ADVANCE VERSION

United Nations

Framework Convention on
Climate Change

Report of the individual review of the annual submission of Belarus submitted in 2010*

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Contents

I. Introduction and summary

A. Overview

1.   This report covers the centralized review of the 2010 annual submission of Belarus, coordinated by the UNFCCC secretariat, in accordance with decision 19/CP.8. The review took place from 30 August to 4 September 2010 in Bonn, Germany, and was conducted by the following team of nominated experts from the UNFCCC roster of experts: generalist – Ms. Anna Romanovskaya (Russian Federation) and Ms. Erasmia Kitou (European Union); energy – Mr. Hristo Vassilev (Bulgaria), Mr. Leonidas Osvaldo Girardin (Argentina), Ms. Ayse Yasemin Orucu (Turkey) and Mr. Leif Hockstad (United States of America); industrial processes – Ms. Valentina Idrissova (Kazakhstan) and Ms. Sina Wartmann (Germany); agriculture – Ms. Batima Punsalmaa (Mongolia) and Mr. Bernard Hyde (Ireland); land use, land-use change and forestry (LULUCF) – Mr. Richard Volz (Switzerland), Ms. Marina Vitullo (Italy) and Ms. Marina Shvangiradze (Georgia); and waste – Ms. Tatiana Tugui (Republic of Moldova) and Ms. Kyoko Miwa (Japan). Mr. Hockstad and Ms. Tugui were the lead reviewers. The review was coordinated by Ms. Inkar Kadyrzhanova and Mr. Javier Hanna (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 Belarus, which made no comment on it.

B. Emission profiles and trends

3.   In 2008, the main greenhouse gas (GHG) in Belarus was carbon dioxide (CO_2), accounting for 66.3 per cent of total GHG emissions[1] expressed in CO_2 eq, followed by nitrous oxide (N_2O) (17.5 per cent) and methane (CH_4) (16.2 per cent). Hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF_6) collectively accounted for 0.04 per cent of the overall GHG emissions in the country. The energy sector accounted for 64.4 per cent of total GHG emissions, followed by the agriculture sector (25.0 per cent), the waste sector (6.2 per cent), the industrial processes sector (4.4 per cent) and the solvent and other product use sector (0.1 per cent). The LULUCF sector offsets 34.1 per cent of total emissions in 2008. Total GHG emissions amounted to 91,112.67 Gg CO_2 eq and decreased by 35.1 per cent between 1990 and 2008. The trend in total GHG emissions is typical of countries with economies in transition, with a rapid decline in the 1990s and a slow increase after 2000. The national inventory report (NIR) explains the main drivers of the emission trends. However, transparency for its description should be improved (see para. 23).

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.

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[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 2008

Greenhouse gas	Gg CO₂ eq							Change 1990–2008 (%)
	1990	1995	2000	2005	2006	2007	2008	
CO_2	103 806.85	57 599.77	53 319.28	56 669.76	59 128.46	58 280.00	60 365.41	–41.8
CH_4	15 404.28	11 575.65	11 401.30	13 249.04	13 928.96	14 327.20	14 758.94	–4.2
N_2O	21 187.85	13 690.94	14 100.95	14 577.07	15 277.38	14 995.20	15 950.13	–24.7
HFCs	NA, NE, NO	2.84	9.35	26.19	30.05	31.00	35.80	NA
PFCs	NA, NE, NO	NA, NE, NO	NA, NE, NO	NA, NE, NO	NA, NE, NO	NA, NE, NO	NA, NE, NO	NA
SF_6	NA, NE, NO	0.01	0.41	1.48	1.87	2.27	2.39	NA

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

Table 2
Greenhouse gas emissions by sector and activity, 1990 to 2008

Sector	Gg CO₂ eq							Change 1990–2008 (%)
	1990	1995	2000	2005	2006	2007	2008	
Energy	102 242.82	57 259.53	52 684.07	55 311.54	57 663.67	56 835.32	58 698.46	–42.6
Industrial processes	3 614.68	2 035.73	2 604.72	3 484.69	3 713.62	3 853.80	3 971.00	9.9
Solvent and other product use	74.40	62.33	76.04	69.19	67.49	72.56	64.09	–13.9
Agriculture	31 892.35	21 373.99	20 510.88	21 037.89	21 803.29	21 536.97	22 746.95	–28.7
LULUCF	–29 815.00	–34 233.59	–35 287.68	–30 804.21	–31 955.55	–31 233.85	–31 034.23	4.1
Waste	2 574.73	2 137.64	2 955.57	4 620.24	5 118.65	5 337.02	5 632.17	118.7
Other	NA	NA	NA	NA	NA	NA	NA	NA
Total (with LULUCF)	110 583.98	48 635.62	43 543.61	53 719.33	56 411.17	56 401.82	60 078.45	–45.7
Total (without LULUCF)	140 398.98	82 869.22	78 831.28	84 523.54	88 366.72	87 635.67	91 112.67	–35.1

Abbreviation: NA = not applicable.

II.   Technical assessment of the annual submission

A.   Overview

1.   Annual submission and other sources of information

5.   A complete set of common reporting format (CRF) tables for the period 1990–2008 was submitted on 8 April 2010 and the NIR was submitted on 15 April 2010. Belarus resubmitted its CRF tables on 15 April 2010. The annual submission was submitted in accordance with 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).

6.   Where necessary, the expert review team (ERT) also used the previous year's submission. During the review, Belarus provided the ERT with additional information and documents which are not part of the annual 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 covers most source and sink categories and gases and is complete in terms of years and geographical coverage. Belarus has provided all relevant CRF tables for the period 1990–2008. The reporting in the CRF tables is complete and notation keys are used throughout; however, CRF table 8(b), with explanatory information for the recalculations, has not been filled in. The ERT reiterates the recommendation made in the previous review report that Belarus provide all necessary information in the corresponding CRF tables in its next inventory submission.

8.   Completeness in the coverage of source and sink categories has improved since the previous submission; all key categories that account for a significant share of the total emissions or removals are estimated. The ERT commends the efforts made by the Party to report estimates of CO_2 and N_2O emissions from fugitive emissions from fuels in the energy sector. Many categories reported as not estimated ("NE") in the previous submission are now reported as not occurring ("NO") (e.g. CO_2, CH_4 and N_2O emissions from residual fuel oil in navigation and international bunkers).

9.   However, Belarus still reports a number of categories as "NE", including: CO_2 emissions from limestone and dolomite use (see para. 57); CO_2 emissions from soda ash production (see para. 57); CO_2 emissions from ferroalloys production (see para. 56); HFC (most of the subcategories) and PFC emissions from consumption of halocarbons and SF_6 (see para. 55); CH_4 and N_2O emissions from industrial wastewater (see para. 93); CH_4 and N_2O emissions from domestic and commercial wastewater (see para. 93); CO_2, CH_4 and N_2O emissions from land converted to other land (except CO_2 forest land converted to other land reported as "NO") (see para. 81); and CO_2 emissions from grassland remaining grassland (see para. 81).

10.   In the NIR and in response to questions raised about completeness by the ERT during the centralized review, Belarus informed the ERT of its intention to estimate missing categories in its next inventory submission. The ERT appreciates this intention. The ERT encourages Belarus to continue improving the completeness of the GHG inventory and recommends that, in its next inventory submission, the Party estimate emissions and removals for all categories for which the *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the Revised 1996 IPCC Guidelines),

the Intergovernmental Panel on Climate Change *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories* (hereinafter referred to as the IPCC good practice guidance) and the IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry* (hereinafter referred to as the IPCC good practice guidance for LULUCF) provide methodologies.

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

Overview

11.   The ERT concluded that the institutional arrangements established by Belarus continued to perform their functions. The NIR does not report on any changes in the institutional arrangements in Belarus since the Party's previous submission. The legal basis for inventory preparation and the overall structure of the institutional arrangements is described in the NIR. However, it is not clear how the legal responsibilities for GHG inventory preparation are defined for single ministries and private companies in official governmental decrees. During the centralized review, in response to the ERT request, Belarus provided resolutions of the Council of Ministries of the Republic of Belarus Nos. 485 and 585 of 2006, which describe the process of preparation and official adoption of the national GHG inventory. The ERT encourages Belarus to provide further information about the legal role of all single institutions in the institutional arrangements for GHG inventory preparation in the NIR of its next inventory submission.

