L.19, 2016) Accuracy	Revise the methodology according to good practice provided in the 2006 IPCC Guidelines (vol. 4, chapter 3) in order to build a consistent land representation, and develop and	Not resolved. The NIR included descriptions of the development of AD and presented land-use matrices in tables 6.4.1–6.4.4, but clear and documented information on the methodology applied according to the 2006 IPCC Guidelines in order to build a

ID#	Issue and/or problem classification[a]	Recommendation made in previous review report	ERT assessment and rationale
		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 its GHG inventory estimates are not affected by technical mistakes.	consistent land representation was not provided in the NIR. The values of AD in the CRF tables and the NIR often differed. The NIR included a common QA/QC plan for the whole inventory, but information on development and implementation of QA/QC procedures for the LULUCF sector in order to check the consistency of conversions between land uses was not provided in the NIR.
L.11	4.A Forest land – CO_2 (L.20, 2016) Accuracy	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.	Not resolved. During the review, Kazakhstan informed the ERT that the deadwood pool was included in the living biomass pool for forest land and clarified some information included in the NIR, but it did not provide information on verification of values of deadwood and biomass carbon stock. The ERT noted that Kazakhstan did not provide relevant explanations on the national circumstances in its NIR.
L.12	4.A.1 Forest land remaining forest land – CO_2 (L.7, 2016) (80, 2013) (124, 2012) (101 and 105, 2011) Accuracy	Report CSC separately for all the pools; report both biomass gains and biomass losses separately.	Not resolved. The ERT noted that in its reporting Kazakhstan included the deadwood pool in the living biomass pool and that biomass losses are reported as "NO" in CRF table 4.A. At the same time, the ERT also noted that information in the NIR (table 9.1) clearly demonstrates that felling occurred in forest areas, indicating that biomass losses occur. The ERT noted that planned improvements are described in the NIR, which include the development of AD for calculations of CSCs for the litter and mineral soils pools.
L.13	4.B Cropland – CO_2 (L.21, 2016) Transparency	Report all information on the method and background data used for calculating the country-specific SOC, as well as the country-specific factors.	Resolved. Information on the method and data used for calculating the country-specific SOC was described in the NIR. Table 6.12 of the NIR included the country-specific values of crop stock which have been used for CSCs per region and per soil type. However, according to the NIR (section 6.4.2) for carbon stock in living biomass, for cropland, the Party used the assumption that the values were the same as those for living biomass of trees in forests without providing a justification for this assumption (see ID# L.17 below).
L.14	4.B.1 Cropland remaining cropland – CO_2 (L.8, 2016) (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. The ERT noted that the NIR included information from the Agency of Statistics of the Republic of Kazakhstan about the separation of abandoned lands from cropland (tables 6.3 and 6.4) and that CRF table 4.C included values of areas and CSC for living biomass and for mineral soils on cropland converted to grassland; however, the area values presented in the NIR and CRF table 4.C were different.

ID#	*Issue and/or problem classification*[a]	*Recommendation made in previous review report*	*ERT assessment and rationale*
L.15	4.B.1 Cropland remaining cropland – CO_2 (L.9, 2016) (83, 2013) (128, 2012) Adherence to the UNFCCC Annex I inventory reporting guidelines	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. The ERT noted that the estimation of CSCs for mineral soils in cropland remaining cropland were performed using country-specific values of SOC and the results were included in the CRF tables. However, the NIR does not include a description of verification or QA/QC procedures for the LULUCF sector, or for emissions from soils under the cropland remaining cropland category. The ERT noted that the QA/QC sections for the LULUCF sector had been included in the NIR of the 2016 annual submission, but not in the NIR of the 2017 annual submission.
L.16	4.B.1 Cropland remaining cropland – CO_2 and N_2O (L.22, 2016) Transparency	Report in the NIR complete information in order to justify any recalculations, including information on the impact of the recalculations on the trend in emissions across the time series.	Resolved. The NIR included the descriptions of recalculations and their impact. This information was specifically provided for the cropland category (section 6.4.5 of the NIR).
L.17	4.B.1 Cropland remaining cropland – CO_2 (L.23, 2016) Transparency	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 CSCs.	Addressing. The ERT noted that estimates of carbon stock losses from biomass in cropland remaining cropland have been reported. The NIR (section 6.4.2) included some descriptions of estimation methodologies and background data. During the review, Kazakhstan provided to the ERT the publications referred to in the NIR with results of scientific research for assessment of CSCs in biomass of arable land. However, the ERT noted that, for carbon stock in living biomass for cropland the Party used the assumption that those values were identical to the values for living biomass of trees in forests without providing a justification for this assumption (see ID# L.13 above).
L.18	4.C.1 Grassland remaining grassland – CO_2 (L.10, 2016) (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 the NIR did not provide numerical information on the reliability of the AD for the degree of grassland degradation. Only a brief reference in the NIR (section 6.5.2) provided a description of the sources of information about the degraded area of grassland (“Map of degradated biomass from the national atlas of Kazakhstan, 2006”). Also, the last sentence of section 6.5.1 of the NIR mentioned the fact that degraded grassland occurs in areas near to settlements. The ERT also noted that Kazakhstan reported estimates for grassland converted to settlements, but the values reported in the NIR and CRF tables were inconsistent.
L.19	4.C.1 Grassland remaining grassland –	Implement the procedures included in the QA/QC plan and	Not resolved. The ERT noted that the areas of grassland reported in the CRF tables are

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	CO_2 (L.11, 2016) (85, 2013) (126, 2012) (111, 2011) Adherence to the UNFCCC Annex I inventory reporting guidelines	correct the error leading to inconsistent reporting of areas of grassland.	different from those reported in the NIR. In addition, the grassland areas in tables 6.3, 6.4 and 6.17 of the NIR are inconsistent. The ERT noted that the 2017 NIR does not include documentation or information on the QC procedures for the grassland category or for the LULUCF sector, although these QC procedures for the LULUCF sector were included in the NIR of the 2016 annual submission.
L.20	4.C.1 Grassland remaining grassland – CO_2 (L.24, 2016) 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. Kazakhstan provided the appropriate explanation in the NIR (section 6.5.1) and information in tables 6.3, 6.4 and 6.17 of the NIR with values of the area. However, the ERT noted that all the total values are different (for example in 2015 it is reported: 186,526.6 kha in table 6.3, 182,114.0 kha in table 6.4, 182,117.5 kha in table 6.17 and 187,245.1 kha in CRF table 4.C). In addition, the ERT noted that the area of grassland for 2013 in the CRF tables is different from the value in the NIR (table 6.4). Section 6.5.2 of the NIR describes the sources and references of EFs reported in table 6.19 of the NIR, but no information on the data used to validate these EFs was provided.
L.21	4.C.2 Land converted to grassland – CO_2 (L.12, 2016) (86, 2013) (130, 2012) Completeness	Include AD in the CRF tables and estimate CSCs in all pools.	Not resolved. The ERT noted that the dead organic matter pool was reported as "NO" in CRF table 4.C and that no references were provided in the documentation box of this table. The NIR (section 6.5.2) indicated that the calculations of CSCs for the dead organic matter pool have not been conducted.
Waste			
W.1	5. General (waste) – CO_2, CH_4 and N_2O (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 24/CP.19, annex I, paragraph 37.	Addressing. Kazakhstan reported notation keys for its estimates of CH_4 and N_2O emissions from composting, and CO_2, CH_4 and N_2O emissions from waste incineration and biogenic open burning. The ERT noted that Kazakhstan reported correctly the notation key "NO" for CH_4 and N_2O emissions from composting under the category biological treatment of solid waste in line with the UNFCCC Annex I inventory reporting guidelines. However, Kazakhstan used inappropriate notation keys ("NA" and "NO") for reporting CO_2, CH_4 and N_2O emissions from waste incineration and biogenic open burning (see ID#s W.10 and W.11).
W.2	5. General (waste) – CO_2, CH_4 and N_2O (W.6, 2016) Adherence to the	Implement a QA/QC check to ensure that data provided in the NIR are consistent with the	Not resolved. Kazakhstan only reported in the NIR (section 7.2.4, p.309) that QA/QC procedures were implemented for solid waste disposal, not for the whole sector. In

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	UNFCCC Annex I inventory reporting guidelines	latest data in the submitted CRF tables.	addition, the ERT noted inconsistencies between the NIR and the CRF tables; in particular, the categories' contributions were incorrectly reported in the NIR (pp.299–300). This suggests that no QC procedures were implemented (see ID# W.15 in table 5).
W.3	5. General (waste) – CO_2, CH_4 and N_2O (W.7, 2016) 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.	Addressing. Kazakhstan provided consistent information on the methods applied in the CRF tables and the NIR and information on the tiers used for the estimated categories in the sector (sections 7.2.2, 7.3.1.2, 7.3.1 and 7.4.2). However, the ERT noted that information on how the tiers used were in line with the decision trees in the 2006 IPCC Guidelines used for method selection was not provided or was inconsistent (e.g. see ID# W.16 in table 5).
W.4	5.A Solid waste disposal on land – CH_4 (W.1, 2016) (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.	Addressing. Kazakhstan provided an explanation on industrial waste management in the NIR. However, information on statistical data on how industrial waste is treated and disposed was not provided in the NIR (section 7.1, p.297). In addition, Kazakhstan informed the ERT that the issue of industrial waste disposed at SWDS will be further considered as a potential source of emissions under category 5.A solid waste disposal (see ID# W.19 in table 5).
W.5	5.A Solid waste disposal on land – CH_4 (W.2, 2016) (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 (instead of the constant value of 0.21 for DOC for the 1990–2011 time series).	Not resolved. Kazakhstan continued to use a constant DOC value (0.21) for 1950–2015 based on information on municipal waste composition from 2010 (NIR, chapter 7.2.2, p.306). Therefore, Kazakhstan did not recalculate the CH_4 emissions based on updated DOC values for 1990–2014 (see ID# W.18 in table 5).
W.6	5.A Solid waste disposal on land – CH_4 (W.8, 2016) Accuracy	Provide an explanation for the unusual ratio between the IEFs for the managed anaerobic and uncategorized disposal sites, and/or recalculate the time series, if necessary.	Not resolved. The NIR did not provide an explanation for the unusual ratio between the IEFs for the managed anaerobic and uncategorized disposal sites. The unusual ratio (0.02–0.03) for 2015 persisted in the current annual submission and the ERT noted that related recalculations were not performed. The ERT noted that the explanations provided by Kazakhstan during the review referred to the MSW landfills categories, which did not address the issue of the ratio.
W.7	5.A Solid waste disposal on land – CH_4	Study available AD and clarify the categorization of landfills beginning with the biggest cities in order to make the necessary	Resolved. Kazakhstan provided new categorization of landfills in the NIR (section 7.2, pp.299–303), according to the programme on waste management that

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	(W.9, 2016) Accuracy	corrections to the estimates for the category.	divides all MSW landfills into three categories: managed (Astana), unmanaged (Almaty) and uncategorized (other cities).
W.8	5.A Solid waste disposal on land – CH_4 (W.10, 2016) Adherence to the UNFCCC Annex I inventory reporting guidelines	Correct the value of DOC_f reported in CRF table 5.A.	Resolved. Kazakhstan corrected the value of DOC_f in CRF table 5.A of its 2017 annual submission. The NIR (section 7.2.2, p.307) provided information of the value used (0.5).
W.9	5.A Solid waste disposal on land – CH_4 (W.11, 2016) Transparency	Provide detailed information on the methodology used for the calculation of waste generation and the parameters used, including data for per capita waste generation and urban population, ensuring transparency of reporting, as well as completeness of the estimates.	Resolved. Kazakhstan provided information on the methods used for the calculation of waste generation and the parameters used in the estimates (section 7.2.1, pp.300–304) (see ID# W.17 in table 5).
W.10	5.C Incineration and open burning of waste – CO_2, CH_4 and N_2O (W.12, 2016) Comparability	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. Emissions from incineration of medical waste are reported in the NIR (section 7.4, p.334). However, the ERT noted an inconsistency in the CO_2 emissions reported in CRF table 5.C, under the category 5.C.1. waste incineration, where CO_2, CH_4 and N_2O emissions are reported as "NO" and "NA". The ERT believes that future ERTs should consider this issue further to ensure that the above-mentioned reporting inconsistency is resolved and there is not an underestimation of CO_2, CH_4 and N_2O emissions from this subcategory.
W.11	5.C.1 Waste incineration – CO_2, CH_4 and N_2O (W.14, 2016) Adherence to the UNFCCC Annex I inventory reporting guidelines	Use the appropriate notation key for waste incineration consistent with decision 24/CP.19, annex I, paragraph 37.	Not resolved. During the review, Kazakhstan informed the ERT that the notation key "NA" will be changed to "NO" in the next annual submission. Based on discussions during the review, the ERT noted that, in 2017, activities of waste incineration were launched in Astana and that in the future, CO_2, CH_4 and N_2O emissions from this category should be reported (see ID# W.10 above).
W.12	5.C.2 Open burning of waste – CO_2, CH_4 and N_2O (W.13, 2016) Completeness	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.	Not resolved. The ERT noted that in CRF table 5.C emissions from open burning of waste were reported as "NO" and "NA". During the review, Kazakhstan informed the ERT that the practice of open burning of waste is prohibited by the Ecological Code of Kazakhstan. The ERT also noted that only 15.0 per cent of SWDS are authorized for operation and most of the disposal sites in Kazakhstan are not authorized but operating. According to the 2006 IPCC Guidelines open burning of waste may occur

ID#	*Issue and/or problem classification*[a]	*Recommendation made in previous review report*	*ERT assessment and rationale*
			at unmanaged sites as well in rural areas, where collection waste systems do not exist. The ERT considered from discussions during the review with country experts that CO_2, CH_4 and N_2O emissions from open burning in unauthorized SWDS may occur owing to 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 subcategory 5.C.2 open burning of waste for 2013, 2014 and 2015. The ERT included this issue in the list of potential problems and further questions raised by the ERT and recommended that Kazakhstan provide additional documentation demonstrating that all waste streams generated by urban and rural populations were included in the GHG emission estimates from the waste sector and that emissions from open burning do not occur. If this is not possible, the ERT recommended that Kazakhstan provide emission estimates from open burning, as recommended in the 2006 IPCC Guidelines (vol. 5, chapter 5.3.2, pp.5.15–5.17), using documented assumptions on the waste treatment practices in rural areas (i.e. open burning of waste). In response to the list of potential problems and further questions raised by the ERT, Kazakhstan indicated that "unauthorized burning of garbage in Kazakhstan entails a fine in the amount of five monthly calculated indicators, according to art. 410 of the Code of Administrative Violations of the Republic of Kazakhstan 'Violation or non-compliance with fire safety requirements'." The ERT considered that the Party's response did not adequately resolve the potential problem. Therefore, in accordance with the guidance for adjustments under Article 5, paragraph 2, of the Kyoto Protocol (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 (see section VI and annex IV below).
W.13	5.D Wastewater treatment and discharge – CH_4 (W.4, 2016) (93, 2013) (144, 2012) Accuracy	Collect available statistical data in order to increase the accuracy and transparency of reporting and provide more detailed information in the NIR on the parameters used (e.g. share of aerobic wastewater treatment), justifying the approach taken.	Resolved. Detailed descriptions of wastewater treatment systems used in Kazakhstan, statistical data and parameters were provided in the NIR (section 7.3.1.1, pp.313 and 314). The ERT noted some small inconsistencies in the information provided in the NIR (see ID# W.20 in table 5).

ID#	*Issue and/or problem classification*[a]	*Recommendation made in previous review report*	*ERT assessment and rationale*
W.14	5.D.2 Industrial wastewater – CH_4 (W.15, 2016) Transparency	Report domestic and industrial wastewater separately and if this is not implemented use the correct notation key in reporting (e.g. "IE") consistent with decision 24/CP.19, annex I, paragraph 37.	Resolved. Kazakhstan reported emissions from domestic and industrial wastewater separately in CRF table 5.D and in the NIR (tables 7.3 and 7.11).
KP-LULUCF			
		There were no recommendations related to KP-LULUCF activities in the previous review report.	

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

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

8. 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 successive reviews, including the review of the 2017 annual submission of Kazakhstan, and have not been addressed by the Party.

Table 4
Issues 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.1	Use the notation key "NO" if the activity is not occurring and "IE" if emissions are included elsewhere	3 (2013, 2015/2016, 2017)
G.4	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 KazNIIEK	5 (2011–2013, 2015/2016, 2017)
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	3 (2013, 2015/2016, 2017)
E.2	Report in the NIR all information regarding the reasons for recalculations and the methodologies used for the recalculated categories	4 (2012, 2013, 2015/2016, 2017)
E.3	Explain the underlying assumptions and the degree of expert judgment used in the applied interpolation methodology to fill	5 (2011–2013, 2015/2016, 2017)

ID#	*Previous recommendation for the issue identified*	*Number of successive reviews issue not addressed*[a]
	in the time series for AD of national statistics and report it in the NIR	
E.4	Ensure the consistency of the entire time series and provide comparisons of AD obtained from different sources	4 (2012, 2013, 2015/2016, 2017)
E.5	Include the description of QA/QC procedures applied for transport and fugitive emissions	3 (2013, 2015/2016, 2017)
E.7	Cross-check the AD and provide explanations for the differences in inter-annual changes between the reference and sectoral approaches	5 (2011–2013, 2015/2016, 2017)
E.8	Carry out the planned improvement to separate coking coal consumption from the total other bituminous coal consumption	3 (2013, 2015/2016, 2017)
E.9	Obtain relevant navigation statistics and use the appropriate EFs for reporting emissions	5 (2011–2013, 2015/2016, 2017)
E.10	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	4 (2012, 2013, 2015/2016, 2017)
E.11	Include detailed data on energy consumption by fuel for all subcategories in the energy sector	3 (2013, 2015/2016, 2017)
E.12	Investigate the allocation of AD and emissions from the energy sector to the industrial processes sector and correct any misallocations	5 (2011–2013, 2015/2016, 2017)
E.13	Reallocate AD and emissions from transportation in agriculture/forestry/fisheries to the subcategory agriculture/forestry/fisheries and emissions from industrial and construction off-road transport to the category manufacturing industries and construction	3 (2013, 2015/2016, 2017)
E.14	Improve the accuracy of the N_2O emission estimates for gasoline consumption from this category, taking into account the pollution control technologies introduced over time in the vehicle fleet	4 (2012, 2013, 2015/2016, 2017)
E.15	Include the background information about the measurements made and time series of the CH_4 concentration in the NIR (underground mines)	4 (2012, 2013, 2015/2016, 2017)
E.16	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	4 (2012, 2013, 2015/2016, 2017)
E.17	Ensure the correct use of notation keys and report the information in the documentation boxes in the CRF tables	3 (2013, 2015/2016, 2017)
IPPU		
I.1	Strengthen its 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	4 (2012, 2013, 2015/2016, 2017)

ID#	*Previous recommendation for the issue identified*	*Number of successive reviews issue not addressed*[a]
I.5	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	3 (2013, 2015/2016, 2017)
I.10	Explore the use and potential imports or exports of calcium carbide and revise the EF, if necessary	3 (2013, 2015/2016, 2017)
I.14	Further improve transparency by providing the AD disaggregated by type of ferroalloy for the entire time series	3 (2013, 2015/2016, 2017)
I.20	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 (2012, 2013, 2015/2016, 2017)
I.22	Use the notation key "NO" for HFC, PFC and SF_6 emissions from fire extinguishers if this activity does not occur	3 (2013, 2015/2016, 2017)
I.23	Choose the appropriate method to estimate SF_6 emissions from electrical equipment and estimate the emissions	4 (2012, 2013, 2015/2016, 2017)
Agriculture		
	No such issues for the agriculture sector were identified	
LULUCF		
L.1	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	5 (2011–2013, 2015/2016, 2017)
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	3 (2013, 2015/2016, 2017)
L.4	Implement the QA/QC plan for the sector	5 (2011–2013, 2015/2016, 2017)
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;	4 (2012, 2013, 2015/2016, 2017)

ID#	*Previous recommendation for the issue identified*	*Number of successive reviews issue not addressed*[a]
	(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) 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.12	Report CSC separately for all the pools; report both biomass gains and biomass losses separately	5 (2011–2013, 2015/2016, 2017)
L.14	Exclude abandoned lands from cropland and report this category under cropland converted to grassland or cropland converted to other land	4 (2012, 2013, 2015/2016, 2017)
L.15	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	4 (2012, 2013, 2015/2016, 2017)
L.18	Check the reliability of the AD for the degree of grassland degradation for the entire time series	4 (2012, 2013, 2015/2016, 2017)
L.19	Implement the procedures included in the QA/QC plan and correct the error leading to inconsistent reporting of areas of grassland	5 (2011–2013, 2015/2016, 2017)
L.21	Include AD in the CRF tables and estimate CSCs in all pools	4 (2012, 2013, 2015/2016, 2017)
Waste		
W.4	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	3 (2013, 2015/2016, 2017)
W.5	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)	3 (2013, 2015/2016, 2017)
KP-LULUCF		
	No such issues for KP-LULUCF activities were identified	

[a] The review of the 2016 annual submission was held in conjunction with the review of the 2015 annual submission. Since the reviews of the 2015 and 2016 annual submissions were not "successive" reviews, but were held in conjunction, for the purpose of counting successive years in table 4, 2015/2016 are considered as one year.

V. Additional findings made during the 2017 individual inventory review

9. Table 5 contains findings made by the ERT during the individual review of the 2017 annual submission of Kazakhstan that are additional to those identified in table 3.

Table 5
Additional findings made during the 2017 individual review of the annual submission of Kazakhstan

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*	*Is finding an issue and/or a problem?[a] If yes, classify by type*
General			
G.11	Recalculations	The ERT noted that, according to the UNFCCC Annex I inventory reporting guidelines (decision 24/CP.19, annex I, paras. 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 also noted that the NIR identified recalculations for some inventory categories (e.g. sections 3.4.6, 4.2.1.5 and 5.5.5). However, the information on recalculations included in the NIR is not sufficiently detailed to understand the reasons for recalculations, the specifics of methods and assumptions used, or the impact of recalculations on the emissions from the particular category, on the entire sector and the total emissions (including and excluding LULUCF). The ERT recommends that Kazakhstan, in the NIR of its future annual submissions, 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).	Yes. Transparency
G.12	QA/QC and verification	The ERT noted that the NIR (section 1.2.3) provided a description of the QA/QC system in Kazakhstan and listed QA/QC procedures in place to ensure the high quality of the inventory. However, the ERT also noted a significant number of inconsistencies between the NIR and the CRF tables in the energy, IPPU, LULUCF and waste sectors (see ID#s I.2, I.4, L.8, L.10, L.18, L.19, L.20, W.2 and W.10 in table 3 and ID#s G.19, E.53, I.25, I.29, L.22, W.20 and KL.4 below). The ERT recommends that, in the NIR of its next annual submission, Kazakhstan 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 in the NIR of its next annual submission.	Yes. Adherence to the UNFCCC Annex I inventory reporting guidelines
G.13	National registry	The ERT noted that in its initial report to facilitate the calculation of the assigned amount for the second commitment period of the Kyoto Protocol, Kazakhstan indicated that "the national registry is currently being developed" (point (m) on p.341). During the review week, the ERT was not able to perform the review of the national registry in accordance with the Article 8 review guidelines because a national registry and related information were not available. From this and responses to the ERT provided by the Party during the review, the ERT concluded that the process of building Kazakhstan's national registry is not complete and, therefore, that Kazakhstan did not establish and maintain a national registry in the form of a standardized electronic database, to ensure the accurate accounting of its holdings of and transactions of Kyoto Protocol units, to track its holdings of	Yes. Adherence to reporting guidelines under Article 7, paragraph 1, of the Kyoto Protocol

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*	*Is finding an issue and/or a problem?[a] If yes, classify by type*
		and transactions of Kyoto Protocol units, and that the national registry is not operating and performing the mandatory requirements for the registry's functionality for the CP2, in accordance with requirements set out in decision 13/CMP.1, annex, section II, in conjunction with decision 3/CMP.11, in particular paragraph 17, and paragraphs 18–25, 28 and 44–48, and the annex to decision 5/CMP.1. The ERT also noted that a thorough review of the national registry would be undertaken in the context of a future initialization of the national registry of Kazakhstan. The ERT noted that the review of the initial report to facilitate the calculation of the assigned amount identified this problem as a question of implementation in accordance with decision 22/CMP.1 in conjunction with decision 4/CMP.11 (see ID# 18 in FCCC/IRR/2017/KAZ). The ERT recommends that Kazakhstan establish and maintain its national registry and report information on how its national registry performs the functions defined in the mandatory requirements for the registry's functionality for the CP2, in accordance with the requirements set out in decision 13/CMP.1, annex, section 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.	
G.14	Kyoto Protocol units	The ERT noted that Kazakhstan did not submit the SEF tables for the years 2013–2016 and other related information on accounting of Kyoto Protocol units (pursuant to decision 15/CMP.1, annex, section I.E, paras. 12–18, in conjunction with decision 3/CMP.11) in conjunction with its first annual inventory submission (2017 annual submission) for CP2. 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 response to the list of potential problems and further questions raised by the ERT, Kazakhstan noted that, owing to the fact that it did not have quantitative commitments under the Kyoto Protocol in the first commitment period and it was not included in Annex B to the Kyoto Protocol before 2012, it did not have Kyoto Protocol units either in the first commitment period or at the beginning of CP2. Therefore, Kazakhstan could not provide information on accounting of Kyoto Protocol units because of the lack of such units. The Party indicated that if the political decision to ratify the Doha Amendment takes place in Kazakhstan and after consultations with the UNFCCC secretariat, this recommendation may be implemented. The ERT considered the Party's response and found that Kazakhstan has not satisfactorily resolved the problem. In particular, the ERT noted that reporting SEF tables is a mandatory part of the inventory submission under the Kyoto Protocol (decision 3/CMP.11, para. 13), independent of the fact that relevant transactions occurred or not within the reported period. Kazakhstan could use relevant notation keys in the SEF tables if the transactions were not occurring. Therefore, the ERT 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 section VIII below).	Yes. Adherence to reporting guidelines under Article 7, paragraph 1, of the Kyoto Protocol

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue and/or a problem?[a] If yes, classify by type
		The ERT recommends that Kazakhstan provide the reporting on its Kyoto Protocol units using the SEF tables as required in decision 3/CMP.11, paragraph 13.	
G.15	National system	The ERT noted that the NIR was submitted on 4 July 2017, which was beyond six weeks after the submission due date of 15 April 2017, although the CRF tables were submitted on time. A similar situation occurred in 2016, when the NIR submission happened in October 2016, several months after the submission of the CRF tables. During the review, Kazakhstan explained that the delay with the NIR submission was due to problems experienced by the designated inventory agency with obtaining inventory data and information from other organizations across multiple inventory sectors (see ID# G.16 below), and provided to the ERT Order #214 of the Ministry of Energy which is used as a legal basis for establishing the national system governing inventory data collection. However, the ERT also noted that Order #214 did not provide sufficient detail on the roles of stakeholders involved in the inventory preparation and did not identify the particular responsibilities of different inventory data providers. Also, it did not include procedural guidance regarding inventory data sharing, data communication and data QC. The ERT concluded that the general functions and inventory planning functions of the national system were not fully implemented in accordance with decision 19/CMP.1 in conjunction with decisions 3/CMP.11 and 4/CMP.11, annex, sections V and VI, paragraphs 10(a) and (d) and 12(c–e). The ERT noted that the review of the initial report to facilitate the calculation of the assigned amount identified this problem as a question of implementation in accordance with decision 22/CMP.1 in conjunction with decision 4/CMP.11 (see ID# 15 in FCCC/IRR/2017/KAZ). The ERT recommends that Kazakhstan, in its next annual submission, provide an action plan and information on its implementation to address the issues identified above, 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.	Yes. Adherence to reporting guidelines under Article 7, paragraph 1, of the Kyoto Protocol
G.16	National system	The ERT noted that the national system is not ensuring sufficient technical capacity of the staff involved in the inventory development process or the enhancement of this capacity. In addition, the ERT noted that the inventory planned improvements did not include building inventory capacity and maintaining business continuity of the GHG inventory preparation and management. During the review, Kazakhstan expressed interest in undertaking related UNFCCC review training for its leading inventory experts and participating in bilateral collaboration with other Annex I Parties as a way to enhance the technical capacity of the staff involved in the inventory development process. As indicated in ID# G.15 above, the ERT also noted that the NIR was submitted on 4 July 2017, which was beyond six weeks after the submission due date of 15 April 2017 and that Kazakhstan explained	Yes. Adherence to reporting guidelines under Article 7, paragraph 1, of the Kyoto Protocol

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*	*Is finding an issue and/or a problem?[a] If yes, classify by type*
		that the delay with the NIR submission in 2017 was due to problems experienced by the designated inventory agency with obtaining inventory data and information from other organizations across multiple inventory sectors, which indicated difficulties for the national system in ensuring timely data collection for estimating GHG emissions and removals. Therefore, the ERT concluded that Kazakhstan is not sufficiently implementing decision 19/CMP.1, annex, section V, paragraph 10(b). The ERT noted that the review of the initial report to facilitate the calculation of the assigned amount identified this problem as a question of implementation in accordance with decision 22/CMP.1 in conjunction with decision 4/CMP.11 (see ID# 16 in FCCC/IRR/2017/KAZ). The ERT recommends that, in the NIR of its next annual submission, Kazakhstan 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 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.	
G.17	National system	The ERT noted that the information reported in the NIR is not sufficiently transparent in terms of roles and responsibilities of different government agencies and other organizations regarding provision of AD and ownership of the QC process for the data and EFs used for estimating emissions. The NIR (section 1.3, p.35) provided a general statement that AD collection occurs on a basis of formal requests through sending letters to the relevant ministries, committees and industrial plants, which does not make it possible for the ERT to identify which organizations are responsible for AD collection for each sector, how the quality of AD was ensured by the data providers, whether preliminary data processing occurred at the data provider's side or at the inventory agency, and how reliability of country-specific EFs was ensured. During the review, Kazakhstan provided the ERT with the list of organizations involved in the collection of AD; however, the ERT considered that the Party's response did not provide sufficient information on the QA/QC procedures ensuring the quality of AD and plant-specific EFs. The ERT recommends that, in the NIR, Kazakhstan 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 (row data) processing; and (3) how the quality and reliability of plant-specific and country-specific EFs are ensured and who is responsible for this.	Yes. Transparency
G.18	Inventory management	The ERT noted that some data in the energy and IPPU sectors requested by the ERT for its review activities during the review were not readily available from the national inventory archive (e.g. see ID#s E.42 and E.43 in table 3 and ID#s E.47, E.48, E.49, E.50, I.31, I.37, I.38, I.41, W.17, W.18 and W.19 below). The ERT concluded	Yes. Adherence to reporting guidelines under Article 7,

