United Nations

FCCC/ARR/2011/KAZ

Framework Convention on Climate Change

Distr.: General
11 September 2012

English only

Report of the individual review of the annual submission of Kazakhstan submitted in 2011*

* In the symbol for this document, 2011 refers to the year in which the inventory was submitted, and not to the year of publication.

Contents

I. Introduction and summary

A. Overview

1. This report covers the centralized review of the 2011 inventory submission of Kazakhstan, coordinated by the UNFCCC secretariat, in accordance with decision 19/CP.8. The review took place from 5 to 10 September 2011 in Bonn, Germany, and was conducted by the following team of nominated experts from the UNFCCC roster of experts: generalist – Mr. Domenico Gaudioso (Italy); energy – Mr. Ricardo Fernandez (European Union), Mr. Sergiy Skybyk (Ukraine) and Mr. Michael Strogies (Germany); industrial processes – Ms. Natalya Parasyuk (Ukraine) and Ms. Ingrid Person (Brazil); agriculture – Ms. Olga Garilova (Estonia) and Mr. Yuriy Pyrozhenko (Ukraine); land use, land-use change and forestry (LULUCF) – Mr. Sandro Federici (San Marino) and Ms. Marina Shvangiradze (Georgia); and waste – Ms. Tatiana Tugui (Republic of Moldova). Ms. Parasyuk and Mr. Federici were the lead reviewers. The review was coordinated by Mr. Stylianos Pesmajoglou and Ms. Ruta Bubniene (UNFCCC secretariat).

2. In accordance with the "Guidelines for the technical review of greenhouse gas inventories from Parties included in Annex I to the Convention" (hereinafter referred to as the UNFCCC review guidelines), a draft version of this report was communicated to the Government of the Kazakhstan, which provided comments that were considered and incorporated, as appropriate, into this final version of the report.

B. Emission profiles and trends

3. In 2009, the main greenhouse gas (GHG) in Kazakhstan was carbon dioxide (CO_2), accounting for 79.6 per cent of total GHG emissions[1] expressed in CO_2 eq, followed by methane (CH_4) (16.6 per cent) and nitrous oxide (N_2O) (3.3 per cent). Hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF_6) collectively accounted for 0.5 per cent of the overall GHG emissions in the country. The energy sector accounted for 84.9 per cent of total GHG emissions, followed by the agriculture sector (8.1 per cent), the industrial processes sector (4.9 per cent) and the waste sector (2.1 per cent). The emissions from the solvent and other product use sector are reported as not estimated ("NE"). Total GHG emissions amounted to 289,765.25 Gg CO_2 eq and decreased by 23.0 per cent between 1990 and 2009.

4. Tables 1 and 2 show GHG emissions under the Convention, by gas and by sector, respectively. In table 1 CO_2, CH_4 and N_2O emissions do not include emissions and removals from the LULUCF sector.

[1] In this report, the term "total GHG emissions" refers to the aggregated national GHG emissions expressed in terms of CO_2 eq excluding LULUCF, unless otherwise specified.

Table 1
Greenhouse gas emissions, by gas, 1990 to 2009

	Gg CO_2 eq							
Greenhouse gas	*1990*	*1995*	*2000*	*2005*	*2007*	*2008*	*2009*	*Change 1990–2009 (%)*
CO_2	281 661.44	165 743.85	151 649.85	207 262.31	241 336.24	211 863.59	230 526.71	–18.2
CH_4	75 657.48	46 150.59	35 358.29	40 602.50	44 413.59	48 560.57	48 212.11	–36.3
N_2O	19 159.62	9 952.76	6 051.06	8 165.42	9 156.44	9 013.28	9 663.48	–49.6
HFCs	NA, NO	0.21	164.19	237.12	412.36	415.22	416.26	NA
PFCs	NA, NO	NA, NO	NA, NO	NA, NO	87.17	788.23	943.38	NA
SF_6	NA, NO	NA, NO	NA, NO	0.15	0.02	0.11	3.31	NA

Abbreviations: NA = not applicable, NO = not occurring.

Table 2
Greenhouse gas emissions by sector, 1990 to 2009

	Gg CO_2 eq							
Sector	*1990*	*1995*	*2000*	*2005*	*2007*	*2008*	*2009*	*Change 1990–2009 (%)*
Energy	311 120.78	183 285.88	162 699.30	216 984.66	253 900.72	227 506.73	245 866.78	–21.0
Industrial processes	17 916.83	8 144.59	10 144.69	13 525.34	13 983.49	14 595.63	14 311.91	–20.1
Solvent and other product use	NA, NE	NA, NE	NA, NE	NA, NE	NA, NE	NA, NE	NA, NE	NA
Agriculture	41 467.80	24 362.71	14 527.10	19 698.00	21 682.84	22 583.16	23 407.62	–43.6
LULUCF	–6 880.63	–4 231.97	–11 555.29	–11 204.39	–11 159.05	–8 326.44	–11 337.79	64.8
Waste	5 973.12	6 054.23	5 852.31	6 059.50	5 838.77	5 955.49	6 178.95	3.5
Other	NA	NA	NA	NA	NA	NA	NA	NA
Total (with LULUCF)	**369 597.91**	**217 615.44**	**181 668.11**	**245 063.12**	**284 246.77**	**262 314.56**	**278 427.46**	**–24.7**
Total (without LULUCF)	**376 478.54**	**221 847.41**	**193 223.40**	**256 267.51**	**295 405.82**	**270 641.00**	**289 765.25**	**–23.0**

Abbreviations: NA = not applicable, NE = not estimated.

II. Technical assessment of the annual submission

A. Overview

1. Annual submission and other sources of information

5. The 2011 annual inventory submission was submitted on 15 April 2011; it contains a complete set of common reporting format (CRF) tables for the period 1990–2009 and a national inventory report (NIR) (submitted on 30 May 2011). The expert review team (ERT) strongly encourages Kazakhstan to submit its next NIR by 15 April 2012 as required by decision 18/CP.8.

6. Where necessary, the ERT also used the previous year's submission during the review. During the review, Kazakhstan provided the ERT with additional information and documents, which are not part of the inventory submission but are in many cases referenced in the NIR. The full list of information and documents used during the review is provided in annex I to this report.

Completeness of inventory

7. The inventory of Kazakhstan is complete in terms of years and mostly complete in terms of geographical coverage, with the exception of the LULUCF estimates which do not cover the total land area of the Party.

8. The inventory does not cover all source and sink categories and estimates for a number of source and sink categories are not reported in the CRF tables or the NIR, for example: net CO_2 emissions/removals from land converted to forest land, and the land converted to wetlands, and the land converted to settlements; CO_2 from coal mining and handling from underground mines; CO_2 and CH_4 from exploration of oil and natural gas; CH_4 from distribution of oil products; CH_4 from venting; and emissions from international transportation. In addition, for some categories (e.g. CO_2 and CH_4 from solid fuel transformation) the corresponding cells in the CRF tables are empty. CH_4 and N_2O emissions from goats, asses and buffalo are reported as not occurring ("NO").

9. The explanatory information in the documentation boxes in the CRF tables 7, 8(a), 8(b), 9(a) and 9(b) is missing for the whole time series. The ERT recommends Kazakhstan to improve the completeness of its future inventory submissions by providing information in all of the above-mentioned CRF tables.

2. A description of the institutional arrangements for inventory preparation, including the legal and procedural arrangements for inventory planning, preparation and management

Overview

10. The ERT concluded that the institutional arrangements continue to not fully perform their required functions. The ERT reiterates the recommendation for strengthening cooperation and information exchange between all institutions involved in inventory preparation should be improved.

Inventory planning

11. The NIR and additional information submitted by the Party described the institutional arrangements for the preparation of the inventory. The Ministry of

Environmental Protection (MoEP), as the Party's focal point for the UNFCCC, has the overall responsibility for organizing and coordinating the inventory preparation process, and for presenting the inventory submission to the UNFCCC secretariat, whereas the Kazakhstan Scientific Research Institute of Ecology and Climate (KazNIIEK) has overall responsibility for the planning, preparation and management of the national inventory. A legal framework for the inventory preparation process had been put in place in Kazakhstan through two orders of the MoEP: No. 258 of 4 December 2009 "On executive body for supporting activity of authorized body on coordination of realization of Kyoto Protocol to the UNFCCC" and No. 193 of 23 July 2010 "On approval of the National Greenhouse Gas Inventory System".

12. The Agency of Statistics of the Republic of Kazakhstan and other institutions (the Ministry of Economic Development and Trade, the Ministry of Oil and Gas, the Ministry of Transport and Communications, the Ministry of Industry and New Technologies, the Ministry of Agriculture, the Agency of land resources management, etc.) collaborate with KazNIIEK in the inventory preparation process by providing initial data for the GHG inventory. KazNIIEK is responsible for the calculation of emissions from the industrial processes, agriculture and waste sectors, while experts from the Kazakhstan Hydrometeorological Service (KazHYDROMET) calculate emissions from the energy and LULUCF sectors and submit their calculations using the CRF tables to KazNIIEK.