Inventory planning

12.   The NIR and additional information provided by the Party during the centralized review described the institutional arrangements for the preparation of the inventory. The Ministry of Natural Resources and Environmental Protection (MNREP) has overall responsibility for the preparation, planning and management of the national inventory. The Belarus Scientific Research Centre "Ecology" (hereinafter referred to as SRC "Ecology") is responsible for the compilation of the GHG inventory and its reporting. In the course of the centralized review, Belarus informed the ERT that final adoption of the annual GHG inventory is made by MNREP. The major set of activity data (AD) is obtained from annual publications of the National Statistical Committee of the Republic of Belarus (Belstat). Other ministries are also involved in the provision of data for the inventory, including the Ministry of Industry, the Ministry of Transportation and Communications, the Ministry of Health Protection, the Ministry of Agriculture and Food, the Ministry of Forestry and the Ministry of Housing and Communal Services. Some AD for the energy and the industry sectors are received by SRC "Ecology" from other organizations such as Belarus State Consortia for Oil and Chemistry, "Beltopgas", "Beltransgas" and "Belenergo" of the Ministry of Energy, the State Committee on Aviation and the State Committee on Property. The role of private companies in providing data for the preparation of the inventory is not clarified in the NIR. The ERT encourages Belarus to provide information on the role of private companies in providing data for the inventory estimates in the NIR of its next inventory submission.

Inventory preparation

Key categories

13.   Belarus has reported a key category tier 1 analysis, both level and trend assessments, as part of its 2010 submission. Belarus has included the LULUCF sector in its key category analysis in accordance with the IPCC good practice guidance and the IPCC good practice

guidance for LULUCF. The key category level assessment performed by the Party and that performed by the secretariat[2] produced similar results with minor differences, such as for the subcategory crop residue (which is defined as key by the secretariat and not by Belarus) and for the category cropland remaining cropland (which is defined as key by Belarus, but was not included in the secretariat's analysis). However, results of the trend assessment made by the secretariat and by Belarus are significantly different in terms of the number of key categories. Belarus identified nine key categories more than the secretariat's assessment, including: CO_2 from gaseous fuels in iron and steel; CO_2 from liquid fuels in iron and steel; CO_2 from gaseous fuels in residential; CO_2 from liquid fuels in residential; CO_2 from solid fuels in residential; CO_2 from transport; CO_2 from solid fuels in public electricity and heat production; CO_2 from cropland remaining cropland; and CO_2 from wetlands remaining wetlands. During the centralized review, Belarus explained to the ERT that, in its 2010 submission, the key category analysis was performed using a higher level of disaggregation of categories, particularly for the energy sector in which categories were disaggregated by fuel type. The ERT recommends that, in the NIR of its next inventory submission, Belarus provide more information relating to the aggregation level used for its key category analysis. The ERT also recommends that Belarus follow more closely the recommendations of the IPCC good practice guidance regarding the aggregation of categories in the energy sector.

14. The results of the key category analysis reported in CRF table 7 and the NIR show different results due to the higher level of aggregation of subcategories in the CRF reporting. The ERT reiterates the recommendation made in the previous review report that Belarus make consistent the reporting between the CRF tables and the NIR in its next inventory submission.

15. Belarus does not report in the NIR whether it uses the key category analysis in the prioritization of development and improvement of its inventory. The ERT encourages Belarus to clarify this in its next inventory submission. The ERT also encourages Belarus to use a qualitative approach in the identification of key categories in its next inventory submission.

16. The ERT noted that most key categories are still estimated using lower tiers and default emission factors (EFs). Some EFs reported by Belarus as country-specific are in fact default values from the Revised 1996 IPCC Guidelines (e.g. in the energy sector for stationary combustion and fugitive emissions) (see paras. 41–43). The ERT further noted that for some key categories Belarus uses old default parameters from the Revised 1996 IPCC Guidelines and the ERT recommends that Belarus apply parameters from the IPCC good practice guidance (e.g. for fugitive emissions in the energy sector) (see para. 45). The ERT reiterates the recommendation from the previous review report that Belarus enhance its efforts in the implementation of higher tiers and country-specific EFs for key categories in accordance with the IPCC good practice guidance.

Uncertainties

17. In its 2010 submission Belarus provided quantitative uncertainty estimates using the tier 1 method following the IPCC good practice guidance, including uncertainty estimates for AD and EFs. The LULUCF sector is included in the Party's uncertainty analysis.

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[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.

Cumulative uncertainty of total GHG emissions for 2008 is 27.0 per cent (level) and 10.5 per cent (trend) and close to values reported for the previous submission (24.9 and 10.0 per cent, respectively). The ERT noted that the descriptions provided in the NIR of uncertainty values used for AD and EFs in most sectors are not transparent. Many uncertainty values are obtained by expert judgement, but the NIR lacks explanations for the rationale and procedures of such judgements. During the centralized review, Belarus informed the ERT that expert judgement was provided by the experts of the National Committee on Statistics through a telephone conversation. The ERT recommends that Belarus perform appropriate procedures for the expert judgement of uncertainties and document them, following the recommendations of the IPCC good practice guidance. In some cases Belarus refers to the use of default values for uncertainties. However, the ERT noted that the values used do not always correspond to the IPCC default values (e.g. in the agriculture and LULUCF sectors uncertainty ranges are generally lower than IPCC default values). This issue was also noted in the previous review report. The ERT reiterates the recommendation made in the previous review report that Belarus improve its uncertainty analysis and provide detailed explanations in the NIR of its next inventory submission. During the centralized review, Belarus expressed to the ERT its intention to revise the uncertainty analysis in its next inventory submission. The ERT welcomes this intention.

Recalculations and time-series consistency

18.   Recalculations have been performed in accordance with the IPCC good practice guidance. The ERT noted that significant recalculations reported by the Party for the time series 1990 to 2007 have been undertaken in the industrial processes, agriculture and LULUCF sectors to take into account the recommendations of the previous review report and to correct mistakes in the application of default EFs and parameters (e.g. CO_2 emissions from cement production (see para. 60), CO_2 emissions from lime production (see para. 61) and CO_2 emissions from ammonia production (see para. 62), animal populations in agriculture and direct N_2O emissions from soils (see paras. 68 and 76–77, respectively)); and due to the use of country-specific EFs for enteric fermentation (see para. 69) and forest land (see para. 82). The 2010 submission includes reporting of fugitive emissions in the energy sector made for the first time for the complete time series. Corrections were also performed to AD and EFs for the complete time series in the energy sector and for 2007 in the waste sector. The ERT commends the effort made by Belarus in improving its inventory and maintaining time-series consistency of estimates and encourages the Party to continue with this effort.

19.   The impact of the recalculations includes: an increase in estimated total GHG emissions in 1990 (8.7 per cent) and an increase in 2007 (9.5 per cent). The rationale for these recalculations is provided in the sectoral chapters of the NIR. However, the overview chapter for recalculations and improvements was not included in the NIR and no explanatory information is provided in CRF table 8(b). The ERT reiterates the recommendation of the previous review report that Belarus report all information related to recalculations in the NIR and CRF table 8(b) and encourages Belarus to use the recommended outline of the NIR provided in the UNFCCC reporting guidelines for its next inventory submission.

Verification and quality assurance/quality control approaches

20.   Belarus has provided a general description of quality assurance/quality control (QA/QC) procedures. However, the NIR lacks information on their implementation. During the centralized review, Belarus provided the ERT with a copy of its QA/QC plan. The ERT concluded that the QA/QC plan is in accordance with the IPCC good practice guidance. Belarus reported in the NIR that the QA/QC plan was adopted by order of SRC "Ecology" in February 2009, but the Party intends to update it during 2010. The rationale for

reconsidering the QA/QC plan is not clear. During the centralized review, Belarus clarified that it plans to add sector-specific procedures to the QA/QC plan and to develop appropriate checklists for these procedures within the framework of continuous improvement of the GHG inventory. The ERT welcomes this intention and encourages Belarus to report on the results of these improvements and their implementation in the NIR of its next inventory submission.