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*	*Is finding an issue and/or a problem?[a] If yes, classify by type*
		that the inventory management functions of the national system described in decision 19/CMP.1, annex, paragraph 16(a)–(c), in conjunction with decisions 3/CMP.11 and 4/CMP.11, need to be strengthened. The ERT recommends that Kazakhstan enhance its inventory archiving system and ensure that all inventory documentation is readily available to both inventory compilers and the ERTs, and also encourages the Party to include, in the NIR of its next annual submission, detailed information in the inventory improvement plan on the actions for strengthening the archiving system.	paragraph 1, of the Kyoto Protocol
G.19	National system	The ERT noted that the information on identification of lands where deforestation, AR, FM and GM activities occurred was not transparently described and presented in Kazakhstan's annual submission and that there are data inconsistencies associated with these activities between the NIR and the CRF tables. For example, according to the NIR (table 9.3) and the corresponding CRF tables, the area of AR and deforestation in all reported years decreased compared with 1990, but according to the NIR, deforestation activity did not occur in the country. The ERT noted that no information on deforestation is provided in the NIR, but numerical values were reported in CRF table NIR-2. Also, the area of FM in CRF tables NIR-2 and 4(KP-I)B.1 was reported as "NO", "NE" and "IE"; however, results of CSC estimations for living biomass were reported in these tables, while the NIR (table 9.3) reported areas under FM. In connection with this issue, the ERT also noted that according to decision 2/CMP.7, annex, paragraph 25, the national inventory systems established under Article 5, paragraph 1, shall ensure that areas of land subject to LULUCF activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, 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, of the Kyoto Protocol. The ERT recommends that Kazakhstan, through its national system, which ensures that areas of land subject to activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol are identifiable, include in the NIR a detailed and transparent description of the process established for this purpose. The ERT also recommends that Kazakhstan, in the NIR, include transparent information on geographical identification of lands where deforestation, AR, FM and GM activities occurred on its territory, in line with the methodological recommendations of the 2006 IPCC Guidelines (vol. 4) and the Kyoto Protocol Supplement. The ERT believes that future ERTs should consider this issue further to ensure that there is not an underestimate of emissions or overestimate of removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol and that the land representation will be in line with methodological recommendations of the 2006 IPCC Guidelines (vol. 4).	Yes. Transparency
G.20	Article 3, paragraph 14, of the Kyoto Protocol	Kazakhstan did not provide information on the minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol in its annual submission. However, in response to questions raised by the ERT during the review, Kazakhstan submitted an addendum to the NIR that included the missing information on the minimization of adverse impacts (see http://unfccc.int/national_reports/initial_reports_under_the_kyoto_protocol/second_commitment_period_2013-	Yes. Adherence to reporting guidelines under Article 7, paragraph 1, of the Kyoto Protocol

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*	*Is finding an issue and/or a problem?[a] If yes, classify by type*
		2020/items/9499.php). The ERT noted that the addendum contained the information required in accordance with Article 3, paragraph 14, of the Kyoto Protocol and welcomed its submission. The ERT recommends that Kazakhstan 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.	
Energy			
E.46	1. General (energy sector) – all fuels – CO_2	The ERT noted that the NIR (table 3.8) provided information on NCVs and carbon content of household fuel, associated petroleum gas, coal with high ash content, and coal with calorific value more than 23.865 MJ/kg used in the reference approach. The ERT also noted that the reference approach did not include apparent consumption of these types of fuels, but included apparent consumption of anthracite, coal tar and other bituminous coal, which are not reported under the respective categories in the sectoral approach. The ERT further noted that the NCV and carbon content of other bituminous coal reported in the reference approach (CRF table 1.A(b)) are 19.61 TJ/Gg and 25.58 t C/TJ, respectively, which are lower than the IPCC default values of 25.8 TJ/Gg and 25.8 t C/TJ, respectively (vol. 2, tables 1.2 and 1.3). The NIR does not provide information on the source, method of calculation or justifications on the use of country-specific NCVs and carbon content (CO_2 EFs) used for specific types of fuels, such as household fuel, stripped gas, associated petroleum gas, coal with high ash content, and coal with calorific value more than 23.865 MJ/kg. During the review, Kazakhstan explained that from 2014 onward, the national energy balance provides data disaggregated by types of fuels, but for technical reasons Kazakhstan was not able to include specific types of fuels in CRF table 1.A(b), therefore the Party reported them aggregated under pre-defined existing types of fuels in the reference approach. The ERT recommends that Kazakhstan: improve the transparency and consistency of its 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.	Yes. Transparency
E.47	Fuel combustion – reference approach – liquid, solid, gaseous and other fossil fuels – CO_2	The ERT noted that the difference of CO_2 emissions reported in CRF table 1.A(c) between the reference and sectoral approaches in 2015 was –3.4 per cent. The ERT also noted large differences of CO_2 emissions between the reference approach and the sectoral approach in 2015 for liquid fuels (–17.1 per cent), solid fuels (–8.3 per cent) gaseous fuels (23.4 per cent) and other fossil fuels (–100.0 per cent). The NIR did not provide sufficient information to explain these differences. In response to a question raised by the ERT during the review week, Kazakhstan indicated that the AD for calculating GHG emissions from all types of fuels were taken from the national energy balance but did not provide any further explanatory information.	Yes. Accuracy

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue and/or a problem?[a] If yes, classify by type
		The ERT concluded that these differences are largely due to incorrect accounting of marine bunkers, which are included in domestic navigation (see ID# E.53 below), incorrect use of CO_2 EFs for international aviation (see ID# E.51 below), inconsistent reporting of emissions from category 1.A.5 other, and improper estimation of non-energy use of natural gas liquids and associated petroleum gas (included together with natural gas in the estimates), which is used for gas-lift operations in oil and gas industries. The ERT recommends that, in order to improve the alignment between the reference and the sectoral approaches and to increase the transparency of reporting in the energy sector, Kazakhstan: 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 non-energy use and feedstocks of natural gas liquids and associated petroleum gas separately from natural gas; implement the recommendations provided in ID#s E.51 and E.53 below; 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.	
E.48	1.A. Fuel combustion – sectoral approach – solid fuels – CO_2, CH_4 and N_2O	The ERT noted that in the original 2017 annual submission in CRF table 1.A(b) for 2015, apparent consumption of coking coal was reported as 349.70 PJ. According to CRF table 1.A.(d), only 2.13 PJ were used for non-energy purposes. The NIR contained information on use of coking coal in respective categories of the sectoral approach for 2015, the aggregated amount of which was about 77.50 PJ. The same problem was detected for 2014. The ERT also noted that for 2013, consumption of coking coal was reported in an aggregated manner under other bituminous coal and lignite. It was not clear from the CRF tables whether or not the remaining coking coal (about 270.07 PJ) was used for combustion activities. During the review, Kazakhstan explained that coking coal consumption was calculated according to the energy balance, which does not provide separate data on consumption by different economic sectors. The ERT also noted that Kazakhstan reported that CO_2 emissions from coking coal were estimated using a tier 3 methodology with plant-specific CO_2 EFs (NIR, section 3.4.3). The NCV (24.01 TJ/Gg) and carbon content (24.89 t C/TJ) used for coking coal provided in the NIR (table 3.8) were lower than the default values of 28.2 TJ/Gg and 25.8 t C/TJ provided in the 2006 IPCC Guidelines (vol. 2, tables 1.2 and 1.3). The ERT further noted that no background information was provided in the NIR on source, method of calculation or justifications on these plant-specific NCV and carbon content (CO_2 EF) values for coking coal, which also indicated a lack of transparency in the inventory reporting. The ERT concluded that not all coking coal was accounted for in the sectoral approach which, together with the use of a low CO_2 EF, led to a potential underestimation of CO_2 emissions (and, correspondingly, CH_4 and N_2O emissions) from category 1.A. fuel combustion for the entire time series and in particular for 2013–2015. The ERT included this issue in the list of potential problems and further questions raised by the ERT and recommended that Kazakhstan provide verifiable information that consumption of coking coal in the country for 2013, 2014 and 2015 was included under the sectoral approach estimates and background information, including sources of information, method of calculation and justifications on the NCVs and plant-specific CO_2 EFs used.	Yes. Transparency

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*	*Is finding an issue and/or a problem?[a] If yes, classify by type*
		If this is not possible, the ERT recommended that Kazakhstan: (1) use the default methodology in the 2006 IPCC Guidelines to calculate emissions of CO_2 (and CH_4 and N_2O) from category 1.A. fuel combustion for coking coal for 2013, 2014 and 2015; and (2) include CO_2 emission estimates (and CH_4 and N_2O) under the category 1.A.5 other (not specified elsewhere) for 2013, 2014 and 2015 if it is not possible to obtain separate data on coking coal consumption by different categories. In response to the list of potential problems and further questions raised by the ERT, Kazakhstan resubmitted a complete set of CRF tables for 1990–2015 with revised CO_2 emission estimates for this category. In its response, Kazakhstan indicated that in consultation with the Agency of Statistics of the Republic of Kazakhstan, it was clarified that in CRF table 1.A(b) (reference approach), data on production of coking coal were reported including the production of coal concentrate. In this regard, coking coal production data for 2015 were corrected and the apparent consumption of coking coal in the reference approach decreased to 236.37 PJ and reported in CRF table 1.A(b). It was also clarified that in CRF table 1.A.5, 535,500 tonnes of "other consumption of coking coal" in 2015 were not taken into account before, and this consumption was added to CRF table 1.A.5 for 2015. Kazakhstan also indicated that the EFs for coking coal were taken from the "Guidelines for the calculation of greenhouse gas emissions from thermal power plants and boiler houses" (Order No. 280-e of the Minister of Environment Protection of the Republic of Kazakhstan of 5 November 2010, available at: https://www.egfntd.kz/rus/page/ME_RK.html). The ERT disagreed with the Party's response and considers that Kazakhstan has not satisfactorily resolved the potential problem. The ERT noted that Kazakhstan did not provide verifiable supporting documentation to prove that the data on coking coal production were previously reported including the production of coal concentrate. Even assuming that this statement is justified, it is still not clear where in the reference approach (CRF table 1.A.(b)) the data on coal concentrate (i.e. 349.70 PJ – 236.37 PJ = 113.33 PJ) were accounted for. Also, according to Kazakhstan's response, only 159.95 PJ of coking coal were accounted for in the sectoral approach and 2.13 PJ for non-energy purposes. Therefore, it is still not clear whether the remaining 74.29 PJ coking coal (236.37 PJ – (159.95 PJ + 2.13 PJ)) was combusted or used for non-energy purposes. No explanations or revised estimates and data were provided for 2013 and 2014. The ERT also noted that Kazakhstan continued to use the NCV of 24.01 TJ/kt and the carbon content of 24.89 t C/TJ for coking coal taken from Order No. 280-e; however, no background information was provided on the method of calculation of these country-specific values for coking coal. The ERT noted that the methodological guidance referred to above only provides the values, but it does not contain any information on the original source of the country-specific NCV and CO_2 EF, the method of calculation/sampling or technical justifications for the values provided. Therefore, the ERT considered the potential problem unresolved and, in accordance with the guidance for adjustments under Article 5, paragraph 2, of the Kyoto Protocol (annex to decision 20/CMP.1, in conjunction	

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue and/or a problem?[a] If yes, classify by type
		with decision 4/CMP.11), the ERT carried out the procedure for the calculation of adjustments for this category (see section VI and annex IV below).	
		The ERT recommends that Kazakhstan, 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 calculation and justifications for the NCV and country-specific CO_2 EF for coking coal used for the emission estimates.	
E.49	1.A. Fuel combustion – sectoral approach – other fossil fuels – CO_2, CH_4 and N_2O	The ERT noted that Kazakhstan used the notation key "IE" to report CO_2, CH_4 and N_2O emissions from other fossil fuels in categories 1.A.1 energy industries and 1.A.2 manufacturing industries and construction for each year from 2009 to 2015. During the review, Kazakhstan informed the ERT that the Agency of Statistics of the Republic of Kazakhstan reallocated "other fuels" to corresponding fuel types (liquid, solid and gaseous) and therefore other fossil fuels were not included in the energy balance of the country from 2009 onward (see ID# E.22 in table 3).	Yes. Transparency
		The ERT recommends that Kazakhstan, in the NIR of its next annual submission, 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.	
E.50	1.A.2.a Iron and steel – solid fuels – CO_2, CH_4 and N_2O	The ERT noted that the NIR (p.97) indicated that in category 1.A.2.a iron and steel production recalculations were performed only for 2014 to adjust emissions from coking coal consumption for own needs by the company JSC ArcelorMittal Temirtau. The NIR does not provide information on the AD and method used for these recalculations and no information on recalculations is reported for the period 1990–2013. During the review, Kazakhstan confirmed that recalculations were performed only for 2014, but no other relevant information was provided.	Yes. Transparency
		The ERT recommends that Kazakhstan, 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.	
E.51	1.A.3.a Domestic aviation – liquid fuels – CO_2	The ERT noted that CO_2 IEFs for jet kerosene reported for domestic aviation are not consistent within the time series. For example, IEF values of 7.25 t/TJ, 64.34 t/TJ and 74.89 t/TJ were reported for 1990, 2007 and 2013, respectively. A value of 70.78 t/TJ was reported for the period 1991–2006, and 72.53 t/TJ for 2008–2012, 2014 and 2015. Kazakhstan indicated that a tier 1 methodology with default CO_2 EFs was used to calculate emissions from jet kerosene, but the ERT noted that the CO_2 EFs used for the emission estimates from this category are different from the default value of 71.5 t/TJ in the 2006 IPCC Guidelines (vol. 2, table 1.4).	Yes. Consistency

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue and/or a problem?[a] If yes, classify by type
		During the review, Kazakhstan confirmed that for 1990 the identified issue was due to technical errors and for the other years the CO_2 IEFs will be verified according to the data provided by the National Air Navigation Services Provider ("Kazaeronavigatsia") of the Ministry of Investments and Development. The ERT recommends that Kazakhstan correct the identified errors for 1990 and for other years and revise its estimates. The ERT also recommends that Kazakhstan, in the NIR of its next annual submission, 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.	
E.52	1.A.3.b.i Cars – liquid fuels – CH_4	The ERT noted that, in 2015, Kazakhstan reported the highest CH_4 IEF value (33.00 kg/TJ) for gasoline cars among Annex I Parties (3.03–33.00 kg/TJ). The ERT further noted that Kazakhstan's CH_4 IEF value was constant over the time series, with the exception of 2010 when the CH_4 IEF was 30.12 kg/TJ, while the general tendency across reporting Annex I Parties was a decrease. The ERT noted that the IPCC default value of the CH_4 EF for uncontrolled gasoline cars is 33.00 kg/TJ which may be applicable to earlier years of the time series, but considering the introduction of catalyst controls and other technologies for cars in the last years of the time series, possibly lower values would be more appropriate. During the review, Kazakhstan explained that the observed CH_4 IEF values could be because of the low quality of gasoline used in Kazakhstan compared with other Annex I Parties, which led to incomplete combustion and the relatively high level of CH_4 emissions from the category. Kazakhstan also indicated that this question is still under investigation. The ERT recommends that Kazakhstan finalize its investigation of the technologies used in the 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 its estimates using corresponding more appropriate IPCC default values.	Yes. Accuracy
E.53	1.A.3.d Domestic navigation – liquid fuels – CO_2, CH_4 and N_2O	The ERT noted that Kazakhstan did not separate the data on fuel consumption for marine bunkers and domestic navigation and reported all emissions from navigation in the country under category 1.A.3.d domestic navigation. This reporting is not in line with the 2006 IPCC Guidelines and the UNFCCC Annex I inventory reporting guidelines. The ERT also noted that, according to the NIR (p.118), about 37 per cent of the emission reductions from the category were observed between 2014 and 2015, while the CRF tables show an increase in emission estimates between 2014 and 2015, from 96.15 kt to 289.51 kt for CO_2, from 0.0005 kt to 0.0016 kt for CH_4 and from 0.00026 kt to 0.00079 kt for N_2O, which is not consistent with the information in the NIR. In addition, the ERT noted that for the period 2003–2007 the notation key "NO" was used to report emissions of all gases under domestic navigation in the CRF tables, while the NIR states that the first oil tanker was bought by Kazakhstan in 2005 (NIR, p.114) and therefore it is likely that at least emissions from international activities occurred from 2005 onwards. The ERT further noted that for 2008, CO_2 emissions from the category (869.09 kt) were	Yes. Accuracy

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue and/or a problem?[a] If yes, classify by type
		significantly higher than emissions from any other year in the time series owing to an unusually high consumption of residual fuel oil. The ERT concluded that the reporting of emissions from this category is inconsistent across the time series and that the approach used by Kazakhstan in reporting emissions from navigation may result in an overestimation of CO_2, CH_4 and N_2O emissions from category 1.A.3.d domestic navigation for 1990 and 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) collect 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 (2) use appropriate EFs for CO_2, CH_4 and N_2O (e.g. default EFs from the 2006 IPCC Guidelines) to calculate emissions of fuels used for domestic navigation for 1990, and following the principle of consistency, provide revised estimates 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 1990–2015 with revised CO_2, CH_4 and N_2O emission estimates for this category. In its response, Kazakhstan indicated that data on water transport statistics do not contain a division between domestic and international activities and are limited to general data on fuel consumption for a particular year. Kazakhstan requested this information from the national company that carries out operator activities in the Caspian Sea, being the only company in Kazakhstan that works with international seaports. However, no data on fuel consumption by navigation type have been obtained from this company. Therefore, the division of fuel consumption into marine bunker and domestic navigation was carried out on the basis of the ratio between the volumes of goods transported for domestic consumption and the volumes of goods transported for international activities. Kazakhstan also indicated that volumes of goods transported based on data on “Main indicators of external water transport” (marine bunkers) and “Main indicators of inland water transport” (domestic navigation) were taken from the compilation of the Agency of Statistics of the Republic of Kazakhstan on the activities of the water transport in Kazakhstan. The Party further explained that, according to expert judgment, fuel oil and diesel oil engines are installed on ships with a large cargo weight and such vessels cannot be used for servicing in inland waters of Kazakhstan because of their size. At the same time, light boats with gasoline and diesel oil engines are used on rivers and in the coastal zone. For this reason, it was assumed that international navigation uses fuel oil and diesel oil, and inland water transport uses gasoline and diesel oil. Accordingly, the obtained ratio indicated above between the respective volumes of goods was used to separate only diesel oil used in water transport for marine bunkers and domestic navigation. The ERT considered Kazakhstan’s response and found that the Party has not satisfactorily resolved the problem. The ERT noted that total emissions (expressed in CO_2 eq) reported from domestic navigation in the revised CRF table 1.A(a) (125.22 kt CO_2 eq) are significantly higher than those provided in Kazakhstan’s written response to the list of potential problems (44.74 kt CO_2 eq) for 1990, while no additional documentation or explanations were provided to support the revised data in CRF table 1.A(a) or the calculations and the AD that were actually	

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue and/or a problem?[a] If yes, classify by type
		used in the calculations, in particular for diesel oil. The ERT also noted that the revised overall fuel consumption of liquid fuels for navigation (domestic navigation and marine bunkers) for all years of the time series differs significantly from the original 2017 annual submission. For example, in the original 2017 annual submission, "NO" was used for residual fuel oil used in domestic navigation for the entire time series (and "NA" for marine bunkers), while in the revised CRF tables "NA" is reported for the entire time series. On the other hand, in the resubmitted CRF tables, a significant amount of residual fuel oil consumption previously not reported as used under navigation activities appears, and is reported under marine bunkers for the entire time series (5,509.53 TJ in 1990 and 740.00 TJ in 2015). No documentation was provided on the source of these new AD for residual fuel oil and it is unclear how the balance of liquid fuels used for navigation (domestic navigation and marine bunkers) has been maintained. The ERT further noted that the EFs for CH_4 and N_2O emissions used for the calculation of emissions from domestic navigation differ from the IPCC default values. Kazakhstan used an EF of 3.90 kg/TJ for gas/diesel oil for both CH_4 and N_2O for the entire time series, while the 2006 IPCC Guidelines default values are 7 and 2 kg/TJ, respectively. A similar situation occurs with the CH_4 and N_2O EFs for gasoline, which differ slightly from the 2006 IPCC Guidelines default values (uncontrolled motor gasoline) of 33.00 and 3.20 kg/TJ, respectively. No explanations or documentation on the choice of the EFs was provided. The ERT concluded that, owing to the lack of reliable and verifiable information on fuel consumption for 1990 (and other years of the time series) as well as the use of a high EF value for N_2O emissions, the CO_2, CH_4 and N_2O emissions from domestic navigation for 1990 (and other years) are overestimated. Therefore, the ERT disagreed with the Party's response and considers that Kazakhstan has not satisfactorily resolved the potential problem (see ID# 20 in FCCC/IRR/2017/KAZ). The ERT recommends that Kazakhstan estimate emissions from category 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.	
E.54	1.A.4.c Agriculture/ forestry/fishing – liquid fuels – CO_2, CH_4 and N_2O	The ERT noted that Kazakhstan reallocated mobile emissions from subcategory 1.A.4.c.i stationary under agriculture/forestry/fishing to subcategory 1.A.4.c.ii off-road vehicles and other machinery for the entire time series. The ERT also noted that the comments, which were provided in CRF table 1.A(a) for the notation key "IE" used to report AD and emissions from gasoline, diesel oil and LPG under this category, indicated that AD and emissions were aggregated with other liquid fuels. Similarly, AD and emissions for all fuels used in subcategory1.A.4.c.iii fishing were reported as "IE" and included under 1.A.4.c.i stationary.	Yes. Comparability

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue and/or a problem?[a] If yes, classify by type
		As the comments included in the CRF tables did not explain the reasons for the allocation used by Kazakhstan, the ERT concluded that there is a lack of comparability and transparency in reporting emissions from subcategory 1.A.4.c. To improve comparability and transparency of reporting, the ERT recommends that Kazakhstan 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.	
E.55	1.A.5 Other (fuel combustion activities) – all fuels – CO_2, CH_4 and N_2O	The ERT noted that between 1997 and 2010 the levels of CO_2, CH_4 and N_2O emissions from stationary sources under category 1.A.5 other (not specified elsewhere) showed significant increases ranging from 1,468.28 to 48,265.58 kt for CO_2, 0.15 to 5.54 kt for CH_4 and 0.01 to 0.49 kt for N_2O. In 2015, Kazakhstan reported 35,020.58 kt, 3.72 kt and 0.35 kt of CO_2, CH_4 and N_2O emissions, respectively, for this category. During the review week, Kazakhstan explained that this category includes statistical differences and emissions from military operations. The ERT concluded that the increase of emissions in category 1A.5 may be caused by the reallocation of energy data from different economic sectors to one single category; for example, data for coking coal consumed in manufacturing industries and construction and for non-energy purposes. The ERT recommends that Kazakhstan revise the AD and emission allocations to ensure that they are included in the appropriate categories in the CRF tables according to the UNFCCC Annex I inventory reporting guidelines and, in the NIR of its next annual submission, include information on the revised allocations, provide detailed explanations on all reallocations and provide revised emission estimates.	Yes. Transparency
E.56	1.B.1.a Coal mining and handling – solid fuels – CO_2 and CH_4	The ERT noted that Kazakhstan used the notation key "NO" to report CO_2 and CH_4 emission estimates from subcategory 1.B.1.a.i abandoned underground mines. The ERT noted that, according to information published by the Global Methane Initiative: "…at least 16 underground coal mines in Kazakhstan have been abandoned since 1995. All are considered gassy and every abandoned mine is classified as a high hazard for coal and gas outbreaks. Starting in May 2001, measurement and data processing for gas drain pipes at abandoned shafts, pit-holes, and boreholes have been implemented at 12 abandoned mines in the Karaganda and Abay-Shakhtinsk districts, some abandoned before 1995" (https://www.globalmethane.org/documents/toolsres_coal_overview_ch20.pdf, p.171). The ERT believes that future ERTs should consider this issue further to ensure that there is not an underestimate of emissions from this category. The ERT recommends that Kazakhstan 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, chapter 4, p.4.24) and strengthen its inventory arrangements procedure to ensure completeness of reporting.	Yes. Completeness
E.57	1.B.2.a Oil – liquid fuels – CH_4	The ERT noted that Kazakhstan reported AD without units for the oil transport subcategory for the entire time series. The ERT also noted that the AD reported for 1993 (9.49 units) differs significantly from the AD reported	Yes. Transparency

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*	*Is finding an issue and/or a problem?[a] If yes, classify by type*
		for other years of this period (in the range of 287.00–1,644.26 units). Nevertheless, for the period 1990–1996, CH_4 emissions are reported as "NA". The ERT recommends that Kazakhstan, in its 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.	
E.58	International aviation – liquid fuels – CO_2, CH_4 and N_2O	The ERT noted that Kazakhstan reported emissions from international aviation for the period 2011–2015, but used the notation key "NA" for 1990–2010. The ERT encourages Kazakhstan to estimate CO_2, CH_4 and N_2O emissions from international aviation for the period 1990–2010 to ensure the completeness of emissions for the entire time series. If this is not possible, the ERT encourages Kazakhstan to include, in the NIR of its next annual submission, a clear explanation for the use of notation keys instead of emission estimates from international aviation.	Not an issue/problem
E.59	International aviation – liquid fuels – CO_2, CH_4 and N_2O	The ERT noted that Kazakhstan reported CO_2, CH_4 and N_2O emission estimates for jet kerosene for international aviation for the period 2011–2015. The ERT also noted that the NIR (p.119) indicated that the Party used a tier 2 methodology to estimate emissions from this category and that relevant data are available for 2015. However, the NIR did not include data sets or EFs used to estimate emissions of CO_2, CH_4 and N_2O from the category. The ERT further noted that, for the period 2011–2015, the CO_2, CH_4 and N_2O EFs used by Kazakhstan are substantially lower than the default values provided in the 2006 IPCC Guidelines (71.5 t/TJ, 0.5 kg/TJ and 2 kg/TJ, respectively). The reported CO_2, CH_4 and N_2O IEFs were in the ranges of 0.499–0.982 t/TJ, 0.0015–0.011 kg/TJ and 0.015–0.04 kg/TJ, respectively, for this period, which are significantly below the corresponding average values for Annex I Parties. During the review, Kazakhstan informed the ERT that a technical error occurred in the 2017 annual submission, which resulted in these low IEFs. The Party also explained its planned improvements and provided the ERT with an official document received from Kazaeronavigatsia (the national aviation authority) with information on take-off and landing cycles for each type of aircraft and numbers of flights by each aviation company. The ERT recommends that Kazakhstan, in its next annual submission, 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.	Yes. Accuracy
IPPU			
I.25	2. General (IPPU)	The ERT noted that information provided in the NIR and CRF tables on key categories under the IPPU sector is inconsistent. According to section 4.1 of the NIR the key categories identified are 2.A.1 cement production and 2.C.1 iron and steel production; however, according to CRF table 7 the following categories are also key: 2.B.5	Yes. Adherence to the UNFCCC Annex

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue and/or a problem?[a] If yes, classify by type
		carbide production, 2.C.2 ferroalloys production, 2.C.3 aluminium production and 2.F.1 refrigeration and air conditioning. During the review, Kazakhstan clarified that only those categories corresponding to both level and trend criteria were considered in the inventory as key. The ERT noted that Kazakhstan has not implemented the requirements of paragraphs 39 and 50(c) of the UNFCCC Annex I inventory reporting guidelines on key categories and on reporting on use of recommended methods from the 2006 IPCC Guidelines. The ERT recommends that Kazakhstan 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).	I inventory reporting guidelines
I.26	2. General (IPPU)	The ERT noted that recalculations of emissions of CO_2, CH_4, HFCs, PFCs and SF_6 had been identified in previous review stages of the 2017 annual submission of Kazakhstan. The ERT also noted that the recalculations of CO_2 emissions from categories 2.B chemical industry, 2.C metal industry and 2.D non-energy products from fuels and solvent use, and CH_4 emissions from 2.C metal industry for the last recalculated year and base year were significant (more than 2 per cent). The ERT further noted that the NIR did not contain the information on the recalculations undertaken as requested by the UNFCCC Annex I inventory reporting guidelines, paragraph 50(h). In addition, the reasons for recalculations, the assessment of the impact of recalculations on GHG emission trends and the changes of calculation methods, AD and EFs were not reported in the NIR as requested by the UNFCCC Annex I inventory reporting guidelines, paragraphs 43–45. Kazakhstan clarified during the review why the recalculations were undertaken, which changes in methods and EFs were undertaken and the trends of emissions, and indicated that it will provide detailed information on recalculations in its next annual submission. The ERT recommends that Kazakhstan 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.	Yes. Transparency
I.27	2.A.1 Cement production – CO_2	The ERT noted that the description of methods used for CO_2 emission estimates from 2.A.1 cement production provided in sections 4.2 and 4.2.1.1 of the NIR is inconsistent. For example, a CKD correction factor of 1.02 was reported as used in the calculations (p.154) but the emissions lost with CKD were assessed to be up to 8 per cent (p.155). Also, calculations are based on data of raw materials consumption and of product output (p.153), whereas only clinker production data were used in the estimations and raw materials were not taken into account (p.154) and the estimations were provided using the total national clinker production data and national CaO content in clinker, or were provided for each cement plant separately using plant-specific data (p.154). Kazakhstan clarified during the review that the CKD correction factor used in the calculations is 1.02 and that calculations were based only on clinker or cement production data and the raw materials were not taken into consideration. Also, Kazakhstan indicated that CO_2 emissions from 1990 to 1999 were estimated based on total cement production data and, for 2000 onwards, were based on plant-specific data on clinker production.	Yes. Transparency

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*	*Is finding an issue and/or a problem?[a] If yes, classify by type*
		The ERT recommends that Kazakhstan provide in the NIR clear and consistent information on the AD, CKD correction factor and methods used for CO_2 emission estimates from 2.C.1 cement production, and include clarifications on changes to the methods and AD sources for 2000 onwards.	
I.28	2.A.1 Cement production – CO_2	The ERT noted that, according to the NIR (section 4.2.1.2), the CO_2 emissions from category 2.A.1 cement production are estimated according to the tier 2 method in the 2006 IPCC Guidelines based on data for CaO content in the clinker collected from cement plants. However, this is not documented in the NIR as recommended by the 2006 IPCC Guidelines when non-carbonate raw materials containing CaO are used in cement plants (e.g. metallurgical slag). During the review, Kazakhstan clarified the types of raw material used for clinker production in several cement plants in the country by providing to the ERT the letters from cement plants with description of technologies and production data. From the letters, it was clear that non-carbonate sources of CaO, such as blast furnace slag, were used (e.g. at the Shemketcement and Heidelbergcement plants). The ERT concluded that CO_2 emissions from category 2.A.1 cement production could be underestimated for 2013–2015 because CO_2 emissions from non-carbonate sources were not taken into account, and included this issue in the list of potential problems and further questions raised by the ERT. The ERT recommended that Kazakhstan identify the non-carbonate sources of CaO and assess the amount used in the cement plants of the country and revise its CO_2 emission estimates from 2.C.1 cement production for 2013–2015 according to the tier 2 method from the 2006 IPCC Guidelines. In response to the list of potential problems and further questions raised by the ERT, Kazakhstan provided a clear explanation on how the non-carbonate sources of CaO (e.g. blast furnace slag) were used in the cement plants and therefore did not revise its CO_2 emission estimates. Slag is used as an additive for grinding cement, which takes place after burning the clinker and does not affect the CO_2 emissions. The ERT agreed with the explanation that CO_2 emissions from cement production were not underestimated for 2013–2015 because the non-carbonate sources were not used for clinker production. The ERT recommends that Kazakhstan 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.	Yes. Transparency
I.29	2.A.1 Cement production – CO_2	The ERT noted that information provided in the NIR and the CRF tables on the tier method and EFs applied for category 2.A.1 cement production is inconsistent. According to the NIR (section 4.2.1.2), the tier 2 method and country-specific EFs were applied; however, according to the CRF tables, a tier 1 method was used for 1990–1999 and default EFs were applied for the whole period. Kazakhstan clarified during the review that the calculation of GHG emissions from 2.C.1 cement production for 1990–1999 was based on official statistical data on cement production, taking into consideration the recalculation of the default clinker share (0.75), while for 2000–2015 data of cement companies for clinker production were used. The ERT recommends that Kazakhstan 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	Yes. Accuracy