13. The ERT reiterates the encouragement for improved cooperation between the inventory team of KazNIIEK, KazHYDROMET and other institutions, such as the Commission on Management of Forestry and Hunting Sectors, on improving activity data (AD), emission factors (EFs) and methodologies in specific sectors.

14. Funding for the national GHG inventory system is provided through public funds, as established by national legislation.

Inventory preparation

Key categories

15. Kazakhstan has reported a key category tier 1 analysis, both and trend assessment, as part of its 2011 inventory submission. The results are presented in chapter 1.5 of the NIR and in annex I to the NIR. The key category analysis performed by the Party and that performed by the secretariat[2] produced different results owing to the different disaggregation of the categories included. Specifically, the analysis performed by the Party does not include specific fuel types for energy categories nor does it include the LULUCF sector, which is not in accordance with the Intergovernmental Panel on Climate Change (IPCC) good practice guidance for LULUCF. The ERT therefore reiterates the recommendation from the previous review report that Kazakhstan include the LULUCF sector in the key category assessment in its next inventory submission.

16. The ERT strongly recommends that Kazakhstan ensure the completeness of its approach, for example, by including all categories. The ERT noted that the CO_2 emissions from the category other (fuel combustion activities) were not identified as a key category, although other categories with significantly lower emissions have been. Furthermore, the

[2] The secretariat identified, for each Party, the categories that are key categories in terms of their absolute level of emissions, applying the tier 1 level assessment as described in the IPCC good practice guidance for LULUCF. Key categories according to the tier 1 trend assessment were also identified for Parties that provided a full set of CRF tables for the base year or period. Where the Party performed a key category analysis, the key categories presented in this report follow the Party's analysis. However, they are presented at the level of aggregation corresponding to a tier 1 key category assessment conducted by the secretariat.

ERT reiterates the recommendation of the previous review report that the Party extend the level of detail for the categories included in the assessment (e.g. it would be more precise to perform an analysis taking into account the different animal species instead of the categories of all enteric fermentation or manure management). Such an assessment would lead to a more focussed inventory preparation.

Uncertainties

17. The NIR states that an IPCC tier 1 uncertainty analysis was performed; however, information on this analysis is only reported in the sectoral chapters. A more detailed description and an assessment for the entire inventory, as requested by the UNFCCC reporting guidelines are not presented in the NIR, and a specific annex to the NIR, including table 6.1 of the IPCC good practice guidance, is not provided. The information on uncertainties included in the sectoral chapters is often only a reference (without further explanation) to the use of IPCC default values, and explanations of the rationale behind the assumptions used (including expert judgement) and the choice of uncertainty values is limited. The ERT therefore reiterates the recommendation of the previous review report that Kazakhstan perform a quantitative uncertainty analysis, including the LULUCF sector, in accordance with the IPCC good practice guidance for LULUCF and present it, as requested in section I.7 of the IPCC good practice guidance, in an annex to the NIR in its next inventory submission. The ERT also encourages Kazakhstan to use country-specific uncertainty values that are more appropriate to its national circumstances. The ERT recommends that the Party use the uncertainty analysis as a driving factor to prioritize the improvements of its inventory and report on how it is doing this in its next inventory submission.

Recalculations and time-series consistency

18. In accordance with data from CRF table 8(a), recalculations have been performed for all categories within the energy, agriculture and LULUCF sectors as well as for the metal production category in the industrial processes sector. However, CRF table 8(b) does not contain information on the rationale for the recalculations made. The ERT strongly recommends that Kazakhstan report in its future NIR and in relevant CRF tables detailed information on the rationale and impact of the recalculations performed.

19. In response to questions by the ERT, the Party noted that recalculations reported by the Party have been made primarily to take into account the availability of more accurate AD for the whole time series. The results of the recalculations were: an increase in estimated total GHG emissions in 1990 by 12.2 per cent (from 329,485.78 to 369,597.91 Gg CO_2 eq with LULUCF) and an increase in 2008 by 7.0 per cent (from 245,221.34 to 262,314.56 Gg CO_2 eq with LULUCF.

Verification and quality assurance/quality control approaches

20. Kazakhstan presented in chapter 1.6 of the NIR an annual quality assurance/quality control (QA/QC) plan. The ERT commends the Party for this improvement. The QA/QC plan states that in July of each year the schedule of QA/QC procedures for the inventory is to be prepared and included in the NIR. QA/QC procedures are performed according to the MoEP order No.258 of 4 December 2009. For the preparation of the 2011 inventory submission, QC procedures have been undertaken mainly by the inventory team with the involvement of specialists from other institutions who provide additional information. QA procedures were undertaken in accordance with table 8.1 of IPCC good practice guidance and included a peer review of the inventory by external experts.

21. However, the ERT noted that the Party did not report any evidence of its implementation of the QA/QC plan (e.g. identified errors, QC worksheets, checklists, etc.)

and there are no records on QA/QC activities available for the energy sector (for instance, a number of typing mistakes and inconsistencies were found in the data for the sector). Therefore, the ERT recommends that Kazakhstan include more information about the results of QA/QC procedures both in chapter 1.6 of the NIR and in the sectoral chapters of its next inventory submission.

Transparency

22. The NIR structure is not in agreement with the requirements of the "Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual inventories" (hereinafter referred to as the UNFCCC reporting guidelines).

23. The ERT considers that the information contained in the NIR is not sufficiently detailed and the methods and EFs used are described in a way that does not allow reviewers to fully assess the underlying assumptions and rationale for choices of AD, methods and other inventory parameters. For example, the data for energy consumption in the specific categories are provided only on an aggregate level for solid, liquid and gaseous fuels and the parameters used are only partly described in detail for specific fuels. When country-specific data are used the documentation provided is not sufficient. Notation keys are missing or improperly used throughout the sectors in CRF tables.

24. The ERT recommends that Kazakhstan improve the transparency of its inventory by including more information on methods, EFs and AD as well as explanations on the fluctuations in emission trends in its next inventory submission and include additional information in the annexes to the NIR, as outlined in the UNFCCC reporting guidelines.

Inventory management

25. Kazakhstan has an archiving system, which includes the control of internal documentation on AD and EFs as well as the methodologies used to calculate emissions. Archiving procedures applied are described in the NIR.

26. It is unclear from the NIR what entity is responsible for maintaining the archive. The ERT therefore recommends that, in the NIR of its next inventory submission, the Party describe in more detail the archiving system and provide information about the entity responsible for archive maintenance. In addition, the ERT reiterates the recommendations from the previous review report that the Party establish a centralized electronic archiving system in the future.

3. Follow-up to previous reviews

27. As recommended by previous review reports, Kazakhstan improved the method used for the reference approach by applying appropriate values for the fraction of carbon oxidized and by developing and implementing specific QA/QC procedures for the entry of data into the calculation sheets. GHG emissions in categories/sectors previously reported as "NE" have been accounted for (e.g. solvents and other product use, indirect N_2O emissions from agricultural soils, poultry manure management).

28. However, many issues still remain to be addressed. Specifically:

(a) The appropriate use of notation keys in the CRF tables;

(b) The application of more specific analyses to reduce discrepancies with the energy consumption data reported to other international organizations, such as the International Energy Agency (IEA);

(c) The inclusion of a key category analysis taking into account the three main fuel categories for energy categories;

(d) The improvement of transparency including improving the documentation in both the NIR and in the relevant documentation boxes of the CRF tables;

(e) The reporting of emissions from goats separately from sheep in the agriculture sector;

(f) The collection of AD and the estimation of emissions for the missing subcategories under consumption of halocarbons and SF_6 in the industrial processes sector;

(g) The development of a carbon balance for iron and steel production in order to avoid CO_2 emissions being double-counted in the energy and industrial processes sectors.

4. Areas for further improvement

Identified by the Party

29. The 2011 NIR identifies several areas for improvement. In its NIR, Kazakhstan indicated the following areas for improvement:

(a) The use of higher tiers (2 or 3) for emissions calculation in the energy sector;

(b) An increase in the use of country-specific EFs and national data in the industrial processes sector (e.g. applying national plant-specific data on calcium oxide (CaO) content in clinker and the cement kiln dust correction factor; calculating emissions from lime, soda ash, carbide and ammonia production using plant-specific AD; collecting data so that a tier 3 methodology can be used for calculating emissions from ferroalloys production);

(c) The development of country-specific EFs and national data in the agriculture sector (e.g. EFs for enteric fermentation relating to cattle, sheep and goats and for cattle manure management);

(d) The use of more accurate AD in the LULUCF sector (e.g. the improvement of the land-use matrix and data on land-use change to take into account the differences in climatic zones and soil conditions);

(e) The use of more accurate data about the composition of solid waste at landfills in the waste sector.

