COMPLIANCE COMMITTEE

CC/ERT/IRR/2008/3
18 February 2008

Report of the review of the initial report of the Russian Federation

Note by the secretariat

The report of the review of the initial report of the Russian Federation was published on 18 February 2008. For purposes of rule 10, paragraph 2, of the rules of procedure of the Compliance Committee (annex to decision 4/CMP.2), the report is considered received by the secretariat on the same date. This report, FCCC/IRR/2007/RUS, contained in the annex to this note, is being forwarded to the Compliance Committee in accordance with section VI, paragraph 3, of the annex to decision 27/CMP.1.

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Report of the review of the initial report of the Russian Federation

According to decision 13/CMP.1, each Annex I Party with a commitment inscribed in Annex B to the Kyoto Protocol shall submit to the secretariat, prior to 1 January 2007 or one year after the entry into force of the Kyoto Protocol for that Party, whichever is later, a report (the 'initial report') to facilitate the calculation of the Party's assigned amount pursuant to Article 3, paragraphs 7 and 8, of the Kyoto Protocol, and to demonstrate its capacity to account for emissions and the assigned amount. This report reflects the results of the review of the initial report of the Russian Federation conducted by an expert review team in accordance with Article 8 of the Kyoto Protocol.

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I. Introduction and summary

A. Introduction

1. This report covers the in-country review of the initial report of the Russian Federation, coordinated by the United Nations Framework Convention on Climate Change (UNFCCC) secretariat, in accordance with guidelines for review under Article 8 of the Kyoto Protocol (decision 22/CMP.1). The review took place from 16 to 22 July 2007 in Moscow, Russia, and was conducted by the following team of nominated experts from the roster of experts: generalist – Ms. Anke Herold (Germany); energy – Ms. Branca Americano (Brazil); industrial processes –Mr. Marius Țăranu (Republic of Moldova); agriculture – Mr. Rob Sturgiss (Australia); land use, land-use change and forestry (LULUCF) – Mr. Zoltán Somogyi (Hungary); waste – Ms. Irina Yesserkepova (Kazakhstan). Ms. Anke Herold and Ms. Branca Americano were the lead reviewers. In addition, the expert review team (ERT) reviewed the national system, the national registry, and the calculations of the Russian Federation's assigned amount and commitment period reserve, and took note of the LULUCF parameters and the elected Article 3, paragraph 4, activities. The review was coordinated by Ms. Katia Simeonova and Mr. Javier Hanna (UNFCCC secretariat).

2. In accordance with the guidelines for review under Article 8 of the Kyoto Protocol (decision 22/CMP.1), a draft version of this report was communicated to the Government of the Russian Federation, which provided comments that were considered and incorporated, as appropriate, in this final version of the report.

B. Summary

1. Timeliness

3. Decision 13/CMP.1 requests Parties to submit the initial report prior to 1 January 2007 or one year after the entry into force of the Kyoto Protocol for that Party, whichever is later. The initial report was submitted on 20 February 2007 which is not in compliance with decision 13/CMP.1. In its initial report the Russian Federation refers to its 2006 greenhouse gas (GHG) inventory submission of 8 January 2007 (national inventory report (NIR)) and 16 February 2007 (common reporting format (CRF) tables). The Russian Federation submitted information additional to the initial report and revised emission estimates on 4 September 2007, including revised estimates for perfluorocarbons (PFCs) for 1995 and additional specific notes in response to questions raised by the ERT during and after the in-country review, which are considered in this review report, in accordance with the guidelines for review under Article 8 of the Kyoto Protocol (decision 22/CMP1). The Russian Federation submitted final revised estimates for 1990 and 2004 on 14 January 2008.

2. Completeness

4. Table 1 below provides information on the mandatory elements that have been included in the initial report and reflects any revised estimates and information provided by the Russian Federation resulting from the review process. These revised calculations are based on revisions of the estimates of emissions of carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O) from most energy categories (see paragraph 62), CO_2 emissions from cement production (see paragraph 129), CO_2 emissions from lime production (see paragraph 132), CO_2 emissions from limestone and dolomite use (see paragraph 130), N_2O emissions from nitric acid production (see paragraph 134), CO_2 emissions from iron and steel production (see paragraph 131), PFCs emissions from aluminium production (see paragraph 135) and CH_4 emissions from domestic and commercial wastewater (paragraph 168). These revisions resulted in changes to the estimates of base year emissions from 3,216,327,004 tonnes CO_2 eq. as reported originally by the Russian Federation to 3,323,419,064 tonnes CO_2 eq. (see paragraphs 175 and 176), and revisions

of the estimates for the 2004 inventory from 2,152,437,201 tonnes CO_2 eq. as reported originally to 2,125,958,943 tonnes CO_2 eq. (see paragraphs 178 and 179).

Table 1. Summary of the reporting on mandatory elements in the initial report

Item	Provided	Value/year/comment
Complete GHG inventory from the base year (1990) to the most recent year available (2004)	Yes	Base year: 1990 The inventory contains considerable gaps in the estimation of individual categories as indicated in section II.B
Base year for HFCs, PFCs and SF_6	Yes	1990 After the in-country review the Russian Federation changed its base year for HFCs, PFCs and SF_6 to 1995
Agreement under Article 4	No	Not applicable
LULUCF parameters	Yes	Minimum tree crown cover: 30 % of minimum crown closure (for additional information see section II.F) Minimum land area: 1.0 ha Minimum tree height: 5 m
Election of and accounting period for Article 3, paragraphs 3 and 4, activities	Yes	Forest management Annual accounting
Calculation of the assigned amount in accordance with Article 3, paragraphs 7 and 8	Yes	16 081 633 595 tonnes CO_2 eq.
Calculation of the assigned amount in accordance with Article 3, paragraphs 7 and 8, revised estimate		16 617 095 319 tonnes CO_2 eq.
Calculation of the commitment period reserve	Yes	10 762 185 580 tonnes CO_2 eq.
Calculation of the commitment period reserve, revised estimate		10 629 794 715 tonnes CO_2 eq.
Description of national system in accordance with the guidelines for national systems under Article 5, paragraph 1	Yes	Description in accordance with guidelines for reporting of supplementary information under Article 7, paragraph 2, section D
Description of national registry in accordance with the requirements contained in the annex to decision 13/CMP.1, the annex to decision 5/CMP.1 and the technical standards for data exchange between registry systems adopted by the CMP	Yes	Description in accordance with guidelines for reporting of supplementary information under Article 7, paragraph 2, section E

5. The information in the initial report covers all elements as required by decision 13/CMP.1, section I of decision 15/CMP.1, and the relevant decisions of the Conference of the Parties serving as the Meeting of the Parties (CMP). Additional information on all elements was provided to the ERT during the in-country review. However, the ERT noted that some elements of the mandatory requirements for the national system are not entirely in line with the guidelines for national systems under Article 5, paragraph 1, of the Kyoto Protocol (decision 19/CMP.1). For example, some emission estimates have not been not prepared fully in line with the *Revised 1996 Intergovernmental Panel on Climate Change (IPCC) Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the Revised 1996 IPCC Guidelines) and the IPCC *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories* (hereinafter referred to as the IPCC good practice guidance); quantitative uncertainty analyses were performed only for the agriculture and LULUCF sectors; general quality control (QC) procedures were not yet systematically implemented and documented; and archiving of inventory information was not yet complete. The ERT requested the Russian Federation to provide additional information. After the in-country review, within the six weeks period, the Russian Federation provided the additional information requested on its national system in accordance with decision 22/CMP.1.

6. The 2006 GHG inventory of the Russian Federation contains a complete set of CRF tables for the years 1990–2004 and an NIR. The inventory submission is complete with regard to the coverage of years, but the coverage of gases and categories is incomplete. The NIR is also incomplete because some sections are missing (e.g. key category assessment and assessment of completeness) and no detailed documentation of methodologies and data is provided for the energy sector. In addition, the Russian Federation has not separately reported any emissions or removals in any mandatory land conversion categories (i.e. forest land converted to cropland, grassland, wetlands, settlements or other land).

3. Transparency

7. The initial report is generally transparent. However, transparency was not sufficient with regard to the roles and responsibilities of the institutions involved in the inventory preparation. This information should be updated in the next inventory submission of the Russian Federation, taking into account the administrative and legal arrangements made after the submission of the initial report, such as the quality assurance/quality control (QA/QC) plan and a number of Orders adopted in 2007. The 2006 GHG inventory submission contained a significant number of gaps in the estimation of emissions. The initial report does not address how these problems will be resolved and does not clearly allocate responsibilities for improvements, in particular in areas where statistical data are not available and additional data collection may be necessary. These and other specific aspects of transparency are described in detail in the relevant paragraphs of this report.

4. Emission profile in the base year, trends and emission reduction target

8. In the base year (1990 for CO_2, CH_4 and N_2O, and 1995 for hydrofluorocarbons (HFCs), PFCs and sulphur hexafluoride (SF_6)), the most important GHG in the Russian Federation was CO_2, contributing 75.2 per cent to total[1] national GHG emissions expressed in CO_2 eq.,[2] followed by CH_4, 17.4 per cent, and N_2O, 6.7 per cent (see figure 1). HFCs, PFCs and SF_6 taken together contributed 0.7 per cent of the overall GHG emissions in the base year The energy sector accounted for 81.5 per cent of the total GHG emissions in the base year followed by agriculture, 9.3 per cent, industrial processes, 7.3 per cent, waste, 1.9 per cent, and solvents and other product use, 0.02 per cent (see figure 2). Total GHG emissions (excluding LULUCF) amounted to 3,323,419.06 Gg CO_2 eq. in the base year and decreased by 36.0 per cent from the base year to 2004. The emission trends by sector and by gas are comparable with those of other Parties with economies in transition.

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

[2] In this report, the values for total and sectoral emissions for the base year and 2004 reflect the revised estimates submitted by the Russian Federation in the course of the review. These estimates differ from the Russian Federation's GHG inventory submitted in 2006.

Figure 1. Shares of gases in total GHG emissions, base year

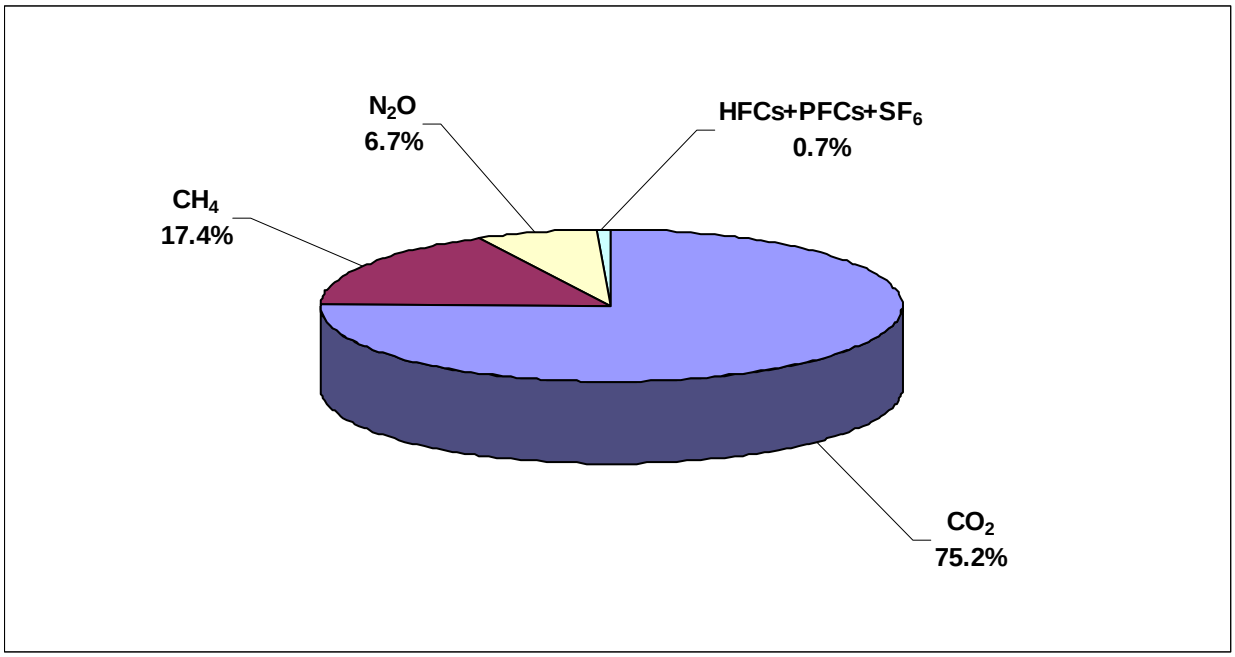
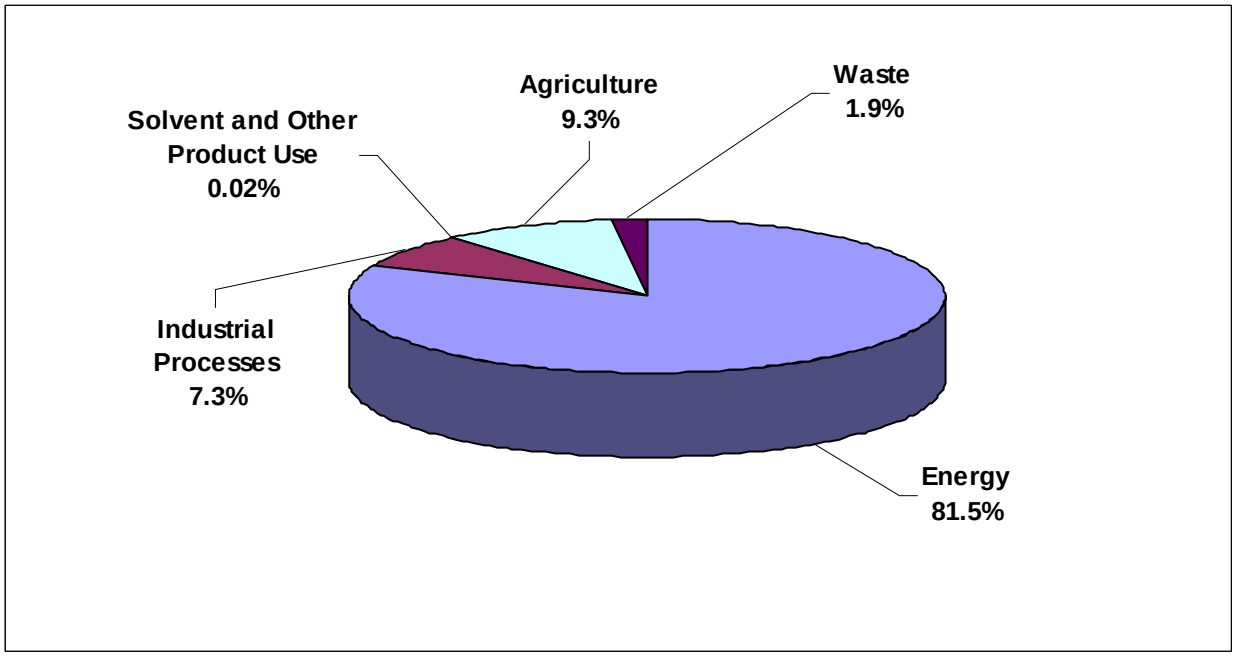


Figure 2. Shares of sectors in total GHG emissions, base year



9. Tables 2 and 3 show the GHG emissions by gas and by sector, respectively.

10. The Russian Federation's quantified emission limitation commitment is 100 per cent as included in Annex B to the Kyoto Protocol.

Table 2. Greenhouse gas emissions by gas, 1990–2004[b]

GHG emissions (without LULUCF)	Gg CO_2 equivalent								Change
	Base year[a]	1990[a]	1995[a]	2000	2001	2002	2003	2004[a]	BY–2004 (%)
CO_2	2 500 352.09	2 500 352.09	1 663 621.74	1 535 269.11	1 586 570.18	1 583 041.55	1 639 680.19	1 529 128.84	–38.8
CH_4	578 241.34	578 241.34	379 750.25	336 460.54	336 435.54	339 329.08	348 999.43	466 597.34	–19.3
N_2O	221 382.92	221 382.92	136 345.51	104 651.27	105 285.09	105 804.93	102 780.28	104 613.22	–52.7
HFCs	7 594.62	7 970.34	7 594.62	12 101.88	13 424.73	9 964.93	9 870.57	9 775.82	28.7
PFCs	15 753.84	15 308.68	15 753.84	18 547.43	18 441.78	14 512.14	15 050.67	15 705.61	–0.3
SF_6	94.25	98.54	94.25	116.53	106.63	107.78	118.21	138.10	46.5

Note: BY = Base year; LULUCF = Land use, land-use change and forestry.

[a] The Russian Federation submitted revised estimates for 1990 (the base year for CO_2, CH_4 and N_2O) and 2004 in the course of the initial review on 14 January 2008, and for PFCs for 1995 (the base year for HFCs, PFCs and SF6) on 4 September 2007. These estimates differ from the Russian Federation's GHG inventory submitted in 2006.

[b] In this table the data for the industrial processes and waste sectors reflect the revised estimates for the complete time series submitted on 4 September 2007, while data for the solvents and other product use, agriculture and LULUCF sectors reflect the original estimates. Data for the energy sector reflect the revised estimates for the base year, 1990 and 2004 submitted on 14 January 2008, while data for the remaining years reflect the original estimates.

Table 3. Greenhouse gas emissions by sector, 1990–2004[b]

Sectors	Gg CO_2 equivalent								Change
	Base year[a]	1990[a]	1995[a]	2000	2001	2002	2003	2004[a]	BY–2004 (%)
Energy	2 707 695.94	2 707 695.94	1 783 415.19	1 625 015.52	1 673 005.21	1 668 944.90	1 723 877.23	1 728 466.20	–36.2
Industrial processes	241 077.93	241 012.77	157 601.43	172 831.26	175 511.54	170 578.42	181 857.36	188 169.92	–21.9
Solvent and other product use	556.44	556.44	506.97	518.07	527.96	526.63	527.72	529.83	–4.8
Agriculture	309 368.59	309 368.59	204 477.60	146 268.29	147 338.90	147 309.23	143 108.45	139 822.01	–54.8
LULUCF	NA	190 271.69	–139 790.93	365 293.23	249 221.66	–176 460.87	–362 147.03	–198 519.78	NA
Waste	64 720.16	64 720.16	57 159.03	62 513.63	63 880.32	65 401.23	67 128.59	68 970.98	6.6
Other	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total (with LULUCF)	NA	3 513 625.59	2 063 369.28	2 372 440.00	2 309 485.61	1 876 299.55	1 754 352.32	1 927 439.17	NA
Total (without LULUCF)	3 323 419.06	3 323 353.90	2 203 160.22	2 007 146.77	2 060 263.95	2 052 760.41	2 116 499.35	2 125 958.94	–36.0

Note: BY = Base year; LULUCF = Land use, land-use change and forestry; NA = Not applicable.