21.   The ERT noted that, in the NIR, Belarus did not report evidence of the implementation of QA/QC procedures, except for the energy sector. At the request of the ERT, during the centralized review, Belarus provided two reports from independent national experts who conducted reviews of estimates and methodologies for the agriculture, LULUCF and waste sectors of the 2010 inventory submission, which proved that the QA procedures had been implemented by the Party. The ERT recommends that Belarus include all related information about the implementation of QA/QC procedures in the relevant chapters of the NIR of its next inventory submission, including recommendations made by independent reviewers and how those were addressed during the preparation of the inventory.

Transparency

22.   The NIR provides most of the required information on the institutional arrangements, key categories, QA/QC procedures, uncertainty assessment, methodologies and AD and EFs for most categories. The ERT commends the efforts made by Belarus to improve the transparency of the information in the NIR since its previous inventory submission, particularly for key categories in the industrial processes sector; in the energy sector for AD of natural gas, gas/diesel oil, liquefied petroleum gas (LPG) and ethane under feedstock and non-energy use of fuels; and in the LULUCF sector for forest land remaining forest land.

23.   However, the ERT noted that the NIR still lacks transparency in the description of methodologies for: data collection; developing some country-specific EFs (see para. 70); allocation of AD by single categories (see para. 34); and descriptions for non-key categories in the industrial processes sector (see para. 58). Sector-specific information on uncertainty values, the rationale for recalculations and the results of sectoral QA/QC procedures are not always clearly reported. The ERT further noted that explanations and responses provided by Belarus during the centralized review, particularly for the LULUCF sector, were very general. Explanatory information on emission trends is not yet supported by quantitative data, as had been recommended in the previous review report. The ERT strongly recommends that Belarus solve the issues identified above, improve the description in the NIR of data collection, methodologies, EFs and uncertainty values and provide all background AD used in the inventory in a transparent manner in its next inventory submission.

24.   Reporting in the LULUCF sector still contains many gaps for mandatory categories, particularly for conversion of land to other land uses (see para. 81). The representation of lands is not reported in accordance to the IPCC good practice guidance for LULUCF and explanatory information is lacking. The ERT strongly recommends that Belarus improve transparency and accuracy of the information for the LULUCF sector in its next inventory submission.

25.   The ERT further noted some inconsistencies between the information in the NIR and the CRF data, particularly: in the energy sector for reporting emissions from stationary combustion, transport and fugitive emissions (e.g. see paras. 38, 39 and 44); in the industrial processes sector for non-key categories (e.g. see para. 58); in the waste sector (e.g. see paras. 88 and 89); and in the use of notation keys (e.g. see paras. 40, 56 and 96).

This problem had also been raised in the previous review report. The ERT recommends that Belarus remove all inconsistencies in its next inventory submission.

Inventory management

26.   As reported in the NIR, Belarus has a centralized archiving system, which includes the archiving of disaggregated EFs and AD, and documentation on how these factors and data have been generated and aggregated for the preparation of the inventory. As the ERT learned during the review, the archived information also includes internal documentation on QA/QC procedures, external and internal reviews, and documentation on annual key categories and key category identification and planned inventory improvements. The archive is kept by SRC "Ecology". The NIR reports some improvements made by Belarus for the archiving of information, namely the establishment of a database for all AD used in the inventory. The ERT appreciates the efforts made by the Party and recommends that Belarus include detailed information on the current situation of the archiving system and improvements made in the NIR of its next inventory submission.

3.   Follow-up to previous reviews

27.   The ERT commends the efforts of Belarus regarding the implementation of recommendations made in previous review reports, particularly regarding the estimation of emissions not previously reported and the improvement of the accuracy in estimations and the transparency of descriptions, particularly in the energy and industrial processes sectors. However, the ERT noted that some of the recommendations have not yet been implemented; the most important of these relate to the completeness and transparency of reporting (see para. 29 (c) and (d)). The ERT strongly recommends that Belarus continue its efforts to improve its GHG inventory and implement previous and current recommendations in its next inventory submission.

4.   Areas for further improvement

Identified by the Party

28.   The 2010 NIR identifies several areas for improvement:

(a)   Further elaboration and implementation of QA/QC procedures;

(b)   Further improvement of methodologies in the collection, analysis and prognosis of data on GHG emissions;

(c)   The enhancement of the level of detail of the AD used, by obtaining AD from private enterprises and governmental organizations directly;

(d)   The collection of additional AD for use in the inventory, particularly for SF_6 emissions from electrical equipment;

(e)   The estimation of some categories that were previously not estimated, particularly in the industrial processes sector for potential HFCs emissions from refrigeration and air-conditioning equipment;

(f)   The development of country-specific EFs, particularly for the agriculture and LULUCF sectors in 2010 and for the waste sector in the future.

Identified by the expert review team

29.   The ERT identifies the following cross-cutting issues for improvement:

(a)   The provision of more detailed information on the legal role of state and private organizations in the institutional arrangements for the preparation of the inventory;

(b)   Reporting, in the NIR, additional information on the implementation of QA/QC procedures, including independent review reports;

(c)   The improvement of the completeness of the GHG inventory by including estimates of missing categories, particularly the following: CO_2 emissions from limestone and dolomite use; CO_2 emissions from soda ash production; HFC (most of the subcategories) and PFC emissions from consumption of halocarbons and SF_6; CH_4 emissions from industrial wastewater; CH_4 emissions from domestic and commercial wastewater; CO_2 and N_2O emissions from waste incineration; CO_2, CH_4 and N_2O emissions from land converted to other land; and CO_2 emissions from grassland remaining grasslands;

(d)   The improvement of the transparency of the inventory, by adding in the NIR descriptions of data collection activities, and of methodologies, EFs and uncertainty values applied in the inventory. In addition, all relevant AD should be reported in a transparent manner, particularly for the industrial processes and waste sectors;

(e)   The improvement of reporting in the LULUCF sector, by including detailed information on land areas and uses, representation of lands and details on EFs and parameters used in the estimates;

(f)   The provision of explanatory information on recalculations and time-series consistency of GHG emission estimates in the corresponding chapter of the NIR and in CRF table 8(b);

(g)   The improvement of the accuracy of GHG inventory estimates by implementing higher tier methods and the development of country-specific EFs for key categories;

(h)   The improvement of consistency in reporting between the NIR and CRF tables;

(i)   The improvement of uncertainty analysis by using documented country-specific uncertainty values and, if necessary, using correct default values in agriculture and LULUCF sectors.

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

B.   Energy

1.   Sector overview

31.   The energy sector is the main sector in the GHG inventory of Belarus. In 2008, emissions from the energy sector amounted to 58,698.46 CO_2 eq, or 64.4 per cent of total GHG emissions. Since 1990, emissions have decreased by 42.6 per cent. The key drivers for this fall in emissions are: the restructuring of the national economy towards a market economy; the increase in energy efficiency; the switch in fuel use from residual oil and coal to natural gas; and the more intensive use of fuel wood in households.

32.   Within the sector, 53.7 per cent of the emissions were from the energy industries, followed by 14.9 per cent from the manufacturing industries and construction, 16.5 per cent from other sectors, 10.8 per cent from transport and 1.1 per cent from other. Fugitive emissions accounted for 3.0 per cent and came only from oil and natural gas. The ERT noted that wood and peat are the main local energy resources. Natural gas is imported from the Russian Federation and a significant volume is transported through Belarus to neighbouring countries. According to the energy balance, crude oil is also imported from the Russian Federation and processed in refineries; significant volumes of produced fuels (mainly gasoline – 64 per cent, diesel oil – 59.6 per cent and residual oil – 83.9 per cent)

are exported and not consumed in the country. A small amount of coal is combusted in Belarus.

33. The ERT concluded that the reporting of the energy sector in the NIR lacks transparency. An energy balance in natural units is provided for 2008 in the NIR, but detailed energy consumption data are not provided for the entire time series. The ERT reiterates the recommendation of the previous review report that Belarus make available in the NIR the detailed and complete energy balances for 1990–2009 in its next inventory submission as a step to improve transparency.

34. The ERT noted that emissions from most subcategories reported under energy industries and manufacturing industries and construction are not estimated at a disaggregated level in the CRF tables. The exceptions are emissions from public electricity and heat production, transport and other sectors, where subcategories are reported at the recommended level of disaggregation. The subcategories petroleum refining, manufacture of solid fuels and other energy industries and all subcategories under manufacturing industries and construction are aggregated and reported under other (manufacturing industries and construction). In the previous review report it was recommended that Belarus disaggregate the emission estimates by subcategory, following the structure of the UNFCCC reporting guidelines, and report these accordingly in its next inventory submission. The ERT reiterates this recommendation and encourages Belarus to implement it in its next inventory submission.

