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Report on the technical expert review of the first biennial transparency report of Kazakhstan

Addendum

Summary

This addendum to the report on the technical expert review of the first biennial transparency report of Kazakhstan, conducted by a technical expert review team in accordance with the modalities, procedures and guidelines for the transparency framework for action and support referred to in Article 13 of the Paris Agreement, contains the results of the review of the consistency of the information submitted by the Party with those modalities, procedures and guidelines, and presents capacity-building needs identified by the Party and by the technical expert review team in consultation with the Party during the review. The review took place from 31 March to 4 April 2025 in Astana.

Abbreviations and acronyms

2006 IPCC Guidelines	*2006 IPCC Guidelines for National Greenhouse Gas Inventories*
AD	activity data
BTR	biennial transparency report
CO_2 eq	carbon dioxide equivalent
COPERT	software tool for calculating road transport emissions
CRT	common reporting table
CTF	common tabular format
DOC	degradable organic carbon
EF	emission factor
ETF	enhanced transparency framework under the Paris Agreement
GDP	gross domestic product
GHG	greenhouse gas
HFC	hydrofluorocarbon
IE	included elsewhere
IEF	implied emission factor
IPCC	Intergovernmental Panel on Climate Change
IPPU	industrial processes and product use
LULUCF	land use, land-use change and forestry
MPGs	modalities, procedures and guidelines for the transparency framework for action and support referred to in Article 13 of the Paris Agreement
MSW	municipal solid waste
N	nitrogen
N_2O	nitrous oxide
NA	not applicable
NDC	nationally determined contribution
NE	not estimated
Nex	nitrogen excretion
NID	national inventory document
NIR	national inventory report
NO	not occurring
PaMs	policies and measures
QA/QC	quality assurance/quality control
SWDS	solid waste disposal site(s)
TERT	technical expert review team
TIMES-KAZ	The Integrated Market Allocation–Energy Flow Optimization Model System for Kazakhstan
WAM	‘with additional measures’
WM	‘with measures’
WOM	‘without measures’

I. Areas of improvement[1] identified during the technical expert review of the Party's first biennial transparency report

1. Tables 1–14 present the results of the review of the consistency with the MPGs2 of the information submitted by Kazakhstan in its BTR1. All recommendations and encouragements contained in the tables are for the next BTR, unless otherwise specified.

A. General reporting provisions

Table 1
Areas of improvement relating to general reporting provisions

ID#	*Reporting requirement*	*Description of area of improvement with recommendation or encouragement*
		No areas of improvement identified

B. Greenhouse gas emissions and removals

Table 2
Areas of improvement relating to general findings on greenhouse gas emissions and removals

ID#	*Reporting requirement*	*Description of area of improvement with recommendation or encouragement*
2.G.1	Specified in paragraph 18 of the MPGs National inventory arrangements	Kazakhstan reported information on institutional arrangements for its GHG inventory according to the MPGs. The TERT noted that, although the arrangements are described in the NID (sections 1.2 and 1.4), there is no clear relationship and agreed process between some data providers and the inventory compilation agency, for example, regarding national energy balance data for the energy and IPPU sectors (see, e.g., ID#s 3.E.2 in table 3 and 4.I.8 in table 4). This lack of an institutional arrangement is not in line with paragraph 18 of the MPGs, which states that each Party should implement and maintain national inventory arrangements, including institutional, legal and procedural arrangements for the continued estimation, compilation and timely reporting of NIRs in accordance with the MPGs. During the review, the Party acknowledged that strengthening the institutional arrangements relating to its GHG inventory would help to improve data flows through the inventory systems and enable better accuracy, completeness and transparency in reporting. Kazakhstan expressed its willingness to continue developing its institutional arrangements and report on progress in its next NID. The TERT encourages Kazakhstan to strengthen its institutional arrangements between data providers under all sectors and the agency responsible for inventory compilation, with an emphasis on the reporting requirements of the MPGs and associated needs for data provision, in terms of both data format and data content, and to report on progress in its next NID.
2.G.2	Specified in paragraphs 35 and 46 of the MPGs QA/QC procedures	Kazakhstan described its general QC procedures for all sectors in annex 4 to the NID. The TERT noted that the NID does not mention the application of category-specific QC procedures, including for key categories. The TERT also noted that the CRTs for many categories, including key categories, contain inaccuracies and omissions that could be resolved by applying category-specific QC procedures (see, e.g., ID#s 3.E.3 in table 3, 4.I.2 in table 4 and 5.A.4 in table 5). During the review, Kazakhstan provided information on category-specific QC procedures for all sectors. The Party indicated that it will consider, as a valuable addition to its QA/QC plan, conducting additional category-specific QC procedures for CRT inputs and outputs in order to minimize the impacts of human and technical errors on the accuracy, transparency and comparability of

[1] As referred to in paras. 7, 8, 146(d) and 162(d) of the MPGs, contained in the annex to decision 18/CMA.1.

[2] Decision 18/CMA.1, annex.

ID#	*Reporting requirement*	*Description of area of improvement with recommendation or encouragement*
		the inventory, as well as providing training for inventory personnel on performing those procedures. The TERT recommends that Kazakhstan improve the transparency of its reporting by including in its next NID a summary of the information on category-specific QC procedures already in place. The TERT encourages Kazakhstan to include in its QA/QC plan additional category-specific QC procedures and to build the capacity of personnel to apply them, including by developing their knowledge of the functionality of the ETF reporting tools.
2.G.3	Specified in paragraphs 30–32 of the MPGs Completeness	Kazakhstan did not report emissions for some categories for which methods are available in the 2006 IPCC Guidelines and instead used notation keys in completing the CRTs for the categories, subcategories and gases for which values were not estimated. The Party included in NID table 1.1 an estimate for six categories reported as "NE" in the CRTs considered as insignificant. However, the TERT noted that (1) CRT 9 has 13 categories reported as "NE", and for 8 of them an explanation for use of the notation key is missing in both the CRTs and the NID; (2) in some instances, in CRT 9, "NO" was reported where "NE" was applicable for certain years (see ID# 4.I.10 in table 4); (3) CRT 9 includes more than 100 entries reported as "IE" for which no allocation to another category or explanation is provided (see, e.g., ID# 6.L.3 in table 6 and categories 1.B.2.b.i (natural gas, exploration) for both CH_4 and CO_2, and 1.A.5.b other (not specified elsewhere)/mobile for CO_2, CH_4 and N_2O for the energy sector); and (4) for several sectors, CRTs have empty cells, and in these cases, notation keys could have been used in the absence of numerical data in accordance with the MPGs (see, e.g., ID#s 3.E.6 in table 3, 4.I.2 in table 4 and 5.A.2 in table 5). During the review, the Party explained that the most complete assessment of insignificant categories is provided in NID table 1.1 and some categories were not included in the CRTs for technical reasons. At the time of preparation of the submission, the Party explained it could not provide a more complete assessment, but will provide further explanation when preparing the next NID. Regarding issues (3) and (4), Kazakhstan informed the TERT that the missing emission allocations and explanations, as well as the blank cells, in the CRTs result from technical issues the inventory team experienced during preparation of the inventory using the earlier version of the ETF reporting tool. The TERT recommends that Kazakhstan improve the completeness and transparency of its inventory reporting by including in its next NID and CRTs information on the use of notation keys "IE" and "NE", including in NID table 1.1 an estimate of likely level of emissions for all categories for which IPCC methodologies are available, ensuring there are no empty cells in the CRTs and using "NE" when considering emissions to be insignificant.
2.G.4	Specified in paragraph 51 of the MPGs Precursor gases (carbon monoxide, nitrogen oxides and non-methane volatile organic compounds) and sulfur oxides	Kazakhstan included in CRT Summary 1 emissions of precursor gases for all sectors except the waste sector. The TERT noted, however, that CRT 6 shows only "NO" or blank cells for all precursor gases for all sectors. There is no specific discussion of these gases and their emissions in the NID. During the review, the Party explained that it estimated direct and indirect emissions and precursor gases (carbon monoxide, nitrogen oxides and non-methane volatile organic compounds), as well as sulfur oxides, and provided the estimates in the relevant CRTs. Furthermore, the Party noted that entering the precursor gases in the CRTs in the dedicated section in order for these emissions to flow into CRT 6 was not possible at the time of data entry (October 2024) owing to the limited functionality of the ETF reporting tool at that time, so the use of "NO" in CRT 6 was a technical issue beyond the Party's control. The TERT, acknowledging the explanation provided during the review, encourages Kazakhstan to make all the necessary entries in the relevant CRTs for the precursor gases to ensure that the CRTs are complete, and to provide information on these gases in the NID.
2.G.5	Specified in paragraphs 25 and 42 of the MPGs	Kazakhstan reported in its NID a key category analysis for 1990 and 2022, with and without the LULUCF sector, using approach 1 for level and trend. The TERT

ID#	*Reporting requirement*	*Description of area of improvement with recommendation or encouragement*
	Key category analysis	noted that Kazakhstan reported the individual percentage contributions from key categories for level and trend. However, it did not report the cumulative percentage contributions, which is not in line with paragraph 42 of the MPGs, according to which each Party shall report the individual and cumulative percentage contributions from key categories, for both level and trend, consistent with the 2006 IPCC Guidelines. The TERT also noted that Kazakhstan did not fully follow the 2006 IPCC Guidelines methodology in performing the key category analysis because it did not use absolute values for emissions and removals in equation 4.1 (vol. 4, chap. 4) when calculating contributions by category and by gas towards the total emissions. The TERT further noted that the emission and removal values entered in the key category analysis tables show only one decimal place, which means that some categories in the key category analysis may not be accurate owing to rounding. During the review, the Party explained that the issues noted by the TERT arose because, when conducting the key category analysis, it relied on the automatic calculations performed by the ETF reporting tool, which produced technical errors. The Party indicated that the errors will be corrected for the next submission by implementing relevant QA/QC procedures. The TERT recommends that Kazakhstan perform for its next NID the key category analysis in line with the 2006 IPCC Guidelines and report cumulative percentage contributions for all categories, for both level and trend, in line with paragraphs 25 and 42 of the MPGs.
2.G.6	Specified in paragraph 43 of the MPGs Recalculations	Kazakhstan reported recalculations for all sectors in the NID (section 1.9). However, the TERT noted that, for some sectors, the recalculations were not described transparently in the relevant category-specific sections of the NID (e.g. ID#s 4.I.11 in table 4, 6.L.4 in table 6 and 7.W.7 in table 7). For each recalculation, the description should include the starting year and all subsequent years of the inventory time series together with explanatory information and justifications for the recalculations and an indication of relevant changes and their impact on the emission trends. During the review, the Party clarified that there were technical difficulties in providing a detailed description of the recalculations because the recalculations for the BTR1 were not performed using the ETF reporting tool and, consequently, both technical and human errors occurred. The Party indicated that it will include a more transparent description of the recalculations in the next NID. The TERT recommends that Kazakhstan include a transparent description of recalculations for all sectors covering the starting year and all subsequent years of the inventory time series together with explanatory information and justifications for recalculations and an indication of relevant changes and their impact on the emission trends.