[a] The Russian Federation submitted revised estimates for 1990 (the base year for CO_2, CH_4 and N_2O) and 2004 in the course of the initial review on 14 January 2008, and for PFCs for 1995 (the base year for HFCs, PFCs and SF6) on 4 September 2007. These estimates differ from the Russian Federation's GHG inventory submitted in 2006.

[b] In this table the data for the industrial processes and waste sectors reflect the revised estimates for the complete time series submitted on 4 September 2007, while data for the solvents and other product use, agriculture and LULUCF sectors reflect the original estimates. Data for the energy sector, reflect the revised estimates for the base year, 1990 and 2004 submitted on 14 January 2008, while data for the remaining years reflect the original estimates.

II. Technical assessment of the elements reviewed

A. National system for the estimation of anthropogenic GHG emissions by sources and sinks

11. The Russian Federation's national system is generally prepared in accordance with the guidelines for national systems under Article 5, paragraph 1, of the Kyoto Protocol (decision 19/CMP.1). However, the national system is still under development and had not yet been completely implemented with regard to all elements at the time of the preparation of the initial report and at the time of the in-country review, for example with regard to the timeliness of the provision of information, the transparent description of the inventory data, the completeness of emission and removals estimates, the implementation of the mandatory QA/QC procedures, the full implementation of the IPCC good practice guidance, the identification of key categories and the uncertainty estimation.

12. Table 4 shows which of the specific functions of the national system are included and described in the initial report.

Table 4. Summary of reporting on the specific functions of the national system

Reporting element	Provided	Comments
Inventory planning		
Designated single national entity*	Yes	See section II.A.1
Defined/allocated specific responsibilities for inventory development process*	Yes	See section II.A.1
Established process for approving the inventory*	Yes	See section II.A.1
Quality assurance/quality control plan*	No	See section II.A.2
Ways to improve inventory quality	Yes	See section II.B.3
Inventory preparation		
Key category analysis*	No	See section II.B.1
Estimates prepared in line with IPCC guidelines and IPCC good practice guidance*	Partly	See section II.B.2
Sufficient activity data and emission factor collected to support methodology*	Partly	See section II.B
Quantitative uncertainty analysis*	Partly	See section II.B.2
Recalculations*	No	See section II.B.2
General QC (tier 1) procedures implemented*	Partly	See section II.A.2
Source/sink category-specific QC (tier 2) procedures implemented	Partly	See section II.A.2
Basic review by experts not involved in inventory	No	See section II.A.2
Extensive review for key categories	No	See section II.A.2
Periodic internal review of inventory preparation	Partly	See section II.A.2
Inventory management		
Archive inventory information*	Yes	See section II.A.3
Archive at single location	Yes	See section II.A.3
Provide ERT with access to archived information*	Yes	See section II.A.3
Respond to requests for clarifying inventory information during review process*	Yes	See section II.A.1

* Mandatory elements of the national system

1. Institutional, legal and procedural arrangements

13. During the in-country review, the Russian Federation explained the institutional arrangements, as part of the national system, for preparation of the inventory. The Federal Service for Hydrometeorology and Environmental Monitoring (Roshydromet) is the designated single national entity with overall responsibility for the national inventory. Roshydromet delegated the responsibility for the preparation and the management of the GHG inventory to the Institute of Global Climate and Ecology (IGCE). This

includes the development and implementation of inventory methodologies, the preparation of emission estimates in all sectors, the development and implementation of QA/QC procedures, the development of internal orders for QC and other purposes, data collection from statistics, reports and publications, storage and archiving of inventory information and the response to requests resulting from the review process. Within the IGCE, the inventory functions are allocated in the Department of Monitoring Anthropogenic GHGs Emissions. The IGCE directs the need for additional activity data (AD) and other parameters to Roshydromet, which sends requests to the other ministries and agencies that form part of the national system. Roshydromet is responsible for providing adequate resources and funding for inventory preparation and management to the IGCE, provides orders to the IGCE and submits the inventory to the UNFCCC secretariat.

14. The Russian Federal Service for State Statistics (Rosstat) compiles and publishes federal statistics and is the main data provider for the inventory. Data are usually collected at 88 Rosstat regional bodies and aggregated by Rosstat to form national estimates. Rosstat annually develops a federal list of statistical data collection on an inter-agency basis, guides the activities of ministries and agencies on the development of state statistical resources and proposes the mandatory all-Russian statistical indicators for technical, economic and social information. Forest statistics are compiled by the Federal Forestry Agency. Customs statistics are compiled by the Federal Customs Service. The ERT was informed that the State decree of 1 March 2006 requests Roshydromet and the IGCE to develop a system for the additional statistical indicators/parameters that are needed for inventory preparation. However, because significant resources are required for this activity, implementation is expected to take some years. The ERT was informed that a draft project for a federal law on statistical activities was on the agenda of the State Duma of the Russian Federation for the autumn of 2007. After the in-country review, the ERT was informed that before the end of 2007 this law had been passed by the State Duma and entered into force.

15. A number of ministries and other agencies are also part of the national system, including the Ministry of Economic Development and Trade, the Ministry of Natural Resources (MNR), the Ministry of Industry and Energy, the Ministry of Transport, the Ministry of Agriculture, the Regional Development Ministry, and the Federal Service for Environmental Engineering and Nuclear Supervision. They have the responsibility for responding to information requests from Roshydromet, for submitting the agreed data for inventory purposes to the IGCE, and for considering and approve the final annual GHG inventory

16. The ERT was informed that the deadlines for presentation of statistical information to the users at the regional and federal levels are set out in the federal list of statistical activities, and that the compilation of this list takes into consideration the international commitments of the Russian Federation. Rosstat informed the ERT that AD for the previous year can be provided to Roshydromet prior to 15 May each year, except for the energy balance of the previous year which can be provided prior to 15 December each year, which is in line with the established annual schedule for inventory preparation. The ERT encourages the Russian Federation to ensure that AD from Rosstat is provided in a timely manner to Roshydromet and the IGCE for the annual inventory preparation.

17. The national system as currently established does not envisage any direct contacts between Roshydromet or the IGCE and private or non-governmental entities such as companies or business associations. Their data are only included through data collection for national statistics. On the one hand, it is efficient to work with top-down, instead of bottom-up plant-specific data in a country as big as the Russian Federation. On the other hand, plant-specific data that currently do not form part of the national statistics are needed to implement higher tier methods for key categories in the energy and industrial processes sectors. This requires access to data and information from companies or business associations. The ERT recommends that in the future the national system be expanded to include private entities as well as governmental bodies because access to this data will be key for the future improvement activities, in particular in the energy and industrial processes sector. This is relevant for private, but also

particularly for the state-owned large companies such as the Russian Joint Stock Company Unified Energy System of Russia (RAO UES) and Gazprom JSC, which were part of the now dissolved Inter-agency Commission on Climate Change (ICCC) but are no longer part of the established national system. In the revisions provided to the ERT during the review, some data from RAO UES and Gazprom JSC were used. The inclusion of private data providers in the national system will require continuous cooperation and exchange of relevant data and information with these companies for the purposes of the GHG inventory.

18. Within the established national system, responsibilities for the collection of additional data are not completely clear for those categories where the available information is not sufficient for the implementation of methodological approaches in line with the IPCC good practice guidance, and in particular the provision of financial resources for such activities. The current established national system mainly addresses the provision of existing data to Roshydromet. The ERT recommends that the Russian Federation develop an inventory improvement plan as part of the QA/QC procedures, which allocates specific responsibilities, resources and timelines for the improvement activities identified and is updated annually. The ERT recommends the Russian Federation to include such information in its next NIR.

19. The ERT was informed of a major administrative reform taking place in the Russian Federation, which changes the structures and responsibilities of federal ministries and agencies and those of the regional organizations responsible for statistical data collection. The ICCC, which was previously responsible for the supervision of the inventory, was dissolved along with other acting inter-agency commissions. The administrative reform has not yet been fully implemented and this situation hinders the allocation of specific responsibilities for inventory preparation and improvement, as uncertainties with regard to responsibilities among different ministries and agencies remain.

20. The ERT found a dedicated inventory team with a high level of expertise at the IGCE, but the team is still very small, and many improvements have not been possible due to a lack of time and because the same persons are responsible for the estimation of several sectors, resulting in a huge workload. Additional resources should be devoted to the team that is compiling the inventory at the IGCE, and improved funding seems essential to the timely submission of inventories in the future. The ERT was also informed that in some instances existing data in the country could not have been acquired because of the costs involved. Roshydromet confirmed that the resources available cover the budget for the acquisition of data and that adequate funding will be provided in future.

21. The Russian Federation has adopted several laws on the establishment of the national system. The function of Roshydromet as single national entity is established under a Decree of the Government of the Russian Federation (No. 278-p of 1 March 2006). The decree also establishes a clear legal basis for the funding of the inventory work from the State budget. Roshydromet adopted an order specifying the institutional arrangements (Order No. 141 of 30 June 2006) and one on the specific roles and responsibilities within the national system, including the role of the IGCE in inventory preparation and management (Order No. 63 of 20 March 2006). The IGCE adopted internal guidelines on organizational and methodological preparation of the GHG inventory, quality management, and storage and archiving of data and information. The existing legislation does not provide public access to detailed energy balances, but only to some aggregated energy data that are not sufficiently transparent for the purposes of the inventory review. It is recommended that the Russian Federation address this issue and ensure access for ERTs to key energy data during reviews.

22. More than 80 per cent of the Russian Federation's emission estimates depend on the data from the national energy balance. The ERT was informed that the resources for the compilation of the federal energy balance on the basis of regional data are extremely scarce (one person who has to perform other tasks in parallel). The energy balance is not part of the mandatory information to be produced under Russian national statistics legislation. Due to this lack of resources, no documentation on methodological changes is available, no revisions of past data after methodological revisions can be

performed, not all the parts of the international questionnaires for the International Energy Agency (IEA) with energy statistics that are relevant for inventory preparation are completed and QA/QC activities are not conducted for the compilation of the energy balance (although QA/QC activities for the input data in the balance are performed). The ERT strongly recommends the Russian Federation to improve funding and resources for the compilation of the federal energy balance and inclusion of the balance in the list of indicators that has to be prepared annually on a mandatory and a clearly defined methodological basis. Additional information should be collected on fuel consumption by companies, industries, households, the services sector and the transport sector, and used to improve the statistical data on disaggregated energy consumption in the Russian Federation. This may require additional legislative arrangements, but the entities included in the national system should have the power to implement such changes.

23. The Russian Federation has a good basis for extending and improving its current national system for estimation of emissions from the LULUCF sector and activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol. However, the development of a reliable system for accurate and transparent reporting under the Kyoto Protocol is pending, in particular regarding development of a consistent land representation, reporting on all the mandatory land conversion categories and application of the IPCC approach 2 for land identification, which is a minimum requirement for reporting on land under the Kyoto Protocol (see paragraphs 151 and 152). The ERT encourages the Russian Federation to enhance and further develop its efforts under the national system to cover activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol.

24. In the Russian Federation there is an established process for the official consideration and approval of the inventory, including recalculations, prior to its submission and for responding to any issues raised by the inventory review. Roshydromet submits the national GHG inventory to the Government of the Russian Federation for approval by 1 March each year. The inventory is agreed with the relevant federal implementing entities (ministries and services). During and after the in-country review, responses to the ERT's questions and requests were provided within short timeframes.

2. Quality assurance/quality control

25. The Russian Federation has elaborated a QA/QC plan in accordance with the IPCC good practice guidance. The QA/QC plan is part of an internal IGCE order on the "Practice of Quality Assurance and Quality Control for the National GHG Inventory" of 7 March 2007, which among other issues includes a description of specific QA/QC procedures, the plan for the preparation of the national GHG inventory and the templates of the QC checklists. However, the QA/QC plan and procedures have not yet been implemented in a systematic way. Some individual QC procedures were used for the preparation of the 2006 inventory submission. A more complete implementation is envisaged for 2008. The ERT recommends the Russian Federation to fully implement the QA/QC plan and to document the implemented checks and activities in a transparent way in its next inventory submission.

26. The QA/QC plan includes general QC procedures (tier 1) as well as general source/sink category-specific procedures (tier 2). These have not yet been applied systematically for key categories and for those individual categories in which significant methodological and/or data revisions have occurred. Tier 2 QC procedures are more advanced in the agriculture and forest sectors but have not been specified in detail in the energy sector, where many revisions occurred prior to and during the in-country review which were not driven by the procedures of the QA/QC plan.

27. During the in-country review, Rosstat informed the ERT that for national statistics a unified system of classification and coding technical, economic and social information has been created in the Russian Federation. An integrated programme for the development and practical implementation of a system of standard indicators and registries has been in place since 2001. Since 2005, the development of statistical parameters has been implemented in accordance with a new All-Russian Registry of Economic Activities, which has been harmonized with the European statistical classification of economic

activities (NACE). From 2008, it is planned to introduce a new All-Russian Registry of Economic Activities, which has been harmonized with the classification of products by activity (CPA). QC checks on data are performed at its regional branches and Rosstat uses software checks to detect errors and problems in regional information. Rosstat has the right to make adjustments on the basis of information received indirectly and sends requests back to its regional branches if problems are detected. Rosstat is the most important data provider in the compilation of the inventory. For other data providers, no information was available on QA/QC procedures and the type of activities estimated in the data sources used was sometimes unclear. The ERT recommends the Russian Federation to include in its next NIR a description of the QA/QC activities conducted by Rosstat on the specific statistics used for the GHG inventory and to add information on the QA/QC activities of other data providers.

28. Currently, no systematic evaluation of necessary improvement activities exists. The ERT recommends that in future years essential improvements should be clearly identified by the IGCE and Roshydromet and that Roshydromet support the IGCE in the collection of data and parameters for these improvement activities. The ERT recommends the Russian Federation to include such information in its next NIRs.

3. Inventory management

29. The Russian Federation has recently implemented a centralized electronic archiving system at the IGCE, which includes the archiving of disaggregated emission factors (EFs), AD, and documentation on how such factors and data have been generated and aggregated for the preparation of the inventory. In addition, this information is stored in hard copies at the IGCE. A special software program (APK MIPG) was developed and implemented for the purpose of inventory preparation, which stores and checks AD, calculates emissions and removals, prepares CRF tables with the CRF reporter software and stores inventory submissions. The software is available to the inventory compilers and training has been provided, but data entry has not been completed yet. The software is currently not linked to the Excel files containing the emissions calculations. The ERT recommends the Russian Federation to fill the software with the relevant data and to link the AD and EFs with the files of emissions calculations. Otherwise, the archive provides a potential source of additional errors and mistakes.

30. The archived information does not yet include internal documentation on QA/QC procedures, external and internal reviews, documentation on annual key category analysis and key category identification and planned inventory improvements, but this is planned for the future. During the in-country review, the ERT was provided with the additional archived information it requested. The ERT recommends that the electronic documentation and archiving system be further developed and implemented as planned, and checked during the next in-country review of the GHG inventory.

31. The 2006 GHG inventory was submitted almost 9 months after the deadline of 15 April 2006 and the initial report was submitted 2 months after the deadline of 31 December 2006. In the past, the Russian Federation did not submit GHG inventories under the UNFCCC. The timelines for the provision of data to Roshydromet and the IGCE are fixed by Order No. 141 of 30 June 2006, Rosstat confirmed that AD are available in time for the annual inventory preparation and Roshydromet confirmed that the ambitious deadlines set in Order No. 141 will be met in the future. It will be essential for the establishment and full functioning of the Russian national inventory system that inventory submissions are provided in time in the future. This function of the national system cannot be checked under this review, but can be through future submissions.

B. Greenhouse gas inventory

32. In conjunction with its initial report, the Russian Federation has submitted a set of CRF tables for the years 1990 to 2004 and an NIR.

33. During the review, the Russian Federation provided the ERT with additional information sources and revised estimates in all sectors. These documents are not part of the initial report submission and presented new and additional information. The full list of materials used during the review is provided in the annex to this report.

34. After the in-country review, following the recommendations of the ERT, the Russian Federation submitted revised CRF tables for the years 1990 and 2004 on 14 January 2008. For the industrial processes and the waste sectors, a complete time series of revised CRF tables from 1990 to 2004 was submitted on 4 September 2007.

1. Key categories

35. The Russian Federation has not reported a key category analysis as part of its initial report. A tier 1 key category analysis (level and trend) was performed in 2007 for the years 1990, 2004 and 2005 and was provided to the ERT during the in-country review. The Russian Federation has included the LULUCF sector in this key category analysis. As the key category analysis was performed fairly recently, it has not yet been used in a systematic way for the prioritization of inventory improvements and QA/QC activities. The secretariat[3] performed a key category analysis for the 2006 submission and this is used in the following sections.

2. Cross-cutting topics

36. The inventory is mostly in line with the Revised 1996 IPCC Guidelines, the IPCC good practice guidance and the IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry* (hereinafter referred to as the good practice guidance for LULUCF). Areas where guidance from the IPCC still needs to be fully implemented are the estimation of emissions from fuel combustion, where a tier 1 approach and IPCC default EFs are generally used, emissions from aviation and navigation, in particular the split between international and domestic emissions, the larger use of country-specific methods and EFs for fugitive emissions, and methods and approaches in the LULUCF sector.

37. The inventory is generally compiled in accordance with Article 7, paragraph 1, and decision 15/CMP.1. Many revisions and improvements were implemented during the course of the review in response to the list of potential problems and further questions raised by the ERT. These are identified in the sectoral sections of this report. The ERT acknowledges that all these problems were resolved during the review where they related to base year emissions, but that further problems need to be resolved for the more recent years that have not been the focus of this review. The ERT recommends the Russian Federation to reflect these improvements and changes in its next inventory submission.

Completeness

38. The inventory submission is complete with regard to coverage of years, but the coverage of gases and categories is incomplete. Many categories are reported as not estimated ("NE") in the CRF tables and many categories are estimated at an aggregated level, in particular in the energy sector. An assessment of the completeness of the 2006 submission is difficult because of the incorrect use of notation keys. The use of notation keys should be improved, indicating clearly the type of gaps, such as a non-existing source ("NO", "NA"), the inclusion of a source in another category ("IE") or the omission of a source due to a lack of data ("NE") or an evaluation showing that the source is negligible ("NE").