35. The ERT noted that emissions from feedstocks and non-energy use of naphtha, lubricants, coal oils and tars and ethane are reported as "NO" without any explanation provided in the NIR. The ERT encourages Belarus to provide, in the NIR of its next inventory submission, an explanation of the use of this notation key for these feedstocks and non-energy uses.

36. Belarus has provided specific details of its QA/QC and verification procedures for the energy sector in the relevant parts of the NIR, as well as estimates of the uncertainties associated with the energy sector and its categories, following the IPCC good practice guidance.

2. Reference and sectoral approaches

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

37. CO_2 emissions from fuel combustion were calculated using both the reference and sectoral approaches. For the year 2008, there is a difference of 4.32 per cent in CO_2 emission estimates and 24.0 per cent in energy consumption between the reference approach and the sectoral approach. The NIR provides some explanatory information for the difference between the two approaches across the time series. The reason stated in the NIR for the differences is that some of these products are missing in the energy balance. According to the NIR, Belstat will provide data for other products of oil refining (bitumen, resins) which now are missing, an improvement the ERT encourages. The ERT further recommends that Belarus improve the inputs to the reference approach energy consumption numbers in the CRF tables to correct the lack of information currently reported.

38. Furthermore, the NIR shows differences between the reference approach and the sectoral approach across the time series, except for 1991–1994. The differences reported in the NIR for all years (table 3.3) are not consistent with differences in the CRF tables. The approach used to calculate the differences is not the same in the NIR and in the CRF tables, with different formulae; with the NIR using a formula inconsistent with the formula provided in the CRF tables. The ERT recommends that Belarus calculate the differences in the NIR with the calculation formula from the CRF table 1.A(c), which states: "Difference

in CO_2 emission estimated by the Reference approach (RA) and Sectoral approach (SA) (difference = 100% x ((RA-SA)/SA))".

39.   The ERT noted some inconsistencies in the reporting of peat production and use in the NIR and in the CRF tables. For instance, data for apparent consumption in the CRF tables are inconsistent with data from the energy balance reported in the NIR, due to a difference in the value for stock changes. The ERT encourages Belarus to ensure consistency for all data of fuels in the energy balances provided in the NIR and the CRF tables. The apparent consumption in Belarus' reference approach for 2008 corresponds closely to the International Energy Agency (IEA) data. For 2008, there is a difference of 4.0 per cent in apparent consumption between the reference approach and the IEA data.

International bunker fuels

40.   Emissions from gas/diesel oil used under international marine bunkers are reported as "NE" for all years. The NIR clarifies that international marine bunkers do not exist in the country according to the information from the Ministry of Transport and Communications of Belarus. Therefore, the ERT recommends that Belarus change the notation keys used from "NE" to "NO", accordingly, in its next inventory submission and further clarify the use of this notation key in the NIR.

3.   **Key categories**

Stationary combustion: liquid, solid and gaseous fuels – CO_2

41.   The methodology for calculating CO_2 emissions from solid fuels, according to the NIR, used an EF for solid fuels based on Belarus's data referenced as country-specific net calorific value (NCV) and carbon content of fuels from the Revised 1996 IPCC Guidelines. The ERT notes that Belarus is using the IPCC tier 1 method by using default IPCC EFs and only country-specific NCVs; the NIR should correctly state this use of a tier 1 sectoral approach method. The ERT recommends that the Party follow the IPCC good practice guidance for key categories and use a higher tier method, which would include obtaining a country-specific carbon content EF for solid fuels. In advance of the use of a higher tier method, the ERT recommends that Belarus: further explain the derivation of the country-specific NCV of solid fuels in the NIR and how an NCV measured with preliminary drying for solid fuels is most appropriate for Belarus's national circumstances; and obtain country-specific carbon contents for solid fuels consistent with this approach to measure country-specific NCVs.

42.   None of the fuels for manufacturing industries and construction are separated by IPCC categories (e.g. iron and steel, chemicals, etc.). The national statistics started to prepare such separation and, as is noted in the NIR, this work will be finished for the next inventory submission. The ERT commends this effort and encourages Belarus to report disaggregated emissions data within the manufacturing industries and construction category as soon as they are available.

43.   Natural gas accounts for more than 90 per cent of the total fuel used in the energy industries category and for two thirds of the total fuel used in the other sectors category. The Party calculates GHG emissions using the tier 1 approach. The ERT recommends that,in line with the IPCC good practice guidance, Belarus use a higher tier approach to estimate emissions from this key category.

Oil and natural gas – CH_4

44.   Data reported in tables 3.8 and 3.9 of the NIR are inconsistent with data reported in CRF table 1.B.2. The ERT recommends that Belarus include detailed descriptions of the oil

and natural gas activities in the country, data used in the emission estimates and, as the Party currently uses a tier 1, that the Party use a higher tier in its next inventory submission.

45.   Belarus reports CH_4 emissions from natural gas transport under the category other, using an EF of 5,124 kg/PJ of gas consumed for 2008. It is not clear to the ERT what the source of this EF is, given that it is far below the EF used for natural gas transmission (10,851.81 kg/PJ of gas consumed). Natural gas transit and transmission through the territory of the country is considerable (more than three times the volume of the domestic consumption), so the ERT recommends that Belarus develop and use a country-specific CH_4 EF based on the length of the transmission pipelines and include in its estimates fugitive and venting emissions from this activity in its next inventory submission.

46.   Emissions from venting of oil are reported as "NE". Noting that Belarus is processing significant volumes of crude oil, the ERT recommends that Belarus estimate CH_4 emissions (including CO_2, if relevant) from the venting of oil systems in its next inventory submission. The ERT further recommends that Belarus clarify its use of notation keys for the reporting of fugitive emissions and more transparently document the inclusion of subcategories in this sector (e.g. the use of the notation key "included elsewhere" ("IE") for oil and natural gas flaring) in both the CRF tables and the NIR.

Road transportation: liquid fuels – CO_2

47.   According to the NIR, the fuels used for road transportation are not separated by type of vehicle (cars, heavy duty and light duty trucks, buses and other) in the emission calculations. Belarus uses a tier 1 approach for the calculations and default EFs from the Revised 1996 IPCC Guidelines. The ERT recommends that Belarus use a higher tier approach to estimate emissions from this key category in line with the IPCC good practice guidance.

4.   **Non-key categories**

Stationary combustion: biomass – CO_2

48.   Solid (peat) and biomass fuels in the commercial/institutional, residential and agriculture/forestry/fisheries categories represent about 24 per cent of total fuel consumption in other sectors for 2008; and CO_2 emissions are reported under the memo items of the CRF tables. There is no information in the NIR about the country-specific NCV or the heat content of the peat and biomass-wood for burning applied in the calculations for these fuels. The ERT encourages Belarus to improve the estimates by more transparently documenting in the NIR the country-specific calorific values and EFs for peat and peat briquettes, as well as for fuel wood, because these fuels contribute significantly to the country's energy consumption.

Road transportation: liquid fuels – CH_4, N_2O

49.   Belarus uses default CH_4 EFs from the Revised 1996 IPCC Guidelines for the road transportation calculations. The ERT notes that the EF for CH_4 for LPG in road transportation used by Belarus appears to be taken from the default EF for natural gas in table 1-7 of the Revised 1996 IPCC Guidelines (50 kg/TJ). This is not the correct EF to use for calculating CH_4 emissions from LPG use by road transportation, so the ERT recommends that Belarus revise its approach in its next submission and instead use the appropriate LPG CH_4 EF, as listed in table 1-45 of the Revised 1996 IPCC Guidelines.

50.   The N_2O EF used in the calculations for gasoline cars (0.6 kg/TJ) for the complete time series is below the IPCC default range (1–20 kg/TJ). The EF used for diesel cars (0.6 kg/TJ) for the complete time series is below the IPCC default range (3–4 kg/TJ). These

EFs may be appropriate to use for old cars without catalytic converters; however, the ERT noted that Belarus's vehicle fleet may include a significant number of new and used cars equipped with such technology. These cars have significantly higher N_2O emissions and the EFs used in the inventory may not be representative of the actual condition of the vehicle fleet. The ERT recommends that Belarus estimate the amount of fuel combusted by vehicle type and in particular consider the number of vehicles equipped with catalytic converters, then revise its N_2O emission estimates using appropriate N_2O EFs in its next inventory submission.