Table 3
Areas of improvement of the reporting on greenhouse gas emissions and removals – energy sector

ID#	*Reporting requirement*	*Description of area of improvement with recommendation or encouragement*
3.E.1	Specified in paragraphs 35–36 of the MPGs Fuel combustion – reference approach – all fuels – CO_2	The Party reported in CRT 1.A(b) that the consumption of other fossil fuels does not occur in the country. The TERT noted that in this table the Party reported a combination of the notation keys "NA" and "NO" for these fuels. However, in CRT 1.A(c), energy consumption for other fossil fuels is reported as 5.15 PJ and CO_2 emissions from the combustion of other fossil fuels are reported as 378 kt (sectoral approach). The TERT noted that the reporting is not in accordance with the MPGs, which state that "NO" shall be used for categories or processes that do not occur within a Party, and "NA" shall be used for activities under a given source/sink category that do occur within a Party but do not result in emissions or removals of a specific gas (para. 31). Therefore, if CO_2 emissions from the combustion of other fossil fuels are reported in the sectoral approach, they should also be reported in the reference approach because the fuels are produced by or imported into the country.

ID#	*Reporting requirement*	*Description of area of improvement with recommendation or encouragement*
		During the review, the Party explained that the issue arose owing to a technical bug in the ETF reporting tool, which appeared after the layout of the table was finalized. During the process of loading data into the CRTs, experts continually faced technical problems. They logged the relevant error reports with the CRT support team. The Party clarified that both data on the consumption of other types of fossil fuels and the notation keys will be corrected for the next NID. The TERT encourages Kazakhstan to report information on the consumption of other fossil fuels for the reference approach, consistently with the sectoral approach, use appropriate notation keys where numerical data are not available, and ensure that, in the Party's QC plan, a consistency check between the data in the sectoral approach and in the reference approach is included.
3.E.2	Specified in paragraph 36 of the MPGs Fuel combustion – reference approach – all fuels – CO_2	The Party reported in CRT 1.A(c) the difference between CO_2 emission estimates from fuel combustion between the sectoral and reference approaches as 4.98 per cent for 2022. However, for the same year, the difference in CO_2 emissions was 35.17 per cent for liquid fuels, 5.42 per cent for solid fuels and 9.17 per cent for gaseous fuels. The TERT noted that, despite providing a figure showing the overall difference between the reference and the sectoral approaches, the differences between these approaches for liquid and gaseous fossil fuels are significantly higher than 5 per cent and compensate each other in the total. The Party provided in NID section 3.2 the overall trend in CO_2 emissions from fuel combustion from the reference and sectoral approaches for 1990–2022 for all fuels and described the key obstacles in reducing the difference between the results from the two approaches, which are largely linked to the collection and processing of data for the national energy balance. During the review, the Party confirmed the information provided in the NID concerning the difficulties in reducing the difference in results between the two approaches, including the number of enterprises and organizations reporting on fuel used for the national statistics varying from year to year; data concerning the production, export and import of certain types of fuel varying significantly; and the Bureau of National Statistics changing the format of the fuel and energy balance following the requirements of the Eurasian Economic Union. The TERT encourages Kazakhstan, wherever possible, to develop and implement procedures that will facilitate further improvement in AD collection and processing for liquid and gaseous fuels that are the sources of the biggest discrepancies between the reference and the sectoral approaches.
3.E.3	Specified in paragraph 54 of the MPGs Fuel combustion – reference approach – all fuels – CO_2	The Party reported in CRT 1.A(d) data on feedstocks, reductants and other non-energy use of fuels. The TERT noted that CRT 1.A(d) contains several inconsistencies and omissions. Specifically, for some feedstocks (e.g. lubricants), the category under which they are reported is not included; for refinery feedstocks, "NA" is reported in the table but the use of those fuels as feedstocks is indicated under the category petrochemical production – other; and for solid fossil fuels, all feedstocks are reported as "NO" but the total for solid fossil fuels is reported as a value. The TERT also noted that the reporting is not in line with the MPGs because, as per paragraph 54, each Party should clearly indicate how feedstocks and non-energy use of fuels have been accounted for in the inventory, under the energy or industrial processes sector. In addition, the CRTs should not contain blank cells (as reported for biomass). During the review, the Party explained that, regarding refinery feedstocks, when using the ETF reporting tool to convert the table from the common reporting format to a CRT, the "Reported under" column automatically copied the value for the entire time series. In CRT 1.A(d), use of coal tar, which is classified as a solid fuel, and other types of feedstock should have been reported as "NO". The TERT recommends that Kazakhstan ensure that CO_2 emissions are correctly allocated to feedstocks in the CRTs and strengthen QA/QC procedures related to completing the CRTs. The TERT noted that, if there are mistakes linked to the use of the ETF reporting tool, these should be included in the report and the Party should work closely with the secretariat to overcome any identified bugs.
3.E.4	Specified in paragraphs 28 and 47 of the MPGs	The Party reported in its NID (table 3.16) that, for category 1.A.2 (manufacturing industries and construction), the fuel consumption value for 2021 was significantly larger than in previous years (i.e. 2018–2020 and 2022). According

ID#	*Reporting requirement*	*Description of area of improvement with recommendation or encouragement*
	1.A.2 Manufacturing industries and construction – all fuels – CO_2	to CRT 10, emissions for category 1.A.2 were also higher in 2021, at 41,573.50 kt CO_2 eq, compared with 25,113.41 kt CO_2 eq in 2020 and 27,821.65 kt CO_2 eq in 2022. The Party explained in the NID that the increases in 2021 were attributable to the appearance of associated petroleum gas consumption under subcategory 1.A.2(a) (ferrous metallurgy). The TERT noted that this does not explain the observed trend because (1) the increase in fuel consumption under category 1.A.2 was observed in 2021 when, according to the explanation in the NID, the consumption of associated petroleum gas in the ferrous metallurgy category was absent; and (2) from 2013 to 2018, data on associated petroleum gas consumption were present in the national energy balance. Furthermore, the TERT noted that the reporting is not in line with paragraph 47 of the MPGs, which states that each Party shall report estimates of emissions and removals for all categories and gases, including a descriptive summary and figures underlying emission trends. During the review, the Party explained that a technical error occurred and a recalculation will be made and that a note provided in NID table 3.7 indicates that natural gas includes associated petroleum gas. The TERT recommends that Kazakhstan investigate the underlying reasons for the observed inter-annual variations in fuel consumption and resulting emissions for category 1.A.2 and improve the transparency and consistency of the inventory reporting by providing explanations for the observed emission trends for the category.
3.E.5	Specified in paragraphs 31 and 45 of the MPGs 1.B.1 Solid fuels – CH_4	The Party reported in its NID (section 3.5.2.2, p.149) that the amount of gas burned during the flaring of drained CH_4 is not currently estimated. The Party also stated its assumption that all gas obtained through drainage is used for energy purposes and accounted for under fuel combustion. However, the TERT noted that the Party did not specify in the NID the category under which the fuel combustion emissions are reported. In CRT 1.B.1, category 1.B.1.a.i.4 (flaring of drained CH_4 or conversion of CH_4 to CO_2) is reported as "NO". Furthermore, the TERT noted that the reporting is not in line with (1) the MPGs, according to which each Party shall use notation keys where numerical data are not available when completing the CRTs, indicating the reasons why emissions from sources and removals by sinks and associated data for specific sectors, categories and subcategories or gases are not reported (para. 31) and each Party shall report information on the reasons for lack of completeness (para. 45); and (2) the 2006 IPCC Guidelines, according to which good practice is to fill in information for all entries regarding notation keys (vol. 1, chap. 8, section 8.2.5). During the review, the Party explained that, given that coal mining enterprises report statistics on coal production amounts and the amount of energy produced in different forms, the assumption is that this reporting includes data on CH_4 extracted from mine drainage and subsequently used to generate energy for the mine's own needs. All of this activity is energy-related and is presented in CRT 1.A.1.c, which includes stationary combustion for energy production for the mine's own needs, emissions from which do not fall under other categories. The Party also explained that it will correct the inconsistency in the notation keys used for category 1.B.1.a.i.4 in CRT 1.B.1. The Party believes that "NE" should be used for category 1.B.1.a.i.4 and that the problems with reporting the correct notation keys are due to technical issues using the reporting tools. The TERT recommends that Kazakhstan improve the transparency and comparability of the inventory by (1) using notation key "IE" for category 1.B.1.a.i.4 if the emissions for that category were allocated to category 1.A.1.c in CRT 1.A(a), and (2) explaining the use of "IE" in both the NID and the CRTs.
3.E.6	Specified in paragraph 39 of the MPGs 1.B.2.b Natural gas – gaseous fuels – CO_2 and CH_4	The Party reported in the CRT for category 1.B.2.b.iv (natural gas – transmission and storage) a CH_4 IEF of 1,066.50 kg/Mm^3 for 1990–1997. Given that Kazakhstan uses the tier 1 approach for estimating emissions for this category, the IEF corresponds to the EF. However, the EF is at the upper end of the default EF range provided in table 4.2.5 of the 2006 IPCC Guidelines (vol. 2, chap. 4, p.4.55), namely 1.66E-04–1.10E-03 Gg/Mm^3 (equal to 166–1,100 kg/Mm^3, with an average of 633 kg/Mm^3). Similarly, in the CRT for category 1.B.2.iv, for 2010–2022, the CH_4 IEF is 480 kg/Mm^3 for subcategory 1.B.2.b.iv, which corresponds to the upper end of the default EF range provided in table 4.2.4 of