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue and/or a problem?[a] If yes, classify by type
		of clinker share in cement (0.75) is appropriate to estimate emissions in 1990–1999. The ERT also recommends that Kazakhstan 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 its estimates for 2.A.1 cement production.	
I.30	2.A.1 Cement production – CO_2	The ERT checked the calculations of CO_2 emissions from 2.C.1 cement production provided during the review by the Party and identified that the values of the CKD correction factor used in the calculations were not justified. A CKD correction factor of 2 was used for 2000–2006 and a CKD correction factor of 1.2 for 2007–2011. The ERT noted that these values are different from the default value of 1.02 in the 2006 IPCC Guidelines and the Party agreed that incorrect values of CKD were used in the calculations. The emissions from cement production were overestimated for the period 2000–2011 because of the application of incorrect values of CKD. The ERT recommends that Kazakhstan 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 accordance with the UNFCCC Annex I inventory reporting guidelines, paragraph 50(h), and explain the resulting recalculations in the NIR of its next annual submission.	Yes. Accuracy
I.31	2.A.2 Lime production – CO_2	The ERT noted that for lime production Kazakhstan used data aggregated at the national level, which include hydrated lime, non-hydrated lime and hydraulic lime (section 4.2.2.2 of the NIR). It is not clear from the NIR which industries are covered in the aggregated data on lime production and if non-marketed lime production is included in the AD. The Party was not able to clarify during the review which industries where lime is produced are covered under national statistics and if the AD of national statistics are complete and include non-marketed lime production. The ERT believes that future ERTs should consider this issue further to ensure that there is not an underestimate of emissions from this activity. The ERT recommends that Kazakhstan 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 emissions calculation from the category.	Yes. Transparency
I.32	2.A.2 Lime production – CO_2	According to the NIR (table 4.2), lime production in Kazakhstan in 2015 was 854.09 kt; however, according to the Agency of Statistics of the Republic of Kazakhstan, lime production was 2 per cent higher and accounted for 870.654 kt (Report on Statistics of Industrial Production in Kazakhstan in 2015). The Party clarified that data on lime production were taken from the archive of bulletins of the Committee on Statistics of the Ministry of Economy of the Republic of Kazakhstan (series 2, p.27), "Basic Indices of Industry of the Republic of Kazakhstan, January–December 2015". The Party also clarified that final data are provided in the Statistical Compilation published in May–June each year, after the due date for annual submission to the UNFCCC. The ERT concluded that emissions from lime production were underestimated in 2015 because the AD used were not	Yes. Transparency

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue and/or a problem?[a] If yes, classify by type
		complete, and included this issue in the list of potential problems and further questions raised by the ERT. The ERT recommended that Kazakhstan revise its CO_2 emission estimates for 2015 using updated data on lime production from the Agency of Statistics of the Republic of Kazakhstan. In response to the list of potential problems and further questions raised by the ERT, Kazakhstan revised its CO_2 emission estimates for category 2.A.2 lime production for 2015 using the recommended updated data. The estimates for 2013, 2014 and 1990 were not revised. The ERT agreed with the Party's revised estimates. As a result of the revision, the CO_2 emissions from this category in 2015 increased by 32.33 kt CO_2 (0.01 per cent of the national total and 0.17 per cent of the IPPU sector). The ERT recommends that Kazakhstan 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 the Republic of Kazakhstan after the inventory submission and, if that is the case, recalculated subsequently.	
I.33	2.A.2 Lime production – CO_2	The ERT noted that the tier 1 method from the 2006 IPCC Guidelines was applied for the estimation of CO_2 emissions from 2.A.2 lime production. The ERT also noted that Kazakhstan used the correction factor of 0.97 for hydrated lime production for its calculations. However, according to the 2006 IPCC Guidelines (vol. 3, p.2.20), correction for hydrated lime for the tier 1 method application is not to be undertaken. If no data on hydrated lime production are available, the fraction of hydrated lime is assumed to be zero for the tier 1 method. Kazakhstan clarified that the fraction of the hydrated lime is not known in the country and only total data are available from national statistics. The ERT further noted that the use of the correction factor for hydrated lime production is not in line with the tier 1 method chosen for the estimation and may lead to an underestimation of emissions from lime production. The ERT believes that future ERTs should consider this issue further to ensure that there is not an underestimation of emissions from this category. The ERT recommends that Kazakhstan 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.	Yes. Accuracy
I.34	2.A.3 Glass production – CO_2	In the CRF tables, Kazakhstan reported emissions from 2.A.3 glass production as "NO". Kazakhstan indicated in section 4.1 of the NIR that flat glass (windows) is not produced in the country. However, according to the 2006 IPCC Guidelines, the category glass production includes not only flat glass production, but also containers, glass fibre and special glass. The ERT noted that the Report on Statistics of Industrial Production in Kazakhstan in 2015 states that at least glass containers are produced in the country (e.g. 151,358,000 pieces of glass containers were produced in 2015). During the review, Kazakhstan confirmed that glass containers (bottles and cans) are produced in Kazakhstan and that emissions occur in category 2.A.3 glass production. The ERT concluded that the inventory is not complete owing to the lack of estimates of CO_2 emissions from 2.A.3 glass production and included this issue in	Yes. Transparency

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue and/or a problem?[a] If yes, classify by type
		the list of potential problems and further questions raised by the ERT. The ERT recommended that Kazakhstan determine the AD of glass containers production using information from the Agency of Statistics of the Republic of Kazakhstan, estimate CO_2 emissions from glass containers production for 2013–2015 by applying methods from the 2006 IPCC Guidelines and, if glass fibre and glass wool production occurs in the country, determine the related AD and estimate CO_2 emissions using methods from the 2006 IPCC Guidelines or, if this production does not occur, justify that glass fibre and glass wool are not produced in Kazakhstan. In response to the list of potential problems and further questions raised by the ERT, Kazakhstan estimated CO_2 emissions from category 2.A.3 glass production for 2013–2015 and also for the previous years since 2000, when the glass container production started in Kazakhstan. The Party confirmed that there is no production of glass fibre and glass wool in the country. The ERT noted that the applied methods and EFs are consistent with the 2006 IPCC Guidelines and the estimation provided is accurate and agreed with the Party's estimates. As a result, the estimated emissions from 2.A.3 glass production were 10.28 kt CO_2 in 2013 (increase by 0.003 per cent of the national total and 0.06 per cent of the IPPU sector), 9.62 kt CO_2 in 2014 (increase by 0.003 per cent of the national total and 0.05 per cent of the IPPU sector) and 7.75 kt CO_2 in 2015 (increase by 0.003 per cent of the national total and 0.04 per cent of the IPPU sector). The ERT recommends that Kazakhstan report relevant information in the NIR according to paragraph 50(a) and (b) of the UNFCCC Annex I inventory reporting guidelines for category 2.A.3 glass production and clarify in the NIR whether or not production of glass fibre and glass wool occurs in Kazakhstan.	
I.35	2.A.4 Other process uses of carbonates – CO_2	The ERT noted that in the CRF tables, CO_2 emissions from 2.A.4.a ceramics (under 2.A.4 other process uses of carbonates) are reported as "NO". However, production of ceramics occurs in the country according to the report of the Agency of Statistics of the Republic of Kazakhstan; for example, in 2015 bricks production amounted to 769.3 thousand m^3 and refractory products to 98,336 t (Report on Statistics of Industrial Production in Kazakhstan in 2015). During the review, Kazakhstan confirmed that ceramic products were produced in the country. The ERT concluded that the inventory is not complete owing to the lack of estimates of CO_2 emissions from 2.A.4.a ceramics and included this issue in the list of potential problems and further questions raised by the ERT. The ERT recommended that Kazakhstan obtain AD on ceramic products manufacture (e.g. bricks and refractory products) from the Agency of Statistics of the Republic of Kazakhstan and estimate CO_2 emissions for 2013–2015 for the subcategory 2.A.4.a ceramics (under 2.A.4 other process uses of carbonates) using the methods from the 2006 IPCC Guidelines. In response to the list of potential problems and further questions raised by the ERT, Kazakhstan estimated CO_2 emissions from 2.A.4.a ceramics and resubmitted a complete set of CRF tables for 1990–2015 using the data from the Agency of Statistics of the Republic of Kazakhstan. However, the ERT noted that the estimation of CO_2 emissions was undertaken incorrectly. First, the amount of bricks produced in Kazakhstan was incorrectly converted from thousand cubic metres to thousand tonnes and, secondly, the EFs used were multiplied by the mass of ceramic products instead of mass of carbonates in the clay that was used for ceramic products	Yes. Accuracy

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*	*Is finding an issue and/or a problem?[a] If yes, classify by type*
		production. Therefore, the ERT disagreed with the Party's response and considers that Kazakhstan has not satisfactorily resolved the potential problem. Therefore, in accordance with the guidance for adjustments under Article 5, paragraph 2, of the Kyoto Protocol (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 estimated adjusted CO_2 emissions from ceramic bricks, refractory products, home ceramics products and ceramic tiles production in Kazakhstan by calculation of total carbonates content in ceramics products and estimation of CO_2 emissions from carbonates calcination using equation 2.14 in volume 3 of the 2006 IPCC Guidelines. The mass of ceramic bricks production was calculated using the average density 1.55 t/m^3 according to the "Interstate Standard GOST 530-2012. Ceramic bricks and stones. General technical conditions". Clay consumption for ceramics production was estimated by multiplying the mass of ceramic products produced by the default loss factor 1.1 in accordance with the 2006 IPCC Guidelines (vol. 3, chapter 2.5.1.3). The default content of carbonates was assumed to be 10 per cent in accordance with the 2006 IPCC Guidelines. The adjusted estimates of CO_2 emissions from 2.A.4.a ceramics were 77.869 kt CO_2 eq in 2013, 81.296 kt CO_2 eq in 2014 and 67.031 kt CO_2 eq in 2015. These emissions are significantly higher than the revised estimates submitted by Kazakhstan; however, the changes resulting from the adjusted values and the submitted revised estimates (73.493 kt CO_2 eq or 0.024 per cent of the national total in 2013, 80.699 kt CO_2 eq or 0.026 per cent of the national total in 2014, and 65.688 kt CO_2 eq or 0.022 per cent of the national total in 2015) are below the thresholds given in decision 24/CP.19, annex I, paragraph 37(b) (500 kt CO_2 eq or 0.05 per cent of the national total), and therefore the calculated adjustment should not be applied. The ERT recommends that Kazakhstan 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 carbonates content in these products and equation 2.14 in volume 3 of the 2006 IPCC Guidelines. The ERT also recommends that Kazakhstan 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, chapter 2.5.1.3) and the default content of carbonates provided in the 2006 IPCC Guidelines (vol. 3, chapter 2.5.1.1), if country-specific values are not available.	
I.36	2.A.4 Other process uses of carbonates – CO_2	The ERT noted that under subcategory 2.A.4.d other (2.A.4 other process uses of carbonates) Kazakhstan reported emissions from limestone and dolomite use in metal industry only from the company ArcelorMittal Temirtau, which produces pig iron, steel and steel products. The ERT also noted that the allocation of emissions from carbonates use in metal industry to subcategory 2.A.4.d other is not in line with the 2006 IPCC Guidelines. The Party clarified during the review that estimated CO_2 emissions occur from limestone and dolomite use in steel melting furnaces and sinter machines. The ERT further noted that according to the 2006 IPCC Guidelines these emissions are to be included under 2.C.1 iron and steel production.	Yes. Comparability

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue and/or a problem?[a] If yes, classify by type
		The ERT also noted that the reallocation of emissions relating to limestone and dolomite use from the 2013 annual submission (using the Revised 1996 IPCC Guidelines) to the 2016 annual submission (using the 2006 IPCC Guidelines) is not clearly reported in the NIR, and some of these emissions may be missing in the 2017 annual submission. For instance, in the 2013 annual submission CO_2 emissions from category 2.A.3 limestone and dolomite use were reported as 1,997.20 kt for 2011; however, in the 2017 annual submission CO_2 emissions from 2.A.4 other process uses of carbonates were reported as 595.61 kt for 2011. During the review, Kazakhstan could not clarify how emissions from limestone and dolomite use were allocated in the 2017 annual submission and could not justify that some emissions are not missing. Therefore, the ERT concluded that CO_2 emissions from limestone and dolomite use could be underestimated for 2013–2015 and included this issue in the list of potential problems and further questions raised by the ERT. The ERT recommended that Kazakhstan: (1) compile the balance of limestone and dolomite use, including production of limestone and dolomite, use of limestone and dolomite with calcination by different activities (e.g. lime production, cement production) and use of limestone and dolomite without calcination by different activities (e.g. construction, agriculture); (2) compare the amount of limestone and dolomite use with calcination activities with the amount of limestone and dolomite included under all categories in the inventory of Kazakhstan; (3) identify the missing amount of limestone and dolomite use where CO_2 emissions occur for 2013–2015 or justify that all emissions are covered and reported in the inventory; and (4) revise the emission estimates for 2013–2015 under 2.A.4.d other, according to the 2006 IPCC Guidelines, if the total consumption of limestone and dolomite where CO_2 emissions occur are not estimated. In response to the list of potential problems and further questions raised by the ERT, Kazakhstan reported revised estimates of CO_2 emissions from the total limestone and dolomite use in the country based on the volume of products sold in the domestic market. Kazakhstan could not identify the amount of limestone and dolomite that was used without release of CO_2 (e.g. in construction industry). The ERT noted that in accordance with the 2006 IPCC Guidelines those emissions are not to be included in the national GHG inventories and that the subcategory 2.A.4.d other should contain estimates of emissions that do not fit into any of the major categories of emissive uses of carbonates presented in table 2.7 (2006 IPCC Guidelines, vol. 3, chapter 2, pp.2.37 and 2.38). The ERT also noted that the main sources of CO_2 emissions from limestone and dolomite use in the country are covered in the inventory under cement production, lime production, glass production, flux stone use in steel and pig iron metallurgy, and so on. The ERT concluded that CO_2 emissions from limestone and dolomite use provided in Kazakhstan's response were overestimated, in particular for 1990; however, the resubmitted CRF tables did not contain the revised CO_2 emissions for subcategory 2.A.4.d other presented in the response, but the estimates of the original 2017 annual submission, and therefore did not contain the identified overestimates. The ERT concluded that CO_2 emissions from limestone and dolomite use reported under the subcategory 2.A.4.d other were not underestimated in 2013–2015, but were incorrectly allocated.	

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*	*Is finding an issue and/or a problem?[a] If yes, classify by type*
		The ERT recommends that Kazakhstan 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.	
I.37	2.B.1 Ammonia production – CO_2	According to table 4.5 of the NIR and CRF table 2(I).A-H, ammonia production in Kazakhstan in 2015 amounted to 179.91 kt; however, according to the information from the Agency of Statistics of the Republic of Kazakhstan (Report on Statistics of Industrial Production in Kazakhstan in 2015), ammonia production in 2015 was 185.09 kt or about 3 per cent higher than the value included in the NIR and CRF table 2(I).A-H. The Party clarified that data on ammonia production were taken from the archive of bulletins of the Committee on Statistics of the Ministry of Economy of the Republic of Kazakhstan (series 2, p.30), "Basic Indices of Industry of the Republic of Kazakhstan, January–December 2015". The Party also clarified that final data are provided in the Statistical Compilation published in May–June each year after the due date for annual submission to the UNFCCC. The ERT concluded that emissions from ammonia production were underestimated in 2015 because the AD used were not complete, and included this issue in the list of potential problems and further questions raised by the ERT. The ERT recommended that Kazakhstan revise its CO_2 emission estimates from 2.B.1 ammonia production for 2015 using updated data on ammonia production from the Agency of Statistics of the Republic of Kazakhstan. In response to the list of potential problems and further questions raised by the ERT, Kazakhstan resubmitted a complete set of CRF tables for 1990–2015 and revised CO_2 emissions from category 2.B.1 ammonia production for 2015 using the recommended data from the Agency of Statistics of the Republic of Kazakhstan. The estimates for 2013, 2014 and 1990 were not revised. The ERT agreed with the Party's revised estimates. As a result of the revision, the CO_2 emissions from this category increased by 10.89 kt CO_2 (0.004 per cent of the national total and 0.06 per cent of the IPPU sector). The ERT recommends that Kazakhstan 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 the Republic of Kazakhstan after the inventory submission and, if that is the case, recalculated subsequently.	Yes. Transparency
I.38	2.B.2 Nitric acid production – N_2O	The ERT noted that Kazakhstan reported N_2O emissions from 2.B.2 nitric acid production as "NO" in CRF tables 2(I).A-H and the NIR. The ERT checked information on some chemical plants in Kazakhstan and found that nitric acid is produced at JSC KazAzot. According to the official website of JSC KazAzot the capacity of nitric acid production amounts to 272 kt of nitric acid per year (http://www.kazazot.kz/page/show/11). The nitric acid is used at JSC KazAzot as input for fertilizer production and is not traded on the market. During the review, Kazakhstan acknowledged that N_2O emissions from nitric acid production at JSC KazAzot were not estimated. The ERT concluded that the inventory is not complete because N_2O emissions from category 2.B.2 nitric acid production were not reported and estimated, and included this issue in the list of potential problems and further questions raised by the ERT. The ERT recommended that Kazakhstan collect AD on nitric acid production and	Yes. Completeness

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue and/or a problem?[a] If yes, classify by type
		information about the technology and abatement system used at JSC KazAzot, and estimate N_2O emissions from nitric acid production for 2013–2015 using the methodology provided in the 2006 IPCC Guidelines. In response to the list of potential problems and further questions raised by the ERT, Kazakhstan resubmitted a complete set of CRF tables for 1990–2015 and estimated N_2O emissions from 2.B.2 nitric acid production for 2013, 2014 and 2015 and previous years since 2006 using data provided by JSC KazAzot on volumes of nitric acid production for the period from 2006 to 2015. The ERT noted that the applied method and EF (2.3 kg N_2O/t nitric acid) are consistent with the 2006 IPCC Guidelines, and the estimation provided is accurate. The ERT agreed with the Party's estimates. As a result of the estimations, emissions from 2.B.2 nitric acid production were 117.77 kt CO_2 eq in 2015 (increase by 0.04 per cent of the national total and 0.61 per cent of the IPPU sector), 109.16 kt CO_2 eq in 2014 (increase by 0.03 per cent of the national total and 0.58 per cent of the IPPU sector) and 75.33 kt CO_2 eq in 2013 (increase by 0.02 per cent of the national total and 0.41 per cent of the IPPU sector). The ERT noted that for 1990–2005, N_2O emissions from 2.B.2 nitric acid production were reported as "NO"; however, Kazakhstan did not justify that nitric acid was not produced in the country in 1990–2005, therefore an incorrect notation key was probably used in the CRF tables for this category. The ERT recommends that Kazakhstan 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, the ERT recommends that Kazakhstan 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) and (b) of the UNFCCC Annex I inventory reporting guidelines.	
I.39	2.B.5 Carbide production – CO_2	The ERT noted that according to section 4.3.2.2 of the NIR, the Party used the default CO_2 EF for estimation of emissions from carbide production taken from the 2006 IPCC Guidelines. However, the reported CO_2 IEF (2.95 t CO_2/t CaC_2) is significantly higher than the default EF value (1.09 t CO_2/t CaC_2 production) from the 2006 IPCC Guidelines. The ERT also noted that according to section 4.3.2.1 of the NIR, plant-specific AD on coke and limestone consumption used for carbide production are available. However, these data were not taken into account for the estimates. Kazakhstan clarified during the review that the value of the IEF (2.95 t CO_2/t CaC_2) was chosen incorrectly and that acetylene is not produced on-site from carbide production. The ERT noted that the use of the incorrect EF led to an overestimation of CO_2 emissions from carbide production in 1990 and the 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 revise its estimates of CO_2 emissions from category 2.B.5 carbide production 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). In response to the list of potential problems and further questions raised by the ERT, Kazakhstan resubmitted a complete set of CRF tables for 1990–2015 and revised its CO_2 emission estimates for category 2.B.5 carbide	Yes. Transparency

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*	*Is finding an issue and/or a problem?[a] If yes, classify by type*
		production for 1990 and also for all other years of the inventory time series. Kazakhstan used for its estimates AD on coke consumption for calcium carbide production from JSC "Temirtau Electrometallurgical Plant" and the default EF from the 2006 IPCC Guidelines. The ERT agreed with the Party's revised estimates. As a result of the revision, the estimated emissions from category 2.B.5 carbide production decreased in 1990 by 629.86 kt CO_2 (0.17 per cent of the national total and 2.64 per cent of the IPPU sector), in 2013 by 35.81 kt CO_2 (0.01 per cent of the national total and 0.2 per cent of the IPPU sector), in 2014 by 50.53 kt CO_2 (0.02 per cent of the national total and 0.3 per cent of the IPPU sector) and in 2015 by 56.61 kt CO_2 (0.02 per cent of the national total and 0.3 per cent of the IPPU sector). The ERT recommends that Kazakhstan transparently report in the NIR the EFs and AD used for its 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).	
I.40	2.C.1 Iron and steel production – CO_2	The ERT noted that, according to section 4.4.1.2.3 of the NIR, the tier 2 method was used for the estimation of CO_2 emissions from 2.C.1.a steel. However, the ERT noted that the same section of the NIR stated that the default EF for the tier 1 method from the 2006 IPCC Guidelines was applied. The ERT also noted that the IEF for the subcategory 2.C.1.a (0.14 t CO_2/t steel) had been kept constant for the entire time series, even though actual data on the carbon balance were used in the estimations. Kazakhstan clarified during the review that CO_2 emissions from steel production were estimated based on the carbon balance of steel production, that carbon emissions were recalculated to CO_2 emissions using the conversion factor of 44/12 and finally the CO_2 amount was multiplied by the default EF (1.06 t CO_2/t steel) from the 2006 IPCC Guidelines. The ERT concluded that the applied methodology is not in accordance with the tier 2 method of the 2006 IPCC Guidelines and the resulting CO_2 emissions were overestimated in 1990 and the 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 revise its CO_2 emission estimates from subcategory 2.C.1.a steel for 1990 using the tier 2 method provided in the 2006 IPCC Guidelines, without application of the default EF for tier 1. In response to the list of potential problems and further questions raised by the ERT, Kazakhstan resubmitted a complete set of CRF tables for 1990–2015 and revised its CO_2 emission estimates for this subcategory by excluding the default EF (1.06 t CO_2/t steel) from the formula used for the estimation for 1990 and also for all other years of the inventory time series. The ERT noted that the applied method corresponds to the tier 2 method of the 2006 IPCC Guidelines and the estimation was undertaken correctly. As a result, the estimated CO_2 emissions from 2.C.1.a steel decreased in 1990 by 14.31 kt (0.004 per cent of the national total and 0.07 per cent of the IPPU sector); decreased in 2013 by 55.30 kt (0.02 per cent of the national total and 0.3 per cent of the IPPU sector); increased in 2014 by 3.35 kt (0.001 per cent of the national total and 0.02 per cent of the IPPU sector); and decreased in 2015 by 5.45 kt (0.002 per cent of the national total and 0.03 per cent of the IPPU sector). The ERT agreed with the Party's revised estimates. The ERT also noted that Kazakhstan revised its CO_2	Not an issue/problem

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue and/or a problem?[a] If yes, classify by type
		emission estimates from this category by including the total steel production in the country. This revision was undertaken in conjunction with the response to the potential problem raised in ID# I.41 below.	
I.41	2.C.1 Iron and steel production – CO_2	The ERT noted that Kazakhstan estimated emissions from the subcategory 2.C.1.a steel based on AD of steel production provided by JSC ArcelorMittal Temirtau as stated in section 4.4.1.2.3 of the NIR. The ERT also noted that the AD on steel production taken for the calculations (3,550.80 t steel in 2015) were lower than the data in the "Report on Statistics of Industrial Production in Kazakhstan in 2015" (crude steel production of 3,902.6 t). Kazakhstan clarified during the review that steel is produced not only at ArcelorMittal Temirtau, but also at other plants in the country. The Party also informed the ERT that it is planning to request the data on steel production at new identified plants for the next annual submission. The ERT concluded that CO_2 emissions from steel production could be underestimated for 2013–2015 because the total steel production data have not been taken into account in the estimates and not included in the inventory. Therefore, the ERT included this issue in the list of potential problems and further questions raised by the ERT, and recommended that Kazakhstan obtain the total amount of steel production in Kazakhstan for 2013–2015, identify the amount of steel produced at JSC ArcelorMittal Temirtau and the amount of steel produced at other steel plants, estimate CO_2 emissions from steel produced at JSC ArcelorMittal Temirtau using the tier 2 method of the 2006 IPCC Guidelines based on the actual AD and EFs provided by the company, and estimate CO_2 emissions from steel produced at other steel plants for 2013–2015 using the tier 2 method of the 2006 IPCC Guidelines, or using the tier 1 method and default EFs chosen for the corresponding technology, if AD and EFs are not available. In response to the list of potential problems and further questions raised by the ERT, Kazakhstan resubmitted a complete set of CRF tables for 1990–2015 and revised its CO_2 emission estimates from this subcategory by including in the estimation the total steel production in the country, covering AD for all steel producers in Kazakhstan for 2013–2015 and also for all other years of the inventory time series. The ERT agreed with the Party's revised estimates. The ERT also noted that Kazakhstan revised its CO_2 emission estimates from this category by using the tier 2 method provided in the 2006 IPCC Guidelines, without application of default EFs for tier 1. This revision was undertaken in conjunction with the response to the potential problem raised in ID# I.40 above. As a result of the revision of the AD and the method applied, the estimated emissions from subcategory 2.C.1.a steel decreased in 1990 by 14.31 kt CO_2 (0.004 per cent of the national total and 0.07 per cent of the IPPU sector); decreased in 2013 by 55.30 kt (0.02 per cent of the national total and 0.3 per cent of the IPPU sector); increased in 2014 by 3.35 kt (0.001 per cent of the national total and 0.02 per cent of the IPPU sector) and decreased in 2015 by 5.45 kt (0.002 per cent of the national total and 0.03 per cent of the IPPU sector). The ERT recommends that Kazakhstan include in the NIR clear descriptions of the method, AD and EFs used in its emission estimates for subcategory 2.C.1.a steel in accordance with paragraph 50(a) and (b) of the UNFCCC Annex I inventory reporting guidelines.	Yes. Transparency

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*	*Is finding an issue and/or a problem?[a] If yes, classify by type*
I.42	2.C.1 Iron and steel production – CO_2	The ERT noted that, according to section 4.4.1.3 of the NIR, Kazakhstan applied the tier 2 method for its estimation of CO_2 emissions from pig iron production under the key category 2.C.1. However, according to the CRF tables, a default EF was applied for 2.C.1.b pig iron. The ERT also noted that only coke consumption in blast furnaces was included in the calculations (average value of 560 kg coke/t pig iron). The Party clarified during the review that according to ArcelorMittal Temirtau only coke was used as a reducing agent in blast furnaces, the plant-specific AD are available for the period 2010–2015, and the values of coke consumption are in the range 554–638 kg coke/t pig iron for 2010–2015. The ERT concluded that CO_2 emissions from pig iron production could be underestimated for 2013–2015 and included this issue in the list of potential problems and further questions raised by the ERT. The ERT recommended that Kazakhstan revise its CO_2 emission estimates for pig iron production in accordance with the tier 2 method of the 2006 IPCC Guidelines by applying the actual plant-specific data of coke consumption for the period 2013–2015 maintaining consistency 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 1990–2015 and revised its CO_2 emission estimates from this subcategory by using the tier 2 method with plant-specific data from the ArcelorMittal Temirtau plant for 2010–2015 and the average value of coke consumption of 560 kg of coke/t of cast iron for 1990–2009. The ERT agreed with the Party's revised estimates. As a result of the revision, the estimated emissions from 2.C.1.b pig iron decreased in 2013 by 1.02 kt CO_2 (0.0003 per cent of the national total and 0.006 per cent of the IPPU sector), increased in 2014 by 7.75 kt CO_2 (0.002 per cent of the national total and 0.04 per cent of the IPPU sector) and increased in 2015 by 8.50 kt CO_2 (0.003 per cent of the national total and 0.05 of the IPPU sector). The ERT recommends that Kazakhstan provide in the NIR clear and complete information on the method, AD and EFs used for its estimates and ensure consistency of this information with the information reported in the CRF tables.	Yes. Transparency
I.43	2.C.1 Iron and steel production – CH_4	The ERT noted that Kazakhstan used the tier 2 method for its estimation of CH_4 emissions from subcategory 2.C.1.b pig iron and, according to the CRF tables, a default EF was applied for estimating CH_4 emissions for this category. The ERT also noted that the 2006 IPCC Guidelines do not contain a tier 2 method for estimating CH_4 emissions from pig iron production, and do not provide a default CH_4 EF for this process. Kazakhstan acknowledged during the review that the tier 2 method for CH_4 emissions estimation from pig iron production is not available in the 2006 IPCC Guidelines and that its estimation was undertaken using an inappropriate EF. Kazakhstan estimated CH_4 emissions from pig iron production in 2013 to be 0.26 t CH_4, 0.32 t CH_4 in 2014 and 0.32 t CH_4 in 2015. The ERT recommends that Kazakhstan revise its 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 of a default CH_4 EF in the 2006 IPCC Guidelines.	Yes. Accuracy

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I.44	2.C.1 Iron and steel production – CO_2	According to the NIR (section 4.4.1.1), Kazakhstan estimated CO_2 emissions from DRI for the inventory year 2015. However, in the CRF tables, emissions from 2.C.1.c direct reduced iron are reported as "NO" for 2015. The Party clarified during the review that the description of the DRI production in section 4.4.1.1 of the NIR is incorrect because DRI is not produced in Kazakhstan. The ERT recommends that Kazakhstan revise the description of subcategory 2.C.1 in the NIR to improve the transparency of the inventory by providing a clear statement that DRI production is not occurring in the country, including relevant references to the existing iron and steel plants.	Yes. Transparency
I.45	2.C.1 Iron and steel production – CO_2	According to the NIR and the CRF tables, the Party used the tier 1 method and a default EF (0.2 t CO_2/t sinter) to estimate CO_2 emissions from sinter production for the complete time series. However, the ERT noted that category 2.C.1 is a key category. Kazakhstan confirmed during the review that the tier 1 method was used for the estimation of CO_2 emissions from 2.C.1.d sinter subcategory and a default EF was applied. Kazakhstan also confirmed that the fuels used for sinter production are estimated and reported under subcategory 1.A.2.a iron and steel in the energy sector. The ERT concluded that CO_2 emissions from subcategory 2.C.1.d sinter were potentially double counted in 1990 and for the complete time series under the IPPU and energy sectors, and included this issue in the list of potential problems and further questions raised by the ERT. The ERT recommended that Kazakhstan collect AD of fuels, reducing agents (coke breeze) and limestone used for sinter production, revise the CO_2 emission estimates for 1990 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. In response to the list of potential problems and further questions raised by the ERT, Kazakhstan resubmitted a complete set of CRF tables for 1990–2015 and revised its CO_2 emission estimates from this subcategory by using the tier 2 method with plant-specific data from JSC ArcelorMittal Temirtau on coke, coke oven gas and blast furnace gas consumption. However, the ERT noted that Kazakhstan did not demonstrate that CO_2 emissions from these fuels were not reported also under the subcategories 1.A.2.a iron and steel and 1.A.1.c. manufacture of solid fuels and other energy industries in the energy sector, and 2.C.1.b pig iron in the IPPU sector. The ERT concluded that CO_2 emissions from subcategory 2.C.1.d sinter continued to be overestimated in 1990 and the complete time series because of double counting of these emissions under the IPPU and energy sectors (see ID#21 in FCCC/IRR/2017/KAZ). The ERT recommends that Kazakhstan collect AD of fuels, reducing agents (coke breeze) and limestone used for sinter production, revise its 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.	Yes. Accuracy
I.46	2.C.1 Iron and steel production – CO_2	According to the NIR and the CRF tables, the Party used the tier 1 method and a default EF (0.03 t CO_2/t pellets) to estimate CO_2 emissions from pellet production for the complete time series. However, the ERT noted that category 2.C.1 is a key category. Kazakhstan confirmed during the review that the tier 1 method was used for the estimation of CO_2 emissions from pellet production and a default EF was applied. Kazakhstan also confirmed	Yes. Accuracy