C. Industrial processes and solvent and other product use

1. Sector overview

51.   In 2008, emissions from the industrial processes sector amounted to 3,971.00 Gg CO_2 eq, or 4.4 per cent of total GHG emissions. Between 1990 and 2008, emissions from the industrial processes sector increased by 9.9 per cent. The key driver for the rise in emissions is an increase in cement production (clinker) by 82.9 per cent due to growth in the construction industry; whereas production levels and emissions from two other key categories (lime production and ammonia production) decreased during the period (17.3 and 25.8 per cent, respectively). Within the industrial processes sector, 66.0 per cent of the emissions were from mineral products, followed by 31.4 per cent from the chemical industry. Metal production accounted for 1.6 per cent and 1.0 per cent came from consumption of halocarbons and SF_6.

52.   In 2008, emissions from the solvent and other product use sector amounted to 64.09 Gg CO_2 eq, or 0.1 per cent of total GHG emissions in Belarus. Emissions from this sector decreased by 13.9 per cent between 1990 and 2008. In this sector, Belarus has estimated only the N_2O emissions from use for anaesthesia and non-methane volatile organic compounds emissions from paint application, degreasing and dry cleaning, chemical products manufacture and processing. The CO_2 and N_2O emissions from the remaining categories are reported as "NA" or "NO".

53.   In 2008, CO_2 was the largest contributor to GHG emissions from the industrial processes sector, accounting for almost 97.6 per cent of sectoral emissions. The contributions of CH_4, N_2O, HFCs and SF_6 were 1.4, 0.02, 0.9 and 0.1 per cent, respectively. Most of the CO_2 emissions (46.8 per cent) came from cement production; ammonia production accounted for 32.0 per cent and lime production for 17.3 percent. CH_4 emissions mostly came from iron and steel production (electric arc furnace steel production); N_2O emissions were reported only from nitric acid production.

54.   Following recommendations from previous reviews, Belarus improved its inventory and NIR in the industrial processes sector for key categories (CO_2 emissions from cement production, lime production and ammonia production) by applying corrected EFs and appropriate methods and added the necessary explanations in the NIR. Belarus recalculated emissions from cement production, lime production, ammonia production, nitric acid production and glass production for the whole time series. There are also recalculations of HFCs emissions from consumption of halocarbons and SF_6 in 2007. All recalculations are explained in the NIR and resulted in an increase in sectoral GHG emissions of 60.5 per cent in 1990 and of 19.7 per cent in 2007.

55.   Belarus reported only actual HFC emissions from refrigeration and air-conditioning equipment and actual SF_6 emissions from electrical equipment under consumption of halocarbons and SF_6. 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 or "NO". The NIR lists several planned improvements on HFC emissions from

refrigeration and air-conditioning equipment and SF_6 from electrical equipment. The ERT recommends that Belarus strengthen its efforts in collecting AD and estimate emissions for the missing subcategories under consumption of halocarbons and SF_6, including mobile sources, as mentioned by Belarus under planned improvements in the 2008 and 2009 submissions that have not yet been implemented.

56.   The ERT noted some incorrect use of notation keys in the CRF tables. Belarus reported CO_2 emissions from pig iron and steel as "IE" (under electric arc furnace steel production). In addition, emissions from ferroalloys production were reported as "NE" because of lack of AD. However, no additional explanations were provided in the NIR, in particular on the metal production activities in Belarus. During the centralized review, Belarus explained to the ERT that only electric arc furnace steel is produced in the country and ferroalloys are imported from the Russian Federation and Ukraine. Thus the notation key "NO" should be used for the above mentioned categories because such activities are not occurring in the country. The ERT strongly recommends that Belarus clarify all industrial activities in the country and make proper use of notation keys and documentation boxes in the CRF tables and corresponding NIR chapters in its next inventory submission.

57.   Belarus reported emissions from some activities that do exist in the country as "NE", for example soda ash production and limestone and dolomite use, explaining that AD are lacking to estimate these emissions. The ERT recommends that Belarus 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 submission.

58.   The ERT noted lack of transparency in the NIR, because information and explanations for non-key categories were reported all together under the other production section. Although it is possible to understand from the CRF tables that IPCC default EFs were used for almost all of these categories, the methodologies and EFs applied are poorly documented in the NIR. The ERT recommends that Belarus 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.

59.   The NIR provided information on overall uncertainties for the AD of key categories and overall uncertainty for the industrial processes sector only. No further discussion of EFs uncertainty is provided, although mostly IPCC default EFs were used. During the centralized review, Belarus expressed to the ERT its intention to revise the uncertainty analysis in its next inventory submission. The ERT recommends that Belarus estimate uncertainties more thoroughly and follow closely the UNFCCC reporting guidelines when providing information on uncertainties for the sector.

2.   Key categories

Cement production – CO_2

60.   Belarus used the IPCC tier 2 methodology, using clinker production volumes as AD and the default IPCC parameters, such as calcium oxide (CaO) content, to estimate emissions. Following the recommendations of the previous review report, Belarus recalculated emissions to account for the cement kiln dust correction factor using the IPCC default value (1.02). In its NIR, Belarus stated that it intends to collect plant-specific data on CaO content in clinker from three producing plants. The ERT encourages Belarus to strengthen its efforts in collecting plant-specific AD and EFs and to report on this in its next inventory submission, if possible recalculating CO_2 emissions for the complete time series to improve the accuracy of the estimates in this category.

Lime production – CO_2

61.   Following the recommendations of the previous review report, Belarus recalculated emissions from lime production using the IPCC tier 2 approach. The NIR explains that Belarus estimated the CO_2 emissions from lime production using the IPCC good practice guidance default EFs for the whole period (0.75 t/t for high-calcium quicklime and 0.86 t/t for dolomitic lime). However, the CRF tables provide an implied emission factor (IEF) equal to 0.74 t/t, which is lower than those referred to in the explanations provided in the NIR. During the centralized review, Belarus confirmed that it included total lime production as AD, although emissions were estimated using a default 0.97 correction factor for hydrated lime, as recommended in the IPCC good practice guidance. After Belarus corrected the AD in the CRF tables the new IEF appeared to be correct (0.77 t/t). The ERT encourages the Party to collect country-specific data on the proportion of quicklime and dolomitic lime production and to use them in estimating emissions from this category to improve the accuracy of the estimates in its next inventory submission.

Ammonia production – CO_2

62.   Following the recommendations of the previous review report, Belarus estimated CO_2 emissions from ammonia (NH_3) production based on natural gas consumption for the entire time series. The carbon content in natural gas was taken from the Revised 1996 IPCC Guidelines (0.525 kg C/m^3 gas). The amount of natural gas used as feedstock in Belarus is less than that assumed in the Revised 1996 IPCC Guidelines (812 m^3 gas/t NH_3), resulting in a lower IEF (1.3 t/t) than the IPCC default (1.6 t/t). No disaggregation by categories is reported for industrial activities in the energy sector CRF tables, thus it is difficult to assess if double counting is excluded from the reporting of this category under the industrial processes sector. During the centralized review, Belarus confirmed the proportion of natural gas used as feedstock and as fuel, which can be explained by the fact that there is only one ammonia producer in the country, and expressed its intention to improve transparency in the energy sector reporting and show that no double counting is occurring. The ERT recommends that Belarus obtain plant-specific data on carbon content in natural gas used for ammonia production to improve the accuracy of estimates and perform a cross-check of natural gas consumption with the energy sector to avoid double counting in its next inventory submission.

3.   **Non-key categories**

Glass production – CO_2

63.   Following the recommendations of the previous review report, Belarus estimated emissions from flat glass production, using an EF of 0.14 t/t from the outdated core inventory of air emissions (CORINAIR) guidebook, although in the CRF tables it reported the use of the default IPCC EF. During the centralized review, Belarus informed the ERT of its intention to use a tier 2 approach from the *2006 IPCC Guidelines for National Greenhouse Gas Inventories* for estimating emissions, due to the availability of AD on crushed glass recycling and to recalculate emissions from this category in its next submission. The ERT encourages Belarus to use available AD and make efforts to develop a country-specific EF to estimate emissions from glass production and report them in its next inventory submission.