Identified by the expert review team

30. During the review, the ERT identified cross-cutting issues for improvement. These are listed in paragraph 125 below.

31. Recommended improvements relating to specific categories are presented in the relevant sector chapters of this report.

B. Energy

1. Sector overview

32. The energy sector is the main sector in the inventory of Kazakhstan. In 2009, emissions from the energy sector amounted to 245,866.78 Gg CO_2 eq, or 84.9 per cent of total GHG emissions. Since 1990, emissions have decreased by 21.0 per cent. The key driver for the fall in emissions is the large reduction of fossil fuel consumption during the process of the establishment of a new independent State (associated with a deep economic crisis) and accompanying social and economic reforms in the period 1992–1999. Following

the recovery from the economic crisis, a stable growth of the energy sector emissions can be observed since 2000.

33. Within the sector, 45.9 per cent of emissions were from energy industries, followed by 14.8 per cent from manufacturing industries and construction and 13.4 per cent from other. Transport accounted for 7.5 per cent and the category other sectors accounted for 5.4 per cent. Fugitive emissions contribute the remaining 12.9 per cent.

34. The geographical coverage of the sector is complete. A few categories are not estimated or reported for the entire time series, such as: fugitive emissions from coal mining and handling from underground mines (CO_2); fugitive emissions from solid fuel transformation (CO_2 and CH_4); exploration for oil and natural gas (CO_2 and CH_4); distribution of oil products (CH_4); and CH_4 from venting; and emissions from international bunkers. Neither data nor notation keys are reported in the CRF tables for some categories, such as other transportation and solid fuel transformation. The ERT recommends that Kazakhstan develop emission estimates for the categories not estimated or reported and that it use notation keys correctly.

35. The emissions of indirect GHGs, including the precursors nitrogen oxides, carbon monoxide, non-methane volatile organic compounds (NMVOC) and sulphur dioxide, are only partly included for the categories under the stationary combustion. The ERT recommends that the Party include estimates for the all categories currently not reported (e.g. transportation, industrial processes) and complete the reporting as recommended by the UNFCCC reporting guidelines.

36. The reporting of the energy sector is not sufficiently transparent. The description of the methods used for the specific categories is not sufficiently detailed for the ERT to be able to assess the quality of the inventory. The data for energy consumption in the specific categories are provided only on an aggregated level for solid, liquid and gaseous fuels and not for individual fuels. The parameters used are only partly described in detail for specific fuels. Where country-specific data are used the documentation provided is insufficient. For instance, the documentation should include details of the kind of analysis used, how often it is performed, what kind of QA/QC is applied and there should be a statement of whether the data are relevant for the entire category. This is of specific importance because the country-specific values reported by the Party often differ significantly from the IPCC default values.

37. Also, the rational for not estimating the emissions from specific categories should be provided in CRF table 9(a). The use of information in the documentation box would enhance the transparency of the information provided by Kazakhstan. The ERT noted that some data in the NIR are reported in tonnes of coal equivalent, which hinders the assessment of the emission estimates. Therefore the ERT encourages Kazakhstan to improve its use of units in the NIR (i.e. the correct use of Gg, GJ or PJ, as appropriate). The ERT recommends that the NIR of the next inventory submission is prepared in accordance with the structure laid out in the UNFCCC reporting guidelines (including complete category descriptions, origin of data sources for the estimations in the different categories, the QA/QC procedures applied, the trend discussion on category level and the application of an uncertainty assessment).

38. The ERT noted discrepancies in the presentation of emissions data from international bunkers between the NIR and the CRF tables. The NIR provides some limited data and information on these emissions but these emissions are not included in the CRF tables. The ERT recommends that Kazakhstan improve the reporting of emissions from international bunkers in future inventory submissions by implementing specific QC checks during the process of the inventory compilation and reporting.

39. Kazakhstan has included estimates of emissions based on data for statistical losses provided by the national energy balance under the category "Other". The definition of the category "Other" states that emissions should include "all remaining emissions from non-specified fuel combustion, at minimum the emissions from military fuel use". However, according to the Party's NIR, its reporting of this category includes "all other sources of emissions from non-specific combustion, not included in any other categories, including fuel combustion in State controlled institutions, loss of fuel and fuel which is represented in the Kazakh national statistical reporting allocated to enterprises and organizations". The ERT recommends that the Party make additional efforts to resolve this misallocation.

40. Uncertainty estimates are reported in the NIR on a sectoral level only. Documentation of the uncertainties values used for AD and EFs is not provided, although it is often mentioned that default values have been used. Transport is the only category for which more detailed information on background assumptions for the uncertainty calculation is provided. The ERT recommends that Kazakhstan extend its documentation on uncertainties for all other categories and provide an overall assessment of the uncertainties for the energy section in its next inventory submission.

41. The NIR does not provide information on the general application of QA/QC procedures in the energy sector, except very limited information for the transportation sector and coal mining. The ERT strongly recommends that Kazakhstan: perform checks for the correctness of the methods, data input and calculations; implement all QC procedures recommended in the IPCC good practice guidance; and carry out a peer review of, and verify the information and studies delivered from external organizations and institutions for, the preparation of the inventory in its next inventory submission. The ERT further recommends that the Party improve its reporting on these in the NIR of its next inventory submission.

42. The NIR of the 2011 inventory submission identifies some areas for improvement in the energy sector. For example, Kazakhstan plans to improve the uncertainty analysis, to reassess the methods applied for the calculation for energy industries, to start research on additional or alternative data sources, to switch to a higher-tier approach by using recommended models and country-specific EFs for CH_4 and N_2O from transport, to assess possible new sources for AD and adjusted data for the non-energy use of fuels for the reference approach. Other planned improvements include the collection of data for oil and gas exploration and for the recycling and recovery of CH_4. The ERT acknowledge these planned improvements and encourages Kazakhstan to implement them as soon as possible.

2. Reference and sectoral approaches

Comparison of the reference approach with the sectoral approach and international statistics

43. CO_2 emissions from fuel combustion were calculated using the reference approach and the sectoral approach. For 2009, there is a difference of –5.9 per cent in the CO_2 emission estimates between the reference approach and the sectoral approach. Explanations for this difference are not provided in the documentation box of CRF table 1.A(c). This difference varies widely from year to year, from –13.6 per cent (2005) to 23.4 per cent (1997) and is above 2 per cent for almost all years. The explanations provided in the NIR are limited and insufficient. Specifically, significant differences are not explained, given that the calculation data are based on the same statistics (i.e. in 2008 the results for the sectoral approach increased by 19,217.9 Gg CO_2 while the reference approach resulted in a reduction of 6,842.4 Gg CO_2).

44. The method used for the reference approach has improved since the previous review report because the Party has applied default parameters in the calculations (mainly values for the fraction of carbon oxidized) and by the implementation of specific QC procedures

during the process of entering data in the calculation sheets. However, the ERT reiterates most of the recommendations from the previous review report, specifically:

(a) The application of a more specific analysis to reduce the discrepancies between the energy consumption data reported in the annual inventory and the data reported to other international organizations (IEA);

(b) The inclusion of a detailed analysis for the comparison of results on the aggregated level as well as of the level of fuel groups (reported in CRF table 1.A(c));

(c) The improvement of the documentation in the NIR, specifically the trend discussion, and in the relevant documentation boxes of the CRF tables;

(d) The provision of further analysis for the parameters used. For example, table 3.2.2.3 of the NIR lists the parameters used for the reference approach, most of which are indicated as default IPCC values. However, compared to the IPCC defaults, the values used by the Party for lignite and coke oven gas are different and should be verified and documented in the next NIR.

International bunker fuels

45. The ERT found it difficult to assess the reporting of emissions from international transport. In CRF table 1.C, AD and emissions for aviation bunkers are reported as "NE" and emissions for marine bunkers are reported as "NA". The documentation box in this table and the NIR explain that, based on a new cooperation with the airlines, background information and AD for international air transportation is available for 2009. The ERT commends Kazakhstan for its efforts to find AD. However, the reporting on this category is still incomplete and inconsistent. The ERT reiterates the recommendations of the previous review report that the Party obtain the required data on fuel consumption for these activities, based on available statistics and expert judgement and report emissions in its next inventory submission.

46. According to the available international statistics (e.g. IEA data), water transportation does occur in Kazakhstan for national and international purposes. The ERT therefore recommends that, in the NIR of its next inventory submission, the Party include relevant transport statistics in the estimation for this category, correctly allocated to international and national transportation and use the appropriate EFs.