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		that the fuels used for pellet production are estimated and reported under subcategory 1.A.2.a iron and steel in the energy sector. The ERT concluded that CO_2 emissions from subcategory 2.C.1.e pellet were potentially double counted in 1990 under the IPPU and energy sectors, and included this issue in the list of potential problems and further questions raised by the ERT. The ERT recommended that Kazakhstan collect AD of fuels, reducing agents and limestone used for pellet production, revise its CO_2 emission estimates for 1990 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. In response to the list of potential problems and further questions raised by the ERT, Kazakhstan indicated that it was not possible to obtain data for a tier 2 calculation and revised estimates will be included in the inventory of its next annual submission. Nevertheless, the ERT noted that Kazakhstan revised its estimates from 2.C.1.e pellet using AD on natural gas for pellet production for 1990; although it had indicated that no revisions were made to its CO_2 emission estimates for this subcategory. In addition, Kazakhstan did not demonstrate that CO_2 emissions from natural gas for pellet production were not reported also under subcategory 1.A.2.a iron and steel in the energy sector. The ERT concluded that CO_2 emissions from subcategory 2.C.1.e pellet continued to be overestimated in 1990 and the complete time series because of double counting of these emissions under the IPPU and energy sectors (see ID#22 in FCCC/IRR/2017/KAZ). The ERT recommends that Kazakhstan collect AD of fuels (natural gas), reducing agents and limestone used for pellet production, revise its 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.	
I.47	2.C.1 Iron and steel production – CO_2 and CH_4	The ERT noted that Kazakhstan reported CO_2 and CH_4 emissions from coke production under 2.C.1.f other (under 2.C.1 iron and steel production) instead of allocating these emissions to the energy sector as recommended by the 2006 IPCC Guidelines. Kazakhstan used the tier 1 approach and default EFs for estimating emissions from coke production (section 4.4.1.2.3 of the NIR). The ERT also noted that the Party estimated and reported emissions from solid fuels combustion, including coking coal used for coke production, in the iron and steel industry under the subcategory 1.A.2.a iron and steel. CO_2 emissions from solid fuels manufacturing are also reported under the subcategory 1.A.1.c manufacture of solid fuels and other energy industries. Kazakhstan was not able to clarify during the review how coking coal is used or to justify that CO_2 emissions from coke production were not double counted. The ERT concluded that CO_2 emissions from coke production could be overestimated in 1990 and included this issue in the list of potential problems and further questions raised by the ERT. The ERT recommended that Kazakhstan revise its estimates of CO_2 and CH_4 emissions from coke production in 1990 from subcategory 2.C.1.f other and allocate the revised estimates in the energy sector under 1.A.1.c. manufacture of solid fuels and other energy industries, as well as justify that 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.	Yes. Transparency

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		In response to the list of potential problems and further questions raised by the ERT, Kazakhstan excluded CO_2 and CH_4 emissions from coke production from subcategory 2.C.1.f other for 1990 and all other years of the inventory and reported these emissions as "IE". The ERT agreed with the Party's revisions. As a result of the revision, the estimated emissions from subcategory 2.C.1.f other decreased in 1990 by 1,559.44 kt CO_2 eq (0.4 per cent of the national total and 7.3 per cent of the IPPU sector), decreased in 2013 by 1,009.08 kt CO_2 eq (0.3 per cent of the national total and 5.6 per cent of the IPPU sector), decreased in 2014 by 1,060.73 kt CO_2 eq (0.3 per cent of the national total and 5.7 per cent of the IPPU sector) and decreased in 2015 by 1,065.46 kt CO_2 eq (0.4 per cent of the national total and 5.6 per cent of the IPPU sector). The ERT recommends that Kazakhstan 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.	
I.48	2.C.2 Ferroalloys production – CO_2	The ERT noted that, according to section 4.4.2.2 of the NIR, Kazakhstan used the tier 1 method and default EFs to estimate CO_2 emissions from 2.C.2 ferroalloys production. The ERT also noted, however, that 2.C.2 ferroalloys production is a key category in accordance with the information in CRF table 7. The NIR does not provide an explanation of why the recommended tier 2 or 3 methods were not applied for the calculations. The Party confirmed during the review that the tier 1 method and default EFs for each type of ferroalloys were used for the emission estimates. The ERT further noted that data on reducing agents used in ferroalloys production are provided by the production plants and are available for estimation. The ERT concluded that CO_2 emissions were not estimated in accordance with the 2006 IPCC Guidelines and that they could be overestimated for 1990 on the basis of preliminary emission estimates for this category using the tier 2 methodology and AD provided by Kazakhstan during the review. Therefore, the ERT included this issue in the list of potential problems and further questions raised by the ERT and recommended that Kazakhstan revise its CO_2 emission estimates for 2.C.2 ferroalloys production in 1990 by applying tier 2 or 3 methods from the 2006 IPCC Guidelines and using the coke consumption data for ferroalloys production available from the plants. In response to the list of potential problems and further questions raised by the ERT, Kazakhstan resubmitted a complete set of CRF tables for 1990–2015 and revised its CO_2 emission estimates for 2.C.2 ferroalloys production in 1990 and also for all other years of the time series, using AD on reducing agent consumption for each type of ferroalloys produced in Kazakhstan and the EF (3.3 t CO_2/t coke) from the 2006 IPCC Guidelines. The amount of ferroalloys that was not identified by type was taken into account by the application of the default EF (1.6 t CO_2/t ferroalloys). The ERT concluded that the AD and revised emissions reported in the resubmitted CRF tables are complete and cover all ferroalloys produced in Kazakhstan and agreed with the Party's revised estimates. As a result of the revision, the estimated emissions from 2.C.2 ferroalloys production decreased in 1990 by 391.21 kt CO_2 eq (0.1 per cent of the national total and 1.8 per cent of the IPPU sector), increased in 2013 by 794.79 kt CO_2 eq (0.3 per cent of the national total and 4.4 per cent of the IPPU sector), increased in 2014 by	Yes. Transparency

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*	*Is finding an issue and/or a problem?[a] If yes, classify by type*
		719.81 kt CO_2 eq (0.2 per cent of the national total and 3.9 per cent of the IPPU sector) and increased in 2015 by 826.47 kt CO_2 eq (0.2 per cent of the national total and 3.8 per cent of the IPPU sector). The ERT recommends that Kazakhstan include in the NIR clear descriptions of the method, AD and EFs used in its emission estimates from 2.C.2 ferroalloys production in accordance with paragraph 50(a) and (b) of the UNFCCC Annex I inventory reporting guidelines.	
I.49	2.C.3 Aluminium production – PFCs	The ERT noted that the NIR did not contain detailed descriptions of the methodology applied for the estimation of PFC emissions from 2.C.3 aluminium production as recommended by paragraph 50(a) of the UNFCCC Annex I inventory reporting guidelines. In particular, the slope coefficient for CF_4 anode effect minutes per cell-day are not reported. During the review, Kazakhstan clarified that the slope coefficient for CF_4 anode effect minutes per cell-day is country-specific. However, the Party could not provide a justification for the values of this coefficient. The ERT concluded that the method used for the estimation of PFC emissions is not transparent. Kazakhstan has been producing aluminium since 2007. The EFs of PFC emissions from aluminium production in Kazakhstan in 2015 were 0.68 kg CF_4/t aluminium and 0.1 kg C_2F_6/t aluminium, which correspond to the range of EFs for prebaked anode technologies provided in the 2006 IPCC Guidelines (0.4–1.6 kg CF_4/t aluminium and 0.04–0.4 kg C_2F_6/t aluminium). The ERT recommends that Kazakhstan 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.	Yes. Transparency
I.50	2.C.3 Aluminium production – CO_2	The ERT noted that, according to section 4.4.3.2 of the NIR, Kazakhstan estimated CO_2 emissions from prebaked anodes consumption using the tier 3 method. The ERT also noted that CO_2 emissions associated with anode baking furnaces are not described in the NIR. Kazakhstan clarified during the review that CO_2 emissions from the combustion of volatile matter released during the baking operation and the combustion of baking furnace packing material (coke) were not estimated. The ERT believes that future ERTs should consider this issue further to ensure that there is not an underestimate of emissions from this category. The ERT recommends that Kazakhstan 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.	Yes. Completeness
I.51	2.F.1 Refrigeration and air conditioning – HFCs	The ERT noted that HFC emissions from category 2.F.1 refrigeration and air conditioning are reported from disposal activities only, while HFC emissions from manufacturing, stocks and recovery are reported as "NO". The ERT also noted that HFC emissions from commercial refrigeration and transport refrigeration are reported in the CRF tables, but HFC emissions from other activities such as domestic refrigeration, industrial refrigeration, mobile air conditioning and stationary air conditioning are reported as "NO". The ERT further noted that the allocation of some HFC emissions is not in line with the 2006 IPCC Guidelines and the UNFCCC Annex I inventory reporting guidelines, because emissions from mobile sources (cars) were reported under the transport	Yes. Completeness

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue and/or a problem?[a] If yes, classify by type
		refrigeration subcategory. During the review, Kazakhstan clarified that HFC emission estimates were based on the data of HFCs consumed in Kazakhstan for charging all types of equipment and AD were obtained from the suppliers of refrigeration equipment and agents. The ERT concluded that the estimation of HFC emissions is not complete, because only HFC emissions from charging of refrigeration and air-conditioning equipment were estimated and emissions from equipment in operation and disposal were not covered by the inventory, thus HFC emissions from this category could be underestimated for 2013–2015. Therefore, the ERT included this issue in the list of potential problems and further questions raised by the ERT and recommended that Kazakhstan collect relevant AD and estimate HFC emissions from 2.F.1 refrigeration and air conditioning for 2013–2015 by applying the corresponding method from the 2006 IPCC Guidelines; however, if that is not possible, the ERT recommended that Kazakhstan estimate HFC emissions from this category using the techniques on data gathering presented in the 2006 IPCC Guidelines (vol. 1, chapter 2) using data from GHG inventories of Parties with similar circumstances and apply the corresponding method from the 2006 IPCC Guidelines. In response to the list of potential problems and further questions raised by the ERT, Kazakhstan reported revised values of HFC emission estimates from 2.F.1 refrigeration and air conditioning for the period 1995–2015. The ERT noted that the submitted revised CRF tables did not contain the revised emission estimates from 2.F.1 refrigeration and air conditioning indicated in the response. The ERT also noted that the values of the revised estimates of HFCs for this category provided in the response of Kazakhstan for 2013–2015 were lower than the values reported in the CRF tables of the original 2017 annual submission, if assuming that the units used were kt of CO_2 eq and the gases reported were HFCs. In addition, the ERT was not able to assess whether this revision was correctly conducted, because Kazakhstan did not provide in its response an explanation on the AD and methods applied, estimation spreadsheets or background information. Thus, the ERT concluded that HFC emissions from 2.F.1 refrigeration and air conditioning for 2013–2015 continued to be underestimated. Therefore, the ERT disagreed with the Party's response and considers that Kazakhstan has not satisfactorily resolved the potential problem. Therefore, in accordance with the guidance for adjustments under Article 5, paragraph 2, of the Kyoto Protocol (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 (see section VI and annex IV below). The ERT recommends that Kazakhstan collect relevant AD (manufacturing, stocks and recovery), in particular for 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, the ERT recommends that Kazakhstan estimate HFC emissions from this category using the techniques on data gathering presented in the 2006 IPCC Guidelines (vol. 1, chapter 2) and apply the corresponding method from the 2006 IPCC Guidelines.	

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I.52	2.G.3 N_2O from product uses – N_2O	The ERT noted that Kazakhstan reported N_2O emissions from subcategory 2.G.3.a medical applications as "NO". However, the ERT considered that the emissions are likely to occur within the country from N_2O use for anaesthesia, analgetic and other medical purposes. The ERT also noted that methods for the estimation of these emissions are provided in the 2006 IPCC Guidelines and that the inventory is not complete in respect of N_2O from product uses as medical applications. The ERT believes that future ERTs should consider this issue further to ensure that there is not an underestimate of emissions from this activity. The ERT recommends that Kazakhstan 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) and (b) of the UNFCCC Annex I inventory reporting guidelines.	Yes. Completeness
Agriculture			
A.11	3. General (agriculture) – CH_4 and N_2O	The ERT noted that the inventory did not include any CH_4 and N_2O emission estimates for rabbits, mules, deer, fur animals and ostriches. During the review, Kazakhstan explained that there is only a small number of rabbits, ostriches, fur animals and deer (maral) in Kazakhstan. There are no mules in the country. The Party indicated that official statistics are available only for rabbits from 1992 to 2014. The ERT noted that these livestock categories may exist in the country and this could lead to a potential underestimation of CH_4 and N_2O emissions from categories 3.A enteric fermentation, 3.B manure management, 3.D.a direct N_2O emissions from managed soils, and 3.D.b indirect N_2O emissions from managed soils for the entire time series, including the latest inventory years (2013, 2014 and 2015), and included this issue in the list of potential problems and further questions raised by the ERT. The ERT recommended that Kazakhstan estimate and report the related CH_4 and N_2O emissions for these livestock categories using the tier 1 method and default EFs from the 2006 IPCC Guidelines. In addition, if AD for 2013–2015 and other years of the time series are not available for these livestock species, the ERT recommended that Kazakhstan determine if their corresponding level of emissions would meet the definition of insignificant as contained in paragraph 37(b) of the UNFCCC Annex I inventory reporting guidelines and, if yes, provide relevant justifications and preliminary estimates of emissions using default EFs provided by the 2006 IPCC Guidelines. In response to the list of potential problems and further questions raised by the ERT, Kazakhstan submitted a complete set of CRF tables for the period 1990–2015 with revised CH_4 and N_2O emission estimates for manure management systems of rabbits. The revised estimates were calculated using default EFs from the 2006 IPCC Guidelines. Owing to the lack of default EFs for enteric fermentation of rabbits in the 2006 IPCC Guidelines, the respective CH_4 emissions were not reported by Kazakhstan. Further, Kazakhstan provided preliminary estimates for 2015 of: 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. Emissions of CH_4 from enteric fermentation of ostriches and fur animals, as well as N_2O emissions from manure management systems of ostriches, were not provided by Kazakhstan owing to the lack of default parameters and EFs in the 2006 IPCC Guidelines. The Party stated that these estimates can be considered	Yes. Transparency

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		insignificant in accordance with paragraph 37(b) of the UNFCCC Annex I inventory reporting guidelines. The ERT agreed with the Party's revised estimates, which were calculated in accordance with the 2006 IPCC Guidelines and the justification provided for insignificant emissions from the species indicated above. As a result of the revision, the estimated total CH_4 and N_2O emissions for 2013 increased by 6.07 kt CO_2 eq (0.002 per cent of the national total and 0.02 per cent of the agriculture sector), for 2014 increased by 6.57 kt CO_2 eq (0.002 per cent of the national total and 0.02 per cent of the agriculture sector) and for 2015 increased by 6.24 kt CO_2 eq (0.002 per cent of the national total and 0.02 per cent of the agriculture sector total). The ERT recommends that Kazakhstan, in the NIR of its next annual submission, include information on the AD and method used to estimate CH_4 and N_2O emissions from manure managements 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.	
A.12	3.B.1 Cattle – N_2O	The ERT noted that Kazakhstan applied the average value of the animal weight of non-dairy cattle (305 kg) for all years in order to estimate N_2O emissions from manure management systems. However, the ERT noted that in table 5.6 of the NIR annual values of non-dairy animal average weight were provided (356 kg in 1990 and 314 kg, 322 kg and 326 kg in 2013, 2014 and 2015, respectively). The ERT concluded that these values indicate that the use of constant animal weight could result in an underestimation of N_2O emissions from manure management systems under category 3.B.1 cattle – non-dairy cattle in 2013, 2014 and 2015 and included this issue in the list of potential problems and further questions raised by the ERT. The ERT recommended that Kazakhstan estimate and report N_2O emissions from manure management of non-dairy cattle for 2013, 2014 and 2015 using available annual average weight of animals and equation 10.30 from the 2006 IPCC Guidelines. In response to the list of potential problems and further questions raised by the ERT, Kazakhstan submitted a complete set of CRF tables for the period 1990–2015 with revised N_2O emission estimates for 2013, 2014 and 2015 for the subcategory of manure management systems of non-dairy cattle. The revised estimates were calculated using available annual average weight of animals and in accordance with the 2006 IPCC Guidelines. The ERT agreed with the Party's revised estimates. As a result of the revision, the estimated emissions for 2013 increased by 14.9 kt CO_2 eq (0.005 per cent of the national total and 0.05 per cent of the agriculture sector), for 2014 increased by 29.80 kt CO_2 eq (0.01 per cent of the national total and 0.1 per cent of the agriculture sector) and for 2015 increased by 32.78 kt CO_2 eq (0.01 per cent of the national total and 0.1 per cent of the agriculture sector). The ERT recommends that Kazakhstan, in the NIR of its 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.	Yes. Transparency

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*	*Is finding an issue and/or a problem?[a] If yes, classify by type*
A.13	3.B.3 Swine – CH_4	The ERT noted that CH_4 emissions from manure management systems from swine contribute about 70.4 per cent in 1990 and 25.2 per cent in 2015 to the total CH_4 emissions from manure management systems (significant species); however, for its estimations Kazakhstan applied the tier 1 method and a default EF of 4 kg CH_4/head/year. During the review, Kazakhstan explained that there are no reliable data on the rates of release of VS to develop estimates using a tier 2 methodology. The ERT reiterates the encouragement made in the 2016 ARR that Kazakhstan make efforts to apply a tier 2 approach for the estimation of CH_4 emissions from manure management systems of swine. Default values for B_o and VS from the 2006 IPCC Guidelines (table 10.A-7) could be applied.	Not an issue/problem
A.14	3.B.3 Swine – N_2O	The ERT noted that Kazakhstan applied a default EF of 0.005 kg N_2O-N/kg N for liquid manure management systems with natural crust cover. The ERT also noted that the IPCC default EF for liquid systems without natural crust cover is 0 kg N_2O-N/kg N. In its NIR and during the review Kazakhstan did not provide any supporting documentation on that methodological choice and on the existence of liquid systems with natural crust cover in the country. During the review, Kazakhstan explained that there are no relevant standards for liquid manure treatment systems in Kazakhstan. Therefore, the ERT concluded that liquid systems without natural crust cover might exist in the country, which leads to a potential overestimation of N_2O emissions in the manure management systems for the subcategory 3.B.3 swine for 1990, and included this issue in the list of potential problems and further questions raised by the ERT. The ERT recommended that Kazakhstan investigate further the existence of liquid manure management systems in the country and their types and revise its N_2O emission calculations for 1990 accordingly or apply the default EF for liquid manure management systems without natural crust cover (0 kg N_2O-N/kg N from table 10.21 of volume 4 of the 2006 IPCC Guidelines) in order to increase the accuracy of the estimates. In response to the list of potential problems and further questions raised by the ERT, Kazakhstan submitted a complete set of CRF tables for the period 1990–2015 with revised N_2O emission estimates for manure management systems for subcategory 3.B.3 swine. The revised estimates were calculated using a default EF for liquid manure management systems without natural crust cover in accordance with the 2006 IPCC Guidelines. The ERT agreed with the Party's revised estimates. As a result of the revision, the estimated N_2O emissions for 1990 decreased by 74.50 kt CO_2 eq (0.02 per cent of the national total and 0.2 per cent of the agriculture sector). For 2013, 2014 and 2015, N_2O emissions decreased by 21.00, 20.14 and 20.21 kt CO_2 eq, respectively (0.007, 0.006 and 0.007 per cent of the national total without LULUCF in 2013, 2014 and 2015, respectively). The ERT recommends that Kazakhstan, in the NIR of its next annual submission, include information on the assumptions, AD and method used to estimate N_2O emissions from manure management systems for subcategory 3.B.3 swine.	Yes. Transparency

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*	*Is finding an issue and/or a problem?[a] If yes, classify by type*
A.15	3.B.4 Other livestock – CH_4	The ERT noted that Kazakhstan applied the default EF from the Revised 1996 IPCC Guidelines (3 kg CH_4/head/year) to estimate CH_4 emissions from manure management systems for buffalo. Considering that the default EF for CH_4 emissions from manure management systems for subcategory 3.B.4 other livestock – buffalo in cool Eastern Europe is 5 kg CH_4/head/year in the 2006 IPCC Guidelines, the ERT concluded that this may lead to a potential underestimation of emissions from manure management systems for subcategory 3.B.4 other livestock – buffalo for the latest inventory years (2013, 2014 and 2015) and included this issue in the list of potential problems and further questions raised by the ERT. The ERT recommended that Kazakhstan apply the default EF for CH_4 emissions from manure of buffalo in cool Eastern Europe (5 kg CH_4/head/year) in accordance with the 2006 IPCC Guidelines (vol. 4, table 10.14) and perform corresponding revisions of its estimates for 2013–2015. In response to the list of potential problems and further questions raised by the ERT, Kazakhstan submitted a complete set of CRF tables for the period 1990–2015 with revised CH_4 emission estimates for manure management systems for subcategory 3.B.4 other livestock – buffalo for all years of the time series. The revised estimates were calculated using a correlation coefficient based on the available AD and the default EF for CH_4 emissions from manure of buffalo in cool Eastern Europe in accordance with the 2006 IPCC Guidelines. The ERT agreed with the Party's revised estimates. As a result of the revision, the estimated emissions for 2013, 2014 and 2015 increased by 0.5 kt CO_2 eq for each year (0.0002 per cent of the national total and 0.002 per cent of the agriculture sector for each year). The ERT recommends that Kazakhstan, in the NIR of its next annual submission, include information on the AD and method used to estimate CH_4 emissions from manure management systems for subcategory 3.B.4 other livestock – buffalo.	Yes. Transparency
A.16	3.C Rice cultivation – CH_4	The ERT noted that Kazakhstan used the method from the IPCC good practice guidance to estimate CH_4 emissions from rice cultivation, which is not in accordance with the UNFCCC Annex I inventory reporting guidelines. The ERT estimated CH_4 emissions from this category using the AD provided by Kazakhstan in CRF table 3.C for 2015 and default parameters from the 2006 IPCC Guidelines (namely, for conditions of intermittently flooded rice fields with multiple aeration, non-flooded water regime before a cultivation period of more than 180 days, and application of organic amendments from rice residues and organic fertilizers estimated from data reported by Kazakhstan for category 3.D.a. direct N_2O emissions from managed soils and average period of rice cultivation for 60 days). The ERT's calculation indicates a potential underestimation of CH_4 emissions from category 3.C rice cultivation of about 50 per cent in Kazakhstan's inventory for 2013–2015, and the ERT therefore included this issue in the list of potential problems and further questions raised by the ERT. The ERT recommended that Kazakhstan estimate and report CH_4 emissions from rice cultivation in accordance with the methodology in the 2006 IPCC Guidelines for 2013–2015, taking into account organic amendments applied with rice residues and organic fertilizers. In response to the list of potential problems and further questions raised by the ERT, Kazakhstan submitted a complete set of CRF tables for the period 1990–2015 with revised CH_4 emission estimates for all years of the	Yes. Transparency

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*	*Is finding an issue and/or a problem?[a] If yes, classify by type*
		time series for category 3.C rice cultivation in accordance with the 2006 IPCC Guidelines (for conditions of intermittently flooded rice fields with multiple aeration; non-flooded water regime before a cultivation period of more than 180 days; the scaling factor for the types, and for the amount of organic fertilizer applied, in accordance with equation 5.3 and table 5.14 of the 2006 IPCC Guidelines, and the average vegetative period of rice cultivation of 100 days).The ERT agreed with the Party's revised estimates. As a result of the revision, the estimated emissions for 2013 increased by 121.00 kt CO_2 eq (0.04 per cent of the national total and 0.44 per cent of the agriculture sector), for 2014 increased by 129.75 kt CO_2 eq (0.04 per cent of the national total and 0.45 per cent of the agriculture sector) and for 2015 increased by 132.75 kt CO_2 eq (0.05 per cent of the national total and 0.44 per cent of the agriculture sector). The ERT recommends that Kazakhstan, in the NIR of its next annual submission, include documented information on the AD and method used to estimate CH_4 emissions from category 3.C rice cultivation.	
A.17	3.D.a.2.a Animal manure applied to soils; 3.D.b Indirect N_2O emissions from managed soils – N_2O	The ERT noted that Kazakhstan estimated N in animal manure applied to soils based on statistical data on the amount of organic fertilizers received from the Agency of Statistics of the Republic of Kazakhstan and its average N content, estimated as 0.0055 kg N/kg d.m. The ERT noted that the value reported in CRF table 3.D is about 2.2 per cent of the amount of N available for the input to soils from manure management systems, as reported in CRF table 3.B(b), which indicates lack of consistency in reporting. Further, the ERT noted that the actual percentage of N applied to soils could be lower if any bedding material is used in solid storage manure systems. The country-specific value of N content in organic fertilizers (0.0055 kg N/kg d.m) is comparable to the N content in straw of grains (0.006) provided in the 2006 IPCC Guidelines (vol. 4, table 11.2), which is unlikely for animal manure. During the review, Kazakhstan explained that owing to the lack of data on other applications of manure, the actual amount of manure applied to the soil is used to calculate the emissions. Manure is introduced into the soil after storage for three–six months. The coefficient for conversion of the manure mass into N was obtained from empirical studies using data on the yield of manure and N from livestock. Bedding material is not traditionally used in private holdings or in large animal farms in Kazakhstan. The ERT noted that this could lead to potential underestimation of 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) for the latest inventory years (2013, 2014 and 2015) and the rest of the time series and included this issue in the list of potential problems and further questions raised by the ERT. The ERT recommended that Kazakhstan investigate the fate of manure after the storage period of three–six months, refine the country-specific value of N content in animal manure and perform the estimations of corresponding direct and indirect N_2O emissions after the storage of manure, or apply the default methodology in accordance with the 2006 IPCC Guidelines (vol. 4, equations 10.34, 11.3 and 11.4), including the estimation of the amount of N available for the input to agricultural soils from manure management systems in order to ensure accuracy between the reporting in CRF table 3.B(b) and CRF table 3.D and avoiding underestimation of emissions for the last years of the time series (2013–2015).	Yes. Transparency

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue and/or a problem?[a] If yes, classify by type
		In response to the list of potential problems and further questions raised by the ERT, Kazakhstan submitted a complete set of CRF tables for the period 1990–2015 with revised estimates of 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) for all years of the time series. The revised estimates were calculated using equations 10.34, 11.3 and 11.4 from the 2006 IPCC Guidelines. The ERT agreed with the Party's revised estimates. As a result of the revision the estimated emissions for 2013 increased by 690.17 kt CO_2 eq (0.22 per cent of the national total and 2.48 per cent of the agriculture sector), for 2014 increased by 708.05 kt CO_2 eq (0.23 per cent of the national total and 2.45 per cent of the agriculture sector) and for 2015 increased by 722.95 kt CO_2 eq (0.24 per cent of the national total and 2.42 per cent of the agriculture sector). The ERT recommends that Kazakhstan, 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).	
A.18	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	The ERT noted that the AD reported in CRF table 3.D for N mineralization of 624,000,000 kg N for 2015 are not consistent with losses of soil carbon of cropland reported in CRF table 4.B (14,951.20 kt C) if a country-specific C:N ratio is used (C:N equals 10.1, as provided to the ERT during the review). The latter value may result in significantly higher N_2O emissions from N mineralization and related indirect N_2O emissions. This issue is relevant for 2013 and 2014 as well. During the review, Kazakhstan explained that this is a technical error related to recalculations of CSCs in mineral soils of cropland that were not taken into account for the inventory of N_2O emissions in the agriculture sector. The ERT also noted that this could lead to a potential underestimation of direct and indirect N_2O emissions from agricultural soils (subcategories 3.D.a.5 mineralization/immobilization associated with loss/gain of soil organic matter and 3.D.b indirect N_2O emissions from managed soils) for the latest inventory years (2013, 2014 and 2015) and the rest of the time series and included this issue in the list of potential problems and further questions raised by the ERT. The ERT recommended that Kazakhstan revise its 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 for the relevant years of the time series, in particular 2013, 2014 and 2015, in consistency with estimates of carbon mineralized on cropland reported in the LULUCF sector. In response to the list of potential problems and further questions raised by the ERT, Kazakhstan submitted a complete set of CRF tables for the period 1990–2015; however, no revised estimates of direct and indirect N_2O emissions from agricultural soils (3.D.a.5 mineralization/immobilization associated with loss/gain of soil organic matter and 3.D.b indirect N_2O emissions from managed soils) or revised data on CSCs in mineral soils of cropland in CRF table 4.B were submitted. Kazakhstan explained in its response that the AD used for 3.D.a.5 mineralization/immobilization associated with loss/gain of soil organic matter (624,000,000 kg N for 2015) only	Yes. Accuracy

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*	*Is finding an issue and/or a problem?[a] If yes, classify by type*
		include N mineralized on cropland remaining cropland, while data in CRF table 4.B include estimations for converted land categories, as well. However, the ERT noted that in accordance with the 2006 IPCC Guidelines the amount of N mineralized includes loss in soil organic matter in mineral soils through both land-use change and management practices. Thus, land-use change categories of cropland should be included. The ERT made a preliminary estimation of direct and indirect N_2O emissions from 3.D.a.5 mineralization/immobilization associated with loss/gain of soil organic matter and 3.D.b indirect N_2O emissions from managed soils using a country-specific C:N ratio of 10:1, country-specific $Frac_{LEACH}$ (10 per cent as provided in table 5.36 of the NIR), default EFs and AD on CSCs in mineral soils of cropland (as reported in CRF table 4.B) and this resulted in significant increases of emissions for 2013, 2014 and 2015 in these subcategories. Thus, the ERT concluded that N_2O emissions from 3.D.a.5 mineralization/immobilization associated with loss/gain of soil organic matter and 3.D.b indirect N_2O emissions from managed soils for 2013–2015 continued to be underestimated. Therefore, the ERT disagreed with the Party's response and considers that Kazakhstan has not satisfactorily resolved the potential problem. Therefore, in accordance with the guidance for adjustments under Article 5, paragraph 2, of the Kyoto Protocol (decision 20/CMP.1, in conjunction with decision 4/CMP.11), the ERT carried out the procedure for the calculation of adjustments for these subcategories (see section VI and annex IV below). The ERT recommends that Kazakhstan report its 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.	
A.19	3.D.a.6 Cultivation of organic soils (i.e. histosols) – N_2O	The ERT noted that Kazakhstan reported N_2O emissions from cultivation of organic soils as "NO". During the review, Kazakhstan explained that there are no organic soils in the country. There are artificially created soils (technozems-soils) with an increased content of organic matter (humus) on an area of about 300 kha; however, the carbon content is less than 12 per cent in the soil layer 0–20 cm (loamy soils) and it does not correspond to the definition of organic soils. The ERT recommends that, in the NIR of its next annual submission, Kazakhstan provide detailed information on the absence of organic soils in the country.	Yes. Transparency
A.20	3.D.b.2 Nitrogen leaching and run-off – N_2O	The ERT noted that in the background calculation sheet provided to the ERT during the review for this subcategory, Kazakhstan did not include the amount of N in urine and dung deposited by grazing animals for the estimations of indirect N_2O emissions from agricultural soils owing to leaching and run-off. The ERT noted that this could lead to a potential underestimation of emissions in subcategory 3.D.b.2 nitrogen leaching and run-off for the latest inventory years (2013, 2014 and 2015) and the rest of the time series and included this issue in the list of potential problems and further questions raised by the ERT. The ERT recommended that Kazakhstan include the amount of N in urine and dung deposited by grazing animals in its estimates of indirect N_2O	Yes. Transparency