D. Agriculture

1. Sector overview

64.   In 2008, emissions from the agriculture sector amounted to 22,746.95 Gg CO_2 eq, or 25.0 per cent of total GHG emissions. Since 1990, emissions have decreased by 28.7 per cent. The key drivers for the fall in emissions are a decrease in livestock population, fertilizer application and cultivated land area. Within the sector, 57.9 per cent of the emissions were from agricultural soils, followed by 28.3 per cent from enteric fermentation and 13.8 per cent from manure management.

65.   The inventory is complete in terms of categories, gases, geographical coverage and years. Belarus mostly used the tier 1 method with IPCC default EFs, except for emission estimates from enteric fermentation (dairy cattle), where Belarus used country-specific EFs. Belarus does not cultivate rice and this activity and the prescribed burning of savannas are reported as "NO" in the country. Field burning of agricultural residues is prohibited by law in Belarus and is also reported as "NO".

66.   In general, the descriptions of AD, EFs and methodologies used provided in the NIR are transparent. Belarus has implemented most of the recommendations made in the previous review report. However, there is still room for improvement in describing methodologies (in particular higher tier methods), the selection of EFs and providing references, specifically when these refer to expert judgement.

67.   The uncertainty analysis for the agriculture sector was conducted in accordance with the tier 1 methodology described in the IPCC good practice guidance. However, information on uncertainty for individual AD and EFs is not provided in the NIR. The uncertainty for AD is reported to be in the range of 3–15 per cent and total uncertainty for EFs is reported to be around 50 per cent. In the previous review report it was recommended that Belarus check uncertainty ranges for all parameters and provide detailed descriptions of the uncertainty analysis in its next inventory submission, but information provided in the NIR of the current submission about uncertainty is not improved. The ERT reiterates this previous recommendation.

68.   Recalculations – related to the updated AD for livestock population and area of cultivated organic soils, correction of EFs in enteric fermentation, correction of decimals in nitrogen excretion on pasture range and paddock, inclusion of some more crops and an update of allocation of manure on pasture, range and paddock – resulted in an increase in emission estimates from the agriculture sector of 45.0 per cent in 1990 and an increase of 40.7 per cent in 2007. Recalculation also led to an increase in the total GHG emissions of 7.7 per cent in 1990 and an increase of 7.8 per cent in 2007.

2. Key categories

Enteric fermentation – CH_4

69.   It is still not clear from the NIR how annual average AD on livestock are derived even though it was recommended in the previous review report that the Party should revise the data for livestock populations using the annual average, as required in the IPCC good practice guidance. The same data were used for this inventory, except for minor corrections to the dairy cattle data for 1993–1997, 1999–2001, 2005 and 2007. Therefore, the ERT reiterates the recommendation made in the previous review report.

70.   Belarus used milk production to develop country-specific EFs for dairy cattle. The country-specific EF to estimate emissions from dairy cattle was obtained by interpolating the IPCC default EF for Western Europe (100 kg CH_4/head/yr), Eastern Europe (81 kg CH_4/head/yr) and North America (118 kg CH_4/head/yr), taking into account milk

productivity. The ERT commends this effort to increase the accuracy of emission estimates but believes that this approach is not fully in line with the IPCC methodologies. The ERT recommends that Belarus revise EFs for dairy cattle according to the IPCC good practice guidance recommendations and report on this in its next inventory submission. In the NIR, Belarus reported that it is working on the development of country-specific EFs for cattle and swine and plans to finish this work in 2010. The ERT welcomes this effort and encourages Belarus to report on this and to use a higher tier for the emission estimates of this key category in accordance with the IPCC good practice guidance in its next inventory submission.

71. Belarus selected the IPCC default EFs for sheep and swine that are recommended for Western Europe, but there is no information in the NIR explaining whether these EFs are more suited to the country than the EFs of Eastern Europe. The ERT recommends that Belarus provide more information on the selection of EFs for these livestock categories.

72. In the previous review report Belarus was recommended to include mules and asses in the inventory, because the Food and Agriculture Organization of the United Nations reports the population of mules and asses as 20.8 thousand heads in 2006, showing that these animals exist in the country. In the current submission, Belarus did not provide any information in the NIR as to whether it had investigated the existence of these animals in the country and reported emissions from this livestock category as "NO" in the CRF tables. The ERT reiterates the recommendation in the previous review report.

Manure management – N_2O

73. The NIR states that a tier 1 method of the IPCC good practice guidance was used to estimate emissions from this category. Belarus selected the IPCC default EFs for sheep, goats and horses (table 6.9 of the NIR) that are recommended for developed countries but there is no additional information in the NIR. The ERT recommends that Belarus provide more information on the selection of EFs for these livestock categories, support its selection of EFs for developed countries taking into account Belarus's conditions and provide information on the methodologies used. The national allocation of manure to management systems was used in the estimates based on expert judgement, but no references to this were provided in the NIR. The ERT recommends that Belarus provide references and information on how the national allocation of manure was made.

74. Belarus reported in the NIR that it is working on the development of country-specific EFs for cattle and swine for this category and plans to finish this work in 2010. The ERT welcomes this effort and encourages Belarus to report on this and use a higher tier for the emission estimates of this key category in accordance with the IPCC good practice guidance in its next inventory submission.

Direct soil emissions – N_2O

75. The tier 1a and tier 1b methodologies with IPCC default EFs were used to estimate emissions from this category. N_2O emissions for this category account for 57.9 per cent of the emissions from the sector and 82.5 per cent of total N_2O emissions in the country.

76. Belarus included nine more crops to estimate N_2O emissions from crop residue and provided information in the NIR on crop residue, dry matter fraction and nitrogen fraction, as recommended in the previous review report. The ERT welcomes this significant improvement and encourages Belarus to continue its efforts to improve reporting in its next inventory submission.

77. The NIR reports that AD for cultivation of organic soils have been updated for the entire time series using different sources of information: national statistics, peer reviewed scientific papers and data from the Laboratory of Bio-geo-chemistry and Landscape of

Belarus. However, it is still not clear how data obtained from sources other than the national statistics have been used for the estimation of N_2O emissions. Updated areas of cultivated organic soils are higher for the entire time series than those reported in the 2009 submission, but the differences and the reliability of these data are not explained in the NIR. The ERT welcomes the implementation of previous recommendations to correct inconsistencies in the time series estimates for histosols, but recommends that Belarus provide relevant explanations for the differences and reliability of data used on the area of cultivation of organic soils in the NIR of its next inventory submission.

78.   In the previous review report Belarus was recommended to correct inconsistencies in 2007 in the fraction of nitrogen excreted on pastures ($Frac_{GRAZ}$) reported in CRF table 4.D (0.02) and in table 4.B(b) (0.13). In the 2010 submission, Belarus reports $Frac_{GRAZ}$ as "IE", explaining that the amount of manure applied to soils is calculated as the sum of animal waste in all animal waste management systems except that which is excreted during grazing and $Frac_{GRAZ}$ is excluded. The information provided in the NIR does not allow the ERT to confirm that this fraction is included elsewhere. The ERT could not reproduce the value reported for this subcategory in the CRF tables. Therefore, the ERT recommends that Belarus provide a clearer description of the methodology used in this subcategory in the NIR of its next inventory submission.

E.   Land use, land-use change and forestry

1.   Sector overview

79.   In 2008, net removals from the LULUCF sector amounted to 31,034.23 Gg CO_2 eq. Since 1990, net removals have increased by 4.1 per cent. The key drivers for this stable trend in removals are the increase in harvesting and forest fires compensated by an increase in forest areas and a decrease in the area of peat extraction in wetlands. In 2008, the LULUCF sector offset 34.1 per cent of the total emissions of the country. Within the sector, 31,108.39 Gg CO_2 eq are offset by forest land, followed by 81.31 Gg CO_2 eq offset by cropland. The only source in the sector is wetlands remaining wetlands, emitting 155.48 Gg CO_2 eq.