ID#	*Reporting requirement*	*Description of area of improvement with recommendation or encouragement*
		the 2006 IPCC Guidelines (vol. 2, chap. 4, p.4.48), namely 6.60E-05–4.80E-04 Gg/Mm^3 (or 66–480 kg/Mm^3). The corresponding IEFs (and, therefore, EFs) for CO_2 for category 1.B.2.iv were reported in the CRT as 6.83 kg/Mm^3 for 1990–1997 and 4.09 kg/Mm^3 for 2020–2022, which differs from the EFs provided in table 4.2.5 of the 2006 IPCC Guidelines, namely 8.80E-07–2.00E-06 Gg/Mm^3 (equal to 0.88–2.0 kg/Mm^3, with an average of 1.44 kg/Mm^3), and as 4.09 kg/Mm^3 for 2020–2022, which also differs from the EFs provided in table 4.2.4 of the 2006 IPCC Guidelines, namely 8.80E-07 Gg/Mm^3 (equal to 0.88 kg/Mm^3). The TERT noted that both EFs corresponding to the IEFs shown in the CRT for 1.B.2.iv for CH_4 and CO_2 were either at the upper limit of the default EF ranges listed in tables 4.2.4 and 4.2.5 of the 2006 IPCC Guidelines or above the default range (for CO_2 in 1990–1997). Although the Party explains in the NID the rationale for the change in the EFs from those of developing to developed countries, it does not include an explanation for the deviations from the IPCC averages or the observed discrepancies.
		During the review, the Party confirmed that for 1990–1997 EFs for developing countries were used, whereas for 2010–2022 coefficients for developed countries were used. This is because in 1990–1997 old technologies typical for developing countries were in use, but in 2010–2022 a segment of the gas sector switched to modern technologies usually applied by developed countries and, at the same time, the biggest portion of emissions from the gas segment came from gas transmission (42 per cent of emissions for category 1.B.2.b in 2022). The period 1998–2009 was a transitional one. However, the Party acknowledged the issue pointed out by the TERT and will double-check all calculations.
		The TERT recommends that Kazakhstan double-check the selected EFs from the IPCC default EF ranges for category 1.B.2.b.iv (natural gas – transmission and storage) and include in the next NID a transparent explanation of the assumptions and approach used in EF selection.
3.E.7	Specified in paragraphs 20 and 39 of the MPGs 1.B.2 Oil, natural gas and other emissions from energy production – CO_2 and CH_4	The Party reported in the CRT emissions for category 1.B.2 (oil, natural gas and other emissions from energy production); however, the TERT noted that the Party did not include the required description of the AD in the table, although in NID section 3.5.3 the Party suggested indirectly that the AD are the amounts of processed oil. Kazakhstan also did not report the units of measurement for the AD value (84,633.02) reported for subcategory 1.B.2.c (venting and flaring) in CRT 1.B.2. Furthermore, the TERT noted that the reporting is not in line with (1) the MPGs, according to which each Party shall use the 2006 IPCC Guidelines and shall report the descriptions, assumptions, references and sources of information used for the EFs and AD used to compile the GHG inventory (paras. 20 and 39).
		During the review, the Party explained that all calculations of GHG emissions for categories 1.B.2.c.1 (venting and flaring of natural gas) and 1.B.2.c.2 (fugitive emissions from natural gas production and processing) are in Mm^3.
		The TERT recommends that Kazakhstan improve the transparency of its reporting by including in the NID and relevant CRT a clear description of the AD for category 1.B.2 and by strengthening the QC procedures relating to consistency of information between the NID and the CRTs.

Table 4

Areas of improvement of the reporting on greenhouse gas emissions and removals – industrial processes and product use sector

ID#	*Reporting requirement*	*Description of area of improvement with recommendation or encouragement*
4.I.1	Specified in paragraph 31 of the MPGs 2. General (IPPU) – CH_4 and N_2O	Kazakhstan in CRT 2(I).A-H reported numerical values for CO_2 emissions but "NO" for CH_4 and N_2O emissions for categories under which activity occurs. Specifically, "NO" was used for categories 2.B.5 (carbide production) (for CH_4), 2.C.1.e (zinc production) (for CH_4) and 2.D.3.d (urea converters) (for CH_4 and N_2O), for which the 2006 IPCC Guidelines do not provide a method for estimating emissions of CH_4 or N_2O. Equation 3.11 in the 2006 IPCC Guidelines (vol. 3, chap. 3) is applicable for calculating CH_4 emissions with the appropriate EF; however, a default EF for CH_4 from calcium carbide production, which takes place in Kazakhstan, is not provided. According to paragraph 31 of the MPGs,

ID#	*Reporting requirement*	*Description of area of improvement with recommendation or encouragement*
		for activities that do occur within the country but do not result in emissions of a specific gas, the correct notation key is "NA". The TERT noted that this provision applies to the above-mentioned gases and categories for which Kazakhstan reported "NO". During the review, the Party acknowledged its incorrect use of notation keys and stated that, in future inventory submissions, a more appropriate notation key ("NA") will be used for categories 2.B.5 (for CH_4), 2.C.1.e (for CH_4) and 2.D.3.d (for CH_4 and N_2O). The TERT recommends that Kazakhstan use the notation key "NA" rather than "NO" for reporting CH_4 and N_2O emissions under categories 2.B.5, 2.C.1.e and 2.D.3.d.
4.I.2	Specified in paragraphs 31 and 35 of the MPGs 2. General (IPPU) – all gases	The Party left several cells blank in CRT 2(I) and 2(I).A-H for categories 2.B.10, 2.C.7, 2.E.2, 2.E.5, 2.G.4 and 2.H.3, under which no activity seems to occur, and for category 2.F, under which activity partly occurs. In CRT 2(II), for HFC-32, HFC-125, HFC-134a and HFC-143a, all cells were blank except those with numerical values. The TERT noted that the reporting is not in accordance with paragraph 31 of the MPGs, which states that each Party shall use notation keys where numerical values are not available. Furthermore, the presence of blank cells in the CRTs implies that QA/QC procedures were not effectively applied. During the review, the Party explained that all the blank cells should have been filled with "NO", but a bug in the ETF reporting tool caused empty cells to appear instead. The TERT recommends that Kazakhstan fill all blank cells in CRTs 2(I), 2(II) and 2(I).A-H with the correct notation keys and enhance QA/QC procedures to ensure that all blank cells in CRTs are filled (manually, if automated filling is not possible) before submission or, if this is not possible, include a note in the NID.
4.I.3	Specified in paragraphs 20, 21 and 39 of the MPGs 2.A.4.d Other uses of carbonates – CO_2	The Party described in NID section 4.2.4.3.2 (pp.236–238) the methodology used for estimating emissions for category 2.A.4.d (other uses of carbonates). The Party explained that the AD are estimated by calculating the difference in the total use of limestone and dolomite between the national statistics and the consumption under certain use categories included in the inventory, namely metallurgical production, cement production and calcium carbide production. The data on limestone and dolomite use in the respective industries were obtained by surveys. The TERT noted that the description in the NID of categories included in the "Sum of used" is unclear as to whether the following categories for which limestone and dolomite are used or likely to be used are included: 2.A.2 (lime production), 2.A.3 (glass production) and 2.C.1.b (pig iron production). During the review, the Party provided the calculation file. During analysis of the file, the TERT noted that the amounts of limestone and dolomite included in the consumption under certain use categories cover categories 2.C.1.a (steel (primary steel)), 2.C.1.d (sinter), 2.A.1 (cement) and 2.B.5 (carbide). The following categories are also included in the inventory but not accounted for in "Sum of used": 2.A.2 (lime production (including production at sugar mills)), 2.A.3 (glass production), 2.C.1.b (pig iron production) and 2.C.1.a steel (secondary steel)). For all of these categories, the use of limestone and dolomite results in CO_2 emissions. The TERT also noted emissions for category 2.A.4.d have potentially been overestimated owing to double counting of emissions from carbonates already included under other categories in the inventory. The TERT further noted that the NID does not include an explanation as to which non-emissive sources relevant for the country are considered in the estimates, except for limestone application for liming in agriculture and use of dolomite in finish mills at cement production plants. The TERT recommends that Kazakhstan improve the accuracy of its emission estimates by (1) subtracting from the total use of limestone and dolomite in the country (according to the national statistics) use in all the relevant categories included elsewhere in the inventory and (2) investigating whether the non-emissive activities listed in table 2.7 of the 2006 IPCC Guidelines (vol. 3, chap. 2) occur in the country, and for those that do occur, collecting data and subtracting the respective amounts of limestone and dolomite from the total

ID#	*Reporting requirement*	*Description of area of improvement with recommendation or encouragement*
		amounts, if applicable. The TERT also recommends that the Party improve the transparency of its NID by including a clear explanation (for instance, in tabular format) of which limestone and dolomite use categories mentioned in table 2.7 of the 2006 IPCC Guidelines are relevant (meaning that activity occurs) or not relevant for Kazakhstan, and which relevant categories are included in the Party's calculations.
4.I.4	Specified in paragraph 39 of the MPGs 2.B.1 Ammonia production – CO_2	According to NID section 4.3.1.1 (pp.242–243), the Party estimated emissions for category 2.B.1 (ammonia production) by applying the tier 2 methodology, specifically equation 3.3 in the 2006 IPCC Guidelines (vol. 3, chap. 3), using as AD amounts of natural gas consumed at the only ammonia production facility in the country. The TERT noted that, although this approach is in line with the 2006 IPCC Guidelines, the NID does not provide a transparent explanation of whether gas amounts used as AD are the amounts used as feedstock or the total amounts of gas consumed at the facility. It is therefore not clear whether the calculations followed the provision in box 3.2 in the 2006 IPCC Guidelines (vol. 3, chap. 3), which states that the amount of gas used as a fuel needs to be subtracted from the natural gas amount reported under the energy sector. During the review, the Party explained that the ammonia plant provides separate data on natural gas used for energy purposes and process use (feedstock). The amount of natural gas used as feedstock is used as AD for estimating emissions for category 2.B.1, while the amount of natural gas used as fuel is included under category 1.A.2.c (chemicals) (CRT 1.A(a)s2, gaseous fuels). The TERT, together with the Party, double-checked the data obtained from the plant, analysed the relevant data from the Party's energy balance used in estimating emissions for the energy sector, and confirmed that the portion of natural gas used as feedstock is not included in the reporting under category 1.A.2.c and that the portion used as fuel is not included under category 2.B.1. The TERT acknowledged the clarification regarding allocation of emissions from natural gas at the ammonia production plant but noted that NID section 4.3.1 does not provide a sufficiently transparent explanation for this allocation. The TERT recommends that Kazakhstan include in the next NID a clear explanation of the allocation of emissions from natural gas use obtained from the only ammonia production plant in the country, including clarification that only natural gas used as feedstock is included under category 2.B.1 while natural gas used as fuel is included under category 1.A.2.c.
4.I.5	Specified in paragraphs 20, 21 and 39 of the MPGs 2.C.1 Iron and steel production – CO_2	The Party reported in NID section 4.4.1.2.2 (p.255) that emissions from steel production are estimated by applying the carbon mass balance approach (tier 2 and 3), specifically equation 4.9 in the 2006 IPCC Guidelines (vol. 3, chap. 4). Kazakhstan produces both primary and secondary steel. The NID provides carbon contents and unit consumption for pig iron, steel scrap and electrodes. It also mentions that limestone and dolomite are used in steel production; however, the carbon contents and unit consumption of limestone and dolomite are not specified. NID table 4.13 provides data on the total amounts of steel produced and the corresponding CO_2 emissions, without specifying whether those amounts are for primary or secondary steel production. The TERT noted that treating primary and secondary steel production together in the carbon mass balance approach results in low transparency of reporting in the NID and hinders the reconstruction of the calculations from the data provided. During the review, the Party provided the calculation file. During analysis of the file, the TERT noted the following inaccuracies in the calculations: (1) primary steel is accounted for as carbon input (added), while it should be accounted for as output (subtracted) according to equation 4.9 in the 2006 IPCC Guidelines; and (2) the amounts of secondary steel are not included in the calculations. The TERT also noted a lack of completeness in the calculations, namely the amounts of electrodes are included only in the calculations for 2005–2019 but are zero for other years owing to a lack of data. The amounts of limestone and dolomite used in steel production are not included in the calculations under category 2.C.1.a, although limestone and dolomite use in primary steel production is estimated in the calculations of emissions for category 2.A.4.d (other uses of carbonates). The TERT recommends that Kazakhstan (1) correct the carbon mass balance calculations such that they account for the steel amounts that should be