[3] The secretariat identified, for each Party, those source 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 Land Use, Land-use Change and Forestry* (hereinafter referred to as the IPCC good practice guidance for LULUCF) for the base year or base year period as well as the latest inventory year. Key categories according to the tier 1 trend assessment were also identified. 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.

The completeness of the inventory was improved considerably by the provision of additional information and data during and after the in-country review. However, the revised CRF tables still do not contain emissions from solid fuel transformation, emissions from closed mines, CO_2 emissions from coal mining and handling, CO_2 emissions from asphalt roofing and road paving with asphalt, emissions and removals from grasslands and emissions from land conversions. An improved disaggregation of emission estimates should be provided in the CRF tables of the next inventory submission, including those missing categories that are likely to be relevant for the Russian Federation. Detailed recommendations are provided in the sectoral sections of this report.

39. The NIR is not complete because the sections on the key category assessment and the assessment of completeness (also with regard to geographical coverage) are missing. For the energy sector, no detailed documentation on methodologies and data is provided. The ERT recommends the Russian Federation to include all the elements and sections outlined in the structure specified in 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) in the NIR of its next submission.

Transparency

40. The NIR submitted in 2006 did not provide the information necessary to replicate the emissions and removals estimates. In particular, the description of the methodologies and data in the energy sector was not sufficiently detailed. Some parts of the emission estimations are not documented at all, and descriptions were not sufficiently detailed for many categories with regard to methods, AD, EFs and data sources. Large parts of the information needed to understand the inventory estimates were only provided orally during the in-country review. These explanations should be documented in the next NIRs. A considerable effort is required to improve the transparency of the information in the NIR, explaining the methods, data, data sources and assumptions, and the rationale for the choice of methods and EFs. It should be explained how the data were collected and compiled by the external data providers. Improved transparency in the NIR is essential for future reviews. Specific recommendations are provided in the sectoral sections of this report.

41. With regard to confidential information, the ERT was informed that there is a differentiation in Russian legislation between statistics that are not publicly available and only "for internal use of governmental institutions" (e.g. disaggregated energy balances) and "state secret" information (e.g. data on aluminium production). Access was completely denied to the ERT to the second category of data, but calculations and assumptions were explained in detail. The ERT recommends that the Russian Federation provide for confidential AD, indices relative to the base year instead of total amounts in its next NIRs. This avoids the disclosure of data, but enables a better evaluation of the information and the emission trends during the review. It also recommends that the Russian Federation clarify within the national system that the inventory review is a form of "internal use" where ERTs can at least be provided with access to the data under this classification. The status of confidentiality should be indicated clearly in the NIR as well as the legal basis for the confidentiality.

42. The disaggregated energy balance for 1990 and the remaining years, the basis for more than 80 per cent of the Russian emissions, was considered to be classified "for internal use only". However, during the in-country review the ERT was able to examine the energy balances and cross-check that the data were used correctly and that it was consistent with the data used in the emissions calculations. The Russian Federation is the only country where the disaggregated energy balance is classified as "for internal use only" for the entire time series. Some parts of the national balance were sent to the IEA and made available in international statistics. It is important that the ERT is provided with national information to enable it to check consistency between national energy data and international sources. The national system should address this issue urgently and disaggregated energy balances should be made available to ERTs in the future.

Consistency

43. The inventory is broadly consistent and the same methods and data sources have generally been used across the entire time series. During the in-country review, the ERT was informed that there were some inconsistencies in the energy balances across the time series due to changes in data compilation methods and sectoral structures. These inconsistencies could not been assessed during the in-country review and it is unclear whether they create minor or major problems because the detailed energy balances were not available for all years and because of the time constraints created by the large number of revisions of data during the review. The ERT recommends that future reviews continue thoroughly to assess time-series consistency, in particular in the energy sector, because this task could only be performed partially during this review.

Comparability

44. The inventory is generally comparable, as defined in the UNFCCC reporting guidelines, including agreed reporting formats. The allocations of the source/sink categories in general follow the split in the Revised 1996 IPCC Guidelines and the IPCC good practice guidance, with some exceptions in particular the allocation of fuel consumption to individual consumption sectors and the allocation of CH_4 and N_2O emissions from all sub-categories of the category manufacturing industries and construction. The Russian Federation should improve the use of notation keys as indicated in the sectoral sections, and more disaggregated data should be provided in energy industries (1.A.1) and for non-CO_2 emissions from manufacturing industries and construction (1.A.2).

Accuracy

45. During the in-country review, the ERT identified a number of categories where the methods, AD or EFs used were not fully in accordance with the IPCC good practice guidance and might lead to an overestimation of emissions in the base year or an underestimation of emissions in the most recent year (e.g. CO_2, CH_4 and N_2O for a number of stationary combustion sources; CO_2, CH_4 and N_2O from civil aviation and navigation; CH_4 from coal mining and handling, and oil and natural gas; CO_2 from cement production; CO_2 from lime production; CO_2 from limestone and dolomite use; N_2O from nitric acid production; CO_2 from iron and steel production; PFCs (CF_4 and C_2F_6) from aluminium production; N_2O from direct soil emissions; CH_4 from solid waste disposal on land; and CH_4 from wastewater handling). The ERT recommended the Russian Federation to revise its estimates for these categories. After the in-country review, following the recommendations of the ERT, the Russian Federation provided such revised estimates for 1990 and 2004, including revised estimates for PFCs for 1995 and a complete time series from 1990 to 2004 for the industrial processes and the waste sectors. Further details are provided in the sectoral sections below.

46. The Russian Federation estimated uncertainties for the agriculture and LULUCF sectors but not for the remaining sectors. Therefore, no general estimate of the accuracy of the overall inventory is available. As many revisions and recalculations are ongoing and a continuous process of improvement is under way, there seems to be considerable potential for further reductions in uncertainties and increases in the accuracy of the inventory mainly by the use of higher tier methods. The ERT recommends the Russian Federation to complete the uncertainty analysis for all sectors in its next submission and the use of the results of the uncertainty assessment together with the results of the key category analysis to identify those categories where methodological improvements have to be implemented as soon as possible to comply with the guidance provided in the decision trees in the IPCC good practice guidance.

Recalculations

47. The Russian Federation did not submit GHG inventories under the UNFCCC in the years prior to 2006 so no recalculations are reported in the 2006 submission. Many recalculations were made in 2007, leading the ERT to believe that the national system can ensure that recalculations of previously submitted

estimates of GHG emissions by sources and removals by sinks are prepared in accordance with the IPCC good practice guidance.

48. Revised emission estimates for the 2006 submission were submitted and discussed during the in-country review and additional revisions were made available to the ERT. These resulted in major changes in the energy sector and smaller revisions in the other sectors. The revisions led to many improvements in the inventory estimates for all sectors. In the next inventory submission it is important that the Russian Federation transparently document and describe all changes and improvements in the NIR and in the CRF tables, including explanations of the revised methodologies and the rationales for their use.

Uncertainties

49. The Russian Federation has not provided an uncertainty analysis for each category and for the inventory in total, as specified in the IPCC good practice guidance. Uncertainly analyses were only performed for the agriculture (tier 1 and tier 2) and LULUCF sectors (tier 1). During the in-country review, Rosstat presented detailed information on the statistical uncertainties of AD. The ERT recommends that uncertainty estimates for AD within the inventory be elaborated in cooperation with Rosstat. The ERT recommends that the Russian Federation provide in its next NIR a complete uncertainty analysis for all inventory sectors based on the revised estimates discussed during the in-country review.

3. Areas for further improvement identified by the Party

50. The NIR identified the following areas for further improvement:

(a) Collection of additional data to fill gaps in the estimated categories and gases;

(b) Further development of country-specific EFs;

(c) The application of higher tier methods for key categories;

(d) Further implementation of the IPCC good practice guidance for LULUCF;

(e) Inclusion of dead organic matter and soil pools in the LULUCF estimates;

(f) Estimation of emissions/removals from the category grazing land management.

51. During and after the in-country review, the ERT received evidence that the IGCE has recently improved the inventory in many areas, in particular through:

(a) Revision of many emission estimates, in particular in the energy sector but also in the industrial processes and waste sectors, based on additional and improved data received;

(b) Development of key category assessment;

(c) Adoption of higher quality (higher tier) methods for some key categories, development of own models for sophisticated parts of the inventory estimation such as in the agriculture sector;

(d) More use of country-specific information;

(e) Implementation of the activities of the QA/QC plan;

(f) Implementation of a database for storing and archiving data incorporated into the inventory and inventory estimations;

(g) Implementation of detailed LULUCF recommendations from the third national communication review.

52. These elements are not yet included in any official inventory documents submitted to the UNFCCC and the ERT recommends that the Russian Federation address all these elements in its next inventory submission.

4. Areas for further improvement identified by the ERT

53. The Russian Federation has only established the necessary formal procedures for the national system very recently, and it is not yet clear whether the formal procedures will work effectively, that all necessary data and information will be provided to the inventory agency and that all formal procedures will be implemented on a regular basis. The ERT considers that the quality of the national system has to be measured on the basis of its output, which is the quality and timeliness of the annual inventory submission. This implies:

(a) Timely annual submission of the NIR and the CRF;

(b) Complete CRF tables with correct use of notation keys where all relevant source/sink categories are estimated at an appropriate level of disaggregation;

(c) A transparent NIR describing and reporting all calculation methodologies, the AD used, EFs and other parameters for all sectors of the inventory, in particular for the energy sector;

(d) Full implementation of the IPCC good practice guidance and the use of higher tier methods for key categories, in particular in the energy and industrial processes sectors;

(e) Speed-up the preparation of the system of additional statistical indicators/parameters that are needed for inventory preparation.

54. The follow-up process to the issues identified during the review and how the recommendations of this review are implemented in the future will show whether the system is working efficiently (e.g. whether relevant data for the estimation of emissions from international bunker fuels will be provided by the corresponding agency). The ERT recommends that another in-country review of the GHG inventory is scheduled for the Russian Federation in 2009 with the aim of reviewing the progress made with the implementation of the national system and with the planned improvements reported during this review, in accordance with the guidelines for review under Article 8 of the Kyoto Protocol, part IV, review of national system, paragraph 99 (decision 22/CMP.1).

55. The ERT identifies the following cross-cutting issues for improvement. The ERT recommends that the Russian Federation:

(a) Improve the resources and QA/QC procedures for the national energy balance and ensure access to the national balance for ERTs;

(b) Improve the data on fuel consumption in the different categories;

(c) Include private and semi-private entities in the national system where plant-specific data increases the accuracy of the inventory estimates;

(d) Provide quantified uncertainty estimates for all sectors;

(e) Provide a key category assessment and prioritize resources for further inventory improvements based on this assessment;

(f) Fully implement the QA/QC procedures and the QA/QC plan for the inventory preparation;

(g) Complete the archiving system and link it with the emission estimations.

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

5. Energy

Sector overview

57. The energy sector contributed 81.5 per cent of the GHG emissions of the Russian Federation in the base year (1990 for CO_2, CH_4, N_2O and 1995 for HFCs, PFCs and SF_6). CO_2 was the major contributor with 84.5 per cent of the sector's emissions, while CH_4 contributed 15.3 per cent and N_2O contributed 0.2 per cent. Emissions from the energy sector decreased by 36.2 per cent between the base year and 2004, from 2,707,695.94 Gg CO_2 eq. to 1,728,466.20 Gg CO_2 eq., mainly due to the steep economic decline in the 1990s. In the base year, emissions from fuel combustion were responsible for 84.3 per cent of energy sector emissions and the remaining 15.7 per cent were fugitive emissions. Energy industries were the largest contributor to emissions from fuel combustion, with 51.5 per cent, followed by transport, 15.8 per cent, other sectors and other, 11.6 per cent each, and manufacturing industries and construction, 9.5 per cent.

58. The 2006 inventory submission was part of the initial report and contained many gaps in the energy sector. The sectoral approach was missing entirely. Only aggregate emissions for fuel combustion (1.A) were reported and there was no sectoral breakdown into major categories and subcategories. For fugitive emissions, CO_2 emissions were not estimated apart from flaring, and emissions from venting and emissions from solid fuel transformation were not estimated. No emissions from international bunker fuels were estimated.

59. The energy sector is covered very briefly and is incomplete in the 2006 NIR. No descriptions of AD, EFs, methodologies, completeness, transparency, consistency of the time series, uncertainties, QA/QC, recalculations and planned improvements are included. During the in-country review, additional oral and written explanations were provided to the ERT in the areas requested, adding transparency in key areas. However, the lack of an appropriate NIR considerably hampered the review. Considerable efforts have to be made by the Russian Federation to provide a transparent NIR as part of its next inventory submission. This should follow the guidance and structure outlined in the UNFCCC reporting guidelines. It should, in particular, include individual trend explanations for all key categories, a description of the methods and their choice, presentation of AD, EFs and other estimation parameters, as well as their sources and the choice of these sources. The energy section of the NIR should include a description and explanations of the differences between the reference approach and the sectoral approach, and a description of the estimation of feedstocks and non-energy use of fuels, uncertainties and time-series consistency, source-specific QA/QC activities, recalculations, planned improvements and responses to the review process.

60. As is mentioned above, detailed Russian energy balances are classified as "for internal use only" and considered confidential. After some discussions, the ERT was able to look at the balance for 1990 during the in-country review in the presence of Russian inventory experts. However, the ERT was not provided with a copy of this balance or with the detailed energy balances for any other year. Only highly aggregated energy information from the energy balance is publicly available. This situation considerably hampered the work of the ERT in a sector that covers more than 80 per cent of the Russian Federation's emissions. No other Annex I Party considers its disaggregated energy balance to be confidential. During the in-country review, the consistency of the 1990 energy balance with AD presented in the preliminary estimations of sectoral and reference approaches was checked, but this task could not be performed for

any other year in the inventory time series. Therefore, the time-series consistency of the inventory data could not be fully assessed. It is important that the Russian Federation provides future ERTs with access to the underlying energy data to enable a complete assessment of time-series consistency and of the accuracy of the inventory data.

61. During the in-country review, the Russian Federation announced that the estimates for the entire energy sector had been completely revised because the IGCE had only been provided with access to the 1990 energy balance shortly before the review visit. The ERT requested the Russian Federation to complete this work and provide these estimates together with substantive supporting information. After the in-country review, the Russian Federation provided a completely revised estimate for the energy sector, including the sectoral approach formally submitted for the first time, and a revised reference approach for 1990 and 2004 in accordance with the recommendations of the ERT. The revised estimation also filled major gaps in the 2006 estimates and corrected problems identified during the in-country review. Additional explanations of the methods and data used and of the underlying sources were also provided. Revised estimates covered the following categories for the years 1990 and 2004, which were not estimated in the 2006 submission as part of the initial report: CO_2 emissions from energy industries (1.A.1); manufacturing industries and construction (1.A.2), including all subcategories; transport (1.A.3), including all subcategories; other sectors (1.A.4), including all subcategories; and other – stationary (1.A.5.a).

62. The revised CRF tables provided after the in-country review did not contain a separate estimate for petroleum refining (1.A.1.b) or for manufacture of solid fuels and other energy industries (1.A.1.c). Emissions from lubricants were not estimated using the reference approach. CH_4 and N_2O emission estimates were frequently included in other categories. The revised estimates also included recalculations for fugitive emissions, but no emissions from solid fuel transformation (1.B.1.b) were estimated, and generally there were no estimates of CO_2 emissions from solid fuels. The ERT strongly recommends that the Russian Federation provide separate estimates for petroleum refining and manufacturing of solid fuels and other energy industries in its next submission. The NIR and CRF tables should clearly explain all the remaining gaps and cases where emissions are reported as included elsewhere ("IE"). In the course of the review, some of these revised estimates were further corrected at the request of the ERT and a second revised set of CRF tables for 1990 and 2004 was provided, including the additional corrections. After the in-country review, following the recommendations of the ERT, the Russian Federation revised upwards the GHG emissions for the base year from fuel combustion by 0.02 per cent (from 2,282,206.19 Gg CO_2 eq. to 2,282,574.19 Gg CO_2 eq.) and the fugitive emissions by 31.1 per cent (from 324,264.74 Gg CO_2 eq. to 425,121.74 Gg CO_2 eq.), mainly due to the addition of previously missing subcategories. Estimates for international bunker fuels in the aviation and marine categories were also provided for the years 1990 and 2004.

63. Due to the lateness of the provision of this additional and improved information and the lack of a complete time series, time series checks, and cross-comparisons of implied emission factors (IEFs) or other specific parameters with other Parties could not be performed. This is an important outstanding task for the review of the next inventory submission.

64. The estimates for the energy sector were recalculated very shortly before the review visit so no time was available for QA/QC procedures. During the review, the ERT discovered a number of mistakes in the calculations which demonstrated gaps in QC procedures. The ERT strongly recommends that the QA/QC activities outlined in the QA/QC plan are fully implemented for the energy sector as soon as possible.

65. No uncertainty assessment was provided for the energy sector. The Russian Federation should prepare a complete uncertainty assessment for its next inventory submission as recommended in the general section.

66. No key category analysis was available for the energy sector. The key category analysis carried out by the UNFCCC secretariat, which was performed on a largely different set of data than the revised CRF tables provided to the ERT, identified the following key categories for the base year: CO_2 from stationary combustion – gaseous, liquid and solid fuels, CH_4 from oil and natural gas, and CH_4 from coal mining and handling. The Russian Federation is strongly urged to provide a complete key category analysis as part of its next inventory submission and to use the key category analysis to further improve its estimation.

67. The Russian energy balance is compiled at the federal level by Rosstat. It is available within 11 months for the previous year. The energy balances since 1990 are available, but 1991 is not covered by the statistical procedures of data collection and processing and the data for 1991 is interpolated. The 1990 energy balance was developed by Rosstat for the Soviet Union and covered all the Soviet republics, including the Russian Federation. A short version of the energy balance is published annually in the Russian Statistical Yearbook and also presented to the IEA. Some methodological revisions have occurred in the past, but the time series was not revised to make it consistent. Therefore, the Russian energy balance includes some time-series inconsistencies, although the quantitative extent of these is unknown.