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue and/or a problem?[a] If yes, classify by type
		emissions from 3.D.b.2 nitrogen leaching and run-off in accordance with the methodology provided in the 2006 IPCC Guidelines and revise its estimates for 2013, 2014 and 2015. In response to the list of potential problems and further questions raised by the ERT, Kazakhstan submitted a complete set of CRF tables for the period 1990–2015 with revised N_2O emission estimates for the subcategory 3.D.b.2 nitrogen leaching and run-off for all years of the time series using equation 11.10 from the 2006 IPCC Guidelines (vol. 4) and including the amount of N in urine and dung deposited by grazing animals. The ERT agreed with the Party's revised estimates. As a result of the revision the estimated emissions for 2013 increased by 169.86 kt CO_2 eq (0.06 per cent of the national total and 0.61 per cent of the agriculture sector), for 2014 increased by 175.82 kt CO_2 eq (0.06 per cent of the national total and 0.61 per cent of the agriculture sector) and for 2015 increased by 181.78 kt CO_2 eq (0.06 per cent of the national total and 0.61 per cent of the agriculture sector). The ERT recommends that Kazakhstan 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.	
A.21	3.G Liming – CO_2	The ERT noted that Kazakhstan reported estimations of CO_2 emissions from liming as "NO". During the review, Kazakhstan explained that the average pH value for arable soils in Kazakhstan is about 6–7 pH, while liming is recommended for soil with pH lower than 5.5. Therefore, no lime is applied to soils in the country and CO_2 emissions from liming do not occur. The ERT recommends that Kazakhstan provide, in the NIR, detailed justification for reporting CO_2 emissions from liming as "NO".	Yes. Transparency
LULUCF			
L.22	4. General (LULUCF) – CO_2, CH_4 and N_2O	The ERT noted that land representation remains a critical issue for the Party's reporting for the LULUCF sector (see ID#s L.1, L.2, L.6, L.8, L.9, L.10, L.14 and L.20 in table 3). The ERT identified discrepancies in the reporting of land-use areas between the NIR (tables 6.4–6.7, 6.10, 6.16, 6.17 and 6.20) and the CRF tables. In response to a question raised by the ERT during the review, Kazakhstan explained that different sources of information were used to identify land-use areas (the Committee for Land Management, the Forestry and Wildlife Committee and the Committee of Water Resources of the Ministry of Agriculture of the Republic of Kazakhstan). Further, Kazakhstan informed the ERT of its intention to resolve these inconsistencies in its next annual submission, although the Party did not provide details of the methods it plans to use. The ERT welcomed the planned improvements by Kazakhstan, which are critical for reporting emissions and removals for the LULUCF sector in accordance with the 2006 IPCC Guidelines. However, it noted that different sources of land information might result in double counting or omission of an area, leading to incorrect estimations of emissions or removals in the sector.	Yes. Accuracy

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*	*Is finding an issue and/or a problem?[a] If yes, classify by type*
		The ERT recommends that Kazakhstan, in its 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 its estimates in accordance with the 2006 IPCC Guidelines.	
Waste			
W.15	5. General (waste) – CO_2, CH_4 and N_2O	The ERT noted a discrepancy in the information provided in the NIR (pp.299–300) related to the reporting of the contribution of emissions from the categories within the waste sector for 2015. The NIR reported that 71.63 per cent of emissions came from solid waste disposal, 8.47 per cent from wastewater treatment and discharge, and 0.06 per cent from incineration and open burning of waste, which totals 80.16 per cent instead of 100 per cent. During the review, Kazakhstan provided revised information on the contribution of emissions from the categories within the waste sector for 2015, namely that the emissions consist of about 65.0 per cent from solid waste disposal, about 34.88 per cent from domestic and industrial wastewater treatment and discharge and 0.12 per cent from clinical waste burning. The ERT recommends that Kazakhstan 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.	Yes. Transparency
W.16	5.A Solid waste disposal on land – CH_4	According to the NIR, Kazakhstan used the tier 2 IPCC FOD method for the calculation of CH_4 emissions from 5.A solid waste disposal. During the review, the ERT noted that the estimation method used by Kazakhstan is the tier 1 IPCC FOD method. The ERT noted that, according to CRF table 7, solid waste disposal is a key category and therefore it is good practice to use the tier 2 IPCC FOD method, following the decision tree in the 2006 IPCC Guidelines for choosing the most appropriate estimation method. The ERT recommends that Kazakhstan obtain good-quality country-specific AD in order to estimate CH_4 emissions for this category using the tier 2 IPCC FOD method.	Yes. Accuracy
W.17	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 CH_4 emission estimates from category 5.A solid waste disposal. In addition, there was no detailed numerical information for the complete time series on the AD used for the emission estimates in this category. Also, it was not clear in the NIR whether the calculation was based on per capita waste generation and urban population or on collected waste volume and waste density. During the review, Kazakhstan confirmed that the calculation was based on per capita waste generation and urban population, and provided a worksheet with calculations data only for Astana and Almaty. The ERT noted that historical data on waste generation in this worksheet for 1950–1990 seem to be overestimated because the per capita generation rates used in the calculations were 226–332 kg/year, which are higher than other Annex I Parties with similar economic and geographical conditions (e.g. the Russian Federation (243 kg/year in 1990) and Ukraine (286 kg/year in 1990)). In addition, Kazakhstan explained that AD on SWDS are available from the	Yes. Transparency

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		Agency of Statistics of the Republic of Kazakhstan, having been collected directly from the SWDS operators since 2008. The ERT noted that this information is available from 2005 onwards (available at: http://www.stat.gov.kz/faces/wcnav_externalId/ecolog-I-33). Therefore, the ERT noted that likely overestimated historical data on waste generation in the years before 1990 and the early 1990s may lead to a potential overestimation of emissions in 1990 for category 5.A solid waste disposal, and included this issue in the list of potential problems and further questions raised by the ERT. The ERT recommended that Kazakhstan revise its CH_4 emissions from category 5.A solid waste disposal using revised historical data for 1950–1990 based on available statistical data on waste disposal for the period 2005–2015 and relevant economic indicators (e.g. population and GDP). In response to the list of potential problems and further questions raised by the ERT, Kazakhstan indicated that a detailed description of the used AD will be included in the NIR of its next annual submission. Kazakhstan also indicated that these AD were based on per capita waste generation and interpolations when data were lacking, and that statistical data should be approached critically sometimes owing to unclear definitions. The ERT noted in Kazakhstan's response that the AD provided in the calculation worksheets for Astana, Almaty and other towns of Kazakhstan were the same AD as those used in the estimates of the original 2017 annual submission for waste generation based on per capita waste generation rate (in the range of 226–332 kg/year) for the period 1950–1990, which seem too high for the conditions of the country in those years. The ERT also noted that there were no differences between the CRF tables of the original 2017 annual submission and the submitted revised CRF tables for 5.A solid waste disposal. Thus, the ERT concluded that historical data on waste generation in the early 1990s and the years before were overestimated, and therefore CH_4 emissions from category 5.A solid waste disposal in 1990 continue to be overestimated. Therefore, the ERT disagreed with the Party's response and considered that Kazakhstan has not satisfactorily resolved the potential problem. Therefore, in accordance with the guidance for adjustments under Article 5, paragraph 2, of the Kyoto Protocol (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 (see ID# 23 in FCCC/IRR/2017/KAZ). The ERT recommends that Kazakhstan 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.	
W.18	5.A Solid waste disposal on land – CH_4	The ERT noted that the average morphological waste composition used in the CH_4 emission calculations for this category was reported in the NIR, but it was not clear for which period it is calculated. During the review, Kazakhstan explained that the average morphological waste composition was estimated for 2010. The ERT also noted that in the NIR (section 7.2.1) the reported 40 per cent share for waste paper and carton, including packaging, is too high, whereas the share for food (15 per cent) is too low in comparison with the IPCC default	Yes. Accuracy

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		values for South-Central Asia (2006 IPCC Guidelines, vol. 5, table 2.3). Referenced materials presented during the review on this matter did not allow the ERT to conclude whether the used data on waste composition for the DOC estimation were correct. During the review, Kazakhstan also explained that data collection is challenging in the country and it is planning to update information on MSW composition in order to calculate DOC values for 1990–2015. The ERT further noted that there is a study led by the Nazarbayev University in Astana containing data on waste composition for the year 2016 (Inglezakis et al., 2017). The ERT concluded that using a constant value of 0.21 for DOC for 1950–2015 did not reflect changes in the waste management practices in the country over time and could lead to a potential overestimation of CH_4 emissions in the category 5.A solid waste disposal, and included this issue in the list of potential problems and further questions raised by the ERT. The ERT recommended that Kazakhstan update DOC values for 1950–2015 based on representative values of waste composition in the country or, if not possible, use DOC values from a country with similar economic and geographical conditions, and revise the CH_4 emissions from 5.A solid waste disposal in accordance with the 2006 IPCC Guidelines. In response to the list of potential problems and further questions raised by the ERT, Kazakhstan indicated that it used the IPCC model to calculate CH_4 emissions from this category with a DOC value changing in the model depending on waste composition and that it would be corrected in its next annual submission. The ERT noted that in the calculation worksheets provided in Kazakhstan's response the data on DOC values were not updated and it used the same values as in the original 2017 annual submission and that no differences between the CRF tables of the original 2017 annual submission and the submitted revised CRF tables for 5.A solid waste disposal were reported. Therefore, the ERT concluded that Kazakhstan had not updated the DOC values and continued to use high values, thus CH_4 emissions from category 5.A solid waste disposal in 1990 continued to be overestimated. Therefore, the ERT disagreed with the Party's response and considers that Kazakhstan has not satisfactorily resolved the potential problem. Therefore, in accordance with the guidance for adjustments under Article 5, paragraph 2, of the Kyoto Protocol (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 (see ID# 24 in FCCC/IRR/2017/KAZ). The ERT recommends that Kazakhstan 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.	
W.19	5.A.1 Managed waste disposal sites – CH_4	In its NIR, Kazakhstan indicated that industrial waste disposal at SWDS is prohibited, but at the same time it indicated that only 26.8 per cent of industrial waste was treated and used in 2016. During the review, Kazakhstan provided the ERT with information on industrial waste management and statistical reports on industrial waste record-keeping since 1998 (http://www.stat.gov.kz/faces/wcnav_externalId/homeNumbersEnvironment). The ERT noted that, according to these reports, there are different categories of disposed industrial waste that are	Yes. Completeness

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		biodegradable. In addition, Kazakhstan informed the ERT that the issue of industrial waste disposed at SWDS will be further considered as a potential source of emissions under category 5.A solid waste disposal. The ERT noted that the emissions from biodegradable industrial waste (coming, for example, from food, wood processing and fishing industries) are not included in the national inventory, and this may lead to a potential underestimation of CH_4 emissions from subcategory 5.A.1 managed waste disposal sites for 2013, 2014 and 2015 and other years of the time series, and included this issue in the list of potential problems and further questions raised by the ERT. The ERT recommended that Kazakhstan provide verifiable documentation showing the methods of treatment or disposal for the remaining industrial waste (about 70 per cent) that is not treated and used, particularly the biodegradable portion, and report CH_4 emissions from industrial waste containing DOC (e.g. from food, wood processing and fishing industries) disposed at SWDS in accordance with the 2006 IPCC Guidelines. In response to the list of potential problems and further questions raised by the ERT, Kazakhstan provided a short explanation on the regulatory framework and practices of handling industrial waste in Kazakhstan. However, this explanation did not fully clarify or provide verifiable information showing the method of treatment and/or disposal of the industrial waste containing DOC and fossil carbon in the country, particularly the biodegradable portion (e.g. from such industries as food, wood processing and fishing). Also, the ERT noted that Kazakhstan provided information on industrial waste generation and its treatment or disposal only for Almaty in 1997. The ERT concluded that the information provided does not demonstrate with verifiable evidence how industrial waste generated in Kazakhstan is treated or disposed and whether CH_4 emissions from all biodegradable industrial waste were estimated and reported in the GHG inventory; thus, CH_4 emissions from the subcategory 5.A.1 managed waste disposal sites in 2013–2015 continue to be underestimated. Therefore, the ERT disagreed with the Party's response and considers that Kazakhstan has not satisfactorily resolved the potential problem. Therefore, in accordance with the guidance for adjustments under Article 5, paragraph 2, of the Kyoto Protocol (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 (see section VI and annex IV below). The ERT recommends that Kazakhstan ensure that CH_4 emissions from industrial waste containing DOC (e.g. from food, wood processing and fishing industries) disposed at SWDS are estimated and reported in its future annual submissions in accordance with the 2006 IPCC Guidelines. The ERT also recommends that Kazakhstan 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.	
W.20	5.D.2 Industrial wastewater – CH_4	The ERT noted an inconsistency in the information provided in chapter 7.3.2.1 of the NIR (p.321) in reporting the contribution of CH_4 emissions from industrial wastewater. Kazakhstan stated that a part of the industrial wastewater that meets the physico-chemical characteristics of the rules of treatment is accepted at domestic wastewater treatment plants. However, the ERT noted that all emissions from the total industrial wastewater are	Yes. Adherence to the UNFCCC Annex I inventory reporting guidelines

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		reported separately from the domestic wastewater in the CRF tables. In its comments on the draft review report, Kazakhstan indicated that the text in the NIR erroneously specified co-processing of municipal and industrial wastewater at domestic wastewater treatment plants. The ERT recommends that Kazakhstan 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.	
KP-LULUCF			
KL.1	General (KP-LULUCF) – CO_2, CH_4 and N_2O	The ERT noted that in its 2017 annual submission Kazakhstan did not provide the mandatory information to be included in annual GHG inventories on LULUCF activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, required in accordance with decision 2/CMP.8, annex II, paragraphs 2(b), 2(d), 2(e), 2(f), 4(a), 4(b), 5(a), 5(b), 5(c) and 5(e). 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.8, annex II, paragraphs 2(b), 2(d), 2(e), 2(f), 4(a), 4(b), 5(a), 5(b), 5(c) and 5(e) on LULUCF activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol. The ERT also 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 above indicated information. The ERT also noted that, later in the review process, Kazakhstan confirmed that it does not intend to apply the provisions to exclude emissions from natural disturbances for the accounting for AR under Article 3, paragraph 3, and for the accounting for FM under Article 3, paragraph 4, of the Kyoto Protocol during the second commitment period, and that therefore information in accordance with decision 2/CMP.8, annex II, paragraph 2(f), does not need to be reported in the 2017 annual submission (see ID# 14 in FCCC/IRR/2017/KAZ). In response to the list of potential problems and further questions raised by the ERT, Kazakhstan indicated that actions have been undertaken by JSC Zhasyl Damu, institution dependent of the Ministry of Energy, to strengthen the LULUCF expert group in the Department of Greenhouse Gas Inventories and to assess activities related to LULUCF in accordance with Article 3, paragraphs 3 and 4, of the Kyoto Protocol. Kazakhstan also indicated that currently this group is undertaking the preparatory work for submitting information on LULUCF in accordance with decision 2/CMP.8, annex II, in 2018 and subsequent years, taking into account the recommendations received from the ERT in the current review process. Kazakhstan further indicated that it concluded a temporary contract with two LULUCF experts who have among their tasks the identification of forest and agricultural land areas where elected activities occur, their areas, geographical locations, natural resources for ensuring removal units, provision of baseline data for the calculation of carbon fluxes in reservoirs, and for the assessment of the FMRL. In addition, Kazakhstan indicated that requests for additional information for 1990–2017, including requests for evaluation of LULUCF activities in accordance with Article 3, paragraphs 3 and 4, of the Kyoto Protocol have been prepared in the Department of Greenhouse Gas Inventories by JSC	Yes. Adherence to reporting guidelines under Article 7, paragraph 1, of the Kyoto Protocol

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue and/or a problem?[a] If yes, classify by type
		Zhasyl Damu and sent to organizations and agencies that carry out regular monitoring of land resources and their management in Kazakhstan. The ERT considered that the Party's response did not adequately resolve the potential problem. The ERT noted that the indicated information by Kazakhstan does not specifically address or cover the mandatory information required in decision 2/CMP.8, annex II, paragraphs 2(b), 2(d), 2(e), 4(a), 4(b), 5(a), 5(b), 5(c) and 5(e). Further, Kazakhstan did not provide any of the required information. The ERT also noted that Kazakhstan, in its initial report to facilitate the calculation of the assigned amount for the second commitment period of the Kyoto Protocol, had informed the ERT of its intention to elect for accounting for anthropogenic GHG emissions by sources and removals by sinks resulting from the activity of RV. However, Kazakhstan later submitted an addendum to its initial report to facilitate the calculation of the assigned amount for the second commitment period of the Kyoto Protocol and reported its intention to elect for accounting for anthropogenic GHG emissions by sources and removals by sinks resulting from GM activity, instead of the activity of RV. The ERT further noted that Kazakhstan stated in its response to the list of potential problems and further questions raised by the ERT that it has the intention and is taking actions to solve the issues related to the preparation and reporting, in 2018, of the mandatory information according to the requirements in decision 2/CMP.8, annex II, paragraphs 2(b), 2(d), 2(e), 4(a), 4(b), 5(a), 5(b), 5(c) and 5(e). However, in this regard, the ERT noted that Kazakhstan, in its 2017 annual submission and during the review, did not clearly identify lands where deforestation, AR, FM and GM activities occurred, and therefore was not ensuring that areas of land subject to LULUCF activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol were identifiable. Further, Kazakhstan did not provide accurate information about these areas in its national GHG inventory, which is an issue closely related to the provision of information required in the above-mentioned paragraphs of annex II to decision 2/CMP.8. Taking into account the issues identified above and the lack of provision of the mandatory information required by decision 2/CMP.8, annex II, paragraphs 2(b), 2(d), 2(e), 4(a), 4(b), 5(a), 5(b), 5(c) and 5(e) 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 section VIII below). The ERT recommends that Kazakhstan provide in the NIR information in accordance with the requirements of decision 2/CMP.8, annex II, paragraphs 2(b), 2(d), 2(e), 4(a), 4(b), 5(a), 5(b), 5(c) and 5(e) on LULUCF activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol and apply, as appropriate, the methodologies provided in the 2006 IPCC Guidelines (vol. 4) and the Kyoto Protocol Supplement for the development of this information.	
KL.2	General (KP-LULUCF) – CO_2, CH_4 and N_2O	The ERT noted that Kazakhstan did not report CSCs in the litter and SOC pools for AR, deforestation and FM activities in its 2017 annual submission. The ERT also noted that CSCs in the above-ground biomass, below-ground biomass and deadwood pools were reported together and included under the above-ground biomass pool.	Yes. Completeness

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*	*Is finding an issue and/or a problem?[a] If yes, classify by type*
		The ERT recommends that Kazakhstan 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 its future annual submissions.	
KL.3	General (KP-LULUCF) – CO_2, CH_4 and N_2O	The ERT noted that Kazakhstan did not clearly distinguish the difference between lands where AR, deforestation and FM activities occurred as required in decision 2/CMP.8, annex II, paragraph 2(b). The ERT noted that information in the 2017 annual submission of Kazakhstan covers only FM and that there is no clear information on emissions/removals and AD for all other activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol.	Yes. Adherence to reporting guidelines under Article 7, paragraph 1, of the Kyoto Protocol
		The ERT recommends that Kazakhstan 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.	
KL.4	Forest management – CO_2	The ERT noted that the reporting of AD for FM (area of mineral soils and area of organic soils) in CRF table 4(KP-I)B.1 for 1990–1992 and 2014–2015 is inconsistent with the NIR (table 9.3). Specifically, for each of the years from 1988 to 1992, table 9.3 of the NIR shows that the area subject to FM is 7,899.9 kha, while CRF table 4(KP-I)B.1 reports the value of 8,534.40 kha for 1990–1992. For each of the years from 2013 to 2015, table 9.3 of the NIR shows the area associated with the activity as 9,598.4 kha, while CRF table 4(KP-I)B.1 for 2014–2015 reports "NO" for the area of organic soils and "NE" for mineral soils.	Adherence to reporting guidelines under Article 7, paragraph 1, of the Kyoto Protocol
		The ERT further noted that from 1990 to 2015, CRF table 4(KP-I)B.1 does not specify how the subtotal for the AD under FM was formed, which is not in line with footnote 10 to CRF table 4(KP-I)B.1. For 1990–2015, apart from the subtotal value itself, all entries below the subtotal under the mineral and organic soils in this table are reported with notation keys.	
		The ERT recommends that Kazakhstan 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.	
KL.5	General (KP-LULUCF)	The ERT noted that Kazakhstan did not include any information in CRF table NIR-3 on key categories for KP-LULUCF activities.	Adherence to reporting guidelines under Article 7, paragraph 1, of the Kyoto Protocol
		The ERT recommends that Kazakhstan improve its 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 inventory reporting guidelines.	

[a] Recommendations made by the ERT during the review are related to issues as defined in paragraph 81 of the UNFCCC review guidelines, or problems as defined in paragraph 69 of the Article 8 review guidelines. Encouragements are made to Kazakhstan to address all findings not related to such issues or problems.

VI. Application of adjustments

10. The ERT identified underestimations in emission estimates for Annex A sources for 2013–2015 and recommended 14 adjustments in the energy, IPPU, agriculture and waste sectors.

11. In accordance with the guidance for adjustments under Article 5, paragraph 2, of the Kyoto Protocol (decision 20/CMP.1, in conjunction with decision 4/CMP.11), the adjustments to the energy, IPPU, agriculture 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.

12. A summary of the adjustments is presented in table 6.

13. Kazakhstan and the ERT agreed on the adjustments estimated for 1.B.1.a.i underground mines – post-mining activities – CH_4; 1.B.1.a.ii surface mines – post-mining activities – CH_4; 1.B.2.a.1 oil – exploration – CO_2, CH_4 and N_2O; 1.B.2.a.2 oil – production – CO_2 and CH_4; 1.B.2.b.2 natural gas – production – CO_2 and CH_4; 1.B.2.b.3 natural gas – processing – CO_2 and CH_4; 1.B.2.b.4 natural gas – transmission and storage – CO_2 and CH_4; 1.B.2.b.5 natural gas – distribution – CO_2 and CH_4; 1.B.2.c venting and flaring – flaring – CO_2 and N_2O; 2.F.1 refrigeration and air conditioning – HFCs; 3.D agricultural soils (mineralization/immobilization associated with loss/gain of soil organic matter) – N_2O; 5.A solid waste disposal (industrial waste) – CH_4; and 5.C.2 open burning of waste – CO_2, CH_4 and N_2O, presented in table 6. Kazakhstan did not agree with the ERT on the adjustment estimated for 1.A fuel combustion (coking coal) – CO_2, CH_4 and N_2O presented in table 6 (see annex VI below).

Table 6
Summary information on adjustments for Kazakhstan

	2013		*2014*		*2015*		*Reference*
	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)*	
Annex A source							
1.A fuel combustion (coking coal) – CO_2, CH_4 and N_2O	–	18 052.255	–	28 323.896	–	8 874.263	For further detail, see annex IV
1.B.1.a.i underground mines – post-mining activities – CH_4	197.284	675.003	187.856	642.530	180.900	619.583	For further detail, see annex IV
1.B.1.a.ii surface mines – post-mining activities – CH_4	0.125	256.029	0.115	235.854	0.103	210.658	For further detail, see annex IV
1.B.2.a.1 oil – exploration – CO_2, CH_4 and N_2O	C[a]	12 376.817	C[a]	12 231.389	C[a]	12 024.218	For further detail, see annex IV
1.B.2.a.2 oil – production – CO_2 and CH_4	244.865	49 499.838	198.093	48 918.213	194.040	48 089.655	For further detail, see annex IV
1.B.2.b.2 natural gas – production – CO_2 and CH_4	2 197.269	11 686.869	2 442.519	11 904.382	2 557.529	12 698.525	For further detail, see annex IV
1.B.2.b.3 natural gas – processing – CO_2 and CH_4	NA	2 828.108	NA	2 880.744	NA	3 072.919	For further detail, see annex IV
1.B.2.b.4 natural gas – transmission and storage – CO_2 and CH_4	0.093	646.517	0.091	658.550	0.094	702.482	For further detail, see annex IV

	2013		2014		2015		Reference
	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)*	
1.B.2.b.5 natural gas – distribution – CO_2 and CH_4	4.338	1 431.115	5.547	1 461.781	5.020	1 546.165	For further detail, see annex IV
1.B.2.c venting and flaring – flaring – CO_2 and N_2O	NA	4 280.295	NA	4 235.786	NA	4 180.273	For further detail, see annex IV
2.F.1 refrigeration and air conditioning – HFCs	998.630	1 160.840	929.618	1 178.145	938.274	1 195.515	For further detail, see annex IV
3.D agricultural soils (mineralization/immobilization associated with loss/gain of soil organic matter) – N_2O	2 988.961	7 604.896	3 062.770	8 355.944	3 139.558	9 107.114	For further detail, see annex IV
5.A solid waste disposal (industrial waste) – CH_4	–	377.522	–	387.862	–	396.608	For further detail, see annex IV
5.C.2 open burning of waste – CO_2, CH_4 and N_2O	NO, NA	482.499	NO, NA	475.798	NO, NA	484.988	For further detail, see annex IV
Total Annex A sources	**6 631.565**	**111 358.602**	**6 826.609**	**121 890.875**	**7 015.519**	**103 202.967**	

[a] C = confidential.

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

14. Kazakhstan has elected commitment period accounting and therefore the issuance and cancellation of units for KP-LULUCF activities is not applicable for the 2017 review.

VIII. Questions of implementation

15. The ERT considers that Kazakhstan 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*
LULUCF activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol	Decision 2/CMP.8, annex II, paragraphs 2(b), 2(d), 2(e), 4(a), 4(b), 5(a), 5(b), 5(c) and 5(e)	For the full description of the problem see ID# KL.1 in table 5
Information on accounting of Kyoto Protocol units	Decision 3/CMP.11, paragraph 13, and decision 15/CMP.1, annex, section I.E, paragraphs 12 to 18, in conjunction with decision 3/CMP.11	For the full description of the problem see ID# G.14 in table 5

Annex I

Overview of greenhouse gas emissions and removals for Kazakhstan for submission year 2017 and data and information on activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, as submitted by Kazakhstan

1. Tables 8–11 provide an overview of total GHG emissions and removals as submitted by Kazakhstan.

Table 8
Total greenhouse gas emissions for Kazakhstan, base year[a]–2015
(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								NE
Base year	358 291.86	375 565.08	NA	NA	NA		2 882.00	
1990	358 291.86	375 565.08	NA	NA				
1995	230 867.78	228 293.48	NA	NA				
2000	207 050.47	189 956.32	NA	NA				
2010	306 232.95	303 633.03	NA	NA				
2011	297 777.82	293 656.71	NA	NA				
2012	308 221.68	302 304.87	NA	NA				
2013	316 447.49	309 096.38	NA	NA		–176.00	–18 362.67	–10 770.21
2014	325 403.94	314 754.89	NA	NA		–260.33	–19 162.00	–10 769.42
2015	312 063.57	298 069.64	NA	NA		–343.57	–19 961.33	–10 758.87

Notes: (1) Emissions/removals reported in the sector other (sector 6) are not included in total GHG emissions. (2) Values in this table do not reflect the adjustments calculated by the ERT for CO_2, CH_4, N_2O, HFCs and SF_6. For further information, please 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, paragraph 4, of the Kyoto Protocol is 1990 for Kazakhstan. For activities under Article 3, paragraph 3, of the Kyoto Protocol and FM under Article 3, paragraph 4, only the inventory years of the commitment period must be reported.

[b] Kazakhstan has not reported indirect CO_2 emissions in CRF table 6.

[c] The value reported in this column refers to 1990.

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

Table 9
Greenhouse gas emissions by gas for Kazakhstan, excluding land use, land-use change and forestry, 1990–2015
(kt CO_2 eq)

	CO_2[a]	*CH_4*	*N_2O*	*HFCs*	*PFCs*	*Unspecified mix of HFCs and PFCs*	*SF_6*	*NF_3*
1990	272 490.03	85 958.41	17 116.64	NO, NA	NA, NO	NO, NA	NA, NO	NO, NA
1995	167 752.29	48 169.69	12 371.50	NO, NA	NA, NO	NO, NA	NA, NO	NO, NA
2000	138 976.97	37 783.20	13 029.80	166.35	NA, NO	NO, NA	NA, NO	NO, NA
2010	236 431.67	52 983.92	11 840.13	957.71	1 419.58	NO, NA	0.01	NO, NA
2011	226 029.33	52 897.87	12 209.58	966.32	1 553.59	NO, NA	0.02	NO, NA
2012	232 875.68	54 777.40	12 109.65	987.38	1 554.73	NO, NA	0.03	NO, NA
2013	237 022.42	57 233.04	12 276.79	998.63	1 565.49	NO, NA	0.02	NO, NA
2014	244 748.79	55 106.95	12 661.03	929.62	1 308.49	NA, NO	0.02	NA, NO
2015	230 078.80	52 622.59	13 046.05	938.27	1 383.89	NO, NA	0.03	NO, NA
Per cent change 1990–2015	**–15.6**	**–38.8**	**–23.8**	**NA**	**NA**	**NA**	**NA**	**NA**

Notes: (1) Emissions/removals reported in the sector other (sector 6) are not included in total GHG emissions. (2) Values in this table do not reflect the adjustments calculated by the ERT for CO_2, CH_4, N_2O, HFCs and SF_6. For further information, please refer to annex IV.
[a] Kazakhstan did not report indirect CO_2 emissions in CRF table 6.

Table 10
Greenhouse gas emissions by sector for Kazakhstan, 1990–2015
(kt CO_2 eq)

	Energy	*IPPU*	*Agriculture*	*LULUCF*	*Waste*	*Other*
1990	305 601.91	21 404.84	43 783.04	–17 273.21	4 775.28	NO
1995	184 823.49	9 740.29	29 238.93	2 574.30	4 490.76	NO
2000	149 311.79	12 326.66	23 723.94	17 094.15	4 593.92	NO
2010	251 857.83	18 558.63	27 761.09	2 599.92	5 455.48	NO
2011	241 743.25	19 147.77	27 155.88	4 121.11	5 609.81	NO
2012	250 914.86	18 575.01	27 115.70	5 916.81	5 699.29	NO
2013	257 283.88	18 187.84	27 809.91	7 351.11	5 814.76	NO
2014	261 270.42	18 613.13	28 888.34	10 649.05	5 983.01	NO
2015	243 057.62	19 006.25	29 890.63	13 993.93	6 115.15	NO
Per cent change 1990–2015	**–20.5**	**–11.2**	**–31.7**	**–181.0**	**28.1**	**NA**

Notes: (1) Emissions/removals reported in the sector other (sector 6) are not included in total GHG emissions. (2) Values in this table do not reflect the adjustments calculated by the ERT for CO_2, CH_4, N_2O, HFCs and SF_6. For further information, please refer to annex IV. (3) Kazakhstan did not report indirect CO_2 emissions in CRF table 6.

Table 11

Greenhouse gas emissions/removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol by activity, base year[a]–2015, for Kazakhstan

(kt CO_2 eq)

	Article 3.7 bis as contained in the Doha Amendment[b]	*Article 3.3 of the Kyoto Protocol*		*FM and elected Article 3.4 activities of the Kyoto Protocol*				
	Land-use change	*AR*	*Deforestation*	*FM*	*CM*	*GM*	*RV*	*WDR*
FMRL				NE				
Technical correction				NA				
Base year	NA				NO, NE, IE	NO, IE	2 882.00	NO, NE, IE
2013		–176.00	NO, NE, IE	–10 770.21	NO, NE, IE	NO, IE	–18 362.67	NO, NE, IE
2014		–260.33	NO, NE, IE	–10 769.42	NO, NE, IE	NO, IE	–19 162.00	NO, NE, IE
2015		–343.57	NO, NE, IE	–10 758.87	NO, NE, IE	NO, IE	–19 961.33	NO, NE, IE
Per cent change base year–2015					**NA**	**NA**	**–792.6**	**NA**

Notes: (1) Values in this table include emissions on lands subject to natural disturbances, if applicable. (2) Values in this table to do not reflect the adjustments calculated by the ERT for CO_2, CH_4, N_2O, HFCs and SF_6. For further information, please refer to annex IV.

[a] The base year for GM under Article 3, paragraph 4, of the Kyoto Protocol is 1990 for Kazakhstan. For activities under Article 3, paragraph 3, of the Kyoto Protocol, and FM under Article 3, paragraph 4, only the inventory years of the commitment period must be reported.

[b] The value reported in this column refers to 1990.

2. Table 12 provides an overview of relevant key data for Kazakhstan's reporting under Article 3, paragraphs 3 and 4, of the Kyoto Protocol.

