**Advance Version**

**COMPLIANCE COMMITTEE** **CC/ERT/ARR/2011/18**
**19 April 2011**

# Report of the individual review of the annual submission of the Russian Federation submitted in 2010

**Note by the secretariat**

The report of the individual review of the annual submission of the Russian Federation submitted in 2010 was published on 18 April 2011. For purposes of rule 10, paragraph 2, of the rules of procedure of the Compliance Committee (annex to decision 4/CMP.2, as amended by decision 4/CMP.4), the report is considered received by the secretariat on the same date. This report, FCCC/ARR/2010/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 individual review of the annual submission of the Russian Federation submitted in 2010*

* In the symbol for this document, 2010 refers to the year in which the inventory was submitted, and not to the year of publication.

# Contents

# I. Introduction and summary

1. This report covers the in-country review of the 2010 annual submission of the Russian Federation, coordinated by the UNFCCC secretariat, in accordance with decision 22/CMP.1. The review took place from 27 September to 2 October 2010 in Moscow, Russian Federation, and was conducted by the following team of nominated experts from the UNFCCC roster of experts: generalist – Mr. Bernd Gugele (European Union); energy – Mr. Ole-Kenneth Nielsen (Denmark); industrial processes – Mr. Marius Țăranu (Republic of Moldova); agriculture – Ms. Britta Hoem (Norway); land use, land-use change and forestry (LULUCF) – Ms. Ana Blondel (Canada) and Mr. Sandro Federici (San Marino); and waste – Ms. Jamsranjav Baasansuren (Mongolia). Mr. Gugele and Mr. Țăranu were the lead reviewers. The review was coordinated by Mr. Harald Diaz-Bone, Mr. Javier Hanna, Ms. Inkar Kadyrzhanova and Ms. Maria Sanz-Sanchez (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, into this final version of the report.

3. In 2008, the main greenhouse gas (GHG) in the Russian Federation was carbon dioxide ($CO_2$), accounting for 72.1 per cent of total GHG emissions[1] expressed in carbon dioxide equivalent ($CO_2$ eq), followed by methane ($CH_4$) (22.0 per cent) and nitrous oxide ($N_2O$) (5.1 per cent). Hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride ($SF_6$) collectively accounted for 0.8 per cent of the overall GHG emissions in the country. The energy sector accounted for 82.2 per cent of total GHG emissions, followed by the industrial processes sector (8.1 per cent), the agriculture sector (6.4 per cent), the waste sector (3.2 per cent) and the solvent and other product use sector (0.02 per cent). Total GHG emissions amounted to 2,239,953.04 Gg $CO_2$ eq in 2008 and decreased by 32.6 per cent between the base year[2] and 2008. The trend is reasonable and reflects the structural and economic changes that have taken place since the break-up of the Soviet Union in the early 1990s.

4. Tables 1 and 2 show GHG emissions from Annex A sources, emissions and removals from the LULUCF sector under the Convention and emissions and removals from activities under Article 3, paragraph 3, and, if any, Article 3, paragraph 4, of the Kyoto Protocol (KP-LULUCF), by gas and by sector, respectively. In table 1, $CO_2$, $CH_4$ and $N_2O$ emissions included in the rows under Annex A sources do not include emissions and removals from the LULUCF sector.

5. Table 3 provides information on the most important emissions and removals and accounting parameters that will be included in the compilation and accounting database.

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

[2] "Base year" refers to the base year under the Kyoto Protocol, which is 1990 for $CO_2$, $CH_4$ and $N_2O$, and 1995 for HFCs, PFCs and $SF_6$. The base year emissions include emissions from Annex A sources only.

Table 1

**Greenhouse gas emissions from Annex A sources and emissions/removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, by gas, base year to 2008**[a]

| | | | *Gg $CO_2$ eq* | | | | | | | *Change* |
|---|---|---|---|---|---|---|---|---|---|---|
| | | *Greenhouse gas* | *Base year*[a] | *1990* | *1995* | *2000* | *2005* | *2006* | *2007* | *2008* | *Base year–2008 (%)* |
| Annex A sources | | $CO_2$ | 2 499 929.26 | 2 499 929.26 | 1 571 220.11 | 1 471 607.83 | 1 526 358.80 | 1 583 283.03 | 1 580 506.02 | 1 615 368.83 | –35.4 |
| | | $CH_4$ | 584 446.24 | 584 446.24 | 453 612.49 | 431 027.21 | 474 098.87 | 485 769.29 | 490 311.86 | 493 623.55 | –15.5 |
| | | $N_2O$ | 226 949.07 | 226 949.07 | 144 502.88 | 110 564.13 | 105 607.11 | 104 838.17 | 108 079.19 | 113 599.12 | –49.9 |
| | | HFCs | 7 080.80 | 15 084.86 | 7 080.80 | 12 996.84 | 13 879.49 | 14 060.25 | 14 047.17 | 12 668.76 | 78.9 |
| | | PFCs | 4 556.09 | 4 369.32 | 4 556.09 | 5 569.92 | 4 144.19 | 4 184.01 | 3 798.36 | 4 115.69 | –9.7 |
| | | $SF_6$ | 96.15 | 217.65 | 96.15 | 168.90 | 716.88 | 999.19 | 715.79 | 577.09 | 500.2 |
| KP-LULUCF | Article 3.3[b] | $CO_2$ | | | | | | | | 22 285.00 | |
| | | $CH_4$ | | | | | | | | 124.47 | |
| | | $N_2O$ | | | | | | | | 104.16 | |
| | Article 3.4[c] | $CO_2$ | NA | | | | | | | –498 185.14 | NA |
| | | $CH_4$ | NA | | | | | | | 19 332.63 | NA |
| | | $N_2O$ | NA | | | | | | | 16 383.50 | NA |