68. During the review it was explained that there is a high uncertainty in the energy balance in the allocation of fuel consumption to individual sectors such as transport, industry, households, services or agriculture for those fuels that are consumed in many sectors. Whereas energy production and total consumption are monitored accurately, the Russian statistical system has no accurate statistics on sectoral consumption levels and total consumption is broadly split between the different sectors based on general assumptions that were not explained in detail to the ERT.

69. The Russian energy balances provide data in tonnes of coal equivalent, a unit not widely used in other countries. Conversion factors from coal equivalents were provided to the ERT during the review. The Russian Federation should report these conversion factors in its next NIRs.

Reference and sectoral approaches

Reference approach

70. In the 2006 submission made as part of the initial report, the reference approach was estimated but CRF table 1.A.b had no information on AD for production, imports, exports, international bunkers and stock change, and AD was provided directly as apparent consumption. Emissions were calculated using the IPCC default EF and the fraction of carbon oxidized. Carbon stored was reported in CRF table 1.A.d and obtained directly from the energy balance, which contains separate information on feedstocks and non-energy uses for fuels. The total of emissions initially estimated for the energy sector in the base year was 2,282,206.19 Gg CO_2. During the in-country review, revised CRF tables were provided in which total emissions under the reference approach for the base year were revised upwards to 2,517,546.11 Gg CO_2, which is 10.3 per cent higher than the original data in the 2006 submission. The difference is because of changes in apparent consumption data for most fuels, in particular crude oil, jet kerosene, residual fuel oil, petroleum coke, coals, lignite, coke oven / gas coke as well as the inclusion of coke used for iron and steel production as other solid fuel. EFs were not changed and remain the IPCC default EFs. The revised CRF tables include AD for production, imports, exports and stock change and some information on international bunker fuels. During the in-country review, the ERT was able to confirm the revised AD for the base year using the disaggregated energy balance.

Sectoral approach

71. In the original 2006 submission the sectoral approach was not reported. The CRF table (1.A(a)) contained no information on AD and IEFs. Only total CO_2 emissions for combustion were reported, taken from the reference approach, and included in category other – stationary (1.A.5.a).

72. During the in-country review, a revised set of CRF tables was provided to the ERT, which included estimates made using the sectoral approach reported in tables 1.A(a). The ERT requested the Russian Federation to provide these revised estimates in line with the discussions with the ERT during the in-country review, including transparent documentation of the method chosen, the assumptions, the AD and the EFs used in the revised calculations and the data sources. After the in-country review, within the six weeks period, the Russian Federation provided a complete revised estimation for the energy sector using the sectoral approach, in accordance with the recommendations of the ERT and correcting the problems identified during the in-country review. Some of these revised estimates were further corrected later at the request of the ERT and second sets of revised CRF tables for 1990 and 2004 were provided that included the additional corrections. These tables contain AD, IEFs and CO_2, CH_4 and N_2O emission estimates for most categories. Estimations for petroleum refining (1.A.1.b) and manufacture of solid fuels and other energy industries (1.A.1.c) were still included under public electricity and heat production (1.A.1.a) and not reported separately. AD are mainly taken from the national energy balance of the former Soviet Union for the Russian Federation. EFs (except for the energy industries category (1.A.1), where country-specific EFs are used), carbon content values, the fraction of carbon oxidized and the other parameters used are from the Revised 1996 IPCC Guidelines. IPCC tier 1 methods are applied to all emissions estimations. The ERT strongly recommends the Russian Federation to at least estimate emissions from key categories using higher tiers and country-specific EFs.

73. The AD reported in CRF table 1.A(a) presented during the in-country review was extracted from the energy balance, which contains highly disaggregated data. The sectoral structure of the energy balance is slightly different from the common international structure and this difference affects primarily transport emissions estimates. Transport in the Russian Federation's energy balance is taken into account as an economic sector and includes more than just data on fuel consumption for transportation. Similarly, consumption for transportation is also included in other sectors (e.g. gasoline consumption for private transportation is included in the residential sector). The reallocation of these emissions was treated properly by the Russian Federation.

74. CH_4 and N_2O emissions from all the subcategories of manufacturing industries and construction (1.A.2) were calculated for this category as a whole and reported under iron and steel (1.A.2.a). This allocation introduces a distortion to the iron and steel IEFs and hampers an assessment of emissions estimates for all the subcategories. In accordance with the IPCC good practice guidance, emissions related to energy use of blast furnace gas were considered under category 2.C.1 in the industrial processes sector. The ERT strongly recommends the Russian Federation to estimate and report separately CH_4 and N_2O emissions from all the subcategories of manufacturing industries and construction.

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

75. In the original 2006 submission there is no reported difference between the reference and sectoral approaches because estimates using the sectoral approach were not made and the reference approach estimates were used to report the sectoral approach. In the revised CRF tables, the differences in CO_2 emissions between the two approaches are 11.16 per cent for the base year and 5.30 per cent for 2004. These differences are significant and need to be further explained in the NIR of the next inventory submission of the Russian Federation.

International bunker fuels

76. Russian Federation national statistics report total jet kerosene consumption but not the split of consumption between domestic and international air traffic. After the in-country review, following the request of the ERT, the Russian Federation provided estimations for international bunker fuels. The method used to estimate the split between domestic and international aviation is not based on aggregate or individual aircraft movements as recommended by the IPCC good practice guidance. The transport

ministry of the Russian Federation only provided fuel consumption data for international (return) flights operated by Russian carriers for the period 1996 to 2004. It is unclear how this data was collected. Total fuel consumption for all international flights is derived using a number of additional general assumptions, for example, that fuel consumption by international air carriers constitutes 50 per cent of fuel consumption of Russian carriers in the period 1990 to 2004. In addition, the resulting fuel consumption by international carriers was divided by three and that by Russian carriers by 1.5. These assumptions are not justified by additional supporting information and they do not seem to be realistic. For example, reports from main international airports show that the number of international carriers operating in the Russian Federation has been constantly increasing as has increased the number of flights operated by international carriers. Many international carriers have launched or expanded long-distance flight operations in the Russian Federation which potentially consume more fuel per flight than the average international distance flown by Russian carriers. The constant relationship of 50 per cent for fuel consumption by international carriers in relation to Russian airlines outlined above does not capture the dynamic development of international air traffic in the Russian Federation.

77. Fuel consumption by international flights operated by Russian carriers in the period 1990 to 1995 was extrapolated using the ratio of average fuel consumption during 1996 to 1999 to average passenger-km for international flights during 1996 to 1999 and on the basis of international passenger-km data for 1990 taken from national statistics. According to the explanations provided by the Russian Federation, the period 1996 to 1999 was selected because of the relative stability in the aircraft fleet. However, during this period Aeroflot (the main national carrier) added a substantial number of new Airbus and Boeing planes to its fleet, which should have resulted in an increase in fuel efficiency in this period. In addition, this method ignores international freight transport completely. According to ICAO data, international freight volumes are about 80 per cent of international passenger volumes (for Russian carriers). It was not explained how the passenger-km for the Russian Federation in 1990 was derived. Statistics for 1990 refer to the territory of the Soviet Union. After the in-country review, the Russian Federation confirmed that the 1990 data refers to the territory of the Russian Federation, but did not explain how the data were manipulated in order to achieve the correct geographic coverage.

78. Thus, the ERT considers that the method used to calculate the split between domestic and international fuel consumption is not in line with the IPCC good practice guidance. According to the IPCC good practice guidance, aircraft movement data may be obtained from passenger kilometres and cargo tonnage data, but these sources are not considered very reliable and inventory agencies are requested to ensure completeness. The Russian Federation only used passenger-kms and neglected cargo data and the data are incomplete as they only cover Russian carriers and not international carriers. The assumptions used to complete the estimate are not based on the IPCC good practice guidance and have not been justified sufficiently. However, these significant problems in the estimates of emissions from international aviation bunkers do not represent an overestimation of the base year emissions. The Russian Federation is strongly recommended to revise its method for splitting jet fuel consumption between international and domestic air traffic and to base it on LTO data per aircraft type and distance travelled as recommended by the IPCC good practice guidance. Such data are available from air traffic control authorities and are collected in the Russian Federation as in other countries. The national system should ensure access to such data for the inventory agency.

Feedstocks and non-energy use of fuels

79. For the base year, the energy balance provides detailed estimates of non-energy fuel use for all individual fuels. The Russian Federation estimates and reports in the CRF only part of its fuel use for non-energy purposes. The reason is that the IPCC default fractions of carbon stored are not available for all fuels for which non-energy use is reported in the energy balances. The ERT encourages the Russian Federation to estimate the fractions of carbon stored for these fuels and to complete the reporting of non-energy fuel use. The ERT recommends the Russian Federation to provide a more transparent description

of the non-energy use of fuel in its next NIR explaining how the AD are collected and reported throughout the entire time series.

Key categories

Stationary combustion: liquid, solid and gaseous fuels – CO_2

Energy industries (1.A.1)

80. CO_2 emissions from petroleum refining (1.A.1.b) are reported together with public electricity and heat production (1.A.1.a). This is an important category and should be reported separately. CH_4 and N_2O emissions from petroleum refining are not estimated. The ERT recommends the Russian Federation to report these emissions separately in its next inventory submission.

81. CO_2 emissions from manufacture of solid fuels and other energy industries (1.A.1.c) are reported together with public electricity and heat production (1.A.1.a). This category should be reported separately. CH_4 and N_2O emissions from the manufacture of solid fuels and other energy industries are not estimated. The ERT recommends the Russian Federation to report these emissions separately in its next inventory submission.

Other sectors – commercial/institutional (1.A.4.a)

82. In the revised CRF tables submitted on 4 September 2007, some significant differences were identified by the ERT compared with the preliminary estimates provided to the ERT during in-country review. The Russian Federation submitted final revised CRF tables on 14 January 2008 where some inputting mistakes were identified and corrected, and also explained some reallocations of fuels that it had made. The differences identified were due to the use of the complete data from the energy balance (incorporation of small fuel amounts not accounted before); partial re-allocation of residual fuel oil to the transport category; and entering fuel wood under wood/wood waste type of fuel.

83. The ERT recommends the Russian Federation to provide detailed explanations in its next NIR of the allocation of fuel consumption to the commercial/institutional, agriculture/forestry/fisheries and transport categories in order to improve the clarity of the estimation and reporting of these categories.

Other sectors – agriculture/forestry/fisheries (1.A.4.c)

84. In the final revised CRF tables, energy consumption and CO_2 emissions from this category increased by 12 per cent compared with the preliminary estimates provided to the ERT during the in-country review. The explanation provided by the Russian Federation was that the consumption from agricultural mobile sources was not included in the preliminary estimates and a misprint occurred under coal consumption. During the follow-up process to the ERT's questions, a number of mistakes and inputting errors were identified in the calculations. The ERT strongly recommends the Russian Federation to improve and implement QC procedures in the energy sector and to include such consistency checks as undertaken by the ERT as part of the national QA/QC procedures in the future.

Coal mining and handling – CH_4

85. CH_4 emissions from the coal mining and handling category contributed 2.0 per cent of the total national emissions and 2.5 per cent of the sectoral emissions in the base year. These emissions decreased by 36.4 per cent in the period 1990–2004, mainly because of a decrease of 44.5 per cent in CH_4 emissions from underground mines – mining activities, which is the main subcategory. The NIR reports the use of IPCC tier 1 and tier 2 methods for the estimates combined with IPCC default EFs for surface mines and post-mining activities. A country-specific EF was used for CH_4 estimates for underground mines. Data on coal production from underground and surface mines are provided by Rosstat.

86. The NIR lacks transparency as the information provided is very limited and does not cover AD, country-specific EFs and the parameters used in calculations, or information on QA/QC activities, uncertainties, time-series consistency and planned improvements or any detailed category-specific information. The NIR provides a short description and interpretation of emission trends, indicating that the period 1990–2004 was characterized by an overall emission decrease during the whole of the 1990s followed by an increase since 2000. Coal mining, along with reductions in produced amounts of coal was also affected by structural changes in production during these years, with an increase in the share of surface mining. The ERT noted fluctuations in the CH_4 emissions trend since 1998 in the order of +/–7.5 per cent, which the Russian Federation explained were due to economic reasons and to the growing share of less CH_4-emitting open mining in coal production. The ERT recommends the Russian Federation to include in its next NIR more detailed category-specific information on the AD, EFs and parameters used in the calculations, as well as on cross-cutting information related to the category, including trends, following closely the outline provided in the UNFCCC reporting guidelines.

87. During the in-country review, the Russian Federation informed the ERT that it had revised its emissions estimation of the 2006 GHG submission for coal mining and handling to incorporate revised AD and, where available, country-specific EFs for individual coal basins. The ERT requested the Russian Federation to provide these revised estimates in line with the preliminary estimates already provided to the ERT during the in-country review, including an overview of the share of emissions calculated based on basin-specific data, information on the coal basin-specific EFs and parameters used for the calculations and transparent documentation on the chosen method, assumptions and activities included in the revised calculations and on the data sources.

88. After the in-country review, following the recommendations of the ERT, the Russian Federation provided revised estimates of CH_4 emissions, including recovery, for the base year and 2004. The overall impact of the revisions in this category was an increase in the CH_4 emissions by 66.3 per cent in the base year from 1,924.66 Gg to 3,201.66 Gg and a minor reduction in the CH_4 recovered of 1.0 per cent (from 25.46 Gg to 25.21 Gg). The impact for 2004 was an increase in the CH_4 emissions by 60.3 per cent from 1,269.91 Gg to 2,035.81 Gg and a reduction in the CH_4 recovered of 15.1 per cent from 52.46 Gg to 44.55 Gg.

89. For the revised estimates, the Russian Federation used a tier 2 method in accordance with the IPCC good practice guidance. The coal production data have been obtained from a published state statistical report (Russian Statistical Yearbook, 2006) and grouped in territorial-geographic regions based on the major coal basins, type of mining activities and types of coal in the country. The country-specific EFs have been developed for each region on the basis of the coal-bed methane content (gas-bearing capacity) and methane abundance in underground mines. The coal-bed methane content data for the major coal basins were taken from published literature. CH_4 abundance data were obtained from measuring equipment installed in operational underground mines.[4]

90. Methane recovery is performed at the mines in the Pechora coal basin and data were derived based on coal-bed methane content (or gas-bearing capacity) and methane abundance in the underground mines. Actual measurement data for recovered CH_4 were available for the years 1990–2000 and 2005 and the years 2001 to 2004 were interpolated. For post-mining activities EFs, the fraction of CH_4 released was accounted for in addition to the actual coal bed CH_4 content and the existence of preliminary drainage in relevant territorial-geographic regions. The CH_4 fraction released from post-mining activities was taken as 10 per cent for the Pechora basin and the relevant territorial-geographic region. For other basins, it was assumed that 30 per cent of methane is released during post-mining activities.[5]

[4] The Gas-Bearing Capacity of the USSR Coal Basins and Deposits, 1979; Malyshev & Ayruni, 1999.
[5] The Gas-Bearing Capacity of the USSR Coal Basins and Deposits, 1979; Malyshev & Ayruni, 1999; IPCC, 2000.

91. The country-specific EFs for underground mining used in the northern (38.9 m^3 t^{-1}) and southern regions (26.4 m^3 t^{-1}) are higher than the IPCC default range for underground mining for the Soviet Union (USSR) (17.8 – 22.2 m^3 t^{-1}) while the country-specific EFs for western Siberia (main producer), the central and the Ural regions and the average Russian EFs across all regions are within the IPCC default range. The Russian Federation explained that the data for the northern and southern regions are obtained from direct measurements in coal mines and that coal from these regions has higher than average CH_4 contents. The Russian Federation also announced plans to further improve the estimation of CH_4 emissions from coal mining by implementing a tier 3 approach.

92. The country-specific EFs for surface mining in the northern region, western and eastern Siberia, the far east region as well as Primorye and Sakhalin (6.0, 6.9, 5.0, 8.4 and 3.4 m^3 t^{-1}, respectively) are about three times higher than the IPCC default range of 0.3 – 2.0 m^3 t^{-1} (global average). Western Siberia is the main producer. The resulting IEF for CH_4 (4.29 kg/t) for the Russian Federation is much higher than the IEFs of all other reporting Annex I Parties. The Russian Federation explained that the higher country-specific EFs are based on measurements that take into account gas bearing strata adjacent to the coal strata from which CH_4 is released when the mine is opened. It was also explained that the major Russian surface mines are in the same region (western Siberia) as the underground mines and that the same coal seams are operated as underground mines in some regions, but are close to the surface in other regions and operated as surface mines. CH_4 EFs are based on direct measurements by Russian coal experts from Russian Academy of Science, published in national literature.[1]

93. CH_4 emissions from post-mining activities for surface mining were not estimated because the IPCC good practice guidance assumes that the post-mining emissions associated with surface mining operations are already accounted for under open mining emissions.

94. Methane recovery measurement data for 1990–2000 and 2005 are available from published national sources and for the years 2001–2004 methane recovery was interpolated on the basis of these data. The general process of CH_4 formation and CH_4 emission control in the estimation is based on Malyshev and Ayruni (1999).

95. The ERT encourages the Russian Federation to make further efforts to improve its estimates using a tier 3 method for underground mining operations in its subsequent submissions, as announced during the review. In order to increase transparency, it also recommends the Russian Federation to provide more detailed information on AD, characteristics of coal basins and their geographic distribution, the types of mining and coals, country-specific EFs (in particular for surface mining) and the parameters used for calculations as well as transparent documentation of the method, assumptions and data sources in its next NIR. The ERT also encourages the Russian Federation to include estimations of emissions from closed underground mines in its future submissions by for example using methods contained in recently published recognized international literature, or in GHG inventory reports of other Parties such as the United Kingdom.

Oil and natural gas – CH_4 and CO_2

96. GHG emissions from the oil and natural gas category contributed 10.8 per cent to the total national emissions and 13.2 per cent to the sectoral emissions in the base year. These decreased by 5.6 per cent in the period 1990–2004, mainly because of a 7.7 per cent decrease in CH_4 emissions from natural gas (the main source of emissions in this category). As is reported in the NIR, estimates of CH_4 emissions from oil- and natural gas-related activities are based on the IPCC tier 1 methodology. IPCC default EFs and country-specific EFs were used for the calculations. Data on oil- and natural gas-related activities were provided by Rosstat.