Table 12
Key relevant data for Kazakhstan under Article 3, paragraphs 3 and 4, of the Kyoto Protocol

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 (see ID# KL.1 in table 5) (f) RV: not elected (see ID# KL.1 in table 5) (g) WDR: not elected
Election of activities under Article 3, paragraph 4	GM (see ID# KL.1 in table 5)
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, ERUs, CERs and/or issuance of RMUs in the national registry for:	
1. AR in 2015	NA
2. Deforestation in 2015	NA
3. FM in 2015	NA
4. CM in 2015	NA
5. GM in 2015	NA
6. RV in 2015	NA
7. WDR in 2015	NA

Annex II

Information to be included in the compilation and accounting database

Tables 13–15 include the information to be included in the compilation and accounting database for Kazakhstan. Data shown are from the original annual submission of Kazakhstan, including the latest revised estimates submitted, adjustments (if applicable), as well as the final data to be included in the compilation and accounting database.

Table 13
Information to be included in the compilation and accounting database for 2015, including on the commitment period reserve, for Kazakhstan
($t CO_2 eq$)

	Original submission	*Revised estimates*	*Adjustment*	*Final*
CPR	2 407 364 007	2 384 557 115		2 539 658 574
Annex A emissions for 2015				
CO_2	230 375 666	230 078 804	24 171 397	254 250 201
CH_4	56 300 855	52 622 587	65 682 905	118 305 492
N_2O	11 921 719	13 046 051	6 075 906	19 121 957
HFCs	938 274		257 240	1 195 515
PFCs	1 383 895			1 383 895
Unspecified mix of HFCs and PFCs	NO, NA			NO, NA
SF_6	91	29		29
NF_3	NO, NA			NO, NA
Total Annex A sources	**300 920 501**	**298 069 639**	**96 187 449**	**394 257 088**
Activities under Article 3, paragraph 3, of the Kyoto Protocol for 2015				
3.3 AR	–343 567			–343 567
3.3 Deforestation	NO, NE, IE			NO, NE, IE
FM and elected activities under Article 3, paragraph 4, of the Kyoto Protocol for 2015				
3.4 FM	–10 758 874			–10 758 874
3.4 GM	NO, IE			NO, IE
3.4 GM in the base year	NO, IE			NO, IE

Table 14
Information to be included in the compilation and accounting database for 2014, for Kazakhstan
($t CO_2 eq$)

	Original submission	*Revised estimates*	*Adjustment*	*Final*
Annex A emissions for 2014				
CO_2	245 073 612	244 748 795	43 491 082	288 239 877
CH_4	58 170 035	55 106 949	65 831 914	120 938 863
N_2O	11 587 161	12 661 026	5 492 744	18 153 770
HFCs	929 618		248 527	1 178 145
PFCs	1 308 486			1 308 486
Unspecified mix of HFCs and PFCs	NA, NO			NA, NO
SF_6	NA, NO	20		20
NF_3	NA, NO			NA, NO
Total Annex A sources	**317 068 912**	**314 754 894**	**115 064 266**	**429 819 161**

	Original submission	*Revised estimates*	*Adjustment*	*Final*
Activities under Article 3, paragraph 3, of the Kyoto Protocol for 2014				
3.3 AR	–260 333			–260 333
3.3 Deforestation	NO, NE, IE			NO, NE, IE
FM and elected activities under Article 3, paragraph 4, of the Kyoto Protocol for 2014				
3.4 FM	–10 769 415			–10 769 415
3.4 GM	NO, IE			NO, IE
3.4 GM in the base year	NO, IE			NO, IE

Table 15
Information to be included in the compilation and accounting database for 2013, for Kazakhstan
(t CO_2 eq)

	Original submission	*Revised estimates*	*Adjustment*	*Final*
Annex A emissions for 2013				
CO_2	237 231 941	237 022 420	33 388 379	270 410 799
CH_4	61 238 505	57 233 038	66 408 287	123 641 325
N_2O	11 303 031	12 276 788	4 768 160	17 044 948
HFCs	998 630		162 211	1 160 840
PFCs	1 565 487			1 565 487
Unspecified mix of HFCs and PFCs	NO, NA			NO, NA
SF_6	NA, NO	19		19
NF_3	NO, NA			NO, NA
Total Annex A sources	**312 337 595**	**309 096 382**	**104 727 037**	**413 823 419**
Activities under Article 3, paragraph 3, of the Kyoto Protocol for 2013				
3.3 AR	–176 000			–176 000
3.3 Deforestation	NO, NE, IE			NO, NE, IE
FM and elected activities under Article 3, paragraph 4, of the Kyoto Protocol for 2013				
3.4 FM	–10 770 213			–10 770 213
3.4 GM	NO, IE			NO, IE
3.4 GM in the base year	NO, IE			NO, IE

Annex III

Additional information to support findings in table 2

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 Kazakhstan's inventory are the following:

(a) 1.A fuel combustion (coking coal) (CO_2, CH_4 and N_2O) (see ID# E.48 in table 5);

(b) 1.B.1.a.i underground mines – abandoned underground mines (CO_2 and CH_4) (see ID# E.56 in table 5);

(c) 1.B.2.a.1 oil – exploration (CO_2, CH_4 and N_2O) (see ID# E.34 in table 3);

(d) 1.B.2.a.3 oil – transport (CH_4) (see ID# E.38 in table 3);

(e) 1.B.2.b.3 natural gas – processing (CO_2 and CH_4) (see ID# E.40 in table 3);

(f) 1.B.2.c venting and flaring – flaring (CO_2 and N_2O) (see ID# E.43 in table 3);

(g) 2.B.2 nitric acid production (N_2O) (see ID# I.38 in table 5);

(h) 2.C.3 aluminium production (CO_2) (see ID# I.50 in table 5);

(i) 2.D.2 paraffin wax use (CO_2) (see ID# I.18 in table 3);

(j) 2.G.1 electrical equipment (SF_6) (see ID# I.24 in table 3);

(k) 2.G.3.a medical applications (N_2O) (see ID# I.52 in table 5);

(l) 2.F.1 refrigeration and air conditioning (HFCs) (see ID# I.51 in table 5);

(m) 4.A.1 forest land remaining forest land – mineral soils (CO_2) (see ID# L.1 in table 3);

(n) 4.A.2.2 grassland converted to forest land – mineral soils (CO_2) (see ID# L.1 in table 3);

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

(p) 4.C.2.1 forest land converted to grassland – dead organic matter and mineral soils (CO_2) (see ID# L.1 in table 3);

(q) 4.C.2 land converted to grassland – dead organic matter (CO_2) (see ID# L.21 in table 3);

(r) 4.D.2 land converted to wetlands (CO_2) (see ID# L.1 in table 3);

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

(t) 4.B 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);

(u) 5.A solid waste disposal (industrial waste) (CH_4) (see ID#s W.4 in table 3 and W.19 in table 5);

(v) 5.C incineration and open burning of waste (CO_2, CH_4 and N_2O) (see ID#s W.1, W.10, W.11 and W.12 in table 3);

(w) 4(KP) AR, deforestation and FM – litter and SOC (CO_2) (see ID#s KL.2, KL.3 and KL.4 in table 5).

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

2. The ERT has recommended that the next review for Kazakhstan be conducted as an in-country review.

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

4. Issue: National inventory arrangements (adherence to the UNFCCC Annex I inventory reporting guidelines). The ERT noted that several issues (in particular ID#s G.15–G.18) reflect that the functions pertaining to national inventory arrangements are not fully implemented in Kazakhstan. The recommended in-country review should address issues related to inventory planning, inventory management, capacity-building and archiving. The ERT noted in particular that ID# G.11 (recalculations) and ID# G.9 (uncertainty analysis) require a special attention, as they are strongly related to the improvement of the accuracy and transparency of the inventory.

Key areas that the next ERT conducting the in-country review should consider are:

(i) National system: inventory planning functions. The ERT noted that roles and responsibilities for the inventory preparation were not clearly identified in sufficient detail and were not fully implemented for proper planning, management and performance monitoring of the inventory compilation. As a result, the inventory has been submitted late several years in a row, owing to problems with providing inventory information and data to the inventory agency from the data holders and producers, and lack of clarity in prioritizing inventory tasks (e.g. timely sign-offs) (see ID#s G.15 and G.17 in table 5);

(ii) Inventory capacity 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 of business continuity and expertise transfer (see ID# G.16 in table 5);

(iii) Archiving of inventory information and data, and the ability to make these data available to the ERT during the review (see ID# G.18 in table 5 as well as related ID#s E.42 and E.43 in table 3 and ID#s E.47, E.48, E.49, E.50, I.31, I.37, I.38, I.41, W.17, W.18 and W.19 in table 5).

5. Issue: National registry. The ERT noted that Kazakhstan did not establish a national registry with functionality for the CP2, in accordance with the requirements set out in decision 13/CMP.1, annex, section II, in conjunction with decision 3/CMP.11 (see ID# G.13 in table 5).

Key areas that the next ERT conducting the in-country review should consider are:

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

(ii) Whether the detailed plan for the next steps in developing the registry is in place, including allocated roles and responsibilities regarding this project.

Annex IV

Additional information on adjustments

As required by paragraph 83(b) of the Article 8 review guidelines, this annex provides the relevant information on the adjustments applied to the 2017 annual submission of Kazakhstan. Quantitative information used in the calculation of each adjustment is presented in tables 16–43.

Table 16
Background information to support adjustments for 1.A fuel combustion (coking coal) – CO_2, CH_4 and N_2O for Kazakhstan

Element	*Description*
Underlying problem and rationale for adjustment	In the original 2017 annual submission in CRF table 1.A(b) for 2015, apparent consumption of coking coal was reported as 349.70 PJ. According to CRF table 1.A.(d), only 2.13 PJ were used for non-energy purposes. The NIR contained information on use of coking coal in respective categories of the sectoral approach for 2015, the aggregated amount of which was about 77.50 PJ. It was not clear from the CRF tables whether the remaining coking coal (about 270.07 PJ) was used for combustion activities or not. The same problem was detected for 2014. In 2013, consumption of coking coal was reported in an aggregated manner under other bituminous coal and lignite. Therefore, not all the amount of coking coal was taken into account in the sectoral approach emission estimates which, together with the use of a low CO_2 EF and NCV, led to a potential underestimation of CO_2 emissions (and CH_4 and N_2O) from 1.A fuel combustion (coking coal) for 2013–2015. For the reference approach, Kazakhstan submitted revised CRF tables covering coking coal consumption only for 2015, while for 2013 and 2014 coking coal consumption was reported as "IE, NA" without further explanation. In CRF table 1.A.5, 535,500 tonnes of "other consumption of coking coal" were included in the calculations reported for 2015. However, the revised 2015 data still did not specify whether approximately 46 per cent (74.29 PJ) of the reported coking coal in the reference approach were combusted or used for non-energy purposes and reported in the sectoral approach. In addition, Kazakhstan continued using a low NCV (24.01 TJ/kt) and carbon content (24.89 t C/TJ) values for coking coal and did not provide any justification for these values. Therefore, the ERT concluded that owing to the lack of reliable and verifiable information on coking coal consumption for 2013–2015 as well as the use of a low NCV and carbon content values for coking coal, the CO_2 emissions (and CH_4 and N_2O) from fuel combustion activities associated with consumption of coking coal were underestimated for 2013–2015.
Recommendation to Kazakhstan to address the underlying problem, as contained in the list of potential problems and further questions raised by the ERT	Provide verifiable information that consumption of coking coal in the country for 2013, 2014 and 2015 is included under the sectoral approach estimates and background information, including sources of information, method of calculation and justifications on NCVs and plant-specific CO_2 EFs used. If this is not possible: (1) use the default methodology in the 2006 IPCC Guidelines to calculate emissions of CO_2 (and CH_4 and N_2O) from category 1.A. fuel combustion for coking coal

	for 2013, 2014 and 2015; and (2) include CO_2 (and CH_4 and N_2O) emission estimates under the category 1.A.5 other (not specified elsewhere) for 2013, 2014 and 2015 if it is not possible to obtain separate data on coking coal consumption by different categories.
Assumptions, data and methodology used to calculate the adjustment	CO_2, CH_4 and N_2O emissions from use of coking coal in category 1.A. fuel combustion were estimated using the following method and data: (a) A tier 1 approach to estimating emissions from stationary combustion from the 2006 IPCC Guidelines (vol. 2, chapter 2, equation 2.1) with a CO_2 EF of 94,600 kg/TJ, a CH_4 EF of 10 kg/TJ and an N_2O EF of 1.5 kg/TJ provided in the 2006 IPCC Guidelines (vol. 2, chapter 2, table 2.3) and AD calculated by the ERT in points (c) and (g) below; (b) NCV (28.2 TJ/kt) of coking coal from the 2006 IPCC Guidelines (vol. 2, chapter 1, table 1.2); (c) Consumption in energy units of coking coal for 2014 and 2015 was provided by the Party, as requested by the ERT for the sectoral approach (138,934.16 TJ and 159,442.10 TJ, respectively) and the reference approach(386,197.73 TJ and 236,367.17 TJ, respectively), but the values were corrected for 2014 and 2015 using the IPCC default NCV value for coking coal indicated in point (b) above for the sectoral approach (163,179.65 TJ and 187,266.44 TJ, respectively) and the reference approach (453,593.34 TJ and 277,615.75 TJ, respectively); (d) The average ratio (0.208) of apparent consumption of coking coal to total apparent consumption of solid fossil (primary fuels) for 2015 (0.176) and 2014 (0.240) was calculated in order to estimate the value of apparent consumption of coking coal in the reference approach in 2013 (324,911.68 TJ) and corrected using the IPCC default NCV value indicated in point (b) above (381,612.22 TJ); (e) The average ratio (0.497) of coking coal feedstocks to total solid fossil feedstocks for 2015 (0.183) and 2014 (0.812) was calculated in order to estimate the value of coking coal feedstock in 2013 (5,070.07 TJ) and corrected using the IPCC default NCV value indicated in point (b) above (5,954.85 TJ); (f) The total actual consumption of coking coal in the reference approach (excluding feedstocks) for 2013 was calculated as the difference of the corrected apparent consumption of coking coal in the reference approach in 2013 and the corrected value of coking coal feedstock in 2013 (375,657.37 TJ); (g) The average ratio (0.524) of consumption of coking coal in the sectoral approach to total actual consumption of coking coal in the reference approach (excluding feedstocks) for 2015 (0.681) and 2014 (0.368) was calculated in order to estimate the value of consumption of coking coal in the sectoral approach in 2013 (196,948.40 TJ).
Description of how the adjustment is conservative	In line with decision 20/CMP.11, conservativeness was ensured by applying the conservativeness factor of 1.06 for AD (manufacturing industries and construction) 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 17
Description of the calculation of adjustments for source categories included in Annex A to the Kyoto Protocol for Kazakhstan

Parameter/estimate	*Value or assessment*	*Unit*	*Reference*
Category: 1.A fuel combustion (coking coal) – CO_2, CH_4 and N_2O			
Party's estimate of: AD (coking coal – missing part)	NE (2013)[a] NE (2014)[a] NE (2015)[a]	TJ	NIR, submitted revised CRF tables and information provided by Kazakhstan as per request of the ERT in accordance with decision 20/CMP.1 in conjunction with decision 4/CMP.11, annex, paragraph 29
Party's emission estimate from 1.A fuel combustion (coking coal – missing part) – CO_2, CH_4 and N_2O	NE (2013)[a] NE (2014)[a] NE (2015)[a]	kt CO_2 eq	NIR, submitted revised CRF tables and information provided by Kazakhstan as per request of the ERT in accordance with decision 20/CMP.1 in conjunction with decision 4/CMP.11, annex, paragraph 29
Input data/parameter for calculation of adjustment			
Calculated estimate of AD (coking coal – missing part)	178 708.974 (2013) 280 393.469 (2014) 87 851.104 (2015)	TJ	ERT calculation
Conservativeness factor	1.06		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 (coking coal – missing part)	189 431.512 (2013) 297 217.077 (2014) 93 122.170 (2015)	TJ	ERT calculation
Adjusted conservative estimate for 1.A fuel combustion (coking coal) – CO_2, CH_4 and N_2O	18 052.255 (2013) 28 323.896 (2014) 8 874.263 (2015)	kt CO_2 eq	ERT calculation
Total aggregated GHG emissions (excluding LULUCF and including indirect CO_2 emissions) as reported by Kazakhstan	309 096.382 (2013) 314 754.894 (2014) 298 069.639 (2015)	kt CO_2 eq	CRF table Summary 2
Total aggregated GHG emissions (excluding LULUCF and including indirect CO_2 emissions) after application of adjustment	327 148.636 (2013) 343 078.790 (2014) 306 943.903 (2015)	kt CO_2 eq	ERT calculation
Difference between original and adjusted total aggregated GHG emissions	18 052.255 (2013) 28 323.896 (2014) 8 874.263 (2015)	kt CO_2 eq	ERT calculation
	5.840 (2013) 8.999 (2014) 2.977 (2015)	%	ERT calculation
The ERT estimates that the change resulting from the adjustment is above the threshold given in decision 24/CP.19, annex, paragraph 37(b)	Yes	Adjusted value for the category is greater than 500 kt CO_2 eq and 0.05 per cent of national emissions	ERT calculation

[a] The notation key "NE" is used in this table to show the missing AD and CO_2, CH_4 and N_2O emissions corresponding to the amount of coking coal used in stationary combustion not reported under category 1.A fuel

combustion for 2013–2015. AD and CO_2, CH_4 and N_2O emissions from coking coal use are not reported explicitly in the CRF tables for the sectoral approach owing to the aggregated reporting structure by types of fuels.

Table 18
Background information to support adjustments for 1.B.1.a.i coal mining and handling – underground mines, post-mining activities – CH_4 for Kazakhstan

Element	*Description*
Underlying problem and rationale for adjustment	Kazakhstan reported in its original submission, CH_4 emission estimates from post-mining activities in underground mines using EFs of 0.65 kg/t, 0.65 kg/t and 0.67 kg/t CH_4 for 2013, 2014 and 2015, respectively. No background information was provided in the NIR on the source, method of calculation or justification for the use of country-specific CH_4 EFs. The ERT noted that the CH_4 EFs used by Kazakhstan are substantially lower than the default value of 1.675 kg/t CH_4 (range of 0.603–2.68 kg/t) provided in the 2006 IPCC Guidelines. The ERT concluded that the use of low CH_4 EFs led to a potential underestimation of CH_4 emissions from post-mining activities in subcategory 1.B.1.a.i. underground mines for 2013, 2014 and 2015. In its revised CH_4 estimates for this subcategory, Kazakhstan used the lowest CH_4 EF value of 0.41 kg/t in 1990, and the highest value of 0.67 kg/t for the period 2011–2015. No justifications of the method used or justification of the use of low country-specific CH_4 EFs for post-mining activities in underground mines were provided. The ERT concluded that CH_4 emissions from post-mining activities in subcategory 1.B.1.a.i. underground mines for 2013–2015 were underestimated.
Recommendation to Kazakhstan to address the underlying problem, as contained in the list of potential problems and further questions raised by the ERT	Provide reliable background information on the use of country-specific CH_4 EFs or, if this is not possible, provide revised CH_4 emission estimates for post-mining activities under 1.B.1.a.i. underground mines using the default CH_4 EF from the 2006 IPCC Guidelines (vol. 2, chapter 4, "Fugitive emissions", p.4.12) for 2013, 2014 and 2015.
Assumptions, data and methodology used to calculate the adjustment	CH_4 emissions from 1.B.1.a.i coal mining and handling – underground mines, post-mining activities were estimated using: (a) Tier 1 method with equation 4.1.4 from the 2006 IPCC Guidelines (vol. 2, chapter 4) and a CH_4 EF of 1.675 kg/t from the 2006 IPCC Guidelines (vol. 2, p.4.12); (b) AD on underground coal production from the revised CRF tables submitted by Kazakhstan.
Description of how the adjustment is conservative	In line with decision 20/CMP.11, conservativeness was ensured by applying the conservativeness factor of 1.37 for CH_4 EFs (fugitive emissions from fuels, solid fuels) 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 19
Description of the calculation of adjustments for source categories included in Annex A to the Kyoto Protocol for Kazakhstan

Parameter/estimate	*Value or assessment*	*Unit*	*Reference*
Category: 1.B.1.a.i underground mines – post-mining activities – CH_4			
Party's estimate of: CH_4 EF	0.671 (2013) 0.671 (2014) 0.670 (2015)	kg/t	CRF table 1.B.1
Party's emission estimate from 1.B.1.a.i underground mines – post-mining activities	197.284 (2013) 187.856 (2014) 180.900 (2015)	kt CO_2 eq	ERT calculation
Input data/parameter for calculation of adjustment			
Calculated estimate for EF for underground mines – post-mining activities – CH_4	1.675	kg/t	2006 IPCC Guidelines, volume 2, chapter 4, p.4.12
Conservativeness factor	1.37		Table 2 in appendix III to the annex to decision 20/CMP.1 in conjunction with decision 4/CMP.11
Adjusted conservative estimate of CH_4 EF (surface mines, post-mining activities)	2.295	kg/t	ERT calculation
Adjusted conservative estimate for 1.B.1.a.i underground mines – post-mining activities	675.003 (2013) 642.530 (2014) 619.583 (2015)	kt CO_2 eq	ERT calculation
Total aggregated GHG emissions (excluding LULUCF and including indirect CO_2 emissions) as reported by Kazakhstan	309 096.382 (2013) 314 754.894 (2014) 298 069.639 (2015)	kt CO_2 eq	CRF table Summary 2
Total aggregated GHG emissions (excluding LULUCF and including indirect CO_2 emissions) after application of adjustment	309 574.101 (2013) 315 209.568 (2014) 298 508.322 (2015)	kt CO_2 eq	ERT calculation
Difference between original and adjusted total aggregated GHG emissions	477.719 (2013) 454.674 (2014) 438.682 (2015)	kt CO_2 eq	ERT calculation
	0.155 (2013) 0.144 (2014) 0.147 (2015)	%	ERT calculation
The ERT estimates that the change resulting from the adjustment is above the threshold given in decision 24/CP.19, annex, paragraph 37(b)	Yes	Adjusted value for the category is greater than 0.05 per cent of national emissions	ERT calculation

Table 20
Background information to support adjustments for 1.B.1.a.ii coal mining and handling – surface mines, post-mining activities– CH_4 for Kazakhstan

Element	*Description*
Underlying problem and rationale for adjustment	Kazakhstan reported "NO" for emissions from post-mining activities from surface mines in CRF table 1.B.1. The NIR (p.139) indicated that emissions from post-mining activities from surface mines are included under emissions from mining activities, which is not in line with the requirements of the 2006 IPCC Guidelines. The ERT concluded that omitting CH_4

	emissions from subcategory 1.B.1.a.ii surface mines – post-mining activities led to a potential underestimation of emissions for 2013, 2014 and 2015. In its revised CH_4 estimates for this subcategory Kazakhstan used a country-specific EF for CH_4 (0.045 g/t), which is substantially lower than the default CH_4 EF (67 g/t) provided in the 2006 IPCC Guidelines (vol. 2, chapter 4, p.4.19) and it did not provide a justification for the use of such an extremely low EF. The ERT concluded that the CH_4 emissions from subcategory 1.B.1.a.ii surface mines – post-mining activities for 2013, 2014 and 2015 were underestimated.
Recommendation to Kazakhstan to address the underlying problem, as contained in the list of potential problems and further questions raised by the ERT	Provide relevant information on the non-occurrence of these activities in the country in accordance with paragraph 37(b) of the UNFCCC Annex I inventory reporting guidelines or, if this is not possible, use surface coal production data and the default methodology from the 2006 IPCC Guidelines to calculate emissions of CH_4 from post-mining activities in surface mines using default EFs (vol. 2, chapter 4, "Fugitive emissions", p.4.19) for 2013, 2014 and 2015.
Assumptions, data and methodology used to calculate the adjustment	CH_4 emissions from 1.B.1.a.ii coal mining and handling – surface mines, post-mining activities were estimated using: (a) Tier 1 method with equation 4.1.8 from the 2006 IPCC Guidelines (vol. 2, chapter 4) and the CH_4 EF of 67 g/t from the 2006 IPCC Guidelines (vol. 2, p.4.19); (b) AD of surface coal production were from the revised CRF tables submitted by Kazakhstan.
Description of how the adjustment is conservative	In line with decision 20/CMP.11, conservativeness was ensured by applying the conservativeness factor of 1.37 for CH_4 EFs (fugitive emissions from fuels, solid fuels) 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 21
Description of the calculation of adjustments for source categories included in Annex A to the Kyoto Protocol for Kazakhstan

Parameter/estimate	*Value or assessment*	*Unit*	*Reference*
Category: 1.B.1.a.ii surface mines – post-mining activities – CH_4			
Party's estimate of: CH_4 EF	0.045 (2013) 0.045 (2014) 0.045 (2015)	g/t	CRF table 1.B.1
Party's emission estimate from 1.B.1.a.ii surface mines – post-mining activities	0.125 (2013) 0.115 (2014) 0.103 (2015)	kt CO_2 eq	ERT calculation
Input data/parameter for calculation of adjustment			
Calculated estimate for EF for surface mines – post-mining activities – CH_4	67.000	g/t	2006 IPCC Guidelines, volume 2, chapter 4, p.4.19
Conservativeness factor	1.37		Table 2 in appendix III to the annex to decision

Parameter/estimate	*Value or assessment*	*Unit*	*Reference*
			20/CMP.1 in conjunction with decision 4/CMP.11
Adjusted conservative estimate of CH_4 EF for surface mines – post-mining activities – CH_4	91.79	g/t	ERT calculation
Adjusted conservative estimate for 1.B.1.a.ii surface mines – post-mining activities	256.029 (2013) 235.854 (2014) 210.658 (2015)	kt CO_2 eq	ERT calculation
Total aggregated GHG emissions (excluding LULUCF and including indirect CO_2 emissions) as reported by Kazakhstan	309 096.382 (2013) 314 754.894 (2014) 298 069.639 (2015)	kt CO_2 eq	CRF table Summary 2
Total aggregated GHG emissions (excluding LULUCF and including indirect CO_2 emissions) after application of adjustment	309 352.285 (2013) 314 990.633 (2014) 298 280.194 (2015)	kt CO_2 eq	ERT calculation
Difference between original and adjusted total aggregated GHG emissions	255.903 (2013) 235.739 (2014) 210.555 (2015)	kt CO_2 eq	ERT calculation
	0.083 (2013) 0.075 (2014) 0.071 (2015)	%	ERT calculation
The ERT estimates that the change resulting from the adjustment is above the threshold given in decision 24/CP.19, annex, paragraph 37(b)	Yes	Adjusted value for the category is greater than 0.05 per cent of national emissions	ERT calculation

Table 22
Background information to support adjustments for 1.B.2.a.1 oil – exploration – CO_2, CH_4 and N_2O for Kazakhstan

Element	*Description*
Underlying problem and rationale for adjustment	Kazakhstan used "NO" to report emissions from oil exploration in CRF table 1.B.2 of its original submission. The ERT concluded that omitting these emissions led to a potential underestimation of CO_2, CH_4 and N_2O emissions for the subcategory 1.B.2.a.i oil – exploration for 2013, 2014 and 2015. The ERT also noted that if AD (total oil production) are reported in the CRF tables, the corresponding emissions should also be reported. In its revised CRF tables for 1990–2015, Kazakhstan used the notation key "C" (confidential) for emissions from 1.B.2.a.1 oil – exploration. The ERT concluded that the CO_2, CH_4 and N_2O emissions for the subcategory 1.B.2.a.i oil – exploration for 2013, 2014 and 2015 were underestimated.
Recommendation to Kazakhstan to address the underlying problem, as contained in the list of potential problems and further questions raised by the ERT	Use AD on the volume of oil production and the default methodology provided in the 2006 IPCC Guidelines (default EFs are provided in vol. 2, chapter 4, table 4.2.5) to estimate CO_2, CH_4 and N_2O emissions from oil exploration activities for 2013, 2014 and 2015.
Assumptions, data and methodology used to calculate the adjustment	CO_2, CH_4 and N_2O emissions for subcategory 1.B.2.a.1 oil – exploration were estimated using: (a) Tier 1 method with equation 4.2.1 of from the 2006 IPCC Guidelines (vol. 2, chapter 4) and IPCC average default values for CO_2, CH_4 and N_2O EFs for well drilling, well testing and

	well servicing from the 2006 IPCC Guidelines (vol. 2, table 4.2.5); (b) AD for total oil production were taken from the IEA database; (c) Density of crude oil (0.830 t/m^3) provided by Kazakhstan in answer to a request for information for the application of adjustments.
Description of how the adjustment is conservative	In line with decision 20/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 23
Description of the calculation of adjustments for source categories 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 production)	NA (2013) NA (2014) NA (2015)	NA	CRF table 1.B.2
Party's emission estimate from 1.B.2.a.1 oil – exploration	C (2013)[a] C (2014)[a] C (2015)[a]	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) 97 380.723 (2014) 95 731.325 (2015)	1 000 m^3	
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 of AD (oil production)	100 509.325 (2013) 99 328.337 (2014) 97 645.952 (2015)	1 000 m^3	ERT calculation
Adjusted conservative estimate for 1.B.2.a.1 oil – exploration	12 376.817 (2013) 12 231.389 (2014) 12 024.218 (2015)	kt CO_2 eq	ERT calculation
Total aggregated GHG emissions (excluding LULUCF and including indirect CO_2 emissions) as reported by Kazakhstan	309 096.382 (2013) 314 754.894 (2014) 298 069.639 (2015)	kt CO_2 eq	CRF table Summary 2
Total aggregated GHG emissions (excluding LULUCF and including indirect CO_2 emissions) after application of adjustment	321 473.199 (2013) 326 986.283 (2014) 310 093.858 (2015)	kt CO_2 eq	ERT calculation
Difference between original and adjusted total aggregated GHG emissions	12 376.817 (2013) 12 231.389 (2014) 12 024.218 (2015)	kt CO_2 eq	ERT calculation

Parameter/estimate	*Value or assessment*	*Unit*	*Reference*
	4.004 (2013) 3.886 (2014) 4.034 (2015)	%	ERT calculation
The ERT estimates that the change resulting from the adjustment is above the threshold given in decision 24/CP.19, annex, paragraph 37(b)	Yes	Adjusted value for the category is greater than 500 kt CO_2 eq and 0.05 per cent of national emissions	ERT calculation

[a] C = confidential.

Table 24
Background information to support adjustments for 1.B.2.a.2 oil – production – CO_2 and CH_4 for Kazakhstan

Element	*Description*
Underlying problem and rationale for adjustment	Kazakhstan used the notation key "NA" to report CO_2 emission estimates from oil production in CRF table 1.B.2 of its original submission for the entire time series; however, it reported an amount of CO_2 captured for 2014 and 2015. Kazakhstan provided in the CRF tables AD for the subcategory for the period 1990–2015 without indication of units. The ERT concluded that the omission of CO_2 emissions from subcategory 1.B.2.a.2 oil – production may lead to a potential underestimation of emissions for 2013, 2014 and 2015. In its revised CRF tables for 1990–2015, Kazakhstan submitted CO_2 and CH_4 emission estimates, but it did not report the value and units of the default EFs used from the 2006 IPCC Guidelines (the Party reported a CO_2 IEF of 259.02 kg/unit and a CH_4 IEF of 106.32 kg/unit), the type of oil produced and the unit of AD (reported as "D"), which are necessary to assess the correctness of choice of the CO_2 and CH_4 EFs according to the 2006 IPCC Guidelines. The ERT was not able to assess the correctness of the revised CO_2 and CH_4 emission estimates and concluded that the CO_2 and CH_4 emissions for the subcategory 1.B.2.a.i oil – production for 2013, 2014 and 2015 were underestimated.
Recommendation to Kazakhstan to address the underlying problem, as contained in the list of potential problems and further questions raised by the ERT	Use the default CO_2 EF provided in the 2006 IPCC Guidelines (vol. 2, chapter 4, table 4.2.5) to calculate emissions of CO_2 from subcategory 1.B.2.a.2 oil – production for 2013, 2014 and 2015.
Assumptions, data and methodology used to calculate the adjustment	CO_2 and CH_4 emissions for 1.B.2.a.2 oil – production were estimated using: (a) Tier 1 method with equation 4.2.1 from the 2006 IPCC Guidelines (vol. 2, chapter 4); (b) The average CO_2 EF of 0.002 Gg/1 000 m^3 and a CH_4 EF of 0.020 Gg/1 000 m^3 for oil production (default weighted total) from the 2006 IPCC Guidelines (vol. 2, table 4.2.5); (c) AD on total oil production from the IEA database; (d) Density of crude oil (0.830 t/m^3) provided by Kazakhstan in response to a request for information on the application of adjustments.