Feedstocks and non-energy use of fuels

47. Kazakhstan reports on the use of fuels as feedstock and for non-energy purposes. The ERT experienced difficulties when assessing the completeness of the estimates because information is not provided on some fuels (e.g. lubricants, coal oil and tars, ethane). In addition, the NIR stated that the use of coal in the chemical industry is unknown and therefore not included. The ERT considers that for the reporting of feedstocks, the values for the fraction of carbon stored are of particular importance. The values used by the Party are partly taken from the Revised 1996 IPCC Guidelines but for coal, coke, crude oil and solid biomass the assumption of 100 per cent storage is taken. The ERT recommends that, in its next inventory submission, the Party revise these estimates, including the provision of complete AD of fuel use as feedstock and for non-energy use in chemical industry and the documentation of the values for the fraction stored. The ERT also recommends that the Party provide information on how emissions are allocated between the Energy and Industrial Processes sectors.

3. Key categories

Stationary combustion: all fuels – CO_2 , CH_4, N_2O

48. The AD used are taken from different data sources. For 1990, data of the fuel use were based on the energy balance of the Kazakh Soviet Socialist Republic, which provided data on the combustion of fuels for electricity and heat, as well as fuel used in refineries and other energy transformation plants. The calculations for 1999–2009 were performed using the fuel and energy balances provided by the Statistical Agency of Kazakhstan, which has separately identified the main producers of electricity and heat, the combustion of fuel in oil refining and coke production, the production of solid fuels and other energy industries including the burning of fuels from coal, oil and gas.

49. The calculations for 1992 and 1994 were based on data on fuel combustion provided by the Agency on Statistics Bulletin on stock changes, supply and consumption of fuel in the Republic of Kazakhstan, minus the primary fuels used to produce secondary fuels. The estimates for 1991, 1993, 1995–1998 were calculated in accordance with the IPCC good practice guidance using data disaggregated to the level of production in the respective industries. The ERT notes this inconsistency in the data used for the time series and recommends that the Party explain in its NIR the underlying assumptions, the degree of expert judgement, the assessment of time-series consistency and the final data sets of AD that is used for the years between 1990 and 2000.

50. The ERT was not able to assess the emission of CO_2, CH_4 and N_2O from the category manufacturing industries and construction on the basis of the information provided in the NIR. The information contained is aggregated, which hinders attempts to understand the choice of methods, data sources and the parameters used for the subcategories, which are reported separately in the CRF tables. The ERT therefore strongly recommends that the Party elaborate the documentation for these estimates in accordance with the NIR structure provided in the UNFCCC reporting guidelines, and in particular that for each subcategory the NIR should provide the necessary information (i.e. category description, methodological issues and trend discussions on category level, uncertainty, time-series consistency, specific QA/QC procedures applied, recalculations and planned improvements).

51. For iron and steel the NIR should include a description of the treatment and use of the released gases – how they are accounted and where are they used. For example, a detailed carbon balance would support the transparency of the reporting and facilitate the acceptance of the calculation in this category. The ERT therefore reiterates the recommendation of the previous review report that the Party extend the documentation in this particular subcategory.

52. According to the NIR, Kazakhstan has included under the category other emissions from the fuel consumption in governmental institutions, industrial facilities and organizations and other unspecified reported fuel consumption. The ERT recommends that the Party reallocate these emissions to the more appropriate subcategory of commercial/institutional. In addition, the ERT recommends that the Party provide a more detailed trend discussion, specifically for the inter-annual variations in the years between 1997 and 2002 as well as for the years after 2006 in its next inventory submission.

53. The NIR states that the emissions related to the fuel consumption in the column "losses" of the energy balance are also included under this category. "Loss" includes loss of coal together with the enrichment and screening for metallurgical coke and industry losses during coal briquetting, the loss of oil during desalting and dehydration, as well as process losses and waste fuel related to its processing into other fuels and the production of chemical, petrochemical and other non-fuel products. It also takes into account all kinds of

shortages and fuel losses during storage and transportation, including losses due to gas flaring of oil and gas processing. The ERT recommends that the Party include the emissions from these specific activities under chemical industries, fugitive emissions and fuel processing categories, as appropriate, in its next inventory submission.

Coal mining and handling: solid fuels – CH_4

54. The implied emission factor (IEF) for CH_4 from underground mines for 1990–2009 (ranging from 20.71–31.05 kg/t) is much higher than the IPCC default range (7.2–18.0 kg/t) and in 2009 (31.05 kg/t) the highest of all reporting Parties (0.74–31.05 kg/t). The 2009 value is 24.3 per cent higher than the 2008 value and 37.3 per cent higher than the 1990 value. The trend fluctuates without explanation in the NIR. The ERT recommends that the Party include documentation on the origin of the EFs used and a description of the underlying reasons for the fluctuation in the trend of these emissions in its next inventory submission.

55. Similarly, the IEF for CH_4 from surface mines for all years of the period 1990–2009 remains constant (8.3 kg/t). This IEF is significantly higher than the IPCC default range (0.2–1.6 kg/t) and in 2009 is the highest of all reporting Parties (the second highest value is 3.7 kg/t). Sufficient information and documentation on the origin of this IEF and its relevance is not provided in the NIR. The ERT recommends that the Party include information on the origin of EF used and a description of the underlying reasons for the fluctuation in the trend of these emissions in its next inventory submission.

Oil and natural gas: gaseous fuels – CH_4

56. Kazakhstan reported emissions from the production of natural gas for the first time in its 2011 inventory submission, including emissions from the transportation and distribution of natural gas. However, the description in the NIR of the methods applied is not sufficient for the ERT to assess the completeness of the emission estimates. Specifically, the methodology to estimate emissions from the distribution networks should be further explained (i.e. further information should be provided on the composition of the network in respect to length and the different materials used in the different parts (e.g. long distance transportation, medium pressure distribution network and the local distribution network)). The ERT strongly recommends that the Party include this information in its next inventory submission. In addition, the ERT recommends that the Party report on the CH_4 emissions from natural gas exploration. According to international available statistics, Kazakhstan is one of the largest gas producing countries in the world. Based on that, emissions from gas exploration are likely to occur in Kazakhstan.

4. Non-key categories

Road transportation: liquid fuels – CH_4 and N_2O

57. The IEF for N_2O is constant over the entire time series, except for 2009 where the value changed from 0.1 kg/TJ to 0.33 kg/TJ. The NIR does not provide an explanation for this change. Compared with the values reported by other Parties these are the lowest values in all reporting Parties. Usually, the IEF for N_2O would change over the time series because of an increase in the use of cars equipped with catalytic converters. In all other reporting Parties, the IEF changed significantly. The ERT therefore reiterates the recommendation of the previous review report that the Party provide a more precise estimation of emissions from this category or provide justification for the constant value. The improvement could be implemented by using internationally agreed models for the estimation of emissions from road transportation such as COPERT.

58. The IEF for CH_4 is constant over the entire time series, except for 2009 where the value changed from 28.3 kg/TJ to 32.5 kg/TJ. The NIR does not provide an explanation for this. Usually, the IEF for CH_4 would reduce over time due to an increase in the use of cars equipped with catalytic converters. In all other reporting Parties, the IEF decreased by between 50 and 80 per cent between 1990 and 2009. Only in Kazakhstan the value for 2009 is higher than the 1990 value. The ERT therefore reiterates the recommendation of the previous review report, that the Party provide a more precise estimation of emissions from this category.

Navigation: liquid fuels – CO_2, CH_4 and N_2O

59. The ERT was unable to assess the completeness and the methods applied in this category based on the very limited information contained in the NIR and the CRF tables. The ERT therefore recommends that the Party provide a more detailed estimation for its next inventory submission.

Other transportation: liquid and gaseous – CO_2, CH_4 and N_2O

60. The emissions from this category are caused by the pipeline transportation of oil, gas and petroleum products and emissions have grown over the time series. The NIR states that the estimates are based on country-specific EFs for CO_2 and default EFs for CH_4 and N_2O. The ERT commends the Party for its efforts to ensure the use of more accurate EFs for CH_4 and N_2O. The ERT recommends that, in the NIR of its next inventory submission, the Party provide a more detailed explanation of the underlying assumptions and the EFs used.

Solid fuel transformation – CH_4

61. Kazakhstan does not estimate CH_4 emissions from this category (empty cells in CRF table 1.B.1). Explanations are not provided in the NIR or the CRF tables (including the documentation boxes). IEA data indicate that Kazakhstan is one of the ten biggest producers of emissions from solid fuel transformation. The ERT recommends that, in its next inventory submission, the Party include emissions from this category or more information about the rationale for their exclusion from the inventory.