ID#	*Reporting requirement*	*Description of area of improvement with recommendation or encouragement*
		subtracted, and (2) include the amounts of limestone and dolomite used in steel production in the calculations. The TERT also recommends that the Party improve the transparency of its reporting on emissions from steel production by including in the next NID separate information on carbon inputs (materials, carbon contents and unit consumption), AD (steel produced) and CO_2 emissions for primary and secondary steel production. The TERT further recommends that the Party apply extrapolation methods to estimate electrode inputs for 1990–2004 and years after 2019 to improve completeness of the inventory.
4.I.6	Specified in paragraphs 20, 21 and 39 of the MPGs 2.C.1 Iron and steel production – CO_2	The Party reported in NID section 4.4.1.2.1 (p.253) that emissions from pig iron production are estimated by applying the carbon mass balance approach (tier 2 and 3), specifically equation 4.9 in the 2006 IPCC Guidelines (vol. 3, chap. 4). NID table 4.12 presents emissions from the use of coke and limestone in the pig iron production process. According to equation 4.9, the carbon mass balance calculations should account for any transfer of metallurgical gases between processes at integrated iron and steel production plants to avoid double counting of emissions. The TERT noted that, in NID section 4.4.1.2.1, the Party did not mention whether emissions from blast furnace gas transferred to sinter production are subtracted from emissions reported under category 2.C.1.b (pig iron) as they should be, implying there is a risk of emissions having been overestimated owing to double counting. The TERT also noted that, although emissions from the use of limestone are included in NID table 4.12, the respective amounts of limestone are not transparently presented together with the amounts of coke. During the review, the Party provided the calculation file. During analysis of the file, the TERT noted the following inaccuracies in the calculations: (1) the EF for limestone was obtained by multiplying carbon content by 0.12 instead of 44/12 in error and (2) the emissions from blast furnace gas transferred to the sinter facility at the same iron and steel production plant and included in the calculations under category 2.C.1.d (sinter) were not subtracted as they should be in line with equation 4.9 in the 2006 IPCC Guidelines. The TERT recommends that Kazakhstan improve the accuracy of the CO_2 emission estimates of pig iron by (1) applying the correct EF for limestone, for example the default EF of 0.44 t CO_2/t limestone provided in table 2.1 of the 2006 IPCC Guidelines (vol. 3, chap. 4); and (2) subtracting emissions from the component of blast furnace gas transferred to the sinter facility to avoid double counting. The TERT also recommends that the Party clarify in the next NID that pig iron and blast furnace gas are accounted for in the calculations as carbon outputs.
4.I.7	Specified in paragraphs 20, 21 and 39 of the MPGs 2.C.1 Iron and steel production – CO_2	According to NID section 4.4.1.2.3 (p.257), the Party estimates emissions from sinter production by applying the carbon mass balance approach (tier 2), specifically equation 4.10 in the 2006 IPCC Guidelines (vol. 3, chap. 4). The TERT noted, however, that the Party did not specify calorific values and carbon contents of metallurgical gases used in sinter production. During the review, the Party provided the calculation file. During analysis of the file, the TERT noted the following inaccuracies in the calculations: (1) the total use of gas is estimated as the sum of the amounts of blast furnace gas and coke oven gas (both in m^3) multiplied by unit gas consumption (in m^3 per t steel produced), but the sum should not be multiplied by any value as it is already the total use of gas; and (2) the carbon content and calorific value of natural gas (assumed to be 14.84 t C/TJ and 33.8 GJ/t respectively in the calculation file) were applied to the total use of gas calculated from the sum of the amounts of blast furnace gas and coke oven gas. The correct approach is to apply EFs and calorific values for blast furnace gas and coke oven gas to their respective amounts. The default values of applicable CO_2 EFs and calorific values are provided in tables 2.2 and 1.2 respectively of the 2006 IPCC Guidelines (vol. 2, chap. 2 and chap. 1 respectively). The Party explained that natural gas is not used at the sinter facility, and that carbon content and unit consumption for natural gas were used in the calculations by mistake. The TERT also noted that amounts of limestone used were not included in the calculations, although limestone use under category 2.C.1.d (sinter production) is estimated in the calculations of emissions for category 2.A.4.d (other uses of carbonates).

ID#	*Reporting requirement*	*Description of area of improvement with recommendation or encouragement*
		The TERT recommends that Kazakhstan improve the completeness of the inventory for sinter production by (1) estimating emissions from blast furnace gas and coke oven gas separately, applying the correct EFs and calorific values; and (2) including the amounts of limestone used in sinter production, as estimated in the calculations of emissions for category 2.A.4.d. The TERT also recommends that the Party clearly describe in the next NID carbon flows to sinter production, specifying the carbon contents and unit consumption of metallurgical gases used and explaining that emissions from blast furnace gas transferred to sinter production are subtracted from category 2.C.1.b (pig iron) to avoid double counting.
4.I.8	Specified in paragraphs 18, 20, 21, 27, 39 and 47 of the MPGs 2.D.2 Paraffin wax use – CO_2	The Party estimates emissions for category 2.D.2 (paraffin wax use) by applying the tier 1 approach, specifically equation 5.4 in the 2006 IPCC Guidelines (vol. 3, chap. 5). The methodology and the emission trend are described in NID sections 4.5.1 and 4.5.5. However, the TERT noted a lack of transparency in those descriptions. The explanation of the trend in NID section 4.5.1 is unclear and does not correspond to the trend shown in NID figure 4.10. In NID section 4.5.5, there is no clarification as to which value for the oxidized-during-use parameter was used in the calculations. In addition, the rapid change in emissions between 2006 and 2007 reported in NID table 4.29 and shown in NID figure 4.12 is not explained. The Party stated in NID section 4.5.5.4 (p.287) that emissions from paraffin wax use in 1990–2006 were estimated by using a splicing technique; however, the TERT noted that details on the technique (method, assumptions) are not provided. During the review, the Party provided the calculation file and stated that no production of paraffin wax occurred in the country for the entire time series (1990–2022). The Party noted that collecting AD for this category is problematic, and there is no established procedure for data providers to submit statistics on annual paraffin wax export and import. The TERT noted that this is not in accordance with the provision in paragraph 18 of the MPGs stating that each Party should implement and maintain national inventory arrangements, including institutional, legal and procedural arrangements for the continued estimation, compilation and timely reporting of NIRs. During the analysis of the Party's calculation file, the TERT noted two distinct periods in the time series for which the AD were treated differently: (a) 2007–2022: statistical data on paraffin wax export and import are available and are used in the calculations; (b) 1990–2006: statistical data on paraffin wax export and import are not available. For this period, the export values were extrapolated from the known values for 2007–2022, while the import values were set to zero without justification; that is, for this period, the splicing techniques from the 2006 IPCC Guidelines were not applied correctly because the constant value used for paraffin wax import was not based on any reasonable assumption. The correct approach would have resulted in negative paraffin wax use values for each year from 1990 to 2006. However, Kazakhstan calculated paraffin wax use as the sum of import and export instead of the difference (import minus export, with a zero-production amount), which is not in line with the 2006 IPCC Guidelines (vol. 3, chap. 5.3.2.3). The TERT recommends that Kazakhstan improve the accuracy of its emission estimates by correcting the equations used in the calculations for estimating emissions from paraffin wax use. The TERT also recommends that Kazakhstan improve the transparency of its reporting by clarifying in the next NID which splicing technique has been used and what assumptions have been made, providing the methodological tier applied and the value used for the oxidized-during-use parameter, and clearly explaining the emission trend. The TERT encourages the Party to improve time-series consistency by using reasonable assumptions for paraffin wax imports and applying the splicing technique for 1990–2006. The TERT also encourages the Party to make further efforts to establish procedures for collecting statistical data on the import and export of paraffin wax on a regular basis, to fill gaps in the estimates of emissions from the use of paraffin wax.

ID#	*Reporting requirement*	*Description of area of improvement with recommendation or encouragement*
4.I.9	Specified in paragraph 40 of the MPGs 2.D.3 Other (non-energy products from fuels and solvent use) – CO_2	According to NID section 3.4.5.3 (pp.121–122), the Party started to report CO_2 emissions from urea use in catalytic converters in 2019. The TERT noted that the Party did not report the amounts of urea used in catalytic converters in CRT 2(I).A-H (the respective cells are blank), although estimates of shares of fuel use covered by catalytic converters (7 per cent for heavy transport and 5 per cent for passenger cars) are reported in NID section 3.4.5.3 and they could be converted to AD to be reported for category 2.D.3.d (urea converters). The TERT noted that the reporting is not in line with the provision in paragraph 40 of the MPGs stating that each Party shall provide information on AD at the most disaggregated level. During the review, the Party explained that emissions for category 2.D.3.d are estimated using COPERT and that the AD for the category were omitted from the CRT in error. The Party indicated that it will include AD for category 2.D.3.d in the CRTs of the next inventory submission. The TERT recommends that Kazakhstan include in CRT 2(I).A-H AD urea used in catalytic converters (for instance, as amounts of urea or as fuel consumption by vehicles equipped with urea converters) or use the appropriate notation key with the relevant explanation.
4.I.10	Specified in paragraphs 31 and 45 of the MPGs 2.E.3 Photovoltaics – tetrafluoromethane and hexafluoroethane	According to NID section 4.6.2 (pp.295–296), during 2012–2017 photovoltaic production occurred in Kazakhstan. However, the Party considers emissions for category 2.E.3 (photovoltaics) to be insignificant and provided the relevant justification in NID section 4.6.2. The TERT noted that the Party reported emissions for category 2.E.3 as "NO" for the entire time series in CRT 2(II), including for the period when production occurred (i.e. 2012–2017). The TERT also noted that, in accordance with paragraphs 31 and 45 of the MPGs, in this case the notation key "NE" should be used instead of "NO" and an explanation for the use of "NE" should be provided in CRT 9. During the review, the Party acknowledged these findings and indicated that it will use "NE" instead of "NO" and explain the use of "NE" in CRT 9 of the next submission. The TERT recommends that Kazakhstan use notation key "NE" rather than "NO" to report emissions for category 2.E.3 (photovoltaics) for 2012–2017, when production occurred in the country, in CRT 2(II), and provide an explanation for the use of "NE" in CRT 9 and in the NID.
4.I.11	Specified in paragraph 43 of the MPGs 2.F.1.d Transport refrigeration 2.F.1.e Mobile air conditioning – HFC-32, HFC-125, HFC-134a and HFC-143a	In NID section 4.7.3.11 the Party provided the rationale for the recalculations made for categories 2.F.1.d (transport refrigeration) and 2.F.1.e (mobile air conditioning), explaining that the main reason for the recalculations was the need to revise the EFs for the operational stage of equipment, which, at 3–5 per cent for transport refrigeration and 4 per cent for mobile air conditioning, were significantly lower than the ranges provided in table 7.9 of the 2006 IPCC Guidelines (vol. 3, chap. 7) (15–50 per cent for transport refrigeration and 10–20 per cent for mobile air conditioning). The Party increased the EFs to 21 per cent for transport refrigeration and 21 per cent for mobile air conditioning. For HFC-143a, an error in equipment lifetime was also corrected (from 3 to 12 years). The cumulative effect of these changes was a significant decrease in all HFC emissions for the category for the entire time series. The TERT noted that the description of the recalculations is not transparent because it does not explain how increasing the EFs for the operational stage of equipment justifies the observed decrease in emissions for the entire time series. During the review, the Party explained that the revision of EFs for the operational stage of equipment necessitated the revision of equipment lifetime, which was increased for both categories. The increased lifetime resulted in a shift of emissions of HFC-32, HFC-125, HFC-134a and HFC-143a from equipment disposal to future years. This aspect of the recalculations was not explained in the NID. The TERT recommends that Kazakhstan, in its future submissions, provide transparent explanations of performed recalculations, including a justification for the recalculations and an indication of the impact of each recalculation on emission trends.