97. As is mentioned above for other categories, the NIR lacks transparency because the information provided is very limited and does not contain any detailed category-specific information. The NIR provides a short interpretation of emission trends, indicating that the period 1990–2004 was

characterized by downward trends that lasted for the whole of the 1990s and subsequent growth. During the in-country review, the Russian Federation explained that these changes in emissions reflect changes in production activities in the sector which decreased as a result of the economic recession in the country and later increased in the years of economic recovery. The ERT noted fluctuations in the trend and abrupt inter-annual changes in CH_4 and CO_2 emissions from flaring – combined at the beginning and the end of the time series (reaching –21.2 per cent in 1992–1993 and +49.8 per cent in 2001–2002). The Russian Federation explained that these changes reflect the actual changes in the amount of associated gas flared within a specific year and that oil production, which decreased during the economic recession in the 1990s and increased in the years 2001–2002, is the main driver of the amount of associated gas flared in the country.

98. During the in-country review, the ERT identified a number of subcategories under the oil and natural gas category for which emissions were not estimated in the 2006 inventory submission for the entire time series (e.g. CO_2 emissions from all categories, with the exception of flaring – combined; CH_4 emissions for oil – exploration, oil – distribution of oil products, oil – other, natural gas – exploration, venting – oil, venting – combined, flaring – oil (including N_2O) and flaring – gas (including N_2O)). In addition, CH_4 emissions for venting – gas are reported as "IE" in the CRF tables and included under the natural gas category. The ERT also noted that, because this is a key category, estimation based entirely on IPCC default EFs is not in accordance with the IPCC good practice guidance for key categories.

99. During the in-country review, the ERT requested the Russian Federation to provide revised estimates for emissions from oil and natural gas operations, representing all relevant emission sources as discussed during the in-country review. The ERT also requested the Russian Federation to ensure and demonstrate that the inclusion of additional sources did not lead to double-counting of emissions and that activities that do not emit fugitive emissions are excluded; and to provide transparent documentation of the chosen method and any assumptions made in the calculations, explaining in detail the activities included in the revised estimates, data sources, EFs and other parameters used.

100. After the in-country review, following the recommendations of the ERT, the Russian Federation provided revised estimates for CH_4 and CO_2 emissions, including previously missing sources and N_2O emissions from flaring, for the base year and 2004. The impact of the revisions in this category was an increase in CO_2 emissions of 18.9 per cent in the base year from 19,063.28 Gg to 22,675.04 Gg, an increase in CH_4 emissions of 26.6 per cent from 12,608.17 Gg to 15,958.65 Gg and an increase in N_2O emissions of 560.3 per cent from 0.04 Gg to 0.26 Gg. The overall impact of the revisions in this category was an increase in GHG emissions of 26.1 per cent in the base year from 283,846.95 Gg CO_2 eq. to 357,886.95 Gg CO_2 eq.. The impact for 2004 was an increase in CO_2 emissions of 21.3 per cent from 24,020.15 Gg to 29,145.25 Gg, an increase in CH_4 emissions of 45.2 per cent from 10,124.46 Gg to 14,701.19 Gg and an increase in N_2O emissions of 575.2 per cent from 0.05 Gg to 0.33 Gg. The overall impact of the revisions in this category was an increase in GHG emissions of 42.8 per cent in 2004 from 236,649.16 Gg CO_2 eq. to 337,973.51 Gg CO_2 eq.

101. For the revised estimates, the Russian Federation used a combination of the tier 1 method from the Revised 1996 IPCC Guidelines and the refined tier 1 method from the IPCC good practice guidance and their corresponding EFs. The AD used to calculate emissions from the oil and natural gas activities were obtained from a published state statistical report (Russian Statistical Yearbook, 2006). The EFs are partly country-specific, taken from published scientific literature, and partly IPCC default EFs. In the paragraphs below a detailed discussion of oil, natural gas and venting and flaring emission estimates is provided separately.

Oil (1.B.2.a)

102. Emissions were calculated for the following operations: servicing of producing oil wells (CO_2 and CH_4 emissions reported under exploration); production of oil and natural gas liquids (NGL)

(CO_2 and CH_4); oil transport (CO_2 and CH_4); refining and storage (CH_4, NO_X, CO, NMVOC and SO_2); venting (CO_2 and CH_4) and flaring of associated gas (CO_2, CH_4 and N_2O). Emissions from the servicing of producing oil wells, from venting and flaring, precursors from refining and storage and emissions from NGL production were calculated for the first time and new data were made available for these calculations.

103. CO_2 and CH_4 emissions from oil exploration were not estimated in the 2006 inventory submission, but were provided after the in-country review. The emissions were calculated using the IPCC default EFs for servicing wells. The number of producing wells was estimated based on the daily average debit of one well and total annual oil production. The assumption was made that oil wells operate continuously for the entire year.

104. The Russian Federation reports a separate estimate for CH_4 emissions from natural gas liquids (NGL) production under other (1.B.2.a.vi). NGL is considered to be a resource that is extracted separately and for which production data are provided in the Russian Statistical Yearbooks. The IEA defines NGL as all liquid products separated from natural gas in gas processing or recycling plants and NGL production is not included in the Revised 1996 IPCC Guidelines as a separate category. Russian experts and additional materials provided to the ERT confirmed that in Russia NGL extraction is a separate production process. The CH_4 EF used by the Russian Federation is 2,650 kg/PJ, calculated using the default IPCC net calorific value (NCV) for Norway and Canada of 45.22 TJ/kt. While oil production decreased between 1990 and 2004 by 12.4 per cent (from 589,861.3 km^3 to 516,570.3 km^3), NGL production increased by 58.9 per cent (from 10,200 kt to 16,204 kt).

105. For oil production, the CH_4 EF used is 1.45 t/km^3 and the CO_2 EF is 0.27 t/km^3 of oil produced, which represent the average value from the range provided by IPCC for oil production in the former USSR. For oil transport, the default IPCC EFs for CO_2 and CH_4 are used. CO_2 emissions from oil production and transport were not estimated for the 2006 inventory, but were provided to the ERT during the in-country review.

Natural gas (1.B.2.b)

106. Apart from associated gas flaring, no CO_2 emission estimates were provided for this category in the 2006 inventory submission. However, CO_2 emissions from natural gas were submitted to the ERT after the in-country review. Nor were CH_4 emission estimates from venting of oil and flaring in gas production estimated in the 2006 inventory, but these were also made available after the in-country review.

107. An average CH_4 content of 98 per cent was assumed in natural gas for the emission estimates from gas production, transmission, storage and distribution. This is higher than the IPCC good practice guidance default content, which is 91.9 per cent, used for EFs for transmission and distribution. The ERT requested the Russian Federation to further substantiate this figure for CH_4 content. It was explained that the CH_4 content in natural gas extracted in western Siberia (Yamburg) is 97 per cent (Wuppertal Institute, 2005). The share of western Siberian gas in the total natural gas production of Russia in 1990–2004 was 91–92 per cent. On this basis, a revised, more conservative, estimate for the CH_4 content (96.5 per cent) in the Russian natural gas was calculated, using 97 per cent CH_4 for western Siberian gas and the IPCC good practice guidance default CH_4 content of 91.9 per cent for the remaining gas produced.

108. The subcategory production/processing (1.B.2.b.ii) includes CO_2 and CH_4 emissions from natural and associated gas production and processing. The content of CH_4 in natural and associated gas was assumed to be the same and production and processing technologies for natural and associated gas were assumed to be relatively similar. A country-specific CH_4 EF for production of natural and associated gas of $3.149 * 10^{-3}$ Gg/Mm^3 was used originally for gas production, which was derived at the IGCE from Russian sources from the early 1990s (Nazarov et al., 1992; Vekilov et al., 1992). As this EF is higher

than the range of default EFs contained in the IPCC good practice guidance ($2.6 – 2.9 * 10^{-3}$ Gg/Mm^3), the ERT requested further evidence for this EF. In response to the ERT request, additional sources of measurement data for fugitive emissions from gas production were identified, which report much lower EFs: $4.02 * 10^{-4}$ Gg/Mm^3 for measurements taken in 1997 and $7.37 * 10^{-4}$ Gg/Mm^3 (EF based on same measurements, but corrected in 2003). The measurements included two production plants, one built in 1986 and one built in 1994. Due to the age of the plants, the low EF derived in these measurements is unlikely to be representative for the year 1990 for the entire country. Due to the high variation in CH_4 EFs in the national literature, the Russian Federation decided to use the average IPCC default value EF of 2.75 * 10-3 Gg/Mm^3, which was accepted by the ERT. It was announced that further work will be conducted to elaborate country-specific EFs for fugitive CH_4 emissions from gas production and processing in future inventories. The ERT recommends that the Russian Federation base this improved country-specific EF on a sufficient number of production and processing facilities with an adequate representation of age and technologies for the Russian gas sector.

109. The subcategory transmission (1.B.2.b.iii) includes CO_2 and CH_4 emissions from leakage during gas transmission through high pressure pipelines and leakage during gas storage. CO_2 emissions were originally not included in the 2006 submission but were provided after the in-country review. The amounts calculated in the base year are 4,718.60 Gg CH_4 for transmission and 119.69 Gg CH_4 for storage.

110. The country-specific EFs used for gas transmission were calculated at Gazprom JSC in cooperation with Ruhrgas AG in 1996–1997 on the basis of case studies on gas leakage (Dedikov et al., 1999). Separate EFs for gas compressor stations and transmission pipelines were derived as a result of these studies, which were used for elaboration of country-specific EFs for gas transmission. The resulting country-specific EF is 0.9 per cent of gas transmitted through high pressure pipelines.

111. The estimated emissions from storage are within the range for emissions if calculated using the IPCC good practice guidance EFs range, albeit closer to the upper end, but higher than if calculated using an average IPCC default EF. The major leakages from gas storage facilities are associated with gas injection into and extraction from storage facilities. In the Russian Federation, the technology for gas storage is based on pumping it into suitable underground geological structures in the warm season and its extraction during the cold season (abandoned gas deposits are suitable and also used for this purpose if located near regions with high gas consumption). Storage facilities generally consist of a compressor station for gas injection, which is similar to compressor stations used at the high-pressure gas pipelines of the Russian gas transmission system, and a set of equipment for gas extraction similar to the equipment used at the natural gas production sites. The EF for a single compressor station was calculated from the data on gas transmission based on the EF by Dedikov et al. (1999) and used as the EF for gas injection into storage facilities. In the cold season, gas is extracted from storage facilities using the same technologies as those used for extraction at the gas deposits. For this reason, the EF for the extraction from storage is the same as that for gas production.

112. For gas distribution, the EF was calculated from the IEA analysis of gas distribution in the Russian Federation (IEA, 2006), which reports an average loss rate of 3.2 per cent of distributed gas. In its 2004 annual report, Gazprom JSC announced the completion of a comprehensive inventory of its gas distribution facilities to determine the current state of equipment and its reconstruction and maintenance requirements. This work should be taken into account in any future improvement of the country-specific EF for gas distribution.

113. CH_4 emissions from leakage during gas use were calculated separately for large industrial plants and power stations, which use the gas coming through high-pressure pipelines, and residential and commercial consumers, which obtain the gas through the medium- or low-pressure gas distribution network. The emissions from leakage during gas consumption were estimated based on the apparent gas

consumption within the country and its use by industrial plants and power stations, which were obtained from the CRF tables on fuel combustion (1.A).

Venting and flaring (1.B.2.c)

114. During the review, the Russian Federation provided new estimates for CO_2 and CH_4 emissions from venting of high pressure pipelines as well as new estimates for CO_2, CH_4 and N_2O emissions from flaring during gas production and processing, which were not estimated before. The EFs for venting and flaring are the mean values from the range provided by the Revised 1996 IPCC Guidelines and the IPCC good practice guidance.

115. The estimates for flaring are separated between flaring of natural gas during gas production and flaring of associated gas from oil production. The state statistics represent only the data on the utilized fraction of associated gas produced within the specific year. It was assumed that all other associated gas that is produced but not utilized is flared. The ERT identified some double-counting for flaring, and the estimates provided were revised. In the estimations, the gas flared during gas production was subtracted from the gas consumption by the end-users as well as from the amount of gas processed.

116. In order to increase transparency, the ERT encourages the Russian Federation to make further efforts to improve its estimates in its subsequent submissions using detailed infrastructure data for natural gas operations, and to provide more detailed information on AD, the characteristics of the oil and gas industry in the country, the available infrastructure data, and the country-specific EFs and parameters used for calculations as well as transparent documentation of the methods, assumptions and data sources in its next NIR. The ERT also encourages the Russian Federation to make efforts to include estimates for categories currently reported as "NE".

Non-key categories

Transport – CO_2

117. The ERT identified many inconsistencies in other categories in the CRF tables of the 2006 submission, and its subsequent revisions after the in-country review, that have implications for the transport category. The Russian Federation explained that the differences and inconsistencies identified by the ERT in commercial/institutional (1.A.4.a) and agriculture/forestry/fisheries (1.A.4.c) were due to the reallocation of emissions that had been initially allocated to the transport category and were subsequently subtracted from this category. The reallocation from the transport category of oil/diesel and residual fuel oil was confirmed by the ERT in the revised CRF tables. The ERT recommends the Russian Federation to provide detailed explanations in its next NIR of the allocation of fuel consumption to the transport, commercial/institutional and agriculture/forestry/fisheries categories in order to improve the clarity of the estimation and reporting of these categories.

Civil aviation – CO_2

118. In the 2006 inventory submission, the Russian Federation did not estimate emissions from civil aviation or provide data on fuel consumption for civil aviation. During the in-country review, the ERT requested the Russian Federation to provide such estimates as data became available. In response to the ERT's request, after the in-country review, CO_2 emissions and jet kerosene consumption data for civil aviation were provided for the years 1990 and 2004 in CRF tables. According to these data, jet kerosene consumption for civil aviation dropped by 91 per cent from 508,308.21 TJ in 1990 to 46,681.08 TJ in 2004. This is the largest decrease in fuel consumption for civil aviation reported by any Annex I Party. In response to the further questions of the ERT, the decrease was explained by reduced demand for passenger and freight air transport and an increase in the fuel efficiency of aircraft. However, in the ERT's opinion the decrease still seems very large taking into account the fact that, according to the Russian response, the domestic passenger volumes of Russian air carriers decreased by 73 per cent

between 1990 and 2004 and freight volumes decrease by 66 per cent between 1991 and 2004. If an average decrease of 70 per cent in passenger or freight volumes is assumed between 1991 and 2003, a reduction in specific fuel consumption per ton-km of about 70 per cent would be necessary to achieve a total reduction of fuel consumption of more than 90 per cent in this period. Such a tremendous increase in the efficiency of aircrafts in Russia does not seem to be realistic. It is also important to note that the aircraft fleet for international flights was modernized in the 1990s, while older planes continued to operate on domestic flights, thus, the efficiency increase for domestic flights would be lower compared to international flights.

119. Jet kerosene is the major fuel used for aviation, along with small amounts of aviation gasoline which are not reported separately in Russian energy statistics but included under jet kerosene consumption. The total for jet kerosene consumption for domestic and international aviation reported in the revised CRF tables is 573 PJ in 1990 and 151 PJ in 2004. IEA energy statistics report 788 PJ of jet kerosene consumption in 1990 and 416 PJ in 2004. Thus, the total jet kerosene consumption included in the GHG inventory is 73 per cent of the IEA total in 1990 and only 36 per cent of the IEA total in 2004. During the review, Rosstat experts explained that IEA data for total jet kerosene consumption is consistent with national statistics, but that the small quantity of aviation gasoline reported by the IEA does not exist in Russian data. Thus, the estimation of total fuel consumption for aviation seems to be incomplete, and total CO_2 emissions from aviation are underestimated, especially for the most recent years. In particular, the emission estimate for civil aviation for 2004 seems to be far too low.

120. In the base year, domestic jet kerosene consumption is 66 per cent of IEA total jet kerosene consumption, which does not point to an overestimation of base year emissions for civil aviation taking into account a high share of domestic flights in the Russian Federation. Therefore, no revisions or adjustments were proposed to base year emissions. However, the method used to split fuel consumption between international and domestic flights is not considered to be in line with IPCC good practice guidance (see paragraphs 76, 77 and 78 above) and actual years will need to be adjusted in the future if the method is not changed because CO_2 emissions for recent years seem to have been considerably underestimated. The Russian Federation is strongly recommended to revise its method for splitting jet kerosene consumption between international and domestic air traffic, and to base any new method on LTO data per aircraft type and distance travelled as recommended by the IPCC good practice guidance. The large discrepancy in total jet kerosene consumption between CRF data and IEA data needs further consideration and explanation, and subsequent correction for future inventory submissions.

Navigation – CO_2

121. For 1990 the residual oil and gas/diesel consumption for domestic navigation included in the CRF is close to IEA data for these fuels (103 per cent for residual fuel oil and 105 per cent for gas/diesel oil). However, for 2004 there are considerable discrepancies: the CRF reports 11,020 TJ residual fuel oil consumption, whereas the IEA reports 16,921 TJ, and for gas/diesel oil use the CRF reports 11,042 TJ and the IEA 29,987 TJ. Fuel consumption for domestic navigation decreased by 90 per cent between 1990 and 2004. Some fuels included in the base year estimate, such as gasoline and other motor fuels, seem to disappear between 1990 and 2004. This strong decrease is not explained and is unrealistic. Together with the discrepancy with IEA data, this points to an underestimation of CO_2 emissions from domestic navigation in recent years. Further justification of the fuel consumption data trends has to be provided. A complete time series of fuel consumption and the resulting emissions is essential to any further assessment of the consistency of the time series. The ERT recommends the Russian Federation to revise its estimation of domestic navigation in order to ensure better consistency with international data. The estimation methods for emissions from domestic navigation should be described separately in the NIR and the data sources for the fuel consumption data should be clearly explained and data for international and domestic fuel use provided.

6. Industrial processes and solvent and other product use

Sector overview

122. In the Kyoto Protocol base year (1990 for CO_2, CH_4, N_2O and 1995 for HFCs, PFCs and SF_6), total GHG emissions from the industrial processes sector amounted to 241,077.93 Gg CO_2 eq., contributing 7.3 per cent to total national GHG emissions. Emissions from this sector declined by 21.9 per cent between the base year and 2004, mainly driven by decreases in emissions from limestone and dolomite use (55.6 per cent), cement production (39.6 per cent), lime production (38.6 per cent), iron and steel production (15.2 per cent), nitric acid production (14.0 per cent) and ammonia production (4.9 per cent). For the base year, CO_2 was the dominant GHG, accounting for 88.3 per cent of sector emissions, followed by PFCs, 6.5 per cent, HFCs, 3.2 per cent, N_2O, 1.7 per cent, CH_4, 0.3 per cent, and the remainder being SF_6 emissions, 0.04 per cent. Iron and steel production was the largest category in the base year, contributing 42.4 per cent to the total sectoral emissions, while the other major categories were limestone and dolomite use, 15.0 per cent, cement production, 14.1 per cent, aluminium production, 8.5 per cent, ammonia production, 7.8 per cent, lime production, 5.0 per cent, and production of HCFC-22, 3.3 per cent.