Description of how the adjustment is conservative	In line with decision 20/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 25
Description of the calculation of adjustments for source categories 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)	84 740.000 (2013) 67 908.000 (2014) 66 520.600 (2015)	D	CRF table 1.B.2
Party's emission estimate from 1.B.2.a.2 oil – production	244.865 (2013) 198.093 (2014) 194.040 (2015)	kt CO_2 eq	ERT calculation
Input data/parameter for calculation of adjustment			
Calculated estimate for AD for oil production	98 538.554 (2013) 97 380.723 (2014) 95 731.325 (2015)	1 000 m^3	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 of AD (oil production)	100 509.325 (2013) 99 328.337 (2014) 97 645.952 (2015)	1 000 m^3	ERT calculation
Adjusted conservative estimate for 1.B.2.a.2 oil – production	49 499.838 (2013) 48 918.213 (2014) 48 089.655 (2015)	kt CO_2 eq	ERT calculation
Total aggregated GHG emissions (excluding LULUCF and including indirect CO_2 emissions) as reported by Kazakhstan	309 096.382 (2013) 314 754.894 (2014) 298 069.639 (2015)	kt CO_2 eq	CRF table Summary 2
Total aggregated GHG emissions (excluding LULUCF and including indirect CO_2 emissions) after application of adjustment	358 351.355 (2013) 363 475.014 (2014) 345 965.254 (2015)	kt CO_2 eq	ERT calculation
Difference between original and adjusted total aggregated GHG emissions	49 254.973 (2013) 48 720.120 (2014) 47 895.615 (2015)	kt CO_2 eq	ERT calculation
	15.935 (2013) 15.479 (2014) 16.069 (2015)	%	ERT calculation
The ERT estimates that the change resulting from the adjustment is above the threshold given in decision 24/CP.19, annex, paragraph 37(b)	Yes	Adjusted value for the category is greater than 500 kt CO_2 eq and 0.05 per cent of national emissions	ERT calculation

Table 26
Background information to support adjustments for 1.B.2.b.2 natural gas – production – CO_2 and CH_4 for Kazakhstan

Element	*Description*
Underlying problem and rationale for adjustment	Kazakhstan used a CH_4 EF (2.90 kg/unit) to calculate emissions from the subcategory 1.B.2.b.2 natural gas – production for the period 2013–2015, which is substantially lower than the EF of 2,100 kg/unit used for the period 1990–2012. Kazakhstan reported in its NIR that it used a default CH_4 EF (2.9 t/million m^3 or 2.9 kg/thousand m^3) from the IPCC good practice guidance to calculate CH_4 emissions from this subcategory. Kazakhstan did not provide an explanation of the change in the EF values after 2012, or an explanation on the source of the EF of 2.90 kg/unit. The ERT concluded that the use of a low CH_4 EF (2.90 kg/unit) led to a potential underestimation of CH_4 emissions from subcategory 1.B.2.b.2 natural gas – production for 2013, 2014 and 2015. In its revised CRF tables for 1990–2015, Kazakhstan submitted CH_4 emission estimates for this subcategory using a CH_4 EF varying from 2,100 to 2,099.75 kg/unit for the period 2013–2015 and reporting a notation key "D" to describe units of AD in CRF tables, which are necessary to assess the correctness of choice of the CH_4 EFs according to the 2006 IPCC Guidelines. The ERT was not able to assess the correctness of the revised CH_4 (and CO_2) emission estimates because no justification for the use of country-specific EFs was provided and no information on units of AD was available, which is necessary to assess the correctness of choice of the EFs according to the 2006 IPCC Guidelines and represents an issue regarding the reliability of these AD, and concluded that the CH_4 emissions for the subcategory 1.B.2.b.2 natural gas – production for 2013, 2014 and 2015 were underestimated.
Recommendation to Kazakhstan to address the underlying problem, as contained in the list of potential problems and further questions raised by the ERT	Provide a clear justification for the use of the EF (2.90 kg/unit), indicating the relevant units, for estimating CH_4 emissions from subcategory 1.B.2.b.2 natural gas – production, revise the CH_4 emission estimates for 1990 and 2013–2015, or, if it is impossible to provide a justification for the use of this EF, provide revised CH_4 emission estimates for 1990 and for 2013–2015 using the most appropriate default EF from the 2006 IPCC Guidelines (vol. 2, chapter 4, table 4.2.5).
Assumptions, data and methodology used to calculate the adjustment	CO_2 and CH_4 emissions from 1.B.2.b.2 natural gas – production were estimated using: (a) Tier 1 method with equation 4.2.1 from the 2006 IPCC Guidelines (vol. 2, chapter 4) and the average CO_2 EF of 0.000097 Gg/10^6 m^3 gas production and an average CH_4 EF of 0.012190 Gg/10^6 m^3 gas production from the 2006 IPCC Guidelines (vol. 2, table 4.2.5); (b) AD on natural gas production from the IEA database (GCV basis); (c) GCV conversion factor of 0.038 TJ/1 000 m^3 from IEA data

	(https://www.iea.org/publications/freepublications/publication/statistics_manual.pdf).
Description of how the adjustment is conservative	In line with decision 20/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 did not apply the conservativeness factor of 1.37 for EFs from table 2 of appendix III to the technical guidance on methodologies for adjustments under Article 5, paragraph 2, of the Kyoto Protocol to avoid an overly conservative adjusted estimate. The ERT therefore considers that the resulting adjusted values are conservative.

Table 27
Description of the calculation of adjustments for source categories 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)	41 840.000 (2013) 46 514.000 (2014) 48 705.900 (2015)	D NA NA	CRF table 1.B.2
Party's emission estimate from 1.B.2.b.2 natural gas – production	2 197.269 (2013) 2 442.519 (2014) 2 557.529 (2015)	kt CO_2 eq	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)	10^6 m^3	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 of AD (natural gas production)	38 336.834 (2013) 39 050.351 (2014) 41 655.404 (2015)	10^6 m^3	ERT calculation
Adjusted conservative estimate for 1.B.2.b.2 natural gas – production	11 686.869 (2013) 11 904.382 (2014) 12 698.525 (2015)	kt CO_2 eq	ERT calculation
Total aggregated GHG emissions (excluding LULUCF and including indirect CO_2 emissions) as reported by Kazakhstan	309 096.382 (2013) 314 754.894 (2014) 298 069.639 (2015)	kt CO_2 eq	CRF table Summary 2
Total aggregated GHG emissions (excluding LULUCF and including indirect CO_2 emissions) after application of adjustment	318 585.981 (2013) 324 216.757 (2014) 308 210.635 (2015)	kt CO_2 eq	ERT calculation
Difference between original and adjusted total aggregated GHG emissions	9 489.599 (2013) 9 461.863 (2014)	kt CO_2 eq	ERT calculation

Parameter/estimate	*Value or assessment*	*Unit*	*Reference*
	10 140.996 (2015)		
	3.070 (2013) 3.006 (2014) 3.402 (2015)	%	ERT calculation
The ERT estimates that the change resulting from the adjustment is above the threshold given in decision 24/CP.19, annex, paragraph 37(b)	Yes	Adjusted value for the category is greater than 500 kt CO_2 eq and 0.05 per cent of national emissions	ERT calculation

Table 28

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

Element	*Description*
Underlying problem and rationale for adjustment	Kazakhstan used the notation key "NA" to report CO_2 and CH_4 emission estimates and AD from natural gas processing for the entire time series. The NIR did not include any information on gas processing activities, although Kazakhstan has several gas processing plants. The ERT concluded that omitting emissions from subcategory 1.B.2.b.3 natural gas – processing led to a potential underestimation of emissions of CO_2 and CH_4 for 2013, 2014 and 2015. In its revised CRF tables for 1990–2015, Kazakhstan used the notation key "NA"for the CO_2 and CH_4 emission estimates, AD and IEFs for this subcategory. The ERT concluded that the CO_2 and CH_4 emissions for the subcategory 1.B.2.b.3 natural gas – processing for 2013, 2014 and 2015 were underestimated.
Recommendation to Kazakhstan to address the underlying problem, as contained in the list of potential problems and further questions raised by the ERT	Provide revised emission estimations using the amount of gas feed in gas plants and default CO_2 and CH_4 EFs provided in the 2006 IPCC Guidelines (vol. 2, chapter 4, table 4.2.5) for subcategory 1.B.2.b.3 natural gas – processing for 2013, 2014 and 2015.
Assumptions, data and methodology used to calculate the adjustment	CO_2 and CH_4 emissions from 1.B.2.b.3 natural gas – processing were estimated using: (a) Tier 1 method with equation 4.2.1 of the 2006 IPCC Guidelines (vol. 2, chapter 4) and a default weighted total average CO_2 EF of 0.000020 Gg/10^6 m^3 gas production, a CH_4 EF of 0.000250 Gg/10^6 m^3 gas production and a CO_2 EF of 0.067500 Gg/10^6 m^3 gas production (raw CO_2 venting) from the 2006 IPCC Guidelines (vol. 2, table 4.2.5); (b) AD on natural gas production from the IEA database (GCV basis); (c) GCV conversion factor of 0.038 TJ/1,000 m^3 from IEA data (https://www.iea.org/publications/freepublications/publication/statistics_manual.pdf).
Description of how the adjustment is conservative	In line with decision 20/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 29
Description of the calculation of adjustments for source categories 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 (raw natural gas feed)	NA (2013) NA (2014) NA (2015)	NA	CRF table 1.B.2
Party's emission estimate from 1.B.2.b.3 natural gas – processing	NA (2013) NA (2014) NA (2015)	kt CO_2 eq	CRF table 1.B.2
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)	10^6 m^3	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 of AD (natural gas production)	38 336.834 (2013) 39 050.351 (2014) 41 655.404 (2015)	10^6 m^3	ERT calculation
Adjusted conservative estimate for 1.B.2.b.3 natural gas – processing	2 828.108 (2013) 2 880.744 (2014) 3 072.919 (2015)	kt CO_2 eq	ERT calculation
Total aggregated GHG emissions (excluding LULUCF and including indirect CO_2 emissions) as reported by Kazakhstan	309 096.382 (2013) 314 754.894 (2014) 298 069.639 (2015)	kt CO_2 eq	CRF table Summary 2
Total aggregated GHG emissions (excluding LULUCF and including indirect CO_2 emissions) after application of adjustment	311 924.490 (2013) 317 635.639 (2014) 301 142.559 (2015)	kt CO_2 eq	ERT calculation
Difference between original and adjusted total aggregated GHG emissions	2 828.108 (2013) 2 880.744 (2014) 3 072.919 (2015)	kt CO_2 eq	ERT calculation
	0.915 (2013) 0.915 (2014) 1.031 (2015)	%	ERT calculation
The ERT estimates that the change resulting from the adjustment is above the threshold given in decision 24/CP.19, annex, paragraph 37(b)	Yes	Adjusted value for the category is greater than 500 kt CO_2 eq and 0.05 per cent of national emissions	ERT calculation

Table 30
Background information to support adjustments for 1.B.2.b.4 natural gas – transmission and storage – CO_2 and CH_4 for Kazakhstan

Element	*Description*
Underlying problem and rationale for adjustment	Kazakhstan used a CH_4 EF (0.88 kg/unit) to calculate emissions from subcategory 1.B.2.b.4 natural gas – transmission and storage for 2014, which is substantially lower than the range used for the remaining years of the time series (383.02–588.42 kg/units). In 2015, the CH_4 EF used was 552.76 kg/unit. Kazakhstan did not provide a justification for the use of this lower EF in 2014. Kazakhstan did not provide CO_2 emission estimates from 1.B.2.b.4 natural gas – transmission and storage for the period 1990–2013 and reported CO_2 emission estimates with a very low value (0.0004 kt) for 2014 and 2015 and a CO_2 IEF of 0.0046 kg/unit and 0.0045 kg/unit, respectively. Kazakhstan used the notation key "NA" to report units of AD for 1.B.2.b.4 natural gas – transmission and storage. The ERT concluded that the use of a very low CH_4 EF led to a potential underestimation of CH_4 emissions from subcategory 1.B.2.b.4 natural gas – transmission and storage for 2014. The ERT also concluded that omitting CO_2 emissions from subcategory 1.B.2.b.4 natural gas – transmission and storage led to a potential underestimation of CO_2 emissions from the category for 2013. In its revised CRF tables for 1990–2015, Kazakhstan submitted CO_2 and CH_4 emission estimates for this subcategory using a CO_2 EF of 0.00144 kg/unit and a CH_4 EF of 0.04150 kg/unit. The notation key "NA" was used to describe units of AD and no background information was provided. The ERT was not able to assess the correctness of the revised CO_2 and CH_4 emission estimates, because information on units of AD was missing and no justification for the use of country-specific EFs was provided, and concluded that the CO_2 and CH_4 emissions for the subcategory 1.B.2.b.4 natural gas – transmission and storage for 2013, 2014 and 2015 were underestimated.
Recommendation to Kazakhstan to address the underlying problem, as contained in the list of potential problems and further questions raised by the ERT	Provide revised CH_4 emission estimates for 2014, ensuring a consistent time series, and the missing CO_2 emission estimates for 2013 from subcategory 1.B.2.b.4 natural gas – transmission and storage, using the default EFs provided in the 2006 IPCC Guidelines (vol. 2, chapter 4, table 4.2.5).
Assumptions, data and methodology used to calculate the adjustment	CO_2 and CH_4 emissions for 1.B.2.b.4 natural gas – transmission and storage were estimated using: (a) Tier 1 method with equation 4.2.1 from the 2006 IPCC Guidelines (vol. 2, chapter 4) and the average values for transmission and storage of a CO_2 EF of 0.000001625 $Gg/10^6$ m^3 marketable gas and a CH_4 EF of 0.0006745 $Gg/10^6$ m^3 marketable gas from the 2006 IPCC Guidelines (vol. 2, table 4.2.5); (b) AD on natural gas production from the IEA database (GCV basis) assumed as marketable gas;

Element	*Description*
	(c) GCV conversion factor of 0.038 TJ/1,000 m^3 from IEA data (https://www.iea.org/publications/freepublications/publication/statistics_manual.pdf).
Description of how the adjustment is conservative	In line with decision 20/CMP.11, conservativeness was ensured by applying the conservativeness factor of 1.02 for AD (fugitive emissions for 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 31
Description of the calculation of adjustments for source categories included in Annex A to the Kyoto Protocol for Kazakhstan

Parameter/estimate	*Value or assessment*	*Unit*	*Reference*
Category: 1.B.2.b.4 natural gas – transmission and storage – CO_2 and CH_4			
Party's estimate of: AD (marketable natural gas)	89 400.100 (2013) 87 300.000 (2014) 90 600.000 (2015)	NA	CRF table 1.B.2
Party's emission estimate from 1.B.2.b.4 natural gas – transmission and storage	0.093 (2013) 0.091 (2014) 0.094 (2015)	kt CO_2 eq	ERT calculation
Input data/parameter for calculation of adjustment			
Calculated estimate for AD on natural gas production	37 585.132 (2013) 38 284.658 (2014) 40 838.632 (2015)	10^6 m^3	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 of AD (natural gas production)	38 336.834 (2013) 39 050.351 (2014) 41 655.404 (2015)	10^6 m^3	ERT calculation
Adjusted conservative estimate for 1.B.2.b.4 natural gas – transmission and storage	646.517 (2013) 658.550 (2014) 702.482 (2015)	kt CO_2 eq	ERT calculation
Total aggregated GHG emissions (excluding LULUCF and including indirect CO_2 emissions) as reported by Kazakhstan	309 096.382 (2013) 314 754.894 (2014) 298 069.639 (2015)	kt CO_2 eq	CRF table Summary 2
Total aggregated GHG emissions (excluding LULUCF and including indirect CO_2 emissions) after application of adjustment	309 742.806 (2013) 315 413.354 (2014) 298 772.027 (2015)	kt CO_2 eq	ERT calculation
Difference between original and adjusted total aggregated GHG emissions	646.424 (2013) 658.459 (2014) 702.388 (2015)	kt CO_2 eq	ERT calculation

Parameter/estimate	*Value or assessment*	*Unit*	*Reference*
	0.209 (2013) 0.209 (2014) 0.236 (2015)	%	ERT calculation
The ERT estimates that the change resulting from the adjustment is above the threshold given in decision 24/CP.19, annex, paragraph 37(b)	Yes	Adjusted value for the category is greater than 500 kt CO_2 eq and 0.05 per cent of national emissions	ERT calculation

Table 32
Background information to support adjustments for 1.B.2.b.5 natural gas – distribution – CO_2 and CH_4 for Kazakhstan

Element	*Description*
Underlying problem and rationale for adjustment	Kazakhstan reported CO_2 emission estimates from subcategory 1.B.2.b.5 natural gas – distribution as "NA" for the period 1990–2013 and very low values of CO_2 emission estimates for 2014 and 2015 (0.0003 and 0.0004 kt, respectively). Kazakhstan also reported CH_4 emissions with CH_4 IEFs of 18,000.00 kg/unit and 18,000.02 kg/unit for 2014 and 2015, respectively. These CH_4 IEFs were the lowest in the time series. Moreover, "NA" was used to report units of AD for subcategory 1.B.2.b.5 natural gas – distribution. The ERT concluded that omitting CO_2 emissions from subcategory 1.B.2.b.5 natural gas – distribution could lead to an underestimation of CO_2 emissions from the category for 2013. In its revised CRF tables for 1990–2015, Kazakhstan submitted CO_2 and CH_4 emission estimates for this subcategory using a CO_2 EF of 0.95 kg/unit and a CH_4 EF of 18.0 kg/unit. The notation key "D" was used to describe the units of AD in the CRF tables and no background information was provided. The ERT was not able to assess the correctness of the revised CO_2 and CH_4 emission estimates, because information on units of AD was missing and no justification for the use of country-specific EFs was provided, and concluded that the CO_2 and CH_4 emissions for the subcategory 1.B.2.b.4 natural gas – distribution for 2013, 2014 and 2015 were underestimated.
Recommendation to Kazakhstan to address the underlying problem, as contained in the list of potential problems and further questions raised by the ERT	Provide revised estimations using default EFs from the 2006 IPCC Guidelines (vol. 2, chapter 4, table 4.2.5) to calculate emissions of CO_2 from subcategory 1.B.2.b.5 natural gas – distribution for 2013.
Assumptions, data and methodology used to calculate the adjustment	CO_2 and CH_4 emissions from subcategory 1.B.2.b.5 natural gas – distribution were estimated using: (a) Tier 1 method with equation 4.2.1 from the 2006 IPCC Guidelines (vol. 2, chapter 4) and an average CO_2 EF of 0.0000955 $Gg/10^6$ m^3 utility sales and a CH_4 EF of 0.0018 $Gg/10^6$ m^3 utility sales from the 2006 IPCC Guidelines (vol. 2, table 4.2.5); (b) AD on natural gas domestic supply for Kazakhstan from the IEA database (GCV basis) assumed as utility sales of natural gas;

Element	*Description*
	(c) GCV conversion factor of 0.038 TJ/1,000 m^3 from IEA data (https://www.iea.org/publications/freepublications/publication/statistics_manual.pdf).
Description of how the adjustment is conservative	In line with decision 20/CMP.11, conservativeness was ensured by applying the conservativeness factor of 1.02 for AD (fugitive emissions for 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 33
Description of the calculation of adjustments for source categories included in Annex A to the Kyoto Protocol for Kazakhstan

Parameter/estimate	*Value or assessment*	*Unit*	*Reference*
Category: 1.B.2.b.5 natural gas – distribution – CO_2 and CH_4			
Party's estimate of: AD (gas utility sales)	9 619.950 (2013) 12 300.000 (2014) 11 131.600 (2015)	D	CRF table 1.B.2
Party's emission estimate from 1.B.2.b.5 natural gas – distribution	4.338 (2013) 5.547 (2014) 5.020 (2015)	kt CO_2 eq	ERT calculation
Input data/parameter for calculation of adjustment			
Calculated estimate for AD on natural gas utility sales	31 112.947 (2013) 31 779.632 (2014) 33 614.184 (2015)	10^6 m^3	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 of AD (natural gas utility sales)	31 735.206 (2013) 32 415.224 (2014) 34 286.468 (2015)	10^6 m^3	ERT calculation
Adjusted conservative estimate for 1.B.2.b.5 natural gas – distribution	1 431.115 (2013) 1 461.781 (2014) 1 546.165 (2015)	kt CO_2 eq	ERT calculation
Total aggregated GHG emissions (excluding LULUCF and including indirect CO_2 emissions) as reported by Kazakhstan	309 096.382 (2013) 314 754.894 (2014) 298 069.639 (2015)	kt CO_2 eq	CRF table Summary 2
Total aggregated GHG emissions (excluding LULUCF and including indirect CO_2 emissions) after application of adjustment	310 523.158 (2013) 316 211.128 (2014) 299 610.785 (2015)	kt CO_2 eq	ERT calculation
Difference between original and adjusted total aggregated GHG emissions	1 426.777 (2013) 1 456.234 (2014) 1 541.146 (2015)	kt CO_2 eq	ERT calculation
	0.462 (2013) 0.463 (2014)	%	ERT calculation

Parameter/estimate	*Value or assessment*	*Unit*	*Reference*
	0.517 (2015)		
The ERT estimates that the change resulting from the adjustment is above the threshold given in decision 24/CP.19, annex, paragraph 37(b)	Yes	Adjusted value for the category is greater than 500 kt CO_2 eq and 0.05 per cent of national emissions	ERT calculation

Table 34
Background information to support adjustments for 1.B.2.c venting and flaring – flaring – CO_2 and N_2O for Kazakhstan

Element	*Description*
Underlying problem and rationale for adjustment	Kazakhstan used the notation key "NA" to report CO_2 emission estimates (as well as N_2O emissions) and AD from oil, gas and combined flaring for the entire time series, but reported CH_4 emissions for flaring of natural gas for the entire time series. The NIR did not provide information on flaring activities in the country. Based on the fact that oil and gas production activities occur in the country, and emissions of CH_4 from flaring are reported, the ERT concluded that the CO_2 (and N_2O) emissions from the subcategory exist but are omitted from the CRF tables, which led to a potential underestimation of CO_2 (and N_2O) emissions from flaring under the subcategory 1.B.2.c venting and flaring for 2013, 2014 and 2015. In its revised CRF tables for 1990–2015, Kazakhstan submitted CO_2 emission estimates for flaring using the notation key "NA", while the CH_4 emissions associated with flaring – gas were reported. The notation key "NA" was used for the CO_2 and CH_4 IEFs in the CRF tables and for subcategory1.B.2.c.ii – flaring – gas, the cells which should contain a value, a description and information on units of AD were left blank. Blank cells were also reported for flaring of oil and combined subcategories. Therefore, the ERT concluded that the CO_2 and N_2O emissions from flaring under the subcategory 1.B.2.c venting and flaring for 2013, 2014 and 2015 were underestimated.
Recommendation to Kazakhstan to address the underlying problem, as contained in the list of potential problems and further questions raised by the ERT	Provide revised estimations for CO_2 (and N_2O) emissions from flaring under subcategory 1.B.2.c venting and flaring using default EFs provided in the 2006 IPCC Guidelines (vol. 2, chapter 4, table 4.2.5) for 2013, 2014 and 2015.
Assumptions, data and methodology used to calculate the adjustment	CO_2 emissions from 1.B.2.c venting and flaring – flaring were estimated using: (a) Tier 1 method with equation 4.2.1 from the 2006 IPCC Guidelines (vol. 2, chapter 4); (b) Average values of CO_2 and N_2O EFs for flaring in gas production, gas processing (default weighted total) and oil production (default weighted total) from the 2006 IPCC Guidelines (vol. 2, table 4.2.5);

	(c) AD on natural gas production from the IEA database (GCV basis) with a GCV conversion factor of 0.038 TJ/1,000 m^3 from IEA data;
	(d) AD on total oil production from the IEA database with density of crude oil (0.830 t/m^3) provided by Kazakhstan in response to a request for information on the application of adjustments.
Description of how the adjustment is conservative	In line with decision 20/CMP.11, conservativeness was ensured by applying the conservativeness factor of 1.02 for AD (fugitive emissions for 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 35
Description of the calculation of adjustments for source categories 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 – flaring – CO_2 and N_2O			
Party's estimate of: AD (gas production and oil production)	0.000 (2013) 0.000 (2014) 0.000 (2015)		CRF table 1.B.2
Party's emission estimate from 1.B.2.c venting and flaring – flaring	NA (2013) NA (2014) NA (2015)	kt CO_2 eq	CRF table 1.B.2
Input data/parameter for calculation of adjustment			
Calculated estimate for AD on natural gas production	37 585.132 (2013) 38 284.658 (2014) 40 838.632 (2015)	10^6 m^3	ERT calculation
Calculated estimate for AD on oil production	98 538.554 (2013) 97 380.723 (2014) 95 731.325 (2015)	1 000 m^3	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 of AD (natural gas production)	38 336.834 (2013) 39 050.351 (2014) 41 655.404 (2015)	10^6 m^3	ERT calculation
Adjusted conservative estimate of AD (oil production)	100 509.325 (2013) 99 328.337 (2014) 97 645.952 (2015)	1 000 m^3	ERT calculation
Adjusted conservative estimate for 1.B.2.c venting and flaring – flaring	4 280.295 (2013) 4 235.786 (2014) 4 180.273 (2015)	kt CO_2 eq	ERT calculation
Total aggregated GHG emissions (excluding LULUCF and including indirect CO_2 emissions) as reported by Kazakhstan	309 096.382 (2013) 314 754.894 (2014) 298 069.639 (2015)	kt CO_2 eq	CRF table Summary 2

Parameter/estimate	*Value or assessment*	*Unit*	*Reference*
Total aggregated GHG emissions (excluding LULUCF and including indirect CO_2 emissions) after application of adjustment	313 376.677 (2013) 318 990.680 (2014) 302 249.912 (2015)	kt CO_2 eq	ERT calculation
Difference between original and adjusted total aggregated GHG emissions	4 280.295 (2013) 4 235.786 (2014) 4 180.273 (2015)	kt CO_2 eq	ERT calculation
	1.385 (2013) 1.346 (2014) 1.402 (2015)	%	ERT calculation
The ERT estimates that the change resulting from the adjustment is above the threshold given in decision 24/CP.19, annex, paragraph 37(b)	Yes	Adjusted value for the category is greater than 500 kt CO_2 eq and 0.05 per cent of national emissions	ERT calculation

Table 36
Background information to support adjustments for 2.F.1 refrigeration and air conditioning – HFCs for Kazakhstan

Element	*Description*
Underlying problem and rationale for adjustment	HFC emissions from subcategory 2.F.1 refrigeration and air conditioning are reported from disposal activities only, while HFC emissions from manufacturing, stocks and recovery are reported as "NO". HFC emissions from commercial refrigeration and transport refrigeration are reported in the CRF tables, but HFC emissions from other activities such as domestic refrigeration, industrial refrigeration, mobile air conditioning and stationary air conditioning are reported as "NO". Kazakhstan clarified that HFC emission estimates were based on the data of HFCs consumed for charging all types of equipment and AD were obtained from the suppliers of refrigeration equipment and agents. Moreover, emissions from mobile sources (cars) were reported under the transport refrigeration subcategory. Therefore, the allocation of some HFC emissions is not in line with the 2006 IPCC Guidelines and the UNFCCC Annex I inventory reporting guidelines. The ERT concluded that the estimation of HFC emissions is not complete, because only HFC emissions from charging of refrigeration and air-conditioning equipment were estimated and emissions from equipment in operation and disposal were not covered by the inventory, thus HFC emissions from this category could be underestimated for 2013–2015. In response to the list of potential problems and further questions raised by the ERT, Kazakhstan provided revised emission estimates of HFCs from 2.F.1 refrigeration and air conditioning for the period 1995–2015. However, Kazakhstan did not provide in its response an explanation on the AD and methods applied, estimation spreadsheets or background information. Therefore, the ERT was not able to assess whether this revision was correctly conducted. The submitted revised CRF tables did not contain the

Element	*Description*
	revised emission estimates from 2.F.1 refrigeration and air conditioning indicated in the response. Thus, the ERT concluded that HFC emissions from 2.F.1 refrigeration and air conditioning for 2013–2015 were underestimated.
Recommendation to Kazakhstan to address the underlying problem, as contained in the list of potential problems and further questions raised by the ERT	Collect relevant AD and estimate HFC emissions from 2.F.1 refrigeration and air conditioning for 2013–2015 by applying the corresponding method from the 2006 IPCC Guidelines; however, if that is not possible, estimate HFC emissions from this subcategory using the techniques on data gathering presented in the 2006 IPCC Guidelines (vol. 1, chapter 2) using data from GHG inventories of Parties with similar circumstances and apply the corresponding method from the 2006 IPCC Guidelines.
Assumptions, data and methodology used to calculate the adjustment	The method used to calculate the adjusted emission estimates involved taking the weighted average emissions rate from a cluster of countries (Russian Federation and Ukraine) with the population of these countries as a driver. Data on population and GDP for 2014 (purchasing power parity, constant 2011 international United States dollars) in Kazakhstan and cluster countries were taken from the World Bank (https://data.worldbank.org/). The HFC emissions from 2.F.1 refrigeration and air conditioning for 2014 for the Russian Federation and Ukraine were taken from CRF table 2(I) of the 2016 annual submission. The weighted average emission rate was calculated with reference to the GDP per capita of these countries. The weighted average rate of HFC emissions from 2.F.1 refrigeration and air conditioning for the cluster of countries amounted to 0.0563 t CO_2 eq/person. This value was multiplied by the population data in Kazakhstan in corresponding years (2013–2015) to calculate the adjusted 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.1, conservativeness was ensured by applying the conservativeness factor of 1.21 for emission estimates (2.F product uses as substitutes for ODS) 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 37
Description of the calculation of adjustments for source categories included in Annex A to the Kyoto Protocol for Kazakhstan

Parameter/estimate	*Value or assessment*	*Unit*	*Reference*
Category: 2.F.1 refrigeration and air conditioning – HFCs			
Party's estimate of: HFC emissions	998.630 (2013) 929.618 (2014) 938.274 (2015)	kt CO_2 eq	CRF table 2(I)
Party's emission estimate from 2.F.1 refrigeration and air conditioning	998.630 (2013) 929.618 (2014) 938.274 (2015)	kt CO_2 eq	CRF, table 2(I)
Input data/parameter for calculation of adjustment			
Calculated estimate for HFC emissions from 2.F.1 refrigeration and air conditioning	959.372 (2013) 973.674 (2014) 988.029 (2015)	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	1 160.840 (2013) 1 178.145 (2014) 1 195.515 (2015)	kt CO_2 eq	ERT calculation
Adjusted conservative estimate for 2.F.1 refrigeration and air conditioning	1 160.840 (2013) 1 178.145 (2014) 1 195.515 (2015)	kt CO_2 eq	ERT calculation
Total aggregated GHG emissions (excluding LULUCF and including indirect CO_2 emissions) as reported by Kazakhstan	309 096.382 (2013) 314 754.894 (2014) 298 069.639 (2015)	kt CO_2 eq	CRF table Summary 2
Total aggregated GHG emissions (excluding LULUCF and including indirect CO_2 emissions) after application of adjustment	309 258.592 (2013) 315 003.421 (2014) 298 326.880 (2015)	kt CO_2 eq	ERT calculation
Difference between original and adjusted total aggregated GHG emissions	162.211 (2013) 248.527 (2014) 257.240 (2015)	kt CO_2 eq	ERT calculation
	0.052 (2013) 0.079 (2014) 0.086 (2015)	%	ERT calculation
The ERT estimates that the change resulting from the adjustment is above the threshold given in decision 24/CP.19, annex, paragraph 37(b)	Yes	Adjusted value for the category is greater than 0.05 per cent of national emissions	ERT calculation