*Abbreviations*: KP-LULUCF = land use, land-use change and forestry emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, NA = not applicable.

[a] "Base year" for Annex A sources refers to the base year under the Kyoto Protocol, which is 1990 for $CO_2$, $CH_4$ and $N_2O$, and 1995 for HFCs, PFCs and $SF_6$. The "base year" for activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol is 1990.

[b] Activities under Article 3, paragraph 3, of the Kyoto Protocol, namely afforestation and reforestation, and deforestation. Only the inventory years of the commitment period must be reported.

[c] Elected activities under Article 3, paragraph 4, of the Kyoto Protocol, including forest management, cropland management, grazing land management and revegetation. For cropland management, grazing land management and revegetation the base year and the inventory years of the commitment period must be reported.

Table 2

**Greenhouse gas emissions by sector and activity, base year to 2008**

| | | | *Gg $CO_2$ eq* | | | | | | | | *Change* |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | *Sector* | *Base year*[a] | *1990* | *1995* | *2000* | *2005* | *2006* | *2007* | *2008* | *Base year–2008 (%)* |
| Annex A | | Energy | 2 715 644.86 | 2 715 644.86 | 1 775 446.27 | 1 667 181.99 | 1 741 200.39 | 1 798 742.92 | 1 793 706.07 | 1 841 158.90 | –32.2 |
| | | Industrial processes | 229 123.65 | 237 062.44 | 143 773.74 | 158 064.53 | 178 453.80 | 189 844.52 | 193 500.30 | 181 869.38 | –20.6 |
| | | Solvent and other product use | 561.61 | 561.61 | 511.68 | 522.89 | 531.90 | 531.96 | 541.40 | 543.67 | –3.2 |
| | | Agriculture | 318 912.07 | 318 912.07 | 210 949.65 | 149 535.37 | 137 646.50 | 134 659.52 | 138 451.19 | 144 092.10 | –54.8 |
| | | Waste | 58 815.42 | 58 815.42 | 50 387.18 | 56 630.06 | 66 972.76 | 69 355.01 | 71 259.43 | 72 288.98 | 22.9 |
| | | Other | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| | | LULUCF | NA | 63 693.79 | –235 152.86 | –458 115.13 | –518 715.25 | –549 538.39 | –545 536.99 | –638 342.63 | NA |
| | | **Total (with LULUCF)** | **NA** | **3 394 690.18** | **1 945 915.66** | **1 573 819.70** | **1 606 090.10** | **1 643 595.55** | **1 651 921.40** | **1 601 610.41** | **NA** |
| | | **Total (without LULUCF)** | **3 323 057.61** | **3 330 996.40** | **2 181 068.52** | **2 031 934.83** | **2 124 805.35** | **2 193 133.93** | **2 197 458.39** | **2 239 953.04** | **–32.6** |
| KP-LULUCF | Article 3.3[b] | Afforestation & reforestation | | | | | | | | –4 093.68 | |
| | | Deforestation | | | | | | | | 26 607.31 | |
| | | **Total (Art. 3.3)** | | | | | | | | **22 513.62** | |
| | Article 3.4[c] | Forest management | | | | | | | | –462 469.01 | |
| | | Cropland management | NA | | | | | | | NA | NA |
| | | Grazing land management | NA | | | | | | | NA | NA |
| | | Revegetation | NA | | | | | | | NA | NA |
| | | **Total (Art. 3.4)** | **NA** | | | | | | | **–462 469.01** | **NA** |

*Abbreviations*: LULUCF = land use, land-use change and forestry, KP-LULUCF = LULUCF emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, NA = not applicable.

[a] "Base year" for Annex A sources refers to the base year under the Kyoto Protocol, which is 1990 for $CO_2$, $CH_4$ and $N_2O$, and 1995 for HFCs, PFCs and $SF_6$. The "base year" for activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol is 1990.

[b] Activities under Article 3, paragraph 3, of the Kyoto Protocol, namely afforestation and reforestation, and deforestation. Only the inventory years of the commitment period must be reported.