123. The key category analysis performed by the secretariat for the base year identified three key categories in the Russian Federation's industrial processes sector: iron and steel production, limestone and dolomite use, and cement production.

124. The industrial processes sector is generally complete. However, during the in-country review the ERT noted that estimates of emissions from asphalt roofing and road paving with asphalt are reported by the Russian Federation as "NE", while fugitive emissions of HFCs, PFCs and SF_6 were reported as not applicable ("NA"). Emissions from the solvent and other product use sector were estimated only for N_2O, while CO_2 and NMVOC emissions were reported as "NE" and "NA". The ERT also noted from Statistical Yearbooks that industrial operations exist for the production of bricks, ceramics, polyethylene, synthetic resins and plastic, and sulphuric acid, which suggests that these emission categories are missing. The Russian Federation is encouraged to report emissions from these categories in its next submission in order to improve the completeness of the inventory.

125. The Russian Federation reported CO_2 emission estimates from glass production as "NE" in its original submission. However, the NIR reports that the categories limestone and dolomite use and soda ash use take into account the amount of limestone, dolomite and soda ash used as raw materials in the glass manufacturing process. During the in-country review, the ERT recommended the Russian Federation to report CO_2 emissions arising from the use of these raw materials in the glass manufacturing process as "IE" and this recommendation was followed in the revised CRF data provided to the ERT after the in-country review.

126. The Russian Federation has estimated actual emissions of HFC-23 from the production of HCFC-22 using the IPCC default methodology. The notation key "NE" was used for subcategories within the consumption of halocarbons and SF_6 (except for refrigeration and air conditioning equipment and electrical equipment). Actual HFCs emissions from the use of HFCs in refrigeration and air conditioning equipment have been reported for stationary refrigeration but not for mobile refrigeration. The Russian Federation is encouraged to report HFCs emissions from mobile refrigeration in its next submission to improve the completeness of the inventory. SF_6 emissions from electrical equipment were reported based on information received from RAO UES using a country-specific approach. However, in the CRF table Summary 3 for this source category the use of other methodology ("OTH") was reported. The Russian Federation is encouraged to use the correct notation key for this category in the respective CRF tables. SF_6 is used in the magnesium industry on a restricted scale as a cover gas in foundries to prevent oxidation of molten magnesium. The default IPCC methodology is used for estimations of these

emissions. PFC emissions from aluminium production were reported using the IPCC tier 1b methodology and default EFs.

127. The Russian Federation provides justifications in the NIR for the assumptions made and the choice of data and of methods used. Most categories are reported with the required detail in the CRF tables, with a few exceptions where AD from some categories (e.g. CO_2 and PFCs emissions from aluminium production) have been reported as confidential ("C") to protect commercially sensitive information. The CRF tables and the NIR provide sufficient transparency to enable the assessment of the data used and methodologies applied, except for the categories production of halocarbons and SF_6 and consumption of halocarbons and SF_6. The Russian Federation is recommended to improve the transparency of the estimates for these categories by including in its next NIR all relevant AD and information on the rationale for the choice of methodology, country-specific EFs, AD and any assumptions used.

128. After the in-country review, revised estimates for the complete time series (1990–2004) based on improved methods and updated AD were submitted by the Russian Federation in response to questions raised by the ERT during the in-country review on cement production – CO_2, lime production – CO_2, limestone and dolomite use – CO_2, nitric acid production – N_2O, iron and steel production – CO_2 and aluminium production – PFCs. For this last category revised estimates for 1995 (the base year for HFCs, PFCs and SF_6) were also submitted, which led the Russian Federation to change its selection of the base year for these gases after the in-country review.

Key categories

Cement production – CO_2

129. The Russian Federation used the IPCC tier 2 methodology and a rounded value of 65 per cent of the default IPCC value for lime (calcium oxide – CaO) content by weight in clinker (64.6 per cent). The use of the rounded value for the calcium oxide content in clinker leads to an overestimation of the base year emissions so, during the in-country review, the Russian Federation was recommended to provide revised estimates for this category. After the in-country review, following the recommendation of the ERT, the Russian Federation revised the default value for lime content in clinker. The CO_2 emissions from cement production have now been revised downwards by 0.6 per cent for the base year (from 34,261.55 to 34,050.71 Gg CO_2) and by 0.6 per cent for 2004 (from 20,705.21 to 20,577.79 Gg CO_2).

Limestone and dolomite use – CO_2

130. The default EFs used by the Russian Federation for the limestone and dolomite use category are based on the stochiometric equation of the chemical reaction, assuming pure limestone/dolomite. This assumption results in higher emissions estimates than an estimation that takes into account the specific purity of limestone/dolomite. During the in-country review, the Russian Federation was recommended to use specific purity factors for limestone and dolomite in its emissions estimation, provide revised calculations for this category and document the assumptions and/or data used on the specific purity of limestone/dolomite. After the in-country review, following the recommendations of the ERT, the Russian Federation provided the ERT with average specific purity factors for limestone flux in metallurgy, limestone for glass production, dolomite for metallurgy and refractory material production, and dolomite for glass production (Shishkin, 1984; Sementovskiy et al., 1997, 1998; Biryulev et al., 1999; Sementovskiy, 1999). Based on these factors, the Russian Federation revised the CO_2 emissions from limestone and dolomite use. The ERT agreed with the approach used by the Russian Federation. The CO_2 emissions from limestone and dolomite use decreased by 5.3 per cent in the base year (from 38,169.63 Gg to 36,162.16 Gg CO_2) and by 4.7 per cent in 2004 (from 16,830.05 to 16,040.86 Gg CO_2). The revised estimation method should be reported transparently in the Russian Federation's next NIR.

Iron and steel production – CO_2

131. The Russian Federation estimated CO_2 emissions from iron and steel production using the IPCC tier 2 methodology. Production data for iron and steel compiled at the national level by Rosstat have been used. The ERT noted that the export and import of "conversion pig iron" was not taken into account in the current inventory submission, and that it was assumed that all "conversion pig iron" produced is used for steel production. During the in-country review, additional data obtained from the Federal Service on State Statistics and the Federal Customs Service were made available to the ERT which document exports and imports of "conversion pig iron". The Russian Federation was recommended to provide revised calculations for this category, and to document the coverage of categories and the methods used for the estimation, as well as the AD and EFs used and the sources from which these data were derived. Following the recommendations of the ERT, after the in-country review, the Russian Federation provided the ERT with information on "conversion pig iron" production, export and import. Based on this information, the Russian Federation revised its CO_2 emission estimates arising from steel production. The ERT agreed with the approach used by the Russian Federation. The CO_2 emissions from steel production decreased by 4.5 per cent in the base year (from 5,688.95 to 5,431.92 Gg CO_2) and by 11.2 per cent in 2004 (from 5,004.86 to 4,446.43 Gg CO_2). The revised estimation method should be reported transparently in the Russian Federation's next NIR.

Non-key categories

Lime production – CO_2

132. The Russian Federation did not disaggregate lime production AD by lime types. This is required by the IPCC good practice guidance, which provides default values for high calcium/dolomitic lime with a default breakdown of lime types of 85/15. During the in-country review, the ERT recommended the Russian Federation to use the default IPCC value of the breakdown into lime types and to provide revised calculations for this category for the entire time series. After the in-country review, following the recommendation of the ERT, the Russian Federation revised its estimates for CO_2 emissions arising from lime production for the entire time series. The ERT agreed with the approach used by the Russian Federation because it follows the IPCC good practice guidance. Due to the revision, CO_2 emissions from lime production increased by 2.2 per cent for the base year (from 11,864.94 to 12,125.97 Gg CO_2) and by 2.2 per cent for 2004 (from 7,288.97 to 7,449.33 Gg CO_2). The revised estimation method should be reported transparently in the Russian Federation's next NIR.

Ammonia production – CO_2

133. The Russian Federation has estimated CO_2 emissions from ammonia production by following the IPCC tier 1b approach. For the next inventory submission the Russian Federation is encouraged to estimate these emissions using the most accurate methodology (tier 1a), based on natural gas input and applying plant-specific EFs based on the carbon content of natural gas.

Nitric acid production – N_2O

134. During the in-country review, the ERT identified a mistake in the conversion factor used to estimate the amount of non-concentrated nitric acid processed into ammonium nitrate. A conversion coefficient of 0.786 tonnes of NHO_3/tonne of NH_4NO_3 should be used, based on the stochiometric equation of the chemical reaction, but the value used by the Russian Federation was 0.780 tonnes of NHO_3/tonne of NH_4NO_3. The Russian Federation was encouraged to revise this conversion factor and provide revised estimates for this category for the entire time series. Following the recommendation of the ERT, after the in-country review, the Russian Federation revised its estimates for N_2O emissions arising from nitric acid production. The ERT agreed with the approach. Due to the revision, the N_2O emissions from this category increased by 0.7 per cent for the base year (from 3,974.92 to 4,002.84 Gg CO_2 eq.) and by 0.7 per cent for 2004 (from 3,416.57 to 3,441.43 Gg CO_2 eq.).

Aluminium production – PFCs

135. The Russian Federation used the IPCC tier 1 methodology and default EFs for the estimation of PFC emissions (CF_4 and C_2F_6) from aluminium production. Only the EFs used for the Soderberg process are in accordance with the IPCC good practice guidance. The shares of Vertical Stud Soderberg (VSS) and Horizontal Stud Soderberg (HSS) technologies were not provided to the ERT during the in-country review. Nor could the assumptions made on the shares of Centre Worked Prebaked (CWPB) and Side Worked Prebaked (SWPB) technologies in the estimation of PFC emissions from aluminium produced through the use of the Prebaked Anode Process be substantiated during the in-country review. As this can lead to overestimations or underestimations of base year emissions for this category, the Russian Federation was encouraged to collect plant-specific information on the shares of VSS, HSS, CWPB and SWPB technologies used in aluminium production and to develop EFs consistent with the technology used in the country. Following the recommendation of the ERT, after the in-country review, the Russian Federation collected plant-specific information on the shares of VSS, HSS, CWPB and SWPB technologies used in aluminium production. Based on this information, the Russian Federation revised the PFC emissions arising from this category using default IPCC EFs that were consistent with the technology used. The ERT agreed with the approach used by the Russian Federation. The estimate for PFC emissions from aluminium production for the base year increased by 9.0 per cent (from 14,449.91 to 15,753.84 Gg CO_2 eq.) and decreased by 15.7 per cent for 2004 (from 18,637.20 to 15,705.61 Gg CO_2 eq.). The revised estimation method should be reported transparently in the Russian Federation's next NIR.

7. Agriculture

Sector overview

136. The agriculture sector contributed 9.3 per cent of the Russian Federation's total emissions in the Kyoto Protocol base year (1990 for CO_2, CH_4, N_2O and 1995 for HFCs, PFCs and SF_6). Emissions were 309,368.59 Gg CO_2 eq. in the base year and are estimated to have declined by 54.8 per cent between the base year and 2004. Emissions of CH_4 fell by 55.9 per cent and emissions of N_2O fell by 54.3 per cent. Estimated uncertainties are high for this sector, particularly for N_2O emissions. Enteric fermentation – CH_4, manure management – N_2O and both direct and indirect N_2O emissions from agricultural soils have all been identified as key categories in the Russian Federation's inventory according to the secretariat's analysis.

137. The coverage for the sector is complete. Estimates have been prepared for all categories and for all years where emissions occur: enteric fermentation, manure management, agricultural soils and rice cultivation. Burning of savannas and burning of agricultural residues are reported as not occurring ("NO").

138. There are no significant fluctuations in the tier 2 or country-specific EFs. The significant decline in the Russian Federation's emissions from the agriculture sector since 1990 is largely attributable to the significant decline in the agricultural output of the Russian Federation and related changes in AD.

139. In general, the Russian Federation's AD collection and reporting systems appear to be of high quality. Comprehensive agricultural data have been collected for independent policy purposes for a long period of time and these are published by Rosstat. Data from government agricultural organizations are collected by census each year and sampling techniques are used for information from small and medium-sized farms. Instructions to respondents for completing questionnaires and methodology descriptions were provided to the ERT during the in-country review. Results from a full census of the industry, undertaken in 2007, should be published in late 2008.

140. Overall, the methodological choice made by the Russian Federation for its estimations is consistent with the IPCC good practice guidance. The Russian Federation used country-specific methods

equivalent to tier 2 methods for important livestock subcategories (dairy cattle, non-dairy cattle and swine) and tier 1 methods are used for the remaining livestock categories. A country-specific method was adopted for the direct soil emissions – crop residues subcategory.

141. Not all the estimation methodologies are fully documented in the NIR, although additional data were provided to the ERT during the course of the in-country review. Transparency of the inventory through the NIR could be improved. The Russian Federation should provide additional information in the NIR with more explanations for the reasons for the trends in emissions and is recommended to implement, and report on, the full set of tier 2 QC measures set out in the IPCC good practice guidance. Reporting on these measures is especially important given the significant declines in emissions since 1990. Such reporting would provide a degree of confidence to users of the inventory that the estimates are soundly based.

Key categories

Enteric fermentation – CH_4

142. The Russian Federation's country-specific methodology for estimations in this category makes use of data published by Rosstat on direct feed intake by livestock. Unusually, this allows the Russian Federation to estimate emissions independently of livestock performance characteristics and livestock herd sizes. The ERT views this method as a significant methodological enhancement over the default methods set out in the IPCC good practice guidance in which direct feed intake is estimated indirectly from livestock performance characteristics.

143. While a number of QC checks were performed, the ERT encourages the Russian Federation to perform and document in its next NIR the full range of QC checks set out in the IPCC good practice guidance. In particular, the country-specific EFs applied for both dairy and non-dairy cattle are similar to those applied in Western Europe, but higher than those indicated by the IPCC good practice guidance tier 2 method that utilizes livestock performance characteristics. Given this outcome, the ERT also encourages the Russian Federation to estimate emissions using the IPCC good practice guidance tier 2 methods as a QC check and to undertake annual reconciliations between the country-specific and the IPCC good practice guidance emission estimates, if necessary.

144. CH_4 emissions decreased significantly for most livestock species between the base year and 2004. In the case of non-dairy cattle, herd size has fallen by over 50 per cent since 1992, largely as a result of a 43 per cent reduction in the consumption of beef in the Russian Federation since 1992. Given the substantial declines in AD since 1990, the ERT encourages the Russian Federation to report data on the underlying causes of the changes in emission trends in its next NIR. In particular, livestock commodity market balances (consumption, production, exports, imports and stock changes) should be compiled and reported in the NIR to provide both an explanation for the causes of the trends in emissions and a QC check for the AD used in the emission calculations.

Manure management – N_2O

145. The emission trends observed for emissions from manure management reflect the trends in livestock AD. Emissions of CH_4 declined by 53.3 per cent between 1990 and 2004 while emissions of N_2O declined by 57.9 per cent over the same period. The Russian Federation has implemented IPCC good practice guidance methodologies for this sector. As is described above, the quality of the AD is high.

Direct soil emissions – N_2O

146. Emissions in this category have declined by 48.0 per cent since the base year, largely reflecting reductions published by Rosstat in the application rates of nitrogen fertilizers by the agricultural sector in the Russian Federation. Given the significant decline in emissions, during the in-country review the ERT

encouraged the Russian Federation to implement QC checks to reconcile application rates of fertilizers with market balances (production, consumption, exports, imports and stock changes) to ensure accurate and consistent estimates for the entire time series. Reconciliations were also recommended for the data reported by the Russian Federation to the United Nations Food and Agriculture Organization (FAO). After the in-country review, the Russian Federation provided the ERT with the additional QC checks and substantiated the sharply declining trend in N_2O emissions from agricultural soils. The Russian Federation is recommended to add these additional checks and the additional information to its next NIR.

147. The Russian Federation has implemented a tier 1 methodology consistent with the IPCC good practice guidance for the synthetic fertilizers subcategory, but with the adoption of country-specific EFs that depend on three soil types. However, emissions have been estimated using highly aggregated AD. Improved emission estimates for this key category, especially given the significant decline in application rates, could be obtained by a spatial disaggregation of AD that reflects variations in soil type. The ERT encourages the Russian Federation to develop more disaggregated methods for this sector over time, while also linking with any developments in soil carbon modelling developed for the LULUCF sector.

148. Like all other categories in the agriculture sector, there was a significant decline in emissions between the base year and 2004 (26.2 per cent) from the crop residue category, reflecting significant declines in crop production particularly for maize and other livestock feeds. The Russian Federation has implemented a country-specific methodology that is consistent with the approach of recently published recognized international literature while utilizing country-specific parameters. The resulting emission estimates are higher than those which would have been estimated using the IPCC good practice guidance default parameters, although the effects on the trend in emissions are minor. Given the significance of the decline in emissions, the ERT encourages the Russian Federation to undertake and report QC checks for this sector in its next inventory submission.

8. Land use, land-use change and forestry

Sector overview

149. The Russian Federation reported a net emission of 190,271.69 Gg CO_2 eq. for 1990 and a net removal of 198,519.78 Gg CO_2 eq. for 2004. These figures are the result of net emissions of 332,539.41 Gg CO_2 eq. (1990) and 329,152.71 Gg CO_2 eq. (2004) from the cropland category, and net removals of 142,267.72 Gg CO_2 eq. (1990) and 527,672.49 Gg CO_2 eq. (2004) from the forest land category, respectively. Based on these figures the secretariat identified both forest land remaining forest land and cropland remaining cropland as key categories for the level (1990 and 2004) and trend (2004) assessments.

150. As a whole, the LULUCF sector was estimated to be a net source in 1990. However, due to the lack of proper data, the Russian Federation did not report emission estimates from deforestation. Therefore, no emissions from the LULUCF sector were accounted for in the calculation of the assigned amount.