80.   Following the recommendations in the previous review report, Belarus presented new data to improve estimates of carbon change in living biomass in the forest land remaining forest land category. A recalculation was made based on the new data. The ERT welcomes the efforts undertaken and encourages Belarus to explain future recalculations in chapter 9 of the NIR and in CRF table 8(b). Belarus plans to further improve its estimates by developing country-specific EFs for assessing different pools that will more accurately represent land use and improving QA/QC procedures. The ERT welcomes such efforts and encourages Belarus to report on them in its future submissions.

81.   As a whole, the Party's inventory of the LULUCF sector remains incomplete. Many of the mandatory categories are not reported, in particular, all conversion categories and grassland remaining grassland. Therefore the system of land-use representation is not yet sufficiently elaborated. A table in the NIR provides a time series of areas of the different land-use categories but does not provide information on land-use conversion. The ERT strongly recommends that Belarus develop its national system for land-use representation and land-use change identification, following the IPCC good practice guidance for LULUCF and the recommendations from previous reviews in order to ensure that all emission categories are estimated and that they are transparently reported.

2. Key categories

Forest land remaining forest land – CO_2

82. Belarus applied the default method of the IPCC good practice guidance for LULUCF to estimate emissions and removals from living biomass. As recommended in the previous review report, Belarus developed new country-specific data in this submission. The use of more disaggregated AD and species-specific conversion and biomass expansion factors disaggregated by species and by age of forest stands qualify the method as a tier 2 approach. The new data are provided in the NIR. The recalculation based on the new data results in an increase in removals from this category, by 26.3 per cent and by 21.1 per cent in 1990 and 2007, respectively. Emissions and removals from dead organic matter and soil are assumed to be zero. The ERT encourages the Party to aspire to full transparency in the description of the basic data used to derive conversion factors and prepare the estimates.

Cropland remaining cropland – CO_2

83. There has been a significant change in this category since the last submission. It changed from a source of 1,118.46 Gg CO_2 in 1990 to a sink of 81.31 Gg CO_2 in 2008. This is as a result of perennial crops being estimated for the first time. In addition, the lime application has been further reduced. Because of the strong trend it has become a key category. The ERT encourages Belarus to provide solid data demonstrating that perennial crops are only estimated as a sink during their first cycle, according to the default method in the IPCC good practice guidance for LULUCF.

3. Non-key categories

Wetlands remaining wetlands – CO_2 and N_2O

84. Belarus estimated emissions of CO_2 and N_2O from peat extraction on wetlands using a tier 1 approach in accordance with the IPCC good practice guidance for LULUCF. The CRF table reports only CO_2 emissions from wetlands (154.81 Gg); CH_4 emissions from this voluntary category are reported as "NE" and "NO" for 2008, while N_2O emissions from wetland are reported 0.002 Gg in 2008. Emissions from wetlands remaining wetlands in 2008 decreased by 79.7 per cent compared with the base year. This decrease is due to a reduced area of peat extraction as a consequence of a decrease in peat consumption as an energy source.

Land converted to forest land – CO_2 and N_2O

85. In the NIR, Belarus provided estimates of emissions from wetlands converted to forest land following drainage and reported increasing emissions of CO_2 and N_2O from 1990 to 2007. In 2008, the emissions were as in 2007: 4,725.00 Gg CO_2 and 0.033 Gg N_2O. The emissions of both gases had increased by 415 per cent since the base year. Belarus did not include these estimates in the CRF tables, but noted its intention to report these estimates in its next annual submission. The ERT encourages Belarus to continue its efforts to provide transparent information and to include the estimates in the CRF tables.

Biomass burning – CO_2, CH_4 and N_2O

86. Following the recommendations provided in the previous review report, Belarus revised its estimates of biomass burning. Biomass burning activities are described in the NIR under forest land remaining forest land. Emissions are distinguished between controlled burning and wildfires. IEFs reported by Belarus (0.00165 Mg CO_2/kg dry matter; 0.0000072 Mg CH_4/kg dry matter; and 0.0000000495 Mg N_2O/kg dry matter) are in the range of the lowest IEFs reported by only a few countries. In the NIR, Belarus states that

controlled burning is mainly of harvest residues and is strongly controlled by the Ministry of Forest. Wildfires are less important; only a relatively small proportion of the growing stock is assumed to be oxidized by wildfires in practice. The ERT encourages the Party to continue its efforts and to consider also dead organic matter in its emission estimations from biomass burning.

F. Waste

1. Sector overview

87. In 2008, emissions from the waste sector amounted to 5,632.17 Gg CO_2 eq, or 6.2 per cent of total GHG emissions. Since 1990, emissions have increased by 118.7 per cent. The key driver for the rise in emissions is the increase of solid waste disposal on land, due to economic growth and increase in the consumption level of the population, as well as due to the improvement of the national waste accounting system. Within the sector, 96.0 per cent of the emissions were CH_4 emissions from solid waste disposal on land and the remaining 4.0 per cent were N_2O emissions from human sewage under wastewater handling. The ERT noted that no significant improvements have been made in the 2010 submission since the previous submission.

88. CH_4 emissions from wastewater handling are reported as "NE", as are N_2O emissions from industrial wastewater and domestic and commercial wastewater. CH_4 emissions from managed solid waste disposal on land are reported as "NO", implying that all landfills are unmanaged; and all GHG emissions from waste incineration are reported as "NO", although the NIR reports on some industrial plants that are incinerating waste. The ERT strongly recommends that Belarus enhance its efforts to estimate those emissions not currently estimated in its next inventory submission.

89. The methodologies and assumptions used for estimating emissions from the waste sector are described in the NIR, but almost all cells in the tables with additional background data in the CRF are reported as "NE". The use of notation key "NO" for waste incineration is not explained in the NIR. The ERT recommends that Belarus provide the missing information and an explanation for the use of all notation keys in the NIR of its next inventory submission.

90. The data verification procedures have been continued and general QA/QC procedures have been performed in the sector. Category-specific QA/QC has been carried out for CH_4 emissions from solid waste disposal on land as a key category. During the centralized review, the ERT received an independent expert review report for the waste sector that indicates an inconsistency of reported data on landfill classification, as well as information on waste management. The independent report reiterates many recommendations of the previous review report concerning further improvements to the GHG inventory in Belarus. The ERT encourages Belarus to take into consideration these recommendations in its next inventory submission.

2. Key categories

Solid waste disposal on land – CH_4

91. The Party's CH_4 emissions from solid waste disposal on land is a key category by level and trend and amounted to 5,408.97 Gg CO_2 eq in 2008 or 5.9 per cent of total GHG emissions. Belarus has defined all solid waste disposal sites (SWDS) in the country as unmanaged for the complete time series because of the absence of control of scavenging at the landfills. In the previous review report it was recommended that Belarus reconsider the current classification of SWDS and use for its estimates country-specific data based on all

available statistical data and results from research available in the country, therefore being able to use a higher tier for its estimates. However, in its 2010 submission, Belarus continued to use the IPCC tier 1 method for estimating emissions from this category. The ERT reiterates the recommendation of the previous review report that Belarus reconsider the current classification of SWDS and that it is good practice to apply the tier 2 method (first order decay) for this key category and strongly recommends that Belarus make efforts to apply this higher tier for its CH_4 estimates in its next inventory submission.

92.   AD and background information on waste management are described in the NIR, providing an overview of the situation in Belarus. However, the NIR does not contain any references about industrial waste management and it is not clear if industrial waste is treated or disposed of at SWDS. During the centralized review, Belarus informed the ERT that waste from industries is being considered in the total amount of waste disposed at SWDS. The ERT recommends that Belarus include the relevant explanations and information about industrial waste disposal in its next inventory submission.

3.   Non-key categories

Wastewater handling – CH_4, N_2O

93.   The Party's CH_4 emissions (as well as N_2O emissions) from industrial, domestic and commercial wastewater handling are reported as "NE". Belarus explained in the NIR that the primary way of treating domestic and industrial sewage in the country is biological under aerobic conditions. The ERT recognizes that the IPCC good practice guidance notes that, in developed countries, most domestic wastewater is handled in aerobic treatment facilities and in developing countries, a small share of domestic wastewater is collected in sewer systems, with the remainder ending up in pits or latrines. However, the ERT noted that countries with similar economical and geographical conditions (e.g. Czech Republic and Ukraine) considered that up to 15–30 per cent of wastewater is treated in anaerobic conditions. The ERT recommends that Belarus use all available statistical data and results from research in the country, which indicate that a small amount of anaerobic wastewater treatment exists, and report emissions from industrial, domestic and commercial wastewater handling in its next inventory submission.