C. Industrial processes and solvent and other product use

1. Sector overview

62. In 2009, emissions from the industrial processes sector amounted to 14,311.91 Gg CO_2 eq, or 4.9 per cent of total GHG emissions, and emissions from the solvent and other products use sector were reported as "NE". Between 1990 and 2009, emissions from the industrial processes sector decreased by 20.1 per cent. The key driver for the fall in emissions is a decline in metallurgy and in the production of mineral products, due to the transition from a planned economy to a market economy. Within the industrial processes sector, 42.2 per cent of the emissions were from iron and steel production, followed by 14.2 per cent from ferroalloys production and 14.2 per cent from cement production, 11.3 per cent from limestone and dolomite use. Aluminum production accounted for 8.4 per cent, lime production accounted for 4.3 per cent, consumption of halocarbons in refrigeration and air-conditioning equipment accounted for 2.9 per cent and ammonia production accounted for 1.1 per cent. The remaining 1.4 per cent of emissions were from soda ash production and use, and carbide production. CO_2 was the largest contributor to GHG emissions from the industrial processes sector, accounting for 90.3 per cent of sectoral emissions. The contributions of PFCs, HFCs, CH_4 and SF_6 were 6.6, 2.9, 0.2 and 0.02 per cent, respectively.

63. In the solvent and other product use sector, Kazakhstan has estimated only the NMVOC emissions from paint application, degreasing and dry cleaning.

64. Kazakhstan has made recalculations for the industrial processes sector between the 2010 and 2011 submissions in response to the 2010 annual review report. The ERT noted that recalculations of the time series 1990–2008 have been undertaken to take into account revised AD for 1999–2008 on carbon content in coke, iron and steel, as well as on specific iron consumption on each type of steel production.

65. The CRF tables include estimates of emissions from most categories from the industrial processes sector for which there are methodologies in the Revised 1996 IPCC Guidelines and the IPCC good practice guidance. Emissions cover all gases, all years of the inventory time series, and all geographical locations. Categories and gases reported as "NE" by Kazakhstan include CO_2 from coke under iron and steel production. CO_2 emissions from glass production are reported as "included elsewhere" ("IE") and AD have been reported as "confidential" ("C") to protect commercially sensitive information. The ERT reiterates the recommendation from previous review reports that Kazakhstan collect AD and estimate emissions from all categories for which the Revised 1996 IPCC Guidelines and the IPCC good practice guidance provide methodologies to improve the completeness of the inventory in its next inventory submission.

66. Kazakhstan reported actual HFC emissions from refrigeration and air-conditioning equipment only. Other subcategories and some missing species of HFCs, PFCs and SF_6 emissions from consumption of halocarbons and SF_6 are reported as "NE" due to lack of AD. The ERT reiterates the recommendation from previous review reports that Kazakhstan strengthen its efforts to collect AD and estimate emissions for the missing subcategories under consumption of halocarbons and SF_6.

67. Kazakhstan has provided some justifications in the NIR for the assumptions made and the choice of AD, EFs and methods used for key categories. However, the ERT noted a lack of transparency in the NIR, in that the information and explanations provided for all categories in the CRF tables and the NIR was insufficient for the ERT to be able to fully assess the data used and the methodologies applied. The ERT therefore reiterates the recommendation from previous review reports that Kazakhstan improve the overall transparency of the inventory by including clear and concise information on methods, EFs and AD used in its NIR, as well as other additional information, in order to fully adhere to the requirements of the UNFCCC reporting guidelines in its next inventory submission.

68. The NIR provided information on overall uncertainties for the AD only. Although no discussion of uncertainties for EFs is provided, it is noted that mostly IPCC default EFs were used. The ERT encourages Kazakhstan to estimate uncertainties in accordance with the IPCC good practice guidance and follow closely the UNFCCC reporting guidelines when providing information on uncertainties for the sector in its next inventory submission.

69. Very limited information is provided in the sectoral chapter on the QA/QC procedures for the industrial processes sector. The ERT recommends that Kazakhstan undertake category-specific QA/QC procedures in its next inventory submission starting with the key categories following the IPCC good practice guidance. The ERT also recommends that Kazakhstan report more detailed information on this in the NIR of its next inventory submission, in particular for the key categories, as well as information on any external reviews undertaken and/or planned to be conducted for the industrial processes sector and key findings on the quality checks of the AD and methods used.

2. Key categories

Cement production – CO_2

70. There are five cement production plants in Kazakhstan. AD and EFs for clinker and cement kiln dust are received directly from these plants. The ERT welcomes the efforts by Kazakhstan to continue using AD and EFs from the plants and encourages the Party to report corresponding emissions in its next inventory submission. The ERT noted that the Party is planning to apply national plant-specific data for CaO content in clinker and for the cement kiln dust correction factor for its next inventory submission. The ERT reiterates the recommendation from previous review reports that Kazakhstan provide a detailed description of the technological process of cement production in the country, together with data, EFs and correction factors used in its next inventory submission in order to improve the transparency of the inventory.

Lime production – CO_2.

71. The inter-annual changes of CO_2 IEFs reported in the CRF tables during the period 1990–1998, ranged from –1.1 per cent to 0.5 per cent, then the value of the CO_2 IEF was practically kept constant for the 1998–2008 period (0.766 t/t), with the value for 2009 (0.762 t/t) being 0.6 per cent lower than those values. The 2009 value is 1.2 per cent lower than the 1990 value. No explanations on the changes or on the methods and AD used for the estimates are provided in the NIR. The ERT noted that the Party is planning to calculate emissions from lime production using plant-specific AD for its next inventory submission. The ERT therefore reiterates the recommendation from previous review reports that Kazakhstan provide detailed descriptions of the method, AD and EFs used for the estimates in its next inventory submission in order to improve the transparency of the inventory.

Limestone and dolomite use – CO_2

72. Kazakhstan estimated emissions based on the national statistics, plant-specific data and default IPCC EFs. However, the applied calculation methods and AD are not presented in the NIR. The ERT noted the Party's plans to study national EFs for calculating emissions from dolomite and limestone production for its next inventory submission. The ERT therefore reiterates the recommendation from previous review reports that Kazakhstan provide a detailed description of the AD, EFs and method used in its next inventory submission in order to improve the transparency of the inventory. The ERT also encourages Kazakhstan to develop the balance of limestone and dolomite use in the country that was referred to in the previous annual review report to enable the accurate estimation of CO_2 emissions and the correct allocation of limestone and dolomite among the different categories of the industrial processes sector.

Carbide production – CO_2

73. The CO_2 IEF value reported in the CRF tables (2.95 t/t) for the whole time series is above the IPCC default range (0.76–1.1 t/t). The EFs, AD and applied calculation methods are not presented in the NIR. The ERT noted that the Party is planning to calculate emissions from carbide production using plant-specific AD for its next inventory submission. The ERT therefore reiterates the recommendation from previous review reports that Kazakhstan provide a detailed description of the AD, EFs and methods used in its next inventory submission in order to improve the transparency of the inventory.

Iron and steel production – CO_2

74. Kazakhstan applied a tier 2 methodology, which is based on plant-specific AD and EFs. The CO_2 IEF values reported in the CRF tables for steel (ranging from 0.11–0.14 t/t)

are below the IPCC default range (1.5–1.6 t/t) and for pig iron (ranging from 1.14–1.86 t/t) are below the IPCC default range (2.5–3.6 t/t). Also, emissions from coke production (although CO_2 emissions are not currently reported in the CRF they could be in the future) should be reported under metal production rather than under chemical products (other). The ERT noted the Party's plans to study national EFs and carbon content in coke used for iron and steel production for its next inventory submission. The ERT therefore reiterates the recommendation from previous review reports that Kazakhstan develop a carbon balance for iron and steel production in order to avoid CO_2 emissions being double-counted in the energy and industrial processes sectors. The ERT also encourages Kazakhstan to continue to use plant-specific data and provide a more detailed description of the AD, EFs and methods used in its next inventory submission in order to improve the transparency of the inventory.

Ferroalloys production – CO_2

75. Kazakhstan reports CO_2 emissions in the CRF tables, but no descriptions of the methods, EFs and AD used are included in the NIR. The ERT noted the Party's plans to collect data to enable a tier 3 methodology to be used for calculating emissions from ferroalloys production. The ERT reiterates the recommendation from previous review reports that Kazakhstan provide a detailed description of the AD, EFs and methods used in its next inventory submission in order to improve the transparency of the inventory.

Aluminium production – CO_2, PFCs

76. Kazakhstan reports CO_2 and the PFCs tetrafluoromethane and hexafluoroethane emissions in the CRF tables, but no descriptions of the methods, EFs and AD used are included in the NIR. AD and emissions are reported for 2007–2009 because aluminium production started in Kazakhstan only in 2007 and hence for all other years "NO" is used in the CRF tables. The ERT noted the Party's plans to study national EFs for calculating emissions from aluminium production for its next inventory submission. The ERT reiterates the recommendation from previous review reports that Kazakhstan provide a detailed description of the AD, EFs and methods used in its next inventory submission in order to improve the transparency of the inventory.