151. The Russian Federation has not separately reported any emissions or removals in any mandatory land conversion categories (i.e. forest land converted to cropland, grassland, wetlands, settlements or other land). This is partly due to the differences in definitions of land-use categories between the national level and the IPCC good practice guidance for LULUCF. The ERT recommends the Russian Federation to reconcile its national level definitions with those of the IPCC good practice guidance for LULUCF, to re-aggregate data from regional or lower level statistics, to revise land statistics to develop a consistent land representation, and to report on all the mandatory land conversion categories. Such land representation will be key to accurate reporting under the Kyoto Protocol. The ERT also suggests that the Russian Federation consider the type of spatial assessment unit that will be used for the determination of forest area (its maximum value, as stipulated by the relevant provisions, cannot exceed 1 ha), and to address the issue of how land will be identified (e.g. by using remote sensing).

152. The Russian Federation applied approach 1 of the IPCC good practice guidance for LULUCF for land identification. During the in-country review, the ERT learned that the current national land statistics used for the GHG inventory are not going to allow for the disaggregation of the land use and land-use change categories (e.g. afforestation, deforestation under Article 3, paragraph 3) that are needed under the Kyoto Protocol for a transparent GHG inventory of the sector. The ERT notes that the application of IPCC approach 2 is a minimum requirement for reporting on land under the Kyoto Protocol. The application of IPCC approach 2, probably in combination with approach 3, also seems necessary, because of the high diversity of the forests, the large area of the country and the existence of large tracts of unmanaged forests. The ERT learned that a detailed land data collection system exists in the country. The development of the inventory using disaggregated data and compilation using either Reporting Method 1 or 2 of the IPCC good practice guidance for LULUCF therefore seems feasible.

153. A partial quantitative uncertainty estimation was made for the LULUCF sector in the 2006 GHG inventory submission. The ERT recommends the Russian Federation to estimate overall uncertainty for the sector in its next inventory submission in order to prioritize the allocation of resources for the further development of the inventory. The uncertainty estimation should be extended by including non-quantifiable elements, for example missing categories such as land-use changes.

154. Partial and not formalized sector-specific QA/QC activities were conducted during the preparation of the 2006 GHG inventory submission. At its request, during the in-country review the ERT was provided with a detailed description of the data flow and the QA/QC activities for the inventory of the forest land categories. A detailed written description of the QA/QC activities in the NIR and their full implementation are recommended for the next inventory submission.

Key categories

Forest land remaining forest land – CO_2

155. The Russian Federation did not report definitions for the various forest land and land-use change categories as required by the IPCC good practice guidance for LULUCF. Therefore, it was not possible to assess the accuracy of the identification of those forests for which the emission and removal data were reported. The definitions should include information on predefined thresholds (e.g. crown closure) and on ecosystem type (as specified in the IPCC good practice guidance for LULUCF), species and age. The Russian Federation is encouraged to develop, consistently apply and report such definitions in its next GHG inventory submission.

156. In the initial report, how managed forests under Article 3, paragraph 4, of the Kyoto Protocol will be differentiated from the rest of the forests in the land statistics is not transparently reported. Nor is how the volume stocks, or their changes, will be developed from available forest statistics. The ERT notes that while the Russian Federation considered all its forests as managed in its third National Communication, it reported much less managed forests in the NIR and in the fourth National Communication, without describing in detail how data for "managed" land or land under Article 3, paragraph 4, forest management are developed. There are also either inconsistent data in the time series, or large changes in the area of both the "forest fund" national land-use category and the managed forests in many years (at an annual rate of one million ha or more), or both. The ERT encourages the Russian Federation to revise the forest land statistics, and to report separately on Article 3, paragraphs 3 and 4, of the Kyoto Protocol land use and land-use change categories.

157. The volume stock data that were used to develop emission and removal estimates were taken from aggregated forestry statistics, and are reported only by main species and age classes. No regional or site disaggregation was undertaken. Such disaggregation is strongly recommended considering the very large variation in the forest types in the highly significant forest area of the country. In addition, the reported combined conversion and expansion factors that are applied for the estimation of carbon stock changes are not transparently derived from a national database of case studies, and there is no

information on their representativeness and thus on their accuracy for its application to the national GHG inventory of the sector. Further disaggregation of these factors is suggested by ecological regions, site and management types. In addition, the ERT recommends the Russian Federation to consider, in a timely manner, the development of new factors (or biomass functions) or the verification of the existing ones using data from a representative forest inventory.

158. The Russian Federation did not estimate emissions and removals in soils, dead wood and litter. Some of these pools, at least in some places, may be subject to significant changes due to human activities (e.g. erosion due to forest operations) or climate change, and thus they may be significant sources or sinks. Therefore, the ERT recommends the Russian Federation to estimate and report these emissions and removals in its next submission.

Cropland remaining cropland – CO_2

159. For cropland remaining cropland, the trend in the reported net carbon (C) stock changes in the biomass is unstable and fluctuates. The net C stock changes in soils per unit area have been identified as outliers and are generally the lowest of the reporting Parties. These inconsistencies may be at least partly explained by the fact that Russia applied a tier 3, that is, country-specific, model to estimate net C stock changes for cropland. The model applies many country-specific assumptions and average values. Although the description of the model is rather detailed in the NIR, there are many gaps in the description and there is a number of unjustified methodological elements. Moreover, the nature and the description of the model do not allow a proper assessment of the accuracy of the model. Although it is claimed that the model has been peer-reviewed in Russia and publication of this review is currently in press in a Russian scientific journal, the ERT suggests that it has yet to be confirmed that the model is robust and is able to provide an unbiased estimate for the entire country. Further verification, development and review of the model by the international scientific community is needed before this model is applied for estimating emissions and removals in this key category.

Non-key categories

Forest land – CH_4 and N_2O

160. The Russian Federation reports non-CO_2 emissions from forest fires. The ERT acknowledges this effort because significant emissions can occur from forest fires especially in certain years of high frequency of fires. The methodology for the estimation conforms with the IPCC good practice guidance for LULUCF methodology using country-specific values. However, the ERT suggests that, in its next submission, the Russian Federation further verify the AD (area of forest fires) and the EFs, and develop uncertainty estimates to assess the accuracy of the reported emissions.

9. Waste

Sector overview

161. In the Kyoto Protocol base year (1990 for CO_2, CH_4, N_2O and 1995 for HFCs, PFCs and SF_6) the total GHG emissions from the waste sector amounted to 64,720.16 Gg CO_2 eq., contributing 1.9 per cent to the national total. Emissions from solid waste disposal on land contributed 39.6 per cent of sectoral emissions and emissions from wastewater handling 60.4 per cent. Between 1990 and 2004 emissions from the waste sector increased by 6.6 per cent.

162. After the in-country review, revised estimates for the complete time series (1990–2004) were submitted by the Russian Federation in response to questions raised by the ERT relating to CH_4 recovery from domestic and commercial wastewater (see paragraph 168).

163. The key category analysis performed by the secretariat for the base year revealed one key category in the Russian Federation's waste sector: CH_4 emissions from wastewater handling.

164. The reporting in the waste sector is generally complete. The Russian Federation has estimated CH_4 and N_2O emissions from solid waste disposal on land and wastewater handling. Emissions from waste incineration are not reported because all incineration plants are with energy recovery and related CO_2 emissions are included in the energy sector. However, the Russian Federation uses the notation key "NE" in the sectoral CRF tables whereas "IE" would be more appropriate in this case.

165. Recalculations and an uncertainty assessment were not carried out in the original 2006 submission, but were provided as part of the revised information.

Key categories

Wastewater handling – CH_4

166. Under the industrial wastewater category, CH_4 emissions are reported for wastewater handling in petroleum refining, chemical and petrochemical production, pulp and paper production, and food industries. The methodology and EFs used are the IPCC default ones. The methane correction factor (MCF) used is a national weighted average factor. However, emissions from wastewater and sludge are estimated together, which is not in line with the IPCC methodology. The ERT recommends the Russian Federation to provide separate emission estimates for these subcategories in its next submissions.

167. Default methodology and EFs are used for estimations of domestic and commercial wastewater emissions. However, emissions from wastewater and sludge have been estimated together, which is not in line with the IPCC methodology. Between 1990 and 2004 CH_4 emissions from domestic and commercial wastewater decreased by 12.4 per cent while recovery of emissions related to energy use or flaring increased by 5.1 per cent, but no explanation was provided in the NIR. The ERT recommends the Russian Federation to include more information about and explanation of these trends in its next NIR.

168. The NIR states that some quantity of biogas is generated when wastewater sewage is treated in methane tanks. This CH_4 is partly flared and partly used for energy recovery. The CRF tables 6.B do not contain data on recovery, which should be subtracted from the CH_4 emissions in this subcategory. During the in-country review, the ERT recommended the Russian Federation to provide revised data for the base year on emissions from commercial and domestic wastewater handling excluding energy recovery. Following the recommendations of the ERT, after the in-country review, the Russian Federation revised its estimates for this category on the basis of the IPCC good practice guidance methodology. The CH_4 emissions from domestic and commercial wastewater have been revised upwards by 77.1 per cent per cent for the base year (from 440.27 to 779.77 Gg CH_4) and by 48.2 per cent for 2004 (from 460.90 to 683.13 Gg CH_4). The revised estimates of CH_4 emissions from wastewater handling take into account two different systems of domestic wastewater treatment which were not differentiated in the original 2006 inventory submission. For urban population it is assumed that systems with aerobic biological water treatment followed by anaerobic sludge treatment in methane-tanks with biogas recovery (first type) are used. For the remaining wastewater in rural areas methane tanks without recovery are used, resulting in higher CH_4 emissions (second type). In the information provided after the in-country review, the Russian Federation stated that this recalculation allowed it to improve the completeness of its estimates in this category.

Non-key categories

Solid waste disposal sites – CH_4

169. A tier 2 methodology (FOD model) for emissions calculations is applied for this category, which is appropriate and in line with the IPCC good practice guidance because it is identified as a key category in 2004 (level and trend). The Russian Federation uses a country-specific degradable organic carbon (DOC) and default IPCC factors. The category only includes municipal household waste and does not take into account industrial waste or sludge disposal. AD on disposal of solid waste to landfills for

1999–2004 were taken from Rosstat statistics and for 1960–1990 from communal services.[6] Data for 1991–1998 were interpolated. It is assumed that all the municipal solid waste (MSW) collected and landfilled is treated in managed landfills. For the share of the rural population for which waste is not collected publicly, it is assumed that the waste is disposed of in unmanaged open sites. Waste generation in rural areas was extrapolated from urban areas and the waste generation rate of the urban population was applied. The NIR states that the high waste generation rate for the rural population could cause an overestimation of emissions. During the in-country review, the ERT recommended the Russian Federation to replace the waste generation rate for urban areas applied to rural areas in this calculation by a specific waste generation rate for rural areas and to revise the emissions estimation accordingly. After the in-country review, the Russian Federation informed the ERT that no specific waste generation rate for the rural population could be found. For 1990 the Russian Federation reports 35,045 tonnes of waste landfilled. With a total population of 147.7 millions and 97 per cent disposal to landfills, this results in an average waste generation rate of 0.24 tonnes per capita per year for 1990. The average waste generation rate for 2004 is 0.36 tonnes per capita per year. The Revised 1996 IPCC guidelines provide a default of 0.32 tonnes per capita per year for the Russian Federation and in recently published recognized international literature the default is 0.34. Thus, the average waste generation rate used for 1990 is considerably lower than the IPCC default, which seems sufficiently conservative not to overestimate base year emissions.

170. The value of the CH_4 generation rate *k* is averaged for the whole country and a single *k* value of 0.05 for dry temperate/boreal climate is used. However, the Russian Federation is a big country with diverse climatic conditions so the CH_4 generation rate should vary between different regions. The ERT recommends using a national weighted average DOC value based on different regional DOC values (wet and dry temperate) for regions with different climate conditions in the next submission, because even a small change in emissions coefficients can cause substantial changes in CH_4 emissions.

171. The NIR includes AD on compost production for the period 1971 to 2004. However, emissions from this activity are not calculated. The ERT encourages the Russian Federation to estimate emissions from compost production using the methodology provided in recently published recognized international literature and to report them under the subcategory other of CRF table 6.A.

Wastewater handling – N_2O

172. For the estimations of emissions in this category, data on protein consumption were taken from FAO reports until 2003. The FAO did not provide this information after 2003 so the Russian Federation used data from a national institute, reporting a protein consumption value lower than FAO data. The ERT recommends the Russian Federation to use FAO data or national AD for the entire time series in order to make emissions estimation consistent. This will require, if necessary, the recalculation of emissions for the entire time series, including the base year.

C. Calculation of the assigned amount

173. The assigned amount pursuant to Article 3, paragraphs 7 and 8, is calculated in accordance with the annex to decision 13/CMP.1.

174. The Russian Federation's base year is 1990 and the Party, after the in-country review, has revised to 1995 its selection of base year for HFCs, PFCs and SF_6. The Russian Federation's quantified emission limitation commitment is 100 per cent as included in Annex B to the Kyoto Protocol.

175. In its initial report, based on the Russian Federation's base year emissions, 3,216,326.719 Gg CO_2 eq., and its Kyoto Protocol quantified emission limitation commitment (100 per cent), the Russian Federation originally calculated its assigned amount to be 16,081,633,595 tonnes CO_2 eq. The ERT did

[6] K. D. Pamfilov. Academy of municipal economy.

not agree with this figure as it noted a discrepancy between the estimate of base year emissions in the initial report and the CRF tables (3,216,327.004 Gg CO_2 eq.), the latter being 0.285 Gg CO_2 eq. higher resulting in a different assigned amount calculation.

176. In response to the inventory issues identified during the review, the Russian Federation submitted revised estimates of its base year inventory (3,323,419.064 Gg CO_2 eq.), which resulted in a recalculation of the assigned amount. Based on the revised estimates, the Russian Federation calculates its assigned amount to be 16,617,095,319 tonnes CO_2 eq. The ERT agrees with this figure.

D. Calculation of the commitment period reserve

177. The calculation of the required level of the commitment period reserve is in accordance with paragraph 6 of the annex to decision 11/CMP.1.

178. In its initial report, based on its national emissions in the most recently reviewed inventory (2004), 2,152,437.116 Gg CO_2 eq., the Russian Federation originally calculated its commitment period reserve to be 10,762,185,580 tonnes CO_2 eq.. The ERT did not agree with this figure as it noted a discrepancy between the estimate of its inventory for the year 2004 in the initial report and the CRF tables (2,152,437.201 Gg CO_2 eq.), the latter being 0.085 Gg CO_2 eq. higher resulting in a different commitment period reserve calculation.

179. In response to the inventory issues identified during the review, the Russian Federation submitted revised estimates of its inventory for the year 2004 (2,125,958.943 Gg CO_2 eq.), which resulted in a recalculation of the commitment period reserve. Based on the revised estimates, the Russian Federation calculates its commitment period reserve to be 10,629,794,715 tonnes CO_2 eq. The ERT agrees with this figure.

E. National registry

180. The Russian Federation has provided practically all the information on the national registry system required by the reporting guidelines under Article 7, paragraphs 1 and 2, of the Kyoto Protocol (decision 15/CMP.1). The information provided is broadly transparent and in accordance with the requirements of these reporting guidelines.

181. During the in-country review, the ERT was provided with additional and updated information on the Russian Federation's national registry, describing the functional design and the user interface of the system (e.g. database and system design documents, user interface description and test results). The information that was publicly accessible through the web-based user interface covered information on the agreement signed by the Federal Centre of Geo-ecological Systems (registry administrator) for the use of the Seringas™ software and some documents on international and national legal and normative frameworks. However, this information did not include the contact information for the Russian Federation's registry administrator. The ERT recommends the Russian Federation to provide this information in its next annual report under the Kyoto Protocol, as well as information on improvements in the hardware environment for the purpose of the recovery plan (information on the identification of equipment for a separate server and off-site location) and any possible changes to the national registry system. The ERT was also informed that the Russian Federation's registry will not have operator accounts for private legal entities, and that the number of operator accounts will be small, which results in a less complex registry system.

182. Table 5 summarizes the information on the mandatory reporting elements of the national registry system as stipulated by decision 15/CMP.1, which describes how the national registry performs the functions defined in the annex to decision 13/CMP.1 and the annex to decision 5/CMP.1.

183. During the in-country review, the ERT was informed that the internal operational test of the registry for network connectivity was completed on 5 June 2007. The initialization process was expected

to be completed by 8–9 October 2007 and the registry was expected to be fully operational by 6 December 2007. After the in-country review, the Russian Federation notified the ERT that the initialization test was completed on 7 November 2007. Information on the registry is publicly available through the Internet at URL <http://www.carbonunitsregistry.ru>.

184. The ERT was also informed about procedures and security measures to minimize discrepancies. These measures are: segregation of duties for working staff trained by software developers and the hardware provider (the registry administrator is responsible for the issuance, checking and validation of operations and operators are responsible for the creation and completion of all the forms, while all operations can be carried out only by national registry staff); checks are performed on registry transactions before they are sent to the ITL at two levels – application level (by business rules) and database level (by SQL Server feature named Referential Integrity). Regarding the information required to terminate transactions and correct problems, the ERT learned that the system automatically terminates transactions by changing the status 'proposed' to 'terminated' when the ITL notifies the registry of a discrepancy with Kyoto rules. The ERT welcomed the efforts of the Russian Federation to put in place adequate procedures to ensure minimization of possible discrepancies, and to terminate transactions and correct the problems, with a final back-up of manual interference and adequate security measures for the national registry, including those made to prevent unauthorized manipulations and to prevent operator error (e.g. clear distribution of roles and responsibilities, field validation routines and user-authentication security with unique user IDs and passwords that are changed every 60 days). All these measures and procedures are integrated into state-of-the-art hardware and software located at a secure data centre.

185. The ERT noted that the national registry of the Russian Federation is supported by the Seringas™ software developed by the Caisse des Dépôts, France. For the installation of the national registry database the production infrastructure includes two dedicated servers (Proliant DL380G4) with five SCSI-discs. The capacity of the system is 72 Gb at each server, united into the RAID-5 block. One is the main server (production environment), while the second is the backup server. Data on the second server is updated through database copying from the first server to the second on a regular basis. Data backup is performed using the Log Shipping technology. Backup of data on magnetic tapes using an HP Ultrium 960 Tape Drive is executed daily. The ERT acknowledged the efforts made by the Russian Federation to put in place adequate infrastructure and qualified staff needed for the functioning of its national registry, and gained the overall impression that the Russian Federation attached adequate importance to, and allocated sufficient resources, including human resources, to the development, operation and maintenance of the registry.