Table 5
Areas of improvement of the reporting on greenhouse gas emissions and removals – agriculture sector

ID#	*Reporting requirement*	*Description of area of improvement with recommendation or encouragement*
5.A.1	Specified in paragraph 21 of the MPGs 3.A.1 Cattle – CH_4 3.A.2 Sheep – CH_4	Kazakhstan estimated CH_4 emissions from enteric fermentation from significant sources, namely dairy cattle, non-dairy cattle and sheep, which account for 86 per cent of CH_4 emissions for the category, using the IPCC tier 2 approach. However, the TERT noted that the Party used basic livestock performance population data and combined national data on milk production, feeding practice, and live and mature weight of animals. According to the 2006 IPCC Guidelines (vol. 4, chap. 10, p.10) it is good practice to use the tier 2 approach for estimating CH_4 emissions from enteric fermentation for key categories with enhanced livestock characterization data instead of basic livestock performance population data and to classify animals, for example by sex and age group, to collect data on weight gain for young growing animals. During the review, the Party explained that it experienced difficulties in disaggregating data on animal populations in a manner that supports enhanced livestock characterization, in particular in collecting data on young livestock for the 1990s. However, if such statistical data become available, an appropriate assessment on the use of enhanced livestock characterization data will be carried out. The TERT encourages Kazakhstan to continue making efforts to collect relevant data that enable the enhanced characterization of livestock populations that would in turn enable the correct application of the IPCC tier 2 approach for calculating CH_4 emissions from the enteric fermentation of cattle and sheep in line with the 2006 IPCC Guidelines (vol. 4, chap. 10).
5.A.2	Specified in paragraphs 31–32 and 45 of the MPGs 3.A.4.h Other livestock – rabbits – CH_4	Kazakhstan reported other livestock population of 98,850 head for 2022 in CRT 3.A (enteric fermentation) under subcategory 3.A.4.h (other livestock). However, the TERT noted that no numerical data for CH_4 emissions or notation key and accompanying explanation of their exclusion were provided in CRT 3.A or in the NID. The TERT also surmised from CRT 3.B(a) under category 3.B.4.h.i (manure management) that the other livestock referred to in CRT 3.A are rabbits (98,850 head) and that CH_4 and N_2O emissions from manure management for these animals are reported in CRT 3.B(a) and CRT 3.B(b). During the review, the Party explained that CH_4 emissions from enteric fermentation of rabbits were not estimated because the 2006 IPCC Guidelines (vol. 4) do not provide a CH_4 EF for rabbits. The TERT noted that the 2006 IPCC Guidelines (vol. 4) provide only a method for calculating approximate EFs for assessing the significance of emissions from non-characterized species such as rabbits, which involves selecting the tier 1 EF for an animal with a similar digestive system and scaling it using the ratio of the weights of the animals raised to the power of 0.75. Therefore, to determine an approximate default CH_4 EF for enteric fermentation of rabbits, the default EFs for non-ruminant herbivores such as horses or mules/asses may be used. The TERT concludes, on the basis of its own estimates, that CH_4 emissions from the enteric fermentation of rabbits are insignificant because they accounted for 0.075 kt CH_4 (2.087 kt CO_2 eq, 0.0006 per cent) of the national total emissions for 2022, which is below the significance threshold of 0.05 per cent. Therefore, CH_4 emission estimates for this category are not needed owing to their insignificance. The TERT recommends that Kazakhstan improve transparency of its reporting and, instead of leaving empty cells, report CH_4 emissions from the enteric fermentation of rabbits as "NE" in CRT 3.A and provide in its NID and CRT 9 an explanation as to why these emissions are not estimated.
5.A.3	Specified in paragraphs 39–40 of the MPGs 3.B Manure management – CH_4 and N_2O 3.D Direct and indirect N_2O emissions from agricultural soils	The TERT noted that, in NID section 5.3 (pp.352–361), Kazakhstan provided limited information on the rationale for its choice of default EFs for estimating CH_4 emissions from manure management, explaining only that they were selected on the basis of climatic conditions and region. In addition, the Party did not report in the NID N losses during manure storage used in estimating indirect N_2O emissions from manure management and direct N_2O emissions from the application of manure to soils.

ID#	*Reporting requirement*	*Description of area of improvement with recommendation or encouragement*
		During the review, the Party clarified that the selection of default CH_4 EFs for manure management systems from table 10.14 of the 2006 IPCC Guidelines (vol. 4, chap. 10) was based on the consideration that the country is entirely located in a cold climate region. The default EFs for Eastern Europe were selected as they are based on EFs for countries of the former Soviet Union and more accurately reflect the characteristics of livestock in Kazakhstan. The Party provided the fraction of N that is volatized from manure per animal according to table 10.23 of the 2006 IPCC Guidelines (vol. 4, chap. 10). The TERT recommends that Kazakhstan include in the next NID a description of the assumptions made in selecting default EFs for estimating CH_4 emissions from manure management and a description of all parameters involved, including sources, in estimating CH_4 and N_2O emissions from manure management for the agriculture sector.
5.A.4	Specified in paragraph 35 of the MPGs 3.B Manure management – N_2O 3.D Direct and indirect N_2O emissions from agricultural soils	In the NID, Kazakhstan reported information on specific QA/QC procedures conducted for ensuring the quality of the GHG inventory. However, the TERT noted a number of inconsistencies between the CRTs and the NID for categories 3.B and 3.D; for example, the fraction of N that is leached is reported as 0.1 in CRT 3.D but as 0.3 in the NID (table 5.4). Nex rates are also inconsistent: for sheep, NID table 5.25 indicates the Nex rate is 17.75 kg/head/year while CRT 3.B(b) shows the value as 12.48 kg/head/year), and for goats, NID table 5.25 indicates the Nex rate is 12.48 kg/head/year while CRT 3.B(b) shows the value as 17.15 kg/head/year. During the review, the Party provided the correct data for the above-mentioned parameters and explained that incorrect values were provided in the NID owing to technical errors that do not affect the results of the N_2O emission estimates for categories 3.B and 3.D. The TERT recommends that Kazakhstan improve the accuracy of the inventory for the agriculture sector for the next submission by implementing specific QA/QC procedures for cross-checking the information provided in the CRTs and the NID.
5.A.5	Specified in paragraph 21 of the MPGs 3.D Direct and indirect N_2O emissions from agricultural soils 3.D.1.b.i Animal manure applied to soils – N_2O	The TERT noted that the NID lacks information on the fraction of N that is lost during the storage of manure and whether an additional portion of N in bedding that is usually considered with excreted manure was accounted for in estimating N_2O emissions from the application of manure to soils, as required by equation 10.34 of the 2006 IPCC Guidelines (vol. 4, chap. 10) when calculating the amount of N applied to soils under the IPCC tier 1 approach. During the review, the Party provided the TERT with calculation sheets showing the parameters and EFs involved in calculating N_2O emissions from manure management and the application of manure to soils; these sheets indicate that the amount of N in bedding is not considered in the estimates. In addition, the Party clarified that application of bedding into manure will be assessed for the next submission. The TERT recommends that Kazakhstan report in its next NID whether bedding is used in the country and, if it is, provide correct estimates of N in manure applied to agricultural soils that account for the additional portion of N that is available in the bedding, in accordance with the 2006 IPCC Guidelines (vol. 4, chap. 10, p.65).
5.A.6	Specified in paragraph 35 of the MPGs 3.D Direct and indirect N_2O emissions from agricultural soils	The TERT noted that the values for amount of N applied to soils for each different type of input reported by the Party in CRT 3.D are provided in kg instead of t. During the review, the Party acknowledged this technical error in units of mass. However, the Party noted that the error does not affect the emission estimates. The TERT, while acknowledging this clarification, concludes that the error has an impact on the automatic calculations of IEFs applied. The TERT recommends that Kazakhstan use the correct unit for amount of N applied to soils, according to the unit specified in the table, in CRT 3.D of the next submission.

Table 6
Areas of improvement of the reporting on greenhouse gas emissions and removals – land use, land-use change and forestry sector

ID#	*Reporting requirement*	*Description of area of improvement with recommendation or encouragement*
6.L.1	Specified in paragraph 39 of the MPGs Land representation	The TERT noted that Kazakhstan did not provide in the NID information on the collection of data supporting the preparation of the land representation matrix; in particular, the NID lacks information on the timing and methodologies used for collecting data, the years in which data were collected and the approach taken for years when data were not collected. During the review, the Party supplied references to regulatory standards and guidelines governing the collection of data and conduct of surveys in forest land, cropland and grassland. The Party also provided information on the implementation of a land transformation matrix, a preliminary version of which is planned for inclusion in the 2026 national inventory submission. The TERT recommends that Kazakhstan further improve the transparency and consistency of its reporting by including in the NID information on the timing and methodologies used for collecting the data required for producing the land representation matrix, the years in which data were collected and the approach taken for years when data were not collected. The TERT encourages the Party to prioritize the implementation of the tier 2 approach to land representation in order to realize both the methodological and the administrative improvements that approach offers.
6.L.2	Specified in paragraphs 31–32 of the MPGs General (LULUCF)	The TERT noted the following misuse of notation keys in the Party's CRTs for several subcategories of the LULUCF sector: (1) reporting "NO" in CRT 4.1, despite the table recommending "NA" be used in situations where the tier 1 approach to land representation has been applied; (2) reporting "IE" without explanation in CRT 9; and (3) using "NO" in CRTs 4.Gs1 and 4.Gs2, justified by the insignificance of the category, whereas, according to paragraph 32 of the MPGs, Parties should use "NE" when categories are not estimated owing to insignificance. During the review, the Party provided the following corresponding clarifications: (1) the notation keys in CRT 4.1 will be corrected to "NA" in the next submission; (2) the lack of an explanation for the use of "IE" in CRT 9 is related to issues with use of the ETF reporting tool; and (3) the notation keys in CRTs 4.Gs1 and 4.Gs2 will be corrected to "NE" in the next submission. The TERT recommends that Kazakhstan ensure the appropriate notation keys are used and corresponding explanations are provided in the CRTs and NID of the next submission, namely by using "NA" rather than "NO" in CRT 4.1 when the tier 1 approach to land representation is applied; explaining the use of "IE" in CRT 9 and in the NID; and using "NE" rather than "NO" in CRTs 4.Gs1 and 4.Gs2, with justification of the insignificance of the category.
6.L.3	Specified in paragraphs 27 and 39 of the MPGs 4.A Forest land	In NID section 6.2.6, the Party stated that checks were made for the forest inventory data for the entire time series for this category in order to identify the need for splicing. However, the TERT noted that no information was provided about the results of these checks, the splicing techniques applied or which data were spliced. During the review, the Party provided information about the splicing, namely that mathematical extrapolation calculations were performed for the National Forest Register data. Data gaps were identified between 2000 and 2005 and between 2010 and 2012; these required gap-filling, which was achieved using extrapolation. The TERT recommends that Kazakhstan include in its next submission information about data splicing for the forest land category, including the technique used, the data sets spliced and the years for which splicing was applied. The TERT encourages the Party to include in its next submission information about the data-collection methods used for both the core data sets and the supplementary data sets used in determining the need for data splicing.