3. Non-key categories

Consumption of halocarbons and SF_6 – HFCs, PFCs and SF_6

77. Actual emissions of HFCs are reported only for HFC-134, under the subcategory refrigeration and air-conditioning equipment, and actual emissions of SF_6 are reported under the subcategory electrical equipment. The assumptions made in estimating actual emissions are not well-documented in the NIR. The ERT therefore reiterates the recommendation from previous review reports that Kazakhstan provide precise documentation and validation of such assumptions, especially for refrigeration equipment and mobile air-conditioning equipment. No actual emissions or notation keys for other gases and species or subcategories are reported under this category. Potential emissions of all gases are reported as "NO". The ERT also therefore reiterates the recommendation from previous review reports that Kazakhstan provide a detailed description in the NIR of the methods, AD and EFs used in estimating emissions under this category in its next inventory submission.

D. Agriculture

1. Sector overview

78. In 2009, emissions from the agriculture sector amounted to 23,407.62 Gg CO_2 eq, or 8.1 per cent of total GHG emissions. Since 1990, emissions have decreased by 43.6 per cent. The key drivers for the decrease in emissions are the reduction in livestock population, reduction in the use of synthetic fertilizers applied on agricultural soils and reductions in the area of cultivated land. Within the sector, 59.0 per cent of the emissions were from enteric fermentation, followed by 21.8 per cent from manure management, 18.8 per cent from agricultural soils. The remaining 0.5 per cent were from rice cultivation.

79. Emissions from prescribed burning of savannas and burning of agricultural residues are reported as 'NO', because there are no savannas in Kazakhstan and burning of agricultural residues was reported as 'NO', since it has not been practiced since the end of the 1980s.

80. The ERT welcomes the efforts made by Kazakhstan to improve the inventory since the last inventory submission, in particular: CH_4 emissions from manure management for poultry and N_2O indirect emissions from agricultural soils were estimated for the first time in the 2011 submission. However, a large number for improvements can still be made, which are described in the following paragraphs.

81. The inventory does not include emission estimates from mules and asses, and buffalo, which were reported as not occurring "NO". However, the FAO reports data on livestock population of mules and asses, and buffalo. The ERT recommends that Kazakhstan estimate emissions using country-specific data and the IPCC good practice guidance methodologies. If the Party does not have these data, then it could use FAO data for its next inventory submission.

82. The ERT noted inconsistencies in the AD, EFs and emissions presented in the CRF and in the NIR and inappropriate use of notation keys in the CRF tables. The ERT recommends that Kazakhstan improve the consistency between the NIR and CRF tables and ensure the correct use of notation keys. The ERT encourages Kazakhstan to follow more closely the IPCC good practice guidance and the UNFCCC reporting guidelines in order to achieve better transparency in its next inventory submission.

83. The tier 1 method is used for the uncertainty analysis, but uncertainty rates for AD and EFs are presented without references to the source(s) of these values. The ERT reiterates the recommendation of the previous review report that Kazakhstan better report the uncertainty estimates and provide the references to the uncertainties rates used in the analysis in its next inventory submission.

84. The NIR contains a chapter on QA/QC and verification procedures that have been performed for the agricultural sector. However, the ERT noted that very limited information was provided in this chapter. The ERT recommends that Kazakhstan provide a detailed explanation of QA/QC activities performed for the agricultural sector.

2. Key categories

Enteric fermentation – CH_4

85. The tier 1 method of the Revised IPCC 1996 Guidelines was used to estimate emissions from enteric fermentation for all animal types. Kazakhstan provided recalculations on emissions from enteric fermentation due to the update of AD on livestock population for all animal types and a change to the EFs for dairy and non-dairy cattle.

86. Emissions from goats and sheep were reported together. According to the NIR, this was done using national statistical data, which do not differentiate between the two types of animals. However, FAO publishes separate data on the population of goats and sheep population for Kazakhstan. The ERT therefore reiterates the encouragement of the previous review report for Kazakhstan to provide separate estimates of emissions for goats and sheep.

Manure management – CH_4, N_2O

87. Kazakhstan used the default method with a disaggregated animal characterization and IPCC default EFs for Western Europe to estimate emissions from this category, which is in line with the IPCC good practice guidance and the Revised 1996 IPCC Guidelines. However, the ERT encourages Kazakhstan to justify the use of EFs for Western Europe in its next inventory submission.

88. Kazakhstan reports the allocation of manure management systems in the NIR and the CRF table 4.B(a). However, the data are not the same in the CRF and the NIR. The ERT recommends that Kazakhstan correct the inconsistency and provide references in the agriculture chapter of its NIR in its next inventory submission.

89. The ERT noted that the methane conversion factors were not provided in the CRF tables or in the NIR. The ERT recommends that Kazakhstan provide the methane conversion factors in its next inventory submission.

Agricultural soils – N_2O

90. The Party used a tier 1 method of the Revised IPCC 1996 Guidelines to estimate direct and indirect emissions from agricultural soils.

91. The ERT noted that emissions from animal manure and synthetic fertilizers applied to agricultural soils reported in CRF table 4.D are not the same as those reported in the NIR. The ERT recommends that Kazakhstan improve the consistency of its reporting between the NIR and CRF tables in order to ensure the correct reporting of emissions estimates.

92. The ERT noted that Kazakhstan reported an incorrect value of $Frac_{GRAZ}$ in the CRF table 4.D (0.66). According to the calculations made by the ERT the value should be 0.43 using the total nitrogen excretion (809,230,359 kgN) from all waste management systems that are given in CRF table 4.B(b). The ERT recommends that Kazakhstan revise the value reported in the CRF table in its next inventory submission.

E. Land use, land-use change and forestry

1. Sector overview

93. In 2009, net removals from the LULUCF sector amounted to 11,337.79 Gg CO_2 eq. Since 1990, net removals have increased by 64.8 per cent. The key driver for the increase in removals is conversion of cropland to grassland and to forests land. Net removals from the category land converted to grassland increased by 2,585 per cent. Within the sector, 5,647.05 Gg CO_2 eq net removals were from grassland, followed by 3,744.45 Gg CO_2 eq from cropland and 1,773.81 Gg CO_2 eq from forest land. Settlements accounted for net removals of 172.48 Gg CO_2 eq. All categories reported by the Kazakhstan are sinks.

94. Kazakhstan has made recalculations for the LULUCF sector between the 2010 and 2011 submissions. The recalculations were undertaken due to detected inconsistencies in the time series of carbon stock changes in forests and in the representation of land use in the previous inventory and a revised method for estimating stock changes in perennial

cropland. The recalculations resulted in an increase in net removals of 1,213.9 per cent (from 633.72 Gg CO_2 eq to 8,326.44 Gg CO_2) for the year 2008.

95. As noted in the previous review report, the report for the LULUCF sector is incomplete although several improvements have been made (e.g. land areas converted to forest land are reported separately from areas from forest land remaining forest land but carbon changes have not been estimated for the former, notation keys have been revised in most cases). Several mandatory categories identified in the previous review report are still not reported: land converted to forest land; land converted to wetlands; land converted to other land; carbon stock changes in soil for forest land converted to grassland; and N_2O emissions from disturbance associated with land-use conversion to cropland). The ERT recommends that Kazakhstan improve the completeness of the inventory by collecting suitable data and reporting all mandatory categories in its next inventory submission.

96. The inventory also lacks completeness regarding geographical coverage. Despite the efforts made by the Party to improve the geographical representation and completeness of the land-area categorization included in the report, the ERT observed some deficiencies. In particular, estimates are not reported for almost all cropland areas and for areas consisting of reserved lands for agricultural and other uses. Only a reduced fraction of the cropland (41 per cent) is reported in the CRF tables, without any justification; and the total reported area is not constant over the time series, but increases from 250,197.34 kha in 1990 to 265,719.90 kha in 2009. Moreover, most areas provided in NIR (table 7.1.2) are not the same as the areas provided in CRF tables. The ERT recommends that Kazakhstan implement, in its next inventory submission, a complete and consistent representation of the use of land in the country, consistent with the IPCC good practice guidance for LULUCF, covering the full time series. The ERT also recommends that the Party consider the use of geographic information systems (GIS) technology to achieve a consistent representation of land use and, eventually, land management.

97. A key category analysis including LULUCF was not conducted by the Party and the secretariat's assessment has been used for this review.

98. The ERT notes that the NIR is not sufficiently transparent because Kazakhstan did not provide some relevant descriptions, references and sources of information for the specific methods (e.g. the national inventory of the forest sector), assumptions, EFs, AD (an inconsistent time series of land representation and lack of land transition matrices)), as well as the rationale for their selection. In addition, the documentation boxes in CRF tables were not used, and the reasons for the trends in key categories (grasslands, forest land) are not clearly explained. The ERT recommends that Kazakhstan report all the information required to ensure full transparency of the reported estimates in its next inventory submission.