94.   In the NIR, Belarus reports that sludge from wastewater treatment plants are disposed of at SWDS. However, the CRF table 6.B does not contain any references about sludge and it is not clear if the sludge is treated or disposed of at landfills, as the notation key "NE" is used for its reporting. In response to questions raised by the ERT during the centralized review, Belarus confirmed that CH_4 emissions from sludge residue of sewage water are considered in the calculation of CH_4 emissions from solid waste at SWDS. The ERT recommends that Belarus provide relevant explanations on the above mentioned issue and use the notation key "IE" in its next inventory submission.

95.   Emissions of N_2O from human sewage were estimated following the methodology from the Revised 1996 IPCC Guidelines. The country-specific parameters are taken from official statistical sources. The ERT noted that N_2O emissions fluctuated throughout the years 1990–2008. During the centralized review, Belarus explained to the ERT that this trend reflects the economic situation within the country and changes in protein consumption during the reported period. The ERT recommends that Belarus explain this trend in the next inventory submission.

Waste incineration – CO_2 and N_2O

96.   AD and corresponding emissions are reported as "NO" in the CRF tables, although the NIR reports that some industrial plants in the country are incinerating waste. In response to questions raised by the ERT during the centralized review, Belarus noted its

intention to report these emissions in its next inventory submission. The ERT supports this intention and recommends that Belarus describe in the NIR the situation of waste incineration in the country and estimate GHG emissions from this category in its next inventory submission.

III. Conclusions and recommendations

97.   Belarus submitted a complete set of CRF tables for the years 1990–2008 on 8 April 2010 and its NIR on 15 April 2010. Belarus resubmitted its CRF tables on 15 April 2010. This is in line with the UNFCCC reporting guidelines.

98.   The ERT concludes that, in general, the inventory submission of Belarus has been prepared and reported in accordance with the UNFCCC reporting guidelines. The inventory submission is generally complete in terms of geographical coverage, years and sectors, but not complete in terms of categories and gases. Some of the categories, particularly in the industrial processes sector (CO_2 emissions from limestone and dolomite use; CO_2 emissions from soda ash production; HFC (most of the subcategories) and PFC emissions from consumption of halocarbons and SF_6; the waste sector (CH_4 and N_2O emissions from industrial wastewater; CH_4 and N_2O emissions from domestic and commercial wastewater; CO_2 and N_2O emissions from waste incineration (reported as "NO")) and the LULUCF sector (CO_2, CH_4 and N_2O emissions and removals from land converted to other land (except CO_2 forest land converted to other land) and CO_2 emissions and removals from grassland remaining grassland), were reported as "NE". The ERT recommends that the Party provide estimates for these categories in its next inventory submission, in order to improve completeness.

99.   The Party's inventory is generally in line with the UNFCCC reporting guidelines, the Revised 1996 IPCC Guidelines, the IPCC good practice guidance and the IPCC good practice guidance for LULUCF. However, the ERT noted that lower tiers and default EFs are applied for most key categories. Some EFs applied are taken from the Revised 1996 IPCC Guidelines although updated values are provided in the IPCC good practice guidance. The ERT further noted that, in its 2010 submission, Belarus undertook a number of recalculations, particularly in the industrial processes, agriculture and LULUCF sectors to take into account recommendations of the previous review report and correct mistakes. The ERT commends Belarus for the efforts made.

100.   The institutional arrangements implemented by Belarus for the preparation of the inventory in general continue to perform its required functions; however, the ERT found that descriptions of institutional arrangements provided in the NIR need to be improved in relation to the legal responsibilities of ministries and private companies involved in the inventory management.

101.   In the course of the review, the ERT formulated a number of recommendations relating to the completeness of the inventory submission, transparency and accuracy of the information presented in Belarus's inventory submission. The key recommendations are that Belarus:

        (a)   Improve descriptions of institutional arrangements and QA/QC procedures, including the independent review reports and the results of their implementation in the NIR;

        (b)   Ensure the inclusion in its next inventory submission of emissions for categories currently reported as "NE" and for which methods are provided in the Revised 1996 IPCC Guidelines, the IPCC good practice guidance and/or the IPCC good practice guidance for LULUCF. If emissions for a given category cannot be estimated, the Party

should provide sufficient explanation in the NIR as to why such an estimate cannot be made;

(c)   Improve the transparency of descriptions of data collection activities, methods, EFs, uncertainty values and AD, particularly in the industrial processes and waste sectors;

(d)   Improve the descriptions and rationale of recalculations made and time-series consistency of GHG emission estimates;

(e)   Improve the reporting in the LULUCF sector, by including detailed information on land areas and uses, EFs and parameters used in the estimates and a matrix of land conversions for consistent representation of areas of land-use categories;

(f)   Enhance the accuracy of the GHG inventory by implementing higher tier methods and developing country-specific EFs for key categories;

(g)   Improve the consistency in reporting between the NIR and the CRF tables;

(h)   Improve the uncertainty analysis by using documented country-specific uncertainty values and, if necessary, using correct default values in the agriculture and LULUCF sectors.

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 Belarus 2010. Available at <http://unfccc.int/resource/docs/2008/asr/blr.pdf>.

Synthesis and assessment report on the greenhouse gas inventories submitted in 2010. Available at <http://unfccc.int/resource/webdocs/sai/2010.pdf>.

FCCC/ARR/2009/BLR. Report of the individual review of the greenhouse gas inventory of Belarus submitted in 2009. Available at <http://unfccc.int/resource/docs/2009/ arr/blr.pdf>.

B. Additional information provided by the Party

Responses to questions during the review were received from Ms. Yauheniya Bertash (Belarus Scientific Research Centre "Ecology"), including additional material on the methodology and assumptions used. The following documents[1] were also provided by Belarus:

Resolution of the Council of Ministers of the Republic of Belarus No. 485 of 10 April 2006 "On approval of the regulation on the development of the state greenhouse gas inventory" <http://pravo.kulichki.com/zak/new03/newc1030.htm>.

Resolution of the Council of Ministers of the Republic of Belarus No. 585 of 4 May 2006 "On approval of the regulation on the national inventory system" <http://pravo.kulichki.com/zak/new03/newc0625.htm>.

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[1] Reproduced as received from the Party.

Order of the Ministry of Natural Resources and Environmental Protection (MoNREP) No. 417 of 29 December 2005.

ОТЧЁТ заведующего лабораторией биогеохимии ландшафтов ГНУ «Институт природопользования НАН Беларуси» академика Бамбалова Н. Н. о рецензировании НИР «Проверка проекта государственного кадастра парниковых газов Республики Беларусь за 2008г. на предмет качества и правильности выполнения расчетов выбросов источниками и абсорбции поглотителями парниковых газов в секторах: «Сельское хозяйство», «ЗИЗЛХ», Минск, 2009, 5 с.

Замечания. Сектор «Отходы», Минск, 2009, 4 с.

План по обеспечению качества и контролю качества кадастра парниковых газов Республики Беларусь, Минск, февраль 2009, 15 с.

Annex II

Acronyms and abbreviations

AD	activity data
CH_4	methane
CaO	calcium oxide
CO_2	carbon dioxide
CO_2 eq	carbon dioxide equivalent
CRF	common reporting format
EF	emission factor
ERT	expert review team
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
GJ	gigajoule (1 GJ = 10^9 joule)
HFCs	hydrofluorocarbons
IEA	International Energy Agency
IPCC	Intergovernmental Panel on Climate Change
kg	kilogram (1 kg = 1,000 grams)
LPG	liquefied petroleum gas
LULUCF	land use, land-use change and forestry
m^3	cubic metre
NA	not applicable
NE	not estimated
NO	not occurring
N_2O	nitrous oxide
NIR	national inventory report
PFCs	perfluorocarbons
PJ	petajoule (1 PJ = 10^{15} joule)
QA/QC	quality assurance/quality control
RA	reference approach
SA	sectoral approach
SF_6	sulphur hexafluoride
SWDS	solid waste disposal sites
TJ	terajoule (1 TJ = 10^{12} joule)
UNFCCC	United Nations Framework Convention on Climate Change