Table 38
Background information to support adjustments for 3.D.a.5 mineralization/immobilization associated with loss/gain of soil organic matter and 3.D.b indirect N_2O emissions from managed soils – N_2O for Kazakhstan

Element	*Description*
Underlying problem and rationale for adjustment	The AD reported in CRF table 3.D for N mineralization of 624,000,000 kg N for 2015 are not consistent with losses of soil carbon of cropland reported in CRF table 4.B (14,951.20 kt C), if a country-specific C:N ratio is used (C:N equals 10:1, as provided to

Element	*Description*
	the ERT during the review). The latter value may result in significantly higher N_2O emissions from N mineralization and related indirect N_2O emissions. This issue is relevant for 2013 and 2014 as well and led to a potential underestimation of direct and indirect N_2O emissions from agricultural soils for the latest inventory years (2013, 2014 and 2015). In response to the list of potential problems and further questions raised by the ERT, Kazakhstan did not revise its estimates of direct and indirect N_2O emissions from agricultural soils (3.D.a.5 mineralization/immobilization associated with loss/gain of soil organic matter and 3.D.b indirect N_2O emissions from managed soils) nor did it submit revised data on CSCs in mineral soils of cropland in CRF table 4.B. Kazakhstan explained that the AD used for 3.D.a.5 mineralization/immobilization associated with loss/gain of soil organic matter (624,000,000 kg N for 2015) only include N mineralized on cropland remaining cropland, while data in CRF table 4.B include estimations for converted land categories, as well. The ERT noted that in accordance with the 2006 IPCC Guidelines the amount of N mineralized includes loss in soil organic matter in mineral soils through both land-use change and management practices. Thus, the ERT concluded that N_2O emissions from 3.D.a.5 mineralization/ immobilization associated with loss/gain of soil organic matter and 3.D.b indirect N_2O emissions from managed soils for 2013–2015 were underestimated.
Recommendation to Kazakhstan to address the underlying problem, as contained in the list of potential problems and further questions raised by the ERT	Revise the estimates for this subcategory and relevant indirect N_2O emissions from leaching and run-off for the relevant years of the time series, in particular 2013, 2014 and 2015, in consistency with estimates of carbon mineralized on cropland reported in the LULUCF sector.
Assumptions, data and methodology used to calculate the adjustment	Direct N_2O emissions from mineralization/immobilization associated with loss/gain of soil organic matter were estimated using: (a) Tier 1 method with equations 11.1 and 11.8 from the 2006 IPCC Guidelines (vol. 4, chapter 1) with a C:N ratio equal to 10 (as provided to the ERT by Kazakhstan during the review) and a default EF1 (0.01 kg N_2O–N/kg N) from the 2006 IPCC Guidelines (vol. 4, chapter 11, table 11.1); (b) AD as reported by Kazakhstan in CRF table 4.B: 12,485.00 kt C (2013); 13,718.00 kt C (2014) and 14,951.20 kt C (2015). Indirect N_2O emission from agricultural soils from mineralization/immobilization associated with loss/gain of soil organic matter were estimated using: (a) Tier 1 method with equation 11.10 from the 2006 IPCC Guidelines (vol. 4, chapter 11) in relation to F_{SOM} only; (b) Country-specific $Frac_{LEACH-(H)}$ (10 per cent, as provided in table 5.36 of the NIR) and a default EF5 (0.0075 kg N_2O–N/kg N leaching/run-off) from the 2006 IPCC Guidelines (vol. 4, chapter 11 table 11.3); (c) AD as estimated using equation 11.8 from the 2006 IPCC 2006 Guidelines (vol. 4, chapter 11).
Description of how the adjustment is conservative	In line with paragraph 5 of decision 20/CMP.1, in conjunction with decision 4/CMP.1, conservativeness was ensured by applying the conservativeness factor of 1.21 for AD (3.D agricultural soils) from table 2 of appendix III to the technical guidance on methodologies for adjustments under Article 5, paragraph 2, of the Kyoto Protocol

Element	*Description*
	(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 39
Description of the calculation of adjustments for source categories included in Annex A to the Kyoto Protocol for Kazakhstan

Parameter/estimate	*Value or assessment*	*Unit*	*Reference*
Categories: 3.D.a.5 mineralization/immobilization associated with loss/gain of soil organic matter and 3.D.b indirect N_2O emissions from managed soils – N_2O			
Party's estimate of: AD (N in mineral soils that is mineralized in association with loss of soil carbon)	594 000 000 (2013) 609 000 000 (2014) 624 000 000 (2015)	kg N/year	CRF table 3.D
Party's emission estimate from 3.D.a.5 mineralization/immobilization associated with loss/gain of soil organic matter	2 780.340 (2013) 2 848.880 (2014) 2 920.400 (2015)	kt CO_2 eq	ERT calculation
Party's emission estimate from 3.D.b indirect N_2O emissions from managed soils (from F_{SOM})	208.621 (2013) 213.890 (2014) 219.158 (2015)	kt CO_2 eq	ERT calculation
Input data/parameter for calculation of adjustment			
Calculated estimate for losses in carbon stocks on mineral soils of cropland	12 485.000 (2013) 13 718.000 (2014) 14 951.200 (2015)	kt C	CRF table 4.B
Calculated estimate for N in mineral soils that is mineralized in association with loss of soil carbon	1 248 500 000 (2013) 1 371 800 000 (2014) 1 495 120 000 (2015)	kg N/year	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 N in mineral soils that is mineralized in association with loss of soil carbon	1 510 685 000 (2013) 1 659 878 000 (2014) 1 809 095 200 (2015)	kg N/year	ERT calculation
Adjusted conservative estimate for 3.D.a.5 mineralization/immobilization associated with loss/gain of soil organic matter	7 074.322 (2013) 7 772.972 (2014) 8 471.734 (2015)	kt CO_2 eq	ERT calculation
Adjusted conservative estimate for 3.D.b indirect N_2O emissions from managed soils (from F_{SOM})	530.574 (2013) 582.973 (2014) 635.380 (2015)	kt CO_2 eq	ERT calculation
Total aggregated GHG emissions (excluding LULUCF and including indirect CO_2 emissions) as reported by Kazakhstan	309 096.382 (2013) 314 754.894 (2014) 298 069.639 (2015)	kt CO_2 eq	CRF table Summary 2
Total aggregated GHG emissions (excluding LULUCF and including indirect CO_2 emissions) after application of adjustment	313 712.317 (2013) 320 048.069 (2014) 304 037.196 (2015)	kt CO_2 eq	ERT calculation

Parameter/estimate	*Value or assessment*	*Unit*	*Reference*
Difference between original and adjusted total aggregated GHG emissions	4 615.935 (2013) 5 293.175 (2014) 5 967.557 (2015)	kt CO_2 eq	ERT calculation
	1.493 (2013) 1.682 (2014) 2.002 (2015)	%	ERT calculation
The ERT estimates that the change resulting from the adjustment is above the threshold given in decision 24/CP.19, annex, paragraph 37(b)	Yes	Adjusted value for the category is greater than 500 kt CO_2 eq and 0.05 per cent of national emissions	ERT calculation

Table 40
Background information to support adjustments for 5.A solid waste disposal (industrial waste) – CH_4 for Kazakhstan

Element	*Description*
Underlying problem and rationale for adjustment	Kazakhstan indicated that industrial waste disposal at SWDS is prohibited, but at the same time it indicated that only 26.8 per cent of industrial waste was treated and used in 2016. Emissions from biodegradable industrial waste (coming, for example, from food, wood processing and fishing industries) were not included in the national inventory, and this may lead to a potential underestimation of CH_4 emissions from category 5.A.1 solid waste disposal for 2013, 2014 and 2015. In response to the list of potential problems and further questions raised by the ERT, Kazakhstan provided a short explanation on the regulatory framework and practices of handling industrial waste in Kazakhstan. However, this explanation did not fully clarify or provide verifiable information showing the method of treatment and/or disposal of the industrial waste containing DOC and fossil carbon in the country, particularly the biodegradable portion (e.g. from such industries as food, wood processing and fishing) and whether CH_4 emissions from this industrial waste were estimated and reported in the GHG inventory. Therefore, the ERT concluded that CH_4 emissions from category 5.A.1 solid waste disposal for 2013, 2014 and 2015 were underestimated.
Recommendation to Kazakhstan to address the underlying problem, as contained in the list of potential problems and further questions raised by the ERT	Provide verifiable documentation showing the methods of treatment or disposal for the remaining industrial waste (about 70 per cent) that is not treated and used, particularly the biodegradable portion, and report CH_4 emissions from all biodegradable industrial waste containing DOC and fossil carbon (e.g. from food, wood processing and fishing industries) in accordance with the 2006 IPCC Guidelines.
Assumptions, data and methodology used to calculate the adjustment	CH_4 emissions from industrial waste from category 5.A solid waste disposal were estimated using: (a) Tier 1 method using the IPCC FOD model for 1950–2015 and default parameters provided in the model and

Element	*Description*
	country-specific distribution of SWDS provided by Kazakhstan; (b) AD on collected industrial waste (equivalent to household waste) assumed to be disposed at SWDS for 2012–2015 available at the web page of the Agency of Statistics of the Republic of Kazakhstan (http://www.stat.gov.kz/faces/wcnav_externalId/homeNumbersEnvironment); (c) AD on industrial waste disposed at SWDS for 2004–2011 was calculated using a weighted average ratio (0.14724 t/t) of collected industrial waste assumed to be disposed at SWDS and total collected communal waste for 2012–2015 (total collected communal waste for 2004–2015 available at the web page of the Agency of Statistics of the Republic of Kazakhstan (http://www.stat.gov.kz/faces/wcnav_externalId/homeNumbersEnvironment)); (d) AD on industrial waste disposed at SWDS for 1950–2003 was calculated using an average ratio (0.00154 t/constant 2011 United States dollars) of collected industrial waste assumed to be disposed at SWDS and Kazakhstan's GDP data for 2004–2015, using GDP data as a driver; (e) GDP data for 1990–2015 (purchasing power parity, constant 2011 international United States dollars) in Kazakhstan were taken from the World Bank (https://data.worldbank.org/). GDP data for 1951–1989 were calculated using linear interpolation between the 1990 and 1950 values. The value for 1950 was calculated based on an exponential trend function of the historical data for 1990–2015.
Description of how the adjustment is conservative	In line with paragraph 5 of decision 20/CMP.1, in conjunction with decision 4/CMP.1, conservativeness was ensured by applying the conservativeness factor of 1.37 for CH_4 emission estimates (5.A solid waste disposal) 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 41
Description of the calculation of adjustments for source categories included in Annex A to the Kyoto Protocol for Kazakhstan

Parameter/estimate	*Value or assessment*	*Unit*	*Reference*
Category: 5.A solid waste disposal (industrial waste) – CH_4			
Party's estimate of: AD (amount of industrial waste disposed at SWDS)	NE (2013)[a] NE (2014)[a] NE (2015)[a]	t	NIR
Party's emission estimate from 5.A solid waste disposal (industrial waste)	NE (2013)[a] NE (2014)[a] NE (2015)[a]	kt CO_2 eq	NIR

Parameter/estimate	*Value or assessment*	*Unit*	*Reference*
Input data/parameter for calculation of adjustment			
Calculated estimate for AD for amount of industrial waste disposed at SWDS	492.891 (2013) 472.378 (2014) 465.069 (2015)	kt	Agency of Statistics of the Republic of Kazakhstan
Calculated estimate for CH_4 emissions from 5.A solid waste disposal (industrial waste)	275.563 (2013) 283.111 (2014) 289.495 (2015)	kt CO_2 eq	ERT calculation
Conservativeness factor	1.37		Table 2 in appendix III to the annex to decision 20/CMP.1 in conjunction with decision 4/CMP.11
Adjusted conservative estimate for CH_4 emissions from 5.A solid waste disposal (industrial waste)	377.522 (2013) 387.862 (2014) 396.608 (2015)	kt CO_2 eq	ERT calculation
Total aggregated GHG emissions (excluding LULUCF and including indirect CO_2 emissions) as reported by Kazakhstan	309 096.382 (2013) 314 754.894 (2014) 298 069.639 (2015)	kt CO_2 eq	CRF table Summary 2
Total aggregated GHG emissions (excluding LULUCF and including indirect CO_2 emissions) after application of adjustment	309 473.903 (2013) 315 142.757 (2014) 298 466.247 (2015)	kt CO_2 eq	ERT calculation
Difference between original and adjusted total aggregated GHG emissions	377.522 (2013) 387.862 (2014) 396.608 (2015)	kt CO_2 eq	ERT calculation
	0.122 (2013) 0.123 (2014) 0.133 (2015)	%	ERT calculation
The ERT estimates that the change resulting from the adjustment is above the threshold given in decision 24/CP.19, annex, paragraph 37(b)	Yes	Adjusted value for the category is greater than 0.05 per cent of national emissions	ERT calculation

[a] The notation key "NE" is used in this table to show the missing AD and CH_4 emissions corresponding to the industrial waste disposed at SWDS not reported under category 5.A solid waste disposal for 2013–2015. AD and CH_4 emissions from industrial waste disposed at SWDS are not reported explicitly in CRF tables owing to the aggregated reporting structure by types of SWDS.

Table 42
Background information to support adjustments for 5.C.2 open burning of waste – CO_2, CH_4 and N_2O for Kazakhstan

Element	*Description*
Underlying problem and rationale for adjustment	Kazakhstan reported in CRF table 5.C emissions from open burning of waste as "NO" and "NA". The Party informed the ERT that the practice of open burning of waste is prohibited by the Ecological Code of Kazakhstan. However, only 15.0 per cent of SWDS are authorized for operation and most of the disposal sites in Kazakhstan are not authorized but operating. The ERT considered from discussions during the review that CO_2, CH_4 and N_2O emissions from open burning in unauthorized SWDS may occur owing to 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

Element	*Description*
	emissions from subcategory 5.C.2 open burning of waste for 2013, 2014 and 2015. In response to the list of potential problems and further questions raised by the ERT, Kazakhstan did not provide revised estimates or any additional documentation demonstrating that open burning does not occur in the country, but indicated that "unauthorized burning of garbage in Kazakhstan entails a fine in the amount of five monthly calculated indicators, according to art. 410 of the Code of Administrative Violations of the Republic of Kazakhstan 'Violation or non-compliance with fire safety requirements'.". The ERT concluded that CO_2, CH_4 and N_2O emissions from 5.C.2 open burning of waste for 2013, 2014 and 2015 were underestimated.
Recommendation to Kazakhstan to address the underlying problem, as contained in the list of potential problems and further questions raised by the ERT	Provide additional documentation demonstrating that all waste streams generated by urban and rural populations were included in the GHG emission estimates from the waste sector and that emissions from open burning do not occur. If this is not possible, provide emission estimates from open burning, as recommended in the 2006 IPCC Guidelines (vol. 5, chapter 5.3.2, pp.5.15–5.17), using documented assumptions on the waste treatment practices in rural areas (i.e. open burning of waste).
Assumptions, data and methodology used to calculate the adjustment	CO_2, CH_4 and N_2O emissions from 5.C.2 open burning of waste were estimated using: (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, chapter 5). CO_2 emissions were calculated using default parameters for 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, chapter 2, table 2.4 and vol. 5, chapter 5, table 5.2); CH_4 emissions were calculated using a default EF (6,500 g/t MSW) from the 2006 IPCC Guidelines (vol. 5, chapter 5, p.5.20) and N_2O emissions were calculated using a default EF (0.15 g/kg dry matter) and total dry matter content (0.73) from the 2006 IPCC Guidelines (vol. 5, chapter 5, p.5.22 and vol. 5, chapter 2, table 2.4, respectively); (b) AD (MSW burned) was calculated using the assumption that 15 per cent of the population uncovered with waste collection systems burns wastes and 20 per cent of this population sends waste to open dumps that are burned. A default fraction of 0.6 was considered to be the waste that is burned relative to the total amount of waste disposed at open dumps; (c) The population uncovered with waste collection systems was calculated from the information provided by Kazakhstan in its calculation spreadsheets for 5.A.1 solid waste disposal (1990–2015) and the total population in the country from the web page of the Agency of Statistics of the Republic of Kazakhstan; (d) The annual waste generation rate was provided by Kazakhstan in its calculation spreadsheets for 5.A.1 solid waste disposal (1990–2015).
Description of how the adjustment is conservative	In line with paragraph 5 of decision 20/CMP.1, in conjunction with decision 4/CMP.1, conservativeness was ensured by

Element	*Description*
	applying the conservativeness factor of 1.21 for AD (5.C incineration and open burning of waste) 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 43
Description of the calculation of adjustments for source categories 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 (2013) NO, NA (2014) NO, NA (2015)	kt	CRF table 5.C
Party's emission estimate from 5.C.2 open burning of waste	NO, NA (2013) NO, NA (2014) NO, NA (2015)	kt CO_2 eq	CRF table 5.C
Input data/parameter for calculation of adjustment			
Calculated estimate for AD for amount of open burned waste	763.789 (2013) 753.182 (2014) 767.730 (2015)	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	924.184 (2013) 911.350 (2014) 928.953 (2015)	kt	ERT calculation
Adjusted conservative estimate for 5.C.2 open burning of waste	482.499 (2013) 475.798 (2014) 484.988 (2015)	kt CO_2 eq	ERT calculation
Total aggregated GHG emissions (excluding LULUCF and including indirect CO_2 emissions) as reported by Kazakhstan	309 096.382 (2013) 314 754.894 (2014) 298 069.639 (2015)	kt CO_2 eq	CRF table Summary 2
Total aggregated GHG emissions (excluding LULUCF and including indirect CO_2 emissions) after application of adjustment	309 578.880 (2013) 315 230.692 (2014) 298 554.628 (2015)	kt CO_2 eq	ERT calculation
Difference between original and adjusted total aggregated GHG emissions	482.499 (2013) 475.798 (2014) 484.988 (2015)	kt CO_2 eq	ERT calculation
	0.156 (2013) 0.151 (2014) 0.163 (2015)	%	ERT calculation
The ERT estimates that the change resulting from the adjustment is above the threshold given in decision 24/CP.19, annex, paragraph 37(b)	Yes	Adjusted value for the category is greater than 0.05 per cent of national emissions	ERT calculation

Annex V

Documents and information used during the review

A. Reference documents

Reports of the IPCC

IPCC. 1997. *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*. JL Houghton, LG Meira Filho, B Lim, et al. (eds.). Paris: IPCC/Organisation for Economic Co-operation and Development/International Energy Agency. Available at https://www.ipcc-nggip.iges.or.jp/public/gl/invs1.html.

IPCC. 2000. *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories*. J Penman, D Kruger, I Galbally, et al. (eds.). Hayama, Japan: IPCC/Organisation for Economic Co-operation and Development/International Energy Agency/Institute for Global Environmental Strategies. Available at http://www.ipcc-nggip.iges.or.jp/public/gp/english/.

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

IPCC. 2006. *2006 IPCC Guidelines for National Greenhouse Gas Inventories.* S Eggleston, L Buendia, K Miwa, et al. (eds.). Hayama: 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: 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/.

Annual review reports

Reports on the individual review of the 2013, 2015 and 2016 annual submissions of Kazakhstan, respectively, contained in documents FCCC/ARR/2013/KAZ, FCCC/ARR/2015/KAZ and FCCC/ARR/2016/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 http://unfccc.int/resource/webdocs/agi/2017.pdf.

Annual status report for Kazakhstan for 2017. Available at http://unfccc.int/resource/docs/2017/asr/kaz.pdf.

V Inglezakis, et al.. 2017. Municipal solid waste management in Kazakhstan: Astana and Almaty case studies. *Chemical Engineering Transactions.* Vol. 56. Available at http://www.aidic.it/cet/17/56/095.pdf.

B. Additional information provided by Kazakhstan

Responses to questions during the review were received from Ms. Irina Yesserkepova (JSC Zhasyl Damu), including additional material on the methodology and assumptions used. The following documents[1] were also provided by Kazakhstan:

Main Indices of Industrial Production in Kazakhstan in 2015. 4th Series of Statistics of Industrial Production. Committee of Statistics of Ministry of National Economy of the Republic of Kazakhstan.

Activity data on MSW collection and disposal since 2000. Available at http://www.stat.gov.kz/faces/wcnav_externalId/ecolog-I-33.

National energy balance of Kazakhstan for 2015.

[1] Reproduced as received from Kazakhstan.

Annex VI

Notification from Kazakhstan on its rejection of the proposed adjustments

As required by paragraph 80(e) of the Article 8 review guidelines, table 44 (and its appendix 1) provides information on the notification from Kazakhstan[1] provided to the ERT on its rejection of the proposed adjustment to CO_2, CH_4 and N_2O emissions from 1.A fuel combustion (coking coal), including its rationale, applied to the 2017 annual submission of Kazakhstan.

Table 44
Notification from Kazakhstan on its rejection of the proposed adjustment to 1.A fuel combustion (coking coal) – CO_2, CH_4 and N_2O

Issue ID# /para. number./Table/Annex	*Party's Comment (including justification for change)*	*Party's text proposal*
Таблица 6 Пересчет в секторе 1.A выбросов ПГ от коксующегося угля	1. Table 6 presents the ERT recalculation for coking coal in sector 1.A (?). It is not very clear. In the "Energy" sector, according to the reporting structure, the inventory of GHG emissions is performed for the sector approach 1.AA and the base approach 1.AB. GHG emissions calculations for the baseline approach, according to the IPCC, are performed to control the calculations of MG emissions by the sector approach. Presumably, this recalculation was performed for the sectoral approach 1.AA. ERT believes that the sectoral approach is an underestimation of GHG emissions from coking coal. ERT calculations of GHG emissions for coking coal in the "Energy" sector were as follows: 2013 - 1,80552 thousand tons of CO_2-eq., 2014 - 28,323 thousand tons of CO_2-eq. and 2015 - 8874 thousand tons of CO_2-eq. ERT calculations are questionable, because very strong drop in GHG emissions over the years. The annual difference of GHG emissions is from + 10 to -20 million tons of CO_2-eq. Such jumps in the production of the steel industry of Kazakhstan did not occur over the years, where coking coal is mainly used for the production of iron and steel. 2. ERT also considers that low values of calorific net value and CO_2 emission factor for coking coal are used.	1. All calculations of GHG emissions from coking coal in the "Energy" sector are based on the initial data of the Fuel and Energy Balance (TEB), which is compiled by the national statistics of the Republic of Kazakhstan. Following the recommendations of Kazakhstan to resolve the problem, some inaccuracies in the data provided by the TEB were identified as a result of requests to national statistics. Details of coking coal consumption for 2013–2015 for the baseline and sector approaches are presented in Appendix 1. In the national GHG inventory of 2018, recalculations of GHG emissions from coking coal for 2014–2015 were carried out. The CRF tables in 1.AB for the base approach for 2014–2015 provide calculations for coking coal. In the 1.AA for the sector approach, the amounts of coking coal are included in the solid fuel composition. CRF tables by sector approach provide aggregated data for liquid, solid, and gaseous fuels. 2. According to the recommendations of the ERT in the inventory of GHG 2018, the coefficients for coking coal were used by default, according to the IPCC 2006 (NCV-28.2 TJ / 103 tons, CO_2 - 25.8 tC / TJ). Coking coal in Kazakhstan is mainly used as a raw material for the processing of coke in the iron and steel industry, only a small part

[1] Reproduced as received from Kazakhstan.

Issue ID# /para. number./Table/Annex	*Party's Comment (including justification for change)*	*Party's text proposal*
		is used as fuel. Therefore, there may be a difference between the baseline and sectoral approaches for GHG emissions from coking coal. In the "Energy" sector by sector approach, according to the 2006 IPCC Guidelines, the fuel used as raw materials, including for processing into other types of fuel, is excluded from the calculations. The amount of coking coal used to produce coke is deducted from the calculations.
VI. Application of adjustment , Table 6	ERT made a recalculation of coking coal for category 1.A, which is not very clear to us and therefore we do not agree with it. ERT calculations were as follows: 2013 - 18052, 2014 - 28323 thousand tons and 2015 - 8874 thousand tons. ERT calculations are very doubtful, because due to a strong change in values in 2014 and 2015 All calculations of GHG emissions for coking coal are based on the fuel and energy balance of national statistics of Kazakhstan. According to the ERT comments in the GHG inventory for the years 1990-2016. The coefficients for coking coal were changed and taken by default from the 2006 IPCC Guidelines (NCV-28.2 TJ / 103 tons, CEE CO_2 - 25.8 tC / TJ). For the years 1990-2013, there has been a substitution for coal (in aggregate) and lignite. Separate coking coal data. In this regard, for 2013, the CRF fuel consumption is given for aggregated subbituminous coal. There were no recalculations for 2013. In the last GHG inventory of 1990-2016. In 2014, GHG emissions from coking coal were adjusted in category 1.AB. It is revealed that the national statistics on the production of coking coal in TEB 2014 is presented in aggregated form with other coal. Other coal mining was deducted from coking coal mining. Coking coal consumption by the base approach has decreased, emissions amounted to 21,954 thousand tons. Accordingly, the difference between the basic and sectoral approaches also decreased. Also in the last GHG inventory, an adjustment of GHG emissions for 2015 from coking coal was made due to an adjustment in the production of coking coal. Here, coal mining, among other things, was also deducted. Emissions amounted to 26026 thousand tons. In response to the comments of ERT in February 2018 (Answer_Saturday Paper Kaz2017_all sectors_final) we wrote that the	

Issue ID# /para. number./Table/Annex	*Party's Comment (including justification for change)*	*Party's text proposal*
	reason for the difference between the basic and sectoral approaches is: - coking coal used for the production of coke, which is subtracted from the calculations. According to the IPCC Guidelines, fuel used as a raw material, including for processing into other types of fuel, is excluded from calculations in the "Energy" sector. This amount of coking coal is taken into account in the Industrial Processes sector.	

Appendix 1

Detailed consumption of coking coal for 2013-2014 in the "Energy" sector

2013

For the years 1990-2013, national statistics provided data on the consumption of solid fuels for power coal (in aggregated form) and lignite. Separate coking coal data was not provided. Therefore, coking coal consumption in CRF is represented as "IE". GHG emissions from coking coal are included in the composition of coal (Table 1). Recalculation of coal consumption for 2013 in the inventory of 2018 was not provided.

Table 1 - Consumption of hard coal in the "Energy" sector for 2013
Note. For 2013, the data are given for energy coal in aggregated form (without lignite).

	Original CRF 2017 annual submission, TJ	*Resubmission CRF 2018, TJ*
1.AB Reference approach	1507118.32	1507118.32
1.AD Feedstorks, reductants and other non-energy use of fuels	10020,61	10020,61
Total 1.AB	**1497097,71**	**1497097,71**
1.A Sectoral approach, including:	**1367803,52**	**1367803,52**
1.A.1 Energy Industries	939905,09	939905,09
1.A.2 Manufacturing Industries and Construction	218232,86	218232,86
1.A.2a Iron and Steel	*70815,12*	*70815,12*
1.A.2b Non-Ferrous Metals	*75763,18*	*75763,18*
1.A.2c Chemical	*265,43*	*265,43*
1.A.2d Pulp, Paper and Print	*14,82*	*14,82*
1.A.2e Food Processing, Beverages and Tobacco	*1264,90*	*1264,90*
1.A.2f Non Metallic Minerals	*34051,49*	*34051,49*
1.A.2g Other	*36057,92*	*36057,92*
1.A.4 Other sectors	74995,02	74995,02
1.A.4a Commercial/Institutional	*24082,98*	*24082,98*
1.A.4b Residential	*44141,52*	*44141,52*
1.A.4c Agriculture/Forestry/Fishing	*6770,32*	*6770,32*
1.A.5 Other	134670,55	134670,55

2014 год

From 2014, national statistics began to provide data on coking coal consumption.
The ERT states that in 2014 CRF tables for 2014, Kazakhstan reports the consumption of coking coal as "NA". This is not true. The tables CRF and R & D for 2014 present data on the consumption of coking coal.
In the inventory of 2018, recalculation of coking coal was made. As a result of additional requests to the national statistics, it was revealed that in 2014, in the TEB, the production of coking coal (17,906,452 thousand tons) was provided in aggregate with other coal. In terms of recalculation, the production of coking coal was adjusted by deducting other coal mining. The consumption of coking coal in the base approach 1.AB was significantly reduced. Accordingly, the difference between basic and sectoral approaches has been reduced (Table 2).

Таблица 2 - Потребление коксующегося угля в секторе «Энергетика» за 2014 г.
Table 2 - Consumption of coking coal in the "Energy" sector for 2014

	Original CRF 2017 annual submission, TJ	*Resubmission CRF 2018, TJ*
1.AB Reference approach	386197,73	242093,33
1.AD Feedstorks, reductants and other non-energy use of fuels	8531,40	10020,22
Total 1.AB	**377666,33**	**232073,11**
1.A Sectoral approach, including:	**138934,16**	**162733,92**
1.A.1 Energy Industries	310,30	364,46
1.A.2 Manufacturing Industries and Construction	136511,56	160366,63
1.A.2a Iron and Steel	*134511,61*	*157985,31*
1.A.2b Non-Ferrous Metals	*336,67*	*395,72*
1.A.2c Chemical	-	-
1.A.2d Pulp, Paper and Print	*1,92*	*2,26*
1.A.2e Food Processing, Beverages and Tobacco	*96,06*	*112,83*
1.A.2f Non Metallic Minerals	*8,86*	*10,41*
1.A.2g Other	*1556,44*	*1860,10*
1.A.4 Other sectors	1818,16	1657,35
1.A.4a Commercial/Institutional	*1256,16*	*1475,37*
1.A.4b Residential	*109,70*	*128,85*
1.A.4c Agriculture/Forestry/Fishing	*452,30*	*53,13*
1.A.5 Other	294,14	345,48

2015

In the inventory of 2018 for 2015, the coking coal was recalculated (table 3):
- 1.AB, adjusted production of coking coal according to the TEB 2015;
- 1.A.2a, adjusted the consumption of coking coal according to the TEB 2015
- 1.A.5, corrected other consumption of coking coal.

Table 3 - Coking coal consumption in the “Energy” sector in 2015

	Original CRF 2017 annual submission, TJ	*Resubmission CRF 2018, TJ*
1.AB Reference approach	349696,77	277615,75
1.AD Feedstorks, reductants and other non-energy use of fuels	2127,02	2498,20
Total 1.AB	**347569,75**	**275117,55**
1.A Sectoral approach, including:	**72987,05**	**163702,41**
1.A.1 Energy Industries	351,90	413,31
1.A.2 Manufacturing Industries and Construction	71168,71	146056,05
1.A.2a Iron and Steel	*70686,23*	*145465,44*
1.A.2b Non-Ferrous Metals	*165,21*	*194,04*
1.A.2c Chemical	-	-
1.A.2d Pulp, Paper and Print	-	-
1.A.2e Food Processing, Beverages and Tobacco	*93,39*	*109,69*
1.A.2f Non Metallic Minerals	*3,26*	*3,84*
1.A.2g Other	*220,62*	*283,04*
1.A.4 Other sectors	1117,72	1312,77
1.A.4a Commercial/Institutional	*974,66*	*1144,75*
1.A.4b Residential	*118,29*	*138,93*
1.A.4c Agriculture/Forestry/Fishing	*24,77*	*29,09*
1.A.5 Other	348,72	15510,70

По рекомендации ERT для коксующегося угля в инвентаризации ПГ 2018 г. использованы коэффициенты ПГ по умолчанию из Руководства 2006 г.