99. The ERT notes some improvements in the assessment of uncertainties. In the 2011 inventory submission, uncertainties are provided separately for the key category forest land remaining forest land and for the LULUCF sector as a whole. Following the recommendations of the previous review report, the Party has made efforts to assess uncertainty partially based on national data. However, the data provided in the 2011 inventory submission are supported mainly by expert judgment and are not verified against publicly available independent sources. Information on sources is limited. Although the NIR includes a section on uncertainties, this is limited to providing basic information on the errors associated with different parameters in the national forest inventory and to reproducing the default values given in the IPCC good practice guidance for LULUCF. The ERT reiterates the recommendation of the previous review report that Kazakhstan provide a complete set of uncertainties for carbon stock changes and other emissions, using country-specific values where possible, in its next inventory submission.

100. Specific QA/QC procedures have not been implemented for the LULUCF sector. The ERT noted that there are inconsistencies in the reporting, for example in the reported land areas subjected to land-use changes, between the NIR and the CRF tables. This could be avoided by applying the necessary QA/QC procedures. The ERT therefore reiterates the recommendation of the previous review report that the Party implement a QA/QC plan in accordance with the IPCC good practice guidance. Further, the ERT encourages that Kazakhstan consider the implementation of any available tools, including software tools (if appropriate), for performing inventory calculations and QA/QC procedures for the LULUCF sector. This would help ensure consistency in the representation of land use and would minimize the risks of errors in data processing and reporting.

101. The ERT notes that although the area of land converted to forest land has been reported separately from the area of forest land remaining forest land, the associated carbon stock changes and other emissions have not been estimated. The ERT recommends that Kazakhstan provide estimates of carbon stock changes and other emissions, with a full description of the methods used for the estimation, the input data for living biomass (BEF, R, wood density by climatic zones) and the estimates for dead organic matter. The ERT recommends that the Party report complete estimates of carbon stock changes for each carbon pool and other emissions in its next inventory submission.

2. Key categories

Forest land remaining forest land – CO_2

102. The carbon stock changes in forest land remaining forest land were, for most of the reported areas, estimated by a tier 2 method using data provided by the national forest inventory. Biomass stocks as well as the dead organic matter pool were estimated by the stock change method.

103. The annual carbon stocks changes show large inter-annual variability, with fluctuations corresponding to five-year cycles associated with national forest inventory measurements. The ERT considers the cause of the variability could be that the number of plots sampled in a year is not representative of the variability of all the forest areas of Kazakhstan. In this case, in order to provide annual estimates, instead of inferring annual population statistics from the subset of plots sampled in the year, the Party could model the expected annual variation in those plots not sampled in that year using the annual data (sampled and estimated) for all plots for inferring population statistics.

104. For modelling, additional data sets including harvesting data and disturbances records may be used. Then the estimates would be revised each following year when the actual data may be substituted for the modelled data. This could smooth the fluctuations related to the five-year cycles of the national forest inventory, as recommended by the previous review report, by implementing suitable statistical procedures to improve the consistency of the time series. The ERT therefore reiterates the recommendation of the previous review report that the Party ensure all trends provided are clearly justified by reported information to improve confidence on the annual estimates.

105. Biomass gains and losses are not reported separately. Losses are indicated as “NO”. The ERT considers that reporting separately the gains and losses contributes to the transparency of the inventory, and that if gains and losses are not separately reported in the CRF table the notation key “IE” should be used for any carbon stock change not explicitly reported. The ERT therefore recommends that the Party report both biomass gains and biomass losses separately in future inventory submissions.

Cropland remaining cropland – CO_2

106. A net removal of 2,422.83 Gg CO_2 is reported for the category cropland remaining cropland in 2009. This is mostly attributed to the implementation of agroforestry systems and to the improvement of hay fields. The area reported in the CRF tables for this category in 2009 is 14,446.6 kha, which corresponds to 42.4 per cent of the total cropland area reported in the NIR (page 198). In response to a question raised during the previous in-country review, the Party had explained that the area reported in the CRF tables corresponds only to the areas were carbon stock changes were assumed to occur. The ERT reiterates the guidance of the preview ERT that is it good practice to report the whole area of cropland, while Kazakhstan may report area where stocks are in equilibrium in a subdivision of the cropland category. Therefore the ERT recommends that the Party implement a full assessment of carbon stock changes in cropland remaining cropland and that it comply with the UNFCCC reporting guidelines by including the total area of cropland remaining cropland in CRF table 5.B, consistent with the information provided in the NIR, in its next inventory submission.

107. The increases in biomass carbon stocks in this category were estimated using the IPCC tier 1 method. The default value for increments in living biomass given in the IPCC good practice guidance for LULUCF (table 3.3.2) for a temperate climate was used. The previous review had raised the issue of conservativeness of this default value and recommended that Kazakhstan develop country-specific growth rate values, or adopt a value within the range of uncertainty given to the default value by the IPCC good practice guidance for LULUCF. However, the value applied in this inventory submission is the same and uncertainty estimates are not provided for this category. The ERT therefore reiterates the aforementioned recommendation in the previous review report.

108. In the NIR the Party reports that all croplands are considered to be on mineral soils. Several problems were identified in the previous review report concerning the choice of stock-change factors for the determination of changes in soil organic carbon stocks using the IPCC tier 1 method. The selected factors were generally not adequate (e.g. the value chosen for f_{MG} (management factor) in generic cropland was 1.10, which corresponds to a no-tillage practice, when it is clear that not all areas of cropland in Kazakhstan are managed without tillage) and a single combination of the three carbon stock-change factors was adopted for the whole country for a given land management type (e.g. for hay fields, selected values for f_{LU} (land use factor), f_{MG} and f_I (input factor) were 0.82, 1.10 and 1.00, respectively, for the whole area of the country).

109. The estimates reported for 2009 applied the same conversion factors and therefore still have a high degree of uncertainty because of these assumptions. The ERT considers the assessment has not been improved in the 2011 inventory submission and additional clarifications are not provided. The ERT therefore reiterates the recommendation of the previous review report that Kazakhstan disaggregate the cropland area into a larger number of subcategories or management systems in order to reflect the wide variety of types of cropping systems and to achieve more accurate estimates of emissions and removals in its next inventory submission. Also, the choice of stock-change factors should follow more closely the recommendations of the IPCC good practice guidance for LULUCF.

110. Changes in soil organic carbon stocks from changes in management practices were estimated for the year in which those changes occurred only. However, the soil organic carbon pool is affected several years after a change is made. The ERT reiterates the recommendation of the previous review report that Kazakhstan produce, for each unit of land where a change in management practice occurs, estimates of changes in soil organic carbon stocks for a number of years equal to the transition period (20 years by default in accordance with the IPCC good practice guidance for LULUCF) after the implementation of new management practices.

Grassland remaining grassland – CO_2

111. An emission of 871.83 Gg CO_2 is reported for this category in 2009. The ERT noted inconsistencies between the areas under grassland in the different tables provided: in the NIR (2011) table 7.1.2 and annex 7A report 188,642.70 kha of total grassland, while CRF table 5.C reports 193,600.80 kha for grassland remaining grassland alone, and 201,193.00 kha for the total area. The ERT recommends that the Party implement the QA/QC plan for this key category in order to improve both the completeness and accuracy of the reporting in its next inventory submission.

Land converted to grassland – CO_2

112. The Party used a single value of reference soil organic carbon for grassland areas for the whole of Kazakhstan. This is the IPCC default for high activity clay mineral soils and dry temperate cold climate. The ERT considers that, as this is a key category, the use of a very basic tier 1 method introduces a large uncertainty to the inventory in so large a country, which spans several different climate and soil types. The ERT therefore recommends that the Party adopt country-specific reference soil organic carbon levels for different climatic zones and mineral soil types. The ERT also reiterates for this category the findings and recommendations related to the selection of a single combination of stock-change factor for a given management system (see para. 108 above) and the use of a transition period (see para. 110 above).

F. Waste

1. Sector overview

113. In 2009, emissions from the waste sector amounted to 6,178.95 Gg CO_2 eq, or 2.1 per cent of total GHG emissions. Since 1990, emissions have increased by 3.4 per cent. However, there was a gradual decrease in 1990–1995. The key drivers for this fluctuation are a fall of the urban population and an increase in the rate of waste generation. Within the sector, 86.6 per cent of the emissions were from solid waste disposal on land, followed by 13.3 per cent from wastewater handling, and 0.1 per cent from waste incineration.