Table 5. Summary of information on the national registry system

Reporting element	Provided in the initial report	Comments
Registry administrator		
Name and contact information	Yes	
Cooperation with other Parties in a consolidated system		
Names of other Parties with which the Russian Federation cooperates, or clarification that no such cooperation exists	Yes	The Russian Federation does not cooperate with other Parties in maintaining a consolidated system of national registries
Database structure and capacity of the national registry		
Description of the database structure	Yes	A description of the hardware and software configuration was provided in the initial report. The database structure was described in design documents that were made available to the ERT during the in-country review
Description of the capacity of the national registry	Yes	
Conformity with data exchange standards (DES)		
Description of how the national registry conforms to the technical DES between registry systems	Yes	Covered in the independent assessment report (IAR)[a]
Procedures for minimizing and handling of discrepancies		
Description of the procedures employed in the national registry to minimize discrepancies in the transaction of Kyoto Protocol units	No	Information provided during the in-country review
Description of the steps taken to terminate transactions where a discrepancy is notified and to correct problems in the event of a failure to terminate the transaction	No	Information provided during the in-country review
Prevention of unauthorized manipulations and operator error		
An overview of security measures employed in the national registry to prevent unauthorized manipulations and to prevent operator error	Yes	Covered in the IAR
An overview of how these measures are kept up to date	No	Information provided during the in-country review
User interface of the national registry		
A list of the information publicly accessible by means of the user interface to the national registry	No	Information provided during the in-country review and covered in the IAR
The Internet address of the interface to Russian Federation's national registry	Yes	<http://www.carbonunitsregistry.ru>
Integrity of data storage and recovery		
A description of measures taken to safeguard, maintain and recover data in order to ensure the integrity of data storage and the recovery of registry services in the event of a disaster	Yes	Covered in the IAR
Test results		
The results of any test procedures that might be available or developed with the aim of testing the performance, procedures and security measures of the national registry undertaken pursuant to the provisions of decision 19/CP.7 relating to the technical standards for data exchange between registry systems.	Yes	Test results covered in the IAR

[a] Pursuant to decision 16/CP.10, the administrator of the international transaction log (ITL), once registry systems become operational, is requested to facilitate an interactive exercise, including with experts from Parties to the Kyoto Protocol not included in Annex I to the Convention, demonstrating the functioning of the ITL with other registry systems. The results of this exercise will be included in an independent assessment report (IAR). They will also be included in the annual report to the Conference of the Parties serving as the Meeting of the Parties to the Kyoto Protocol.

186. The ERT took note of the results of the technical assessment of the national registry, including the results of standardized testing, as reported in the independent assessment report (IAR) that was forwarded to the ERT by the administrator of the international transaction log, pursuant to decision 16/CP.10, on 13 November 2007.

187. The ERT reiterated the main findings of this report, that the registry has fulfilled all of its obligations regarding conformity with the Data Exchange Standards. These obligations include having adequate transaction procedures, adequate security measures to prevent and resolve unauthorized manipulations and adequate measures for data storage and registry recovery.

188. Based on the results of the technical assessment, as reported in the IAR, the ERT concluded that the Russian Federation's national registry is fully compliant with the registry requirements as defined by decisions 13/CMP.1 and 5/CMP.1, noting that registries do not have obligations regarding operational performance or the public availability of information prior to the operational phase.

F. Land use, Land-use change and forestry parameters and election of activities

189. Table 6 shows the Russian Federation's choice of parameters for forest definition as well as elections for Article 3, paragraphs 3 and 4, activities in accordance with decision 16/CMP.1.

Table 6. Selection of LULUCF parameters

Parameters for forest definition		
Minimum tree cover	18 %	
Minimum land area	1.0 ha	
Minimum tree height	5 m	
Elections for Article 3, paragraphs 3 and 4, activities		
Article 3.3 activities	**Election**	**Accounting period**
Afforestation and reforestation	Mandatory	Annual
Deforestation	Mandatory	Annual
Article 3.4 activities		
Forest land management	Elected	Annual
Cropland management	Not elected	Not applicable
Grazing land management	Not elected	Not applicable
Revegetation	Not elected	Not applicable

190. The ERT noted that the Russian Federation reported in its initial report a minimum tree crown cover of 30 per cent for major forests, and 40 per cent for young forest (threshold values of stocking density). However, according to the relevant provisions, a single value must be selected. The ERT also noted that in its latest national report to the FAO,[7] the Russian Federation reported that stocked forest lands consist of closed stands of trees and bushes with relative crown density of more than 25 per cent. The above indicated values are inconsistent. In addition, no information is provided in the country report to the FAO concerning minimum land area and minimum tree height, which are relevant to the forest definition under the Kyoto Protocol. During the in-country review, the ERT learned that the Russian Federation does not in practice apply a crown closure threshold in its forest inventory, and instead uses a stock density value. The ERT recommended that the Russian Federation select a single minimum value for tree crown cover and requested the Russian Federation to provide an explanation of the differences

[7] Global Forest Resources Assessment. Russian Federation. Country report 053. 2005 available at: http://www.fao.org/forestry/webview/media?mediaId=8859&geoId=166.

between the forest definition historically reported to the FAO and the forest definition selected under the Kyoto Protocol, including the deviation from the selected crown cover threshold in relation to the information reported to FAO and, in cases where stock density is used, how the relationships between stock density and crown cover will be demonstrated; as well as why and how the elected minimum land area and tree height values were chosen.

191. After the in-country review, the Russian Federation provided further information on the election of forest parameters and confirmed that the stocking density was used as the measure of forest cover in the definition of forest included in the initial report because it is the basic parameter used in the national forest inventory and management practices. This information included a demonstrated statistical relationship between crown density and stocking density, and a historical application of forest parameters in the national forest inventory. Based on this information, the Russian Federation informed the ERT that in order to account for activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, the following single minimum values were selected by the Russian Federation for its definition of forest: the minimum crown cover is 18 per cent (equivalent to a minimum stocking density of 30 per cent), the minimum tree height at maturity is 5 m, and the minimum land area is 1 ha. The ERT agreed with the information provided by the Russian Federation. The ERT suggests that the Russian Federation in its next inventory report under the Kyoto Protocol add to this definition the minimum value of forest width of 20 m, which was selected and used for managed forests by the Russian Federation in its reporting of the LULUCF sector inventories under the Convention, as this is good practice.

192. In addition, after the in-country review, the Russian Federation informed the ERT that for the reporting to international organizations the mandatory values[8] of stocking density are recalculated to crown cover and, in the case of the last report to the FAO, the minimum stocking density value for the juvenile forest stands (40 per cent) was taken as a single and universal threshold of forest cover equivalent to a crown cover threshold of 25 per cent. The ERT notes that, according to this information, a higher than 18 per cent minimum crown density, that is, of 25 per cent (equivalent to a higher associated stocking density of 40 per cent), is used for "young" forests in the forest inventory practice. This means that areas where trees are "young" and where the crown density is between 18 and 25 per cent (i.e. stocking density is between 30 and 40 per cent) are not accounted as forests. Where these areas are a net sink, this approach yields an underestimation of removals, that is, a conservative estimate of net emissions. On the other hand, where these areas are a net source (including cases of deforestation), this approach may yield an underestimation of emissions. In order to avoid this underestimation, the definition of "forest management" and "deforestation", as required by the relevant provisions of the Kyoto Protocol, shall include information on how these cases are to be identified, and how potential underestimations of net emissions are to be avoided. Therefore, the ERT recommends the Russian Federation to include in its next inventory report under the Kyoto Protocol such detailed information.

193. The Russian Federation also informed the ERT that 1 hectare is set as the minimum value of forest stand unit area in table 2 of the Directive on the Forest Inventory (1995), and that, in order to maintain consistency with national practices of forest management, this value was included in the national definition of forest for the purposes of reporting under the Kyoto Protocol. Additionally, the yield tables developed and currently used for forest inventory and forest management practices (Uniform Forest Taxation Regulations, 1991) demonstrate that the height of forest stands in the Russian Federation at maturity is 5 m and higher. In order to maintain consistency with national forest management practice, this value was included in the national definition of forest.

194. In the initial report, how managed forests under Article 3, paragraph 4, of the Kyoto Protocol are to be differentiated from the rest of the forest in the land statistics, and how the volume stocks, or their changes, will be developed from available forest statistics is not transparently reported. The ERT also noted some inconsistencies in the reporting of forest areas in different sources (see paragraph 156

[8] Directive on the Forest Inventory, 1995 and Directive on the State Forest Fund Account, 1997.

above). The ERT encourages the Russian Federation to revise the forest land statistics, and to separately report on Article 3, paragraphs 3 and 4, of the Kyoto Protocol land use and land-use change categories.

III. Conclusions and recommendations

A. Conclusions

195. In the initial report, the Russian Federation submitted all the information in accordance with the relevant provisions of paragraphs 5, 6, 7 and 8 of the annex to decision 13/CMP.1, section I of the annex to decision 15/CMP.1, and the relevant decisions of the CMP. Additional information on all elements was provided to the ERT during and following the in-country review.

196. The Russian Federation's national system was not fully established and prepared in accordance with the guidelines for national systems under Article 5, paragraph 1, of the Kyoto Protocol (decision 19/CMP.1) and reported in accordance with the guidelines for the preparation of the information required under Article 7 of the Kyoto Protocol (decision 15/CMP.1). During the in-country review, the ERT asked the Russian Federation to provide additional information. After the in-country review, the Russian Federation provided the required additional information and the ERT concluded that the national system is fully in line with the guidelines for national systems, but needs to maintain and enhance its operational functions, such as flows of necessary data and information to the inventory agency, and needs to ensure that all formal procedures are implemented on a regular basis. Also, the ERT concluded that additional resources should be devoted to the inventory agency as improved funding seems essential to the timely submission of inventories of high quality in the future. The ERT noted that the Russian Federation provided timely and thorough replies to its questions concerning potential problems, following the ERT's recommendations and in line with the relevant reporting guidelines and CMP decisions.

197. The Russian Federation has provided its GHG inventory data for the base year (1990 for CO_2, CH_4, N_2O and 1995 for HFCs, PFCs and SF_6) and the years 1990 to 2004, including a full set of the CRF tables required with data on all relevant gases and an NIR. The Russian Federation's GHG inventory is generally accurate, as defined in the UNFCCC reporting guidelines, and is consistent with the Revised 1996 IPCC Guidelines and the IPCC good practice guidance. During the in-country review, the ERT identified a number of categories where the methods, AD or EFs used were not fully in accordance with the IPCC good practice guidance and might lead to overestimation of emissions in the base year or underestimation of emissions in the most recent years. The ERT recommended the Russian Federation to revise its estimates for these categories. After the in-country review, the Russian Federation provided revised estimates and additional information for these categories for the base year, 1990 and 2004 in accordance with the recommendations of the ERT and in line with the IPCC good practice guidance. For the industrial processes and waste sectors, a complete time series of revised CRF tables from 1990 to 2004 was submitted.

198. The ERT did not recommend any adjustments to the Russian Federation's GHG inventory, and noted that the assigned amount pursuant to Article 3, paragraphs 7 and 8, and the commitment period reserve, as calculated to incorporate the revised estimates submitted during the review, are in accordance with the modalities for the accounting of assigned amounts under Article 7, paragraph 4, of the Kyoto Protocol (decision 13/CMP.1) and paragraph 6 of the annex to decision 11/CMP.1, respectively.

199. The ERT confirms that the Russian Federation's assigned amount is 16,617,095,319 tonnes CO_2 eq. based on its base year emissions (3,323,419.064 Gg CO_2 eq., including the revised estimates provided) and its Kyoto Protocol emission limitation commitment of 100 per cent, and that the Russian Federation's commitment period reserve is 10,629,794,715 tonnes CO_2 eq. based on its 2004 emissions (2,125,958.943 Gg CO_2 eq., including the revised estimates provided). The ERT agrees with these figures.

200. The Russian Federation has provided all the required information on parameters and elections for LULUCF under Article 3, paragraphs 3 and 4, of the Kyoto Protocol in accordance with decision 16/CMP.1. This includes minimum tree crown cover of 18 per cent, minimum land area of 1.0 ha and minimum tree height of 5 m. The Russian Federation has chosen to account for forest management under Article 3, paragraph 4, activities and has chosen to account for Article 3, paragraphs 3 and 4, activities annually. During the in-country review, the ERT identified some questions for clarification on the parameters and elections for LULUCF chosen by the Russian Federation. After the in-country review, the Russian Federation provided the ERT with additional information and clarifications, which the ERT considers adequate. In addition, the ERT noted that the Russian Federation applied approach 1 of the IPCC good practice guidance for LULUCF for land identification and learned that the current national land statistics used for the GHG inventory are not going to allow for the disaggregation of the land use and land-use change categories (e.g. afforestation, deforestation under Article 3, paragraph 3) that are needed for a transparent GHG inventory of the LULUCF sector. The ERT notes that the application of IPCC approach 2 is a minimum requirement for reporting on land under the Kyoto Protocol.

201. The Russian Federation has provided practically all the information on the national registry system required by the reporting guidelines under Article 7, paragraphs 1 and 2, of the Kyoto Protocol (decision 15/CMP.1). During the in-country review, the ERT was provided with additional and updated information on the national registry. The information provided is transparent and in accordance with these guidelines.

202. During the in-country review, the registry was still not operational, but the initialization process of the national registry was under way and was completed on 7 November 2007. Based on the results of the technical assessment, as reported in the IAR, the ERT concluded that the Russian Federation's national registry is fully compliant with the registry requirements as defined by decisions 13/CMP.1 and 5/CMP.1.

B. Recommendations

203. In the course of the review, the ERT formulated a number of recommendations relating to the completeness, consistency, accuracy and transparency of the information presented by the Russian Federation in its initial report. Most of the recommendations were implemented during the review process, including those relating to the national system and parameters and elections for LULUCF. The potential problems that could have led to an overestimation of emissions in the base year have also been resolved. The key remaining recommendations[9] are that the Russian Federation should:

(a) Maintain and enhance the operational functions of its national system, such as flows of necessary data and information to the inventory agency and implementation of the mandatory QA/QC procedures, as outlined in the information provided in the initial report and during and after the in-country review, and ensure that all formal procedures are implemented on a regular basis and in accordance with the guidelines for national systems (decision 19/CMP.1);

(b) Provide a timely annual submission of the NIR and the CRF;

(c) Fully implement the IPCC good practice guidance;

(d) Include private and semi-private entities in the national system where plant-specific data increases the accuracy of the inventory estimates;

(e) Include in its next submission updated information on the national system, covering the information that was provided to the ERT during the review and reflecting the

[9] For a complete list of recommendations, the relevant sections of this report should be consulted.

improvements made and planned, for example, with respect to QA/QC activities, archiving procedures, key category analyses, and the completeness, consistency and transparency of the inventory.

204. The ERT identified the following recommendations relating to the Russian Federation's GHG inventory submission that it believes should be considered in the course of future reviews. The key recommendations[10] are that the Russian Federation should:

(a) Make the necessary efforts to provide data and emissions estimates for all sectors, categories and gases that have not been estimated, in particular the missing estimates for the energy sector and emissions from all stages of the use of ozone depleting substances (ODS) substitutes;

(b) Provide a transparent and comprehensive NIR describing and reporting all calculation methodologies, AD used, EFs and other parameters for all sectors of the inventory, in particular for the energy sector;

(c) Provide complete CRF tables with correct use of notation keys where all relevant categories are estimated at an appropriate level of disaggregation;

(d) Fully implement the QA/QC management system and develop an inventory improvement plan as part of the QA/QC procedures;

(e) Improve the resources and QA/QC procedures for the national energy balance and ensure access to the national balance for the ERTs;

(f) Provide quantified uncertainty estimates for all sectors taking into account national circumstances and existing data gaps and use these to prioritize inventory improvements;

(g) Improve the data on fuel consumption in the different categories, in particular with regard to the method for splitting jet kerosene consumption between international and domestic air traffic, and base its estimations on the recommendations of the IPCC good practice guidance;

(h) Reconcile its national level definitions with those of the IPCC good practice guidance for LULUCF, develop a consistent land representation, report separately on all the mandatory land conversion categories and apply the IPCC approach 2 (probably in combination with approach 3) as this is a minimum requirement for reporting on land under the Kyoto Protocol;

(i) Complete the archiving system with relevant data and link it with the emissions estimations;

(j) Report, document and describe transparently the information on recalculations in the CRF tables and in the NIR.

C. Questions of implementation

205. No questions of implementation were identified by the ERT during the initial review.

[10] For a complete list of recommendations, the relevant sections of this report should be consulted.

Annex I

Documents and information used during the review

A. Reference documents

IPCC. Good practice guidance and uncertainty management in national greenhouse gas inventories, 2000. Available at: <http://www.ipcc-nggip.iges.or.jp/public/gp/english/>.

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UNFCCC secretariat. Russian Federation: Independent assessment report of the national registry of the Russian Federation. Reg_IAR_RUS_2007_1. Will be available at: <www.unfccc.int>.

B. Additional information provided by the Party

Responses to questions during the review were received from Mr. Alexander Nakhutin (Institute of Global Climate and Ecology) including additional material on the methodology and assumptions used as included in the sectoral parts of this overview.

References for cross-cutting issues

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Annex II

Acronyms and abbreviations

AD	activity data
CH_4	methane
CO_2	carbon dioxide
CO_2 eq.	carbon dioxide equivalent
CRF	common reporting format
EIT	economy in transition
EF	emission factor
ERT	expert review team
EU	European Union
F-gas	fluorinated gas
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)
GWP	global warming potential
HFCs	hydrofluorocarbons
IEA	International Energy Agency
IPCC	Intergovernmental Panel on Climate Change
kg	kilogram (1 kg = 1 thousand grams)
kgoe	kilograms of oil equivalent
LULUCF	land use, land-use change and forestry
m^3	cubic metre
Mg	megagram (1 Mg = 1 tonne)
Mt	million tonnes
Mtoe	millions of tonnes of oil equivalent
NA	not applicable
N_2O	nitrous oxide
NIR	national inventory report
PFCs	perfluorocarbons
PJ	petajoule (1 PJ = 10^{15} joule)
QA/QC	quality assurance/quality control
SF_6	sulphur hexafluoride
SO_2	sulphur dioxide
Tg	teragram (1 Tg = 1 million tonnes)
TJ	terajoule (1 TJ = 10^{12} joule
UNFCCC	United Nations Framework Convention on Climate Change

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