ID#	*Reporting requirement*	*Description of area of improvement with recommendation or encouragement*
6.L.4	Specified in paragraphs 28 and 43 of the MPGs 4.A Forest land – CO_2	In NID section 6.2.6, the Party provided the reasons for recalculations for the forest land category. However, the TERT noted that the impact of each recalculation on the emission trends was not separately quantified; only the total impact of the recalculation was presented. This reporting is not in accordance with the 2006 IPCC Guidelines (vol. 4, chap. 5.4), which state that countries should clearly document any recalculations. During the review, the Party provided additional information about the nature of the recalculations, specifically that their need arose owing to (1) the merging of primary forest and restored forest subcategories; (2) corrections to the algorithm for calculating emissions from and carbon sequestration in living biomass, deadwood, litter and soils; (3) a revision to the approach to accounting for areas of arable land and fallow land and (4) corrections of methodological inaccuracies from previous years. In addition, the Party clarified that, owing to the large number of recalculations, the impact of each individual recalculation was not quantified separately. The TERT recommends that Kazakhstan, in its future submissions for which recalculations occur, report recalculations for the starting year and all subsequent years of the inventory time series together with explanatory information and justifications for the recalculations and an indication of relevant individual changes and the impact of each change on emission trends.
6.L.5	Specified in paragraph 28 of the MPGs 4.B Cropland	In NID table 6.3.2, the Party provided data demonstrating that the humus percentage in the 0–0.2 m soil horizon decreased steadily in Kazakhstan between 1989 and 2022. However, the TERT noted that the same table also shows that the survey area increased between 2010 and 2022 (and the survey area was not estimated in 1989, when the original humus percentage was calculated). This reporting is not in accordance with the best practice guidance provided in the 2006 IPCC Guidelines (vol. 4, chap. 5.2.1) because a false trend could be produced if site characteristics in the additional survey area are not similar to those in the existing survey area. During the review, the Party explained that studies of the characteristics of the additional survey area have not been conducted. The Party indicated that this issue will be addressed for the next submission. The TERT recommends that Kazakhstan (1) stratify the AD presented in NID table 6.3.2 such that a consistent time series of survey data is considered to avoid the possibility of false trends being observed in those data, and (2) provide information on the survey area in 1989 to further facilitate the trend analysis.
6.L.6	Specified in paragraph 39 of the MPGs 4.B Cropland	In section 6.3.1 of the NID, the Party describes the cropland category as including perennial plantations, which are represented mainly by horticultural and berry crops, vine plantations and other plantations. The TERT noted that the national definition of forest that the Party supplied in its NID does not specifically exclude perennial plantations. Therefore, the inclusion of perennial plantations in the cropland category could constitute a misallocation of land areas. This is because these plantations should be included in the forest land category if they meet the national definition of forest, as per chapter 5.1 of the 2006 IPCC Guidelines (vol. 4). During the review, the Party clarified that the national definition of forest includes only the main forest-forming species, such as coniferous, softwood and hardwood trees, as well as saxaul, shrubs and other plant species. In the light of this information, the TERT concludes that the reporting of perennial plantations under the cropland category is valid. The TERT recommends Kazakhstan revise for the next inventory submission its national definition of forest and description of cropland and clarify that land with perennial plantations is not considered as forest land.
6.L.7	Specified in paragraph 20 of the MPGs 4(I) Direct and indirect N_2O emissions from N input to managed soils	The Party reported AD and N_2O emissions for N inputs to managed soils as "NO" in CRT 4(I). However, the TERT noted that the Party did not provide in the NID or the CRTs a justification for the assertion that no N fertilizer has been applied in forest land, wetlands or settlements, as reported in CRT 4(I). The TERT also noted that the reporting is not in accordance with chapter 11.2.1 of the 2006 IPCC Guidelines (vol. 4), which outlines that Parties shall, at a minimum,

ID#	*Reporting requirement*	*Description of area of improvement with recommendation or encouragement*
		report N_2O emissions from managed soils using default data and a tier 1 approach. During the review, the Party clarified that, according to information received from the Forestry and Wildlife Committee of the Ministry of Ecology and Natural Resources, no N fertilizer is applied on forest land in Kazakhstan. The TERT recommends that Kazakhstan either include in the NID a justification for the assumption that no N fertilizer is applied on forest land, settlements or wetlands in the country (and thus for use of the notation key "NO" in CRT 4(I)) or estimate the N_2O emissions from managed soils and report them in CRT 4(I) and the NID.

Table 7
Areas of improvement of the reporting on greenhouse gas emissions and removals – waste sector

ID#	*Reporting requirement*	*Description of area of improvement with recommendation or encouragement*
7.W.1	Specified in paragraph 39 of the MPGs 5. General (waste) – CH_4	The Party reported in NID section 7.2.1 the waste amounts for the time series. For 2022, for example, 4,340.6 t waste was collected. However, the TERT noted that the NID does not include information on the amounts of waste (in percentage terms) sent to SWDS, treated biologically, and incinerated or open burned. During the review, the Party explained that, regarding SWDS, the calculation of emissions from landfills was based on the *Handbook on Municipal Waste Management in the Republic of Kazakhstan*, published by the Bureau of National Statistics. According to this handbook, the amount of municipal waste used for estimating emissions from the managed landfill in Astana was 288,710 t, while for unmanaged landfills across the country, it was 2,772,230 t. Regarding waste treated biologically, because reliable data on the share of composting of the total amount of waste generated in the country were not available, the default value of 0.05 from table 2.1 of the 2006 IPCC Guidelines (vol. 2, chap. 2) was used for the calculations. Regarding incineration, the calculation for medical waste incineration emissions was based on data from the Ministry of Healthcare on the amount of medical waste, and regarding open burning, estimation of emissions was based on the proportion of the rural population that burns waste informally. The TERT recommends that Kazakhstan provide in its next submission clear information on the amounts of waste (e.g. in percentage terms) sent to SWDS, treated biologically, and incinerated or open burned.
7.W.2	Specified in paragraph 39 of the MPGs 5. General (waste) – CH_4	The TERT noted that NID section 7.2.1, containing baseline data on MSW generation, does not include clear information on the classification of landfills as managed or unmanaged. For the landfill in Astana, a methane correction factor of 1.0 was applied to estimate the emissions and the landfill was considered as managed and anaerobic. For landfills in other cities, the methane correction factor value is 0.8, because waste comes to these landfills in a non-centralized manner, and the landfills are considered as unmanaged and shallow. The TERT also noted that Kazakhstan did not provide a justification for the classification of landfill sites in line with table 3.1 of the 2006 IPCC Guidelines (vol. 5, chap. 3). During the review, the Party confirmed that detailed information on and a justification for the classification of the landfills in the country could have been provided given that documentation on the landfill sites is available. The TERT recommends that Kazakhstan provide in the next NID clear information on and a justification for the classification of the landfills in the country as managed or unmanaged across the time series.
7.W.3	Specified in paragraph 47 of the MPGs 5.A Solid waste disposal on land – CH_4	In NID section 7.2.1, containing data on MSW generation, the Party reported that industrial waste contributes a 20.2 per cent share of total solid waste generated in Kazakhstan. This means industrial waste is the second largest type of waste after household waste, the share of which is 65.6 per cent. However, the TERT noted that the Party did not include industrial waste in emission estimates for category 5.A in accordance with the 2006 IPCC Guidelines (vol. 5, chap. 3). During the review, the Party clarified that estimates of CH_4 emissions from industrial waste were not included under category 5.A owing to limited data

ID#	*Reporting requirement*	*Description of area of improvement with recommendation or encouragement*
		availability and methodological constraints. The Party indicated that data collection and research on industrial waste management are ongoing. The TERT recommends that Kazakhstan estimate and report in its next NID CH_4 emissions from industrial waste under category 5.A.
7.W.4	Specified in paragraph 40 of the MPGs 5.A Solid waste disposal on land – CH_4	The TERT noted that the Party did not report in its NID any information on the delay time used in estimating CH_4 emissions from solid waste disposal on land. During the review, Kazakhstan explained that it used a default value of six months as the lag time in estimating CH_4 emissions from landfills, in line with the 2006 IPCC Guidelines (vol. 5, chap. 3, p.3.19). The Party stated that this information will be included in its next NID. The TERT recommends that Kazakhstan include in its next NID information on the delay time applied in estimating CH_4 emissions from solid waste disposal on land.
7.W.5	Specified in paragraphs 21 and 23 of the MPGs 5.A Solid waste disposal on land – CH_4	In NID section 7.2.1, Kazakhstan reported that it used a DOC value of 0.5 for bulk waste, based on waste composition, in estimating CH_4 emissions from solid waste disposal on land. During the review, the Party agreed with the TERT that the DOC value applied does not accurately reflect the morphological composition of waste and acknowledged that table 2.4 of the 2006 IPCC Guidelines (vol. 5, chap. 2) provides default values for waste by composition that can be used if no country-specific DOC values are available. The TERT recommends that Kazakhstan use DOC values for waste that are representative of the country's waste composition in estimating CH_4 emissions from solid waste disposal on land.
7.W.6	Specified in paragraph 43 of the MPGs 5.A Solid waste disposal on land – CH_4	The TERT noted that NID section 7.2.5 does not include any details on the recalculations performed for the waste sector, including the resulting percentage change in emissions for the entire time series. During the review, the Party indicated that information on the rationale behind and percentage changes related to the recalculations will be included in the next NID. The TERT recommends that Kazakhstan provide in its next NID information on the rationale behind and percentage changes related to all recalculations made for the waste sector.
7.W.7	Specified in paragraph 39 of the MPGs 5.B Biological treatment of solid waste – CH_4 and N_2O	In NID section 7.3.1, the Party described the methodological approach used for estimating emissions for category 5.B, stating that it applied the tier 1 approach with default EFs from table 4.1 of the 2006 IPCC Guidelines (vol. 5, chap. 4). However, the TERT noted that that table 4.1 provides EFs based on dry and wet weight but Kazakhstan did not clarify in the NID the unit of the AD used and whether it used the wet weight based EFs or dry weight based EFs. During the review, the Party explained that for the emission estimation it used an EF of 10 g CH_4/kg for CH_4 and 0.6 g N_2O/kg for N_2O, and both EFs are based on dry weight. The TERT recommends that Kazakhstan indicate clearly in its next NID whether the EFs used for estimating CH_4 and N_2O emissions from the biological treatment of solid waste are based on dry weight or wet weight.
7.W.8	Specified in paragraph 21 and 47 of the MPGs 5.B Biological treatment of solid waste – CH_4	The Party reported in NID section 7.3 that a significant amount of organic waste ends up in landfills. However, the TERT noted that the percentage that is treated biologically is not provided in the NID and that there are publicly available sources of information on biological treatment practices and composting in Kazakhstan. During the review, the Party explained that the majority of the organic waste in MSW is disposed of in landfills without prior biological treatment. There are currently no data available on the biological treatment of waste occurring at MSW landfill sites.