114. The methodologies and assumptions used for estimating emissions from the waste sector are described in the NIR and additional background data are provided in the CRF tables. However, there is some inconsistency between the NIR and the CRF tables. In the general part of the NIR it is mentioned that emissions from the waste sector amounted to 6,178.95 Gg CO_2 eq, but in table 8.1 the total emissions are given as 4,654.5 Gg CO_2 eq. Also in CRF table 6.A, the degradable organic carbon value is reported as "0.00", which is inconsistent with the value 0.21 reported in the NIR. The ERT reiterates the recommendation of the previous review report that Kazakhstan increase transparency of its reporting in its next inventory submission.

115. In its 2011 submission Kazakhstan made recalculations of the emissions from solid waste disposal on land, wastewater handling and waste incineration, following the recommendations of the previous review report. The impact of these recalculations on the waste sector is a decrease in CH_4 emissions by 2.8 per cent and CO_2 emission by 99.6 per cent for 2008. The ERT welcomes the Party's effort and notes that the data verification procedures have been continued and general QA/QC procedures have been performed for the sector.

2. Key categories

Solid waste disposal on land – CH_4

116. CH_4 emissions from solid waste disposal on land are a key category by level and trend and amounted to 3,820.53 Gg CO_2 eq in 2009. Kazakhstan used the IPCC tier 2 first order decay method and IPCC default parameters to estimate CH_4 emissions from solid waste disposal on land. The AD on municipal solid waste disposal have been calculated based on the urban population and the daily waste generation rate. The ERT welcomes this effort and encourages the Party to continue its work to improve the country-specific EFs, based on available statistical data and results from research available in the country.

117. In its 2011 submission, Kazakhstan improved the information on the calculations and parameters used to estimate CH_4 emissions from municipal solid waste. However, the NIR does not contain any references on industrial waste management and it is not clear if the industrial waste is treated or disposed at solid waste disposal sites. The ERT recommends that Kazakhstan include the relevant explanations and information about municipal and industrial waste disposal in its next inventory submission.

118. The ERT noted that Kazakhstan reported, for the first time, CO_2 emissions from solid waste disposal on land, but that this is not in line with the Revised 1996 IPCC Guidelines because the CO_2 emission from this category should only be included if they are derived from non-biogenic waste. The ERT encourages Kazakhstan to provide further clarification on this issue in its next inventory submission.

3. Non-key categories

Wastewater handling – CH_4– N_2O

119. The CH_4 emissions from wastewater handling were recalculated, which led to a decrease of CH_4 emissions by 21.6 per cent. Country-specific parameters are taken from official statistical sources. The NIR does not contain any explanation on the recalculated emissions from wastewater handling. The ERT recommends that Kazakhstan include relevant explanations of recalculations in its next inventory submission.

Waste incineration – CO_2 and N_2O

120. In its 2011 submission, following a recommendation from the previous review report, Kazakhstan recalculated emissions from waste incineration, due to the availability of updated AD and EFs. This led to a decrease in CO_2 emissions by 99.6 per cent for the period of 2006–2008. The ERT welcomes this effort.

III. Conclusions and recommendations

121. Kazakhstan submitted a complete set of CRF tables for the period 1990–2009 on 15 April 2011 and an NIR on 30 May 2011. The inventory was submitted in accordance with the UNFCCC reporting guidelines; however the ERT strongly encourages the Party to submit its next NIR by 15 April 2012 as required by decision 18/CP.8.

122. The ERT concludes that the inventory submission of Kazakhstan has been prepared and reported in accordance with the UNFCCC reporting guidelines. It is generally complete in terms of geographical coverage, years and sectors, as well in terms of categories and gases. However, estimates for a number of source and sink categories are not reported in the CRF tables (for example, net CO_2 emissions/removals from land converted to forest land). The ERT recommends that Kazakhstan improve the completeness of its inventory

submission by achieving full coverage of the LULUCF sector; preparing and reporting estimates for all missing categories for which the Revised 1996 IPCC Guidelines, the IPCC good practice guidance and the IPCC good practice guidance for LULUCF provide estimation methodologies; and appropriately applying notation keys and using documentation boxes in the CRF tables.

123. The Party's inventory is generally not in line with the IPCC good practice guidance and the IPCC good practice guidance for LULUCF. Specific references and recommendations are provided in several paragraphs of this report (see paras. 15, 17, 39, 63, 66, 67, 79, 93, 97, 103, 106 and 107).

124. The institutional arrangements implemented by Kazakhstan continue to not fully perform their required functions. The ERT reiterates the recommendation of the previous review report for strengthening cooperation and information exchange between all institutions involved in inventory preparation should be improved.

125. The ERT identified the following cross-cutting issues for improvement:

(a) Improve the structure of the NIR in accordance with the UNFCCC reporting guidelines;

(b) Include the LULUCF sector in the key categories assessment and present the results of the key category analysis in CRF table 7;

(c) Improve the completeness of the inventory by reporting estimates for missing categories and revising the use of notation keys, as appropriate;

(d) Improve the transparency of the inventory by providing: descriptions of the rationale behind the assumptions used in the expert judgement and the choice of uncertainty values; detailed information on recalculations performed, including the rationale and impact of recalculations made; more information on methods, EFs and AD in the NIR; and additional information in the annexes to the NIR, as outlined in the UNFCCC reporting guidelines;

(e) Use the key category analysis and uncertainty analysis to identify the areas for further improvement in the inventory.

126. During the course of the review, the ERT also formulated a number of recommendations relating to the completeness of the inventory submission. Specific recommendations are included in the sectoral chapters of this report.

Annex I

Documents and information used during the review

A. Reference documents

Intergovernmental Panel on Climate Change. *2006 IPCC Guidelines for National Greenhouse Gas Inventories*. Available at <http://www.ipcc-nggip.iges.or.jp/public/2006gl/index.html>.

Intergovernmental Panel on Climate Change. *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*. Available at <http://www.ipcc-nggip.iges.or.jp/public/gl/invs1.htm>.

Intergovernmental Panel on Climate Change. *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories*. Available at <http://www.ipcc-nggip.iges.or.jp/public/gp/english/>.

Intergovernmental Panel on Climate Change. *Good Practice Guidance for Land Use, Land-Use Change and Forestry*. Available at <http://www.ipcc-nggip.iges.or.jp/public/gpglulucf/gpglulucf.htm>.

"Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual inventories". FCCC/SBSTA/2006/9. Available at <http://unfccc.int/resource/docs/2006/sbsta/eng/09.pdf>.

"Guidelines for the technical review of greenhouse gas inventories from Parties included in Annex I to the Convention". FCCC/CP/2002/8. Available at <http://unfccc.int/resource/docs/cop8/08.pdf>.

Status report for Kazakhstan 2011. Available at <http://unfccc.int/resource/docs/2011/asr/kaz.pdf>.

Synthesis and assessment report on the greenhouse gas inventories submitted in 2011. Available at <http://unfccc.int/resource/webdocs/sai/2011.pdf>.

FCCC/ARR/2010/KAZ. Report of the individual review of the greenhouse gas inventory of Kazakhstan submitted in 2010. Available at <http://unfccc.int/resource/docs/2010/arr/kaz.pdf>.

B. Additional information provided by the Party

Responses to questions during the review were received from Mr. Cherednichenko Alexey (Kazakhstan Scientific Research Institute of Ecology and Climate), including additional material on the methodology and assumptions used.

Annex II

Acronyms and abbreviations

AD	activity data
C	confidential
CaO	calcium oxide
CH_4	methane
CO	carbon monoxide
CO_2	carbon dioxide
CO_2 eq	carbon dioxide equivalent
CRF	common reporting format
EF	emission factor
ERT	expert review team
FAO	Food and Agriculture Organization (of the United Nations)
GHG	greenhouse gas; unless indicated otherwise, GHG emissions are the sum of CO_2, CH_4, N_2O, HFCs, PFCs and SF_6 without GHG emissions and removals from LULUCF
GIS	geographical information system
GJ	gigajoule (1 GJ = 10^9 joule)
HFCs	hydrofluorocarbons
IE	included elsewhere
IEA	International Energy Agency
IEF	implied emission factor
IPCC	Intergovernmental Panel on Climate Change
kg	kilogram (1 kg = 1,000 grams)
LULUCF	land use, land-use change and forestry
N	nitrogen
NA	not applicable
N_2O	nitrous oxide
NE	not estimated
NIR	national inventory report
NMVOC	non-methane volatile organic compounds
NO	not occurring
PFCs	perfluorocarbons
PJ	petajoule (1 PJ = 10^{15} joule)
QA/QC	quality assurance/quality control
SF_6	sulphur hexafluoride
SO_2	sulphur dioxide
TJ	terajoule (1 TJ = 10^{12} joule)
UNFCCC	United Nations Framework Convention on Climate Change