ID#	*Reporting requirement*	*Description of area of improvement with recommendation or encouragement*
		The TERT recommends that Kazakhstan enhance the completeness of the waste sector emissions inventory by collecting AD on the biological treatment of solid waste.
7.W.9	Specified in paragraph 39 of the MPGs 5.C Incineration and open burning of waste	The TERT noted that the Party did not report on hazardous waste emissions in its NID. During the review, the Party explained that, in Kazakhstan, hazardous waste is processed using various disposal methods, but the majority is stored at industrial facilities without resulting in GHG emissions. The TERT recommends that Kazakhstan enhance the transparency of its reporting by providing in its next NID information on the disposal and treatment methods of hazardous waste and resulting emissions, if any.
7.W.10	Specified in paragraph 39 of the MPGs 5.C Incineration and open burning of waste	The TERT noted that, in NIR section 7.6.1, the Party did not provide any information on the incineration of waste with energy recovery from 1990 to 2022. During the review, the Party explained that, in Kazakhstan, waste incineration with energy recovery was not a common practice from 1990 to 2022. The primary waste management methods during that period were disposal at managed and unmanaged landfills. There are no large-scale industrial facilities for thermal waste treatment with energy recovery in the country. The TERT recommends that Kazakhstan clarify in its next NID whether incineration of waste occurs with or without energy recovery.
7.W.11	Specified in paragraph 21 of the MPGs 5.C Incineration and open burning of waste – CH_4 and N_2O	In NID section 7.6.1, Kazakhstan reported that, for estimating emissions from periodic stokers, it used an EF for CH_4 of 0.6 kg/kt waste incinerated on a wet-weight basis and an EF for N_2O of 0.6 kg/Gg waste incinerated on a wet-weight basis. The TERT noted that these values differ from the default values provided in the 2006 IPCC Guidelines (vol. 5, chap. 5, pp.5.20–5.21), specifically in table 5.3 for CH_4 (e.g. 6 kg/Gg waste incinerated on a wet-weight basis for semi-continuous incineration stokers) and in table 5.4 for N_2O (e.g. 41 kg/Gg waste incinerated on a wet-weight basis for semi-continuous incineration stokers). No technical information justifying the values used for the country-specific EFs was provided in the NID. Furthermore, in NID tables 7.22 and 7.23 and in CRT Summary 3, Kazakhstan reported "NA" for those EFs. During the review, the Party clarified that there are no data available on medical waste management prior to 2006. The Party informed the TERT that in the next submission it will clarify information on medical waste management used for estimating emissions and use notation keys where appropriate in the CRTs. The TERT recommends that Kazakhstan estimate emissions from medical waste incineration, using the correct EFs provided in the 2006 IPCC Guidelines (vol. 5, chap. 5, pp.5.20–5.21) and correct notation keys, where appropriate, in the CRTs.
7.W.12	Specified in paragraph 21 of the MPGs 5.D Wastewater treatment and discharge	In NID section 7.5.1, on municipal wastewater treatment, the Party indicated that accumulated sewage sludge is not treated and is regularly transported to sludge disposal sites. However, the TERT noted that emission estimates from sewage sludge were not provided in CRT 5.D. During the review, the Party explained that there are no reliable data on the amount of sludge at sludge storage sites; hence this source was not included in the emission estimates and the notion key "NO" was used in reporting. The Party indicated that studies on assessing potential emissions from sludge storage sites are planned. The TERT recommends that Kazakhstan obtain data on the generation and management of sludge, and estimate and report the related emissions in the next NID.

C. Information necessary to track progress in implementing and achieving the nationally determined contribution under Article 4 of the Paris Agreement

Table 8
Areas of improvement of the reporting on national circumstances and institutional arrangements

ID#	*Reporting requirement*	*Description of area of improvement with recommendation or encouragement*
		No areas of improvement identified

Table 9
Areas of improvement of the description of the nationally determined contribution under Article 4 of the Paris Agreement, including updates

ID#	*Reporting requirement*	*Description of area of improvement with recommendation or encouragement*
9.1	Specified in paragraph 64(e) of the MPGs	Kazakhstan provided in its BTR information on the scope and coverage of its NDC. It stated that the NDC includes the LULUCF categories and pools defined in decision 5/CMA.3 (BTR section 2.B and CTF appendix). However, the TERT noted that it is unclear which carbon pools are included in the Party's NDC. During the review, the Party explained that the biomass (above-ground, below-ground), dead organic matter (deadwood, litter) and soil (soil organic matter) pools are covered in its NDC. The TERT recommends that Kazakhstan improve the transparency of its reporting by including, as applicable, in its next BTR and CTF tables information on which specific carbon pools of the LULUCF sector are covered by the NDC.

Table 10
Areas of improvement of the reporting of the information necessary to track progress in implementing and achieving the nationally determined contribution under Article 4 of the Paris Agreement

ID#	*Reporting requirement*	*Description of area of improvement with recommendation or encouragement*
10.1	Specified in paragraph 75(b) of the MPGs	Kazakhstan reported in its BTR that for estimating emissions and subsequent removals from natural disturbances on managed land it uses IPCC guidelines (BTR section 2.C.2, p.69, and CTF table 3). The TERT noted that it is unclear which IPCC guidelines were used. During the review, the Party clarified that the 2006 IPCC Guidelines were used for estimating emissions and removals from natural disturbances on managed land. The TERT recommends that Kazakhstan, as per the availability of information and as applicable, clarify in its BTR and relevant CTF table which IPCC guidelines (i.e. 2006 IPCC Guidelines or *2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories*) have been used for estimating emissions and subsequent removals from natural disturbances on managed land.

Table 11
Areas of improvement of the reporting on mitigation policies and measures, actions and plans, including those with mitigation co-benefits resulting from adaptation actions and economic diversification plans, related to implementing and achieving the nationally determined contribution under Article 4 of the Paris Agreement

ID#	*Reporting requirement*	*Description of area of improvement with recommendation or encouragement*
11.1	Specified in paragraph 83 of the MPGs	The TERT observed that information reported by Kazakhstan in its BTR (section 2.D) relating to paragraph 83 of the MPGs (i.e. on costs, non-GHG mitigation benefits and how the mitigation actions as identified in paragraph 80 of the MPGs interact with each other, as appropriate) is incomplete. During the review, the Party clarified that it has made some relevant estimates, such as for the cost of measures in the waste sector; however, the estimates were deemed too preliminary to report.

		The TERT encourages Kazakhstan to improve the completeness of its reporting by providing the information called for in paragraph 83 of the MPGs for each action, policy and measure reported.
11.2	Specified in paragraph 90 of the MPGs	In its BTR, Kazakhstan included a section (2.D.8) on response measures, in which it stated that it has yet to implement a process for assessing the economic and social impacts of key mitigation PaMs. Therefore, it could not provide detailed information, to the extent possible, on the assessment of economic and social impacts of response measures, in accordance with paragraph 90 of the MPGs. During the review, the Party explained that the main challenges it faced regarding this reporting requirement include limited data availability, methodological complexity and the need for institutional coordination in conducting a comprehensive evaluation. The TERT encourages Kazakhstan to improve the completeness of its reporting by providing, to the extent possible, the detailed information on the assessment of economic and social impacts of response measures called for in paragraph 90 of the MPGs.

Table 12
Areas of improvement of the summary of greenhouse gas emissions and removals

ID#	*Reporting requirement*	*Description of area of improvement with recommendation or encouragement*
		No areas of improvement identified

Table 13
Areas of improvement of the projections of greenhouse gas emissions and removals

ID#	*Reporting requirement*	*Description of area of improvement with recommendation or encouragement*
13.1	Specified in paragraph 94 of the MPGs	Kazakhstan reported WM, WAM and WOM projections for all GHG emissions and removals. However, the TERT noted that the Party reported the following different definitions of the WM scenario throughout the BTR: as including implemented, adopted and planned measures (BTR section 2.F.3.2, p.106); as including PaMs that have been implemented, adopted and are planned to be adopted in the "nearest future" (BTR section 2.F.4.2, p.114); as considering all actions that have been implemented and adopted by 2022 (BTR section 2.F.7.2, p.128); and as considering the PaMs that have already been implemented by 2022 and those PaMs that were adopted and will be implemented by 2040 (BTR section 2.F.2, p.102). Furthermore, the WOM scenario excludes PaMs that were implemented, adopted or planned before 2022, which is the starting year for those projections (BTR section 2.F.2, p.102). According to paragraph 94 of the MPGs, the WM scenario should be defined as encompassing currently implemented and adopted PaMs and the WOM scenario as excluding PaMs implemented, adopted and planned after the year chosen as the starting point for the projections. The TERT noted that the definitions are inconsistent across the BTR and not in accordance with those in paragraph 94 of the MPGs. During the review, the Party clarified that, for the WM scenario, "planned" refers to plans, programmes and measures already approved by the Government and that "adopted by 2022" and "implemented by 2022" refer to measures adopted by 2022 but with implementation extending beyond that year. The Party also explained there is an editorial error in the definition of the WOM scenario and confirmed that this scenario excludes PaMs that are implemented, adopted or planned after 2022. The TERT recommends that Kazakhstan adopt a definition of the WM scenario that aligns with paragraph 94 of the MPGs and consistently apply it throughout its next BTR. The TERT encourages the Party to correct the editorial error in the definition of the WOM scenario in its next BTR.

13.2	Specified in paragraph 96(a) and (d) of the MPGs	Kazakhstan reported in its BTR (section 2.F.3.1) the methodology used to develop the projections; however, the TERT noted the following omissions and lack of clarity when defining the key underlying assumption used (para. 96(a) of the MPGs): (a) No explanation is included in the BTR as to why the reference year for TIMES-KAZ, which was used for projecting GHG emissions for the energy sector, is 2021 while the starting year for the projections is 2022 (para. 96(a) of the MPGs); (b) Assumptions of GDP growth rate are inconsistent: GDP growth rate is assumed to be stable at 6 per cent from 2030 to 2050 for estimating future waste generation while the key underlying assumptions used for projecting emissions for the waste sector include a GDP growth rate of 6.1 per cent in 2035 and 2040 (para. 96(a) of the MPGs); (c) Industrial waste is not included in the projections of GHG emissions for the waste sector generated by the model used (para. 96(a) of the MPGs); (d) A sensitivity analysis for the IPPU sector is not provided (para. 96(d) of the MPGs). During the review, the Party provided the following clarifications on the points above: (a) The reference year for TIMES-KAZ is 2021 because, at the time of its development, the latest data available were for 2021. However, for the purpose of projecting emissions for the BTR, the model was calibrated using the most recent data available, which are for 2022; (b) The value of 6.1 per cent for GDP growth rate is an editorial error. The value of 6 per cent GDP growth rate is correct and was used for projections across all sectors; (c) Work on including industrial waste in the projections for the waste sector is under way; (d) A sensitivity analysis for projections of GHG emissions from the IPPU sector was not conducted owing to sector-specific characteristics and related technical constraints arising from the distinct nature and drivers of emissions and emission projections for the sector. However, a sensitivity analysis is planned to be included in the next BTR. The TERT encourages Kazakhstan to enhance the completeness and transparency of its reporting in the next submission by improving the description of TIMES-KAZ and ensuring that the correct GDP growth rate is used consistently for all assumptions relating to the projections, including industrial waste in the projections of emissions for the waste sector, and providing a sensitivity analysis for the IPPU sector together with a brief explanation of the methodologies and parameters used.

Table 14
Areas of improvement of other information relevant to tracking progress in implementing and achieving the nationally determined contribution under Article 4 of the Paris Agreement

ID#	*Reporting requirement*	*Description of area of improvement with recommendation or encouragement*
		No areas of improvement identified

II. Capacity-building needs[3] identified by the Party and by the technical expert review team in consultation with the Party during the technical expert review of its first biennial transparency report

2. Table 15 presents capacity-building needs identified by the Party and by the TERT in consultation with the Party during the technical expert review of its BTR1.

Table 15
Capacity-building needs identified in consultation with the Party

ID#	*Reporting requirement*	*Area in which capacity-building is needed*
General reporting		
NA	NA	No capacity-building needs identified
NIR – general		
1.G_CBN.1	Specified in paragraph 18 of the MPGs	Strengthening institutional arrangements to enable the efficient and timely provision of data that are appropriate in both content and format for the national GHG inventory
1.G_CBN.2	Specified in paragraphs 20 and 39 of the MPGs	Strengthening QC procedures to ensure that information in the NID and the CRTs, as well as between internal documentation and the CRTs, is consistent and to ensure adherence of that information to both IPCC good practices for data reporting and the MPG reporting requirements
NIR – energy		
3.E_CBN.1	Specified in paragraph 36 of the MPGs	Improving the analysis of time-series consistency by fuel type in the national energy balance to improve the accuracy of data collected that support the estimation of energy sector emissions using the reference and sectoral approaches
3.E_CBN.2	Specified in paragraph 47 of the MPGs	Improving the transparency and consistency of the national GHG inventory by providing an explanation for the observed emission trends for AD and emissions across all sectors of the inventory based on the findings of an investigation of the underlying reasons for the observed inter-annual variations in fuel consumption and resulting emissions for the category
NIR – IPPU		
4.I_CBN.1	Specified in paragraphs 20, 21 and 39 of the MPGs	Enhancing technical capacity relating to the methodological aspects of estimating CO_2 emissions from integrated iron and steel production facilities, including allocating emissions as either energy-related or process-related, compiling carbon mass balances and accurately accounting for emissions from metallurgical gases (coke oven gas and blast furnace gas) transferred between processes
NIR – agriculture		
5.A_CBN.1	Specified in paragraph 21 of the MPGs	Collecting relevant data to enhance the characterization of livestock populations to enable the application of the IPCC tier 2 approach for estimating CH_4 emissions from the enteric fermentation of cattle and sheep (in line with the 2006 IPCC Guidelines (vol. 4, chap. 10))
NIR – LULUCF		
6.L_CBN.1	Specified in paragraphs 20 and 26 of the MPGs	Collecting data that will facilitate implementation of the IPCC tier 2 approach to land representation, and constructing an associated land-transition matrix

[3] As referred to in paras. 7, 8 and 162(d) of the MPGs.

ID#	*Reporting requirement*	*Area in which capacity-building is needed*
NIR – waste		
7.W_CBN.1	Specified in paragraph 21 of the MPGs	Regarding EFs for the waste sector, enhancing technical capacity to: (a) Select EFs based on wet weight or dry weight, as appropriate, for estimating CH_4 and N_2O emissions from the biological treatment of solid waste; (b) Determine appropriate EFs for estimating CH_4 and N_2O emissions from waste incineration, taking into account that EFs differ for each gas and by technology of waste incineration, among other factors; (c) Determine appropriate EFs for estimating emissions from cesspools and estimate those emissions
7.W_CBN.2	Specified in paragraph 40 of the MPGs	Enhancing technical capacity to identify appropriate DOC values that are representative of Kazakhstan's waste composition
7.W_CBN.3	Specified in paragraph 39 of the MPGs	Enhancing technical capacity to classify SWDS (i.e. as managed, unmanaged or uncategorized) and collect relevant data and information to estimate its emissions
Information necessary to track progress in implementing and achieving the NDC under Article 4 of the Paris Agreement – PaMs		
11_CBN.1	Specified in paragraph 83 of the MPGs	Improving reporting on PaMs by developing expertise and enhancing capacity in collecting data and using relevant methodologies for calculating the costs of PaMs; identifying the non-GHG mitigation benefits of PaMs; applying modelling and systems analysis and addressing regulatory complexity relating to PaMs; aggregating PaMs; and analysing how PaMs interact with one another
11_CBN.2	Specified in paragraphs 85–86 of the MPGs	Estimating GHG emission reductions achieved by implementing PaMs and developing methodological approaches for retrospective analysis and progress analysis, including identifying key indicators and data sources and organizing the collection of necessary data
11_CBN.3	Specified in paragraph 90 of the MPGs	Developing methodologies and improving data collection, including by engaging stakeholders, for assessing the economic and social impacts, both national and cross-border, of response measures
Information necessary to track progress in implementing and achieving the NDC under Article 4 of the Paris Agreement – projections		
13_CBN.1	Specified in paragraphs 94 and 96(a) of the MPGs	Enhancing the institutional arrangements for developing emission projections to improve the accuracy of projections; ensuring the consistent application of scenario definitions; and including industrial waste in projections for the waste sector
13_CBN.2	Specified in paragraph 96(d) of the MPGs	Conducting a sensitivity analysis for projections of GHG emissions for the IPPU sector and reporting the findings together with a brief explanation of the methodologies and parameters used

Annex

Documents and information used during the review

A. Reference documents

BTR1 of Kazakhstan. Available at https://unfccc.int/first-biennial-transparency-reports.

BTR1 CTF tables of Kazakhstan. Available at https://unfccc.int/first-biennial-transparency-reports.

CRTs of Kazakhstan. Available at https://unfccc.int/first-biennial-transparency-reports.

"Guidance for operationalizing the modalities, procedures and guidelines for the enhanced transparency framework referred to in Article 13 of the Paris Agreement". Decision 5/CMA.3. FCCC/PA/CMA/2021/10/Add.2. Available at https://unfccc.int/documents/460951.

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

IPCC. 2019. *2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories*, E Buendia, K Tanabe, et al. (eds.). Geneva: IPCC. Available at https://www.ipcc-nggip.iges.or.jp/public/2019rf/.

"Modalities, procedures and guidelines for the transparency framework for action and support referred to in Article 13 of the Paris Agreement". Annex to decision 18/CMA.1. FCCC/PA/CMA/2018/3/Add.2. Available at https://unfccc.int/documents/193408.

NID of Kazakhstan. Available at https://unfccc.int/first-biennial-transparency-reports.

Report on the individual review of the inventory submission of Kazakhstan submitted in 2023. Available at https://unfccc.int/process-and-meetings/transparency-and-reporting/reporting-and-review/reporting-and-review-under-the-convention/greenhouse-gas-inventories-annex-i-parties/inventory-review-reports-2023.

"Reviews on a voluntary basis of the information reported pursuant to decision 18/CMA.1, annex, chapter IV, and respective training courses needed." Decision 9/CMA.4. FCCC/PA/CMA/2022/10/Add.2. Available at https://unfccc.int/documents/626570.

B. Additional information provided by the Party

Responses to questions during the review were received from Saule Sabiyeva, Gulmira Sergazina, Shattyk Tastemirova and Aiman Yessekina (Ministry of Ecology and Natural Resources). The following references were provided by Kazakhstan and may not conform to UNFCCC editorial style as some have been reproduced as received:

Approved by the order of the Minister of Ecology, Geology and Natural Resources of the Republic of Kazakhstan dated March 31, 2020 No. 85: Rules for carrying out work in the state forest fund not related to forest management and forest use Forest land. Available at https://adilet.zan.kz/rus/docs/V2000020327.

Approved by the order of the Acting Minister of Agriculture of the Republic of Kazakhstan dated February 27, 2015 No. 18-02/161: Rules for the allocation and taxation of logging areas in areas of the state forest fund. Available at https://adilet.zan.kz/rus/docs/V1500010693.

Approved by order of the Acting Minister of Agriculture of the Republic of Kazakhstan dated February 27, 2015 No. 4-1/147: Rules for conducting agrochemical soil survey. Available at https://adilet.zan.kz/rus/docs/V1500010686.

Approved by order of the Minister of Agriculture of the Republic of Kazakhstan dated August 10, 2022 No. 250: Methodology for conducting land monitoring Available at https://adilet.zan.kz/rus/docs/V2200029085.

Approved by the order of the Minister of Agriculture of the Republic of Kazakhstan dated July 3, 2019 No. 252: Rules for organizing and conducting monitoring of the use of agricultural lands provided for running a peasant or farm enterprise, agricultural production. Available at https://adilet.zan.kz/rus/docs/V1900018997.

Consolidated analytical report on the state and use of lands of the Republic of Kazakhstan for 2022. Available at https://www.gov.kz/memleket/entities/land/documents/details/579164?lang=ru.

Bureau of National Statistics, Handbook on Municipal Waste Management in the Republic of Kazakhstan.