[c] Elected activities under Article 3, paragraph 4, of the Kyoto Protocol, including forest management, cropland management, grazing land management and revegetation. For cropland management, grazing land management and revegetation the base year and the inventory years of the commitment period must be reported.

Table 3
**Information to be included in the compilation and accounting database, in t $CO_2$ eq**

| | *As reported* | *Adjustment*[a] | *Final*[b] | *Accounting quantity*[c] |
|---|---|---|---|---|
| **Commitment period reserve** | 11 147 825 745 | | 11 199 765 202 | |
| **Annex A emissions for current inventory year** | | | | |
| $CO_2$ | 1 615 116 822 | | 1 615 368 827 | |
| $CH_4$ | 486 151 852 | | 493 623 554 | |
| $N_2O$ | 111 051 934 | | 113 599 118 | |
| HFCs | 12 551 765 | | 12 668 765 | |
| PFCs | 4 115 691 | | 4 115 691 | |
| $SF_6$ | 577 085 | | 577 085 | |
| **Total Annex A sources** | **2 229 565 149** | | **2 239 953 040** | |
| **Activities under Article 3, paragraph 3, for current inventory year** | | | | |
| 3.3 Afforestation and reforestation on non-arvested land for current year of commitment eriod as reported | –6 451 211 | | –4 093 685 | –4 093 685 |
| 3.3 Afforestation and reforestation on harvested land for current year of commitment period as reported | NA | | NA | 0 |
| 3.3 Deforestation for current year of ommitment period as reported | 398 310 | | 26 607 307 | 26 607 307 |
| **Activities under Article 3, paragraph 4, for current inventory year**[d] | | | | |
| 3.4 Forest management for current year of commitment period | –428 117 571 | | –462 469 007 | –462 469 007 |
| 3.4 Cropland management for current year of commitment period | | | | |
| 3.4 Cropland management for base year | | | | |
| 3.4 Grazing land management for current year of commitment period | | | | |
| 3.4 Grazing land management for base year | | | | |
| 3.4 Revegetation for current year of commitment period | | | | |
| 3.4 Revegetation in base year | | | | |

*Abbreviations*: NA = not applicable.

[a] "Adjustment" is relevant only for Parties for which the expert review team (ERT) has calculated one or several adjustment(s).

[b] "Final" includes revised estimates, if any, and/or adjustments, if any.

[c] "Accounting quantity" is included in this table only for Parties that chose annual accounting for activities under Article 3, paragraph 3, and elected activities under Article 3, paragraph 4, if any.

[d] Activities under Article 3, paragraph 4, are relevant only for Parties that elected one or more such activities.

6. The GHG inventory is generally in line with the *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the Revised 1996 IPCC Guidelines) and the Intergovernmental Panel on Climate Change (IPCC) *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories* (hereinafter referred to as the IPCC good practice guidance) and the IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry* (hereinafter referred to as the IPCC good practice guidance for LULUCF). The 2010 inventory submission is generally of a high quality and shows significant improvement in the major issues compared to the previous submission (e.g. recalculations in the LULUCF sector). However, the expert review team (ERT) identified a need for further improvements, in particular the further development of country-specific emission factors (EFs) and other parameters (e.g. in the energy sector) in order to move to higher-tier methods. Other improvements needed are reflected in the recommendations.

7. The Russian Federation carried out major improvements to its GHG inventory during the review by revising LULUCF estimates and by providing revised estimates in the energy, industrial processes, LULUCF and waste sectors in order to prevent the underestimation of emissions. Also, the KP-LULUCF submission was significantly revised. The overall impact of these revised estimates on total GHG emissions in 2008 was an increase by 10,387.89 Gg $CO_2$ eq or 0.5 per cent.

8. By submitting the revised inventories and by supplying the additional information requested by the ERT, the Russian Federation has demonstrated sufficient capacity to comply with the "Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual inventories" (hereinafter referred to as the UNFCCC reporting guidelines), the IPCC good practice guidance and the IPCC good practice guidance for LULUCF.

9. The Party has submitted supplementary information required under Article 7, paragraph 1, of the Kyoto Protocol in accordance with chapter I of the annex to decision 15/CMP.1.

10. The Russian Federation has chosen to account for activities under Article 3, paragraph 3, of the Kyoto Protocol annually. The Russian Federation has elected forest management under Article 3, paragraph 4, of the Kyoto Protocol and has chosen annual accounting. The Russian Federation has reported information on activities under Article 3, paragraph 3, of the Kyoto Protocol and elected activities under Article 3, paragraph 4, of the Kyoto Protocol in accordance with decisions 15/CMP.1, 16/CMP.1 and 6/CMP.3. The Party provided substantial revised estimates during the review, which significantly improved the accuracy of the inventory.

11. The Russian Federation has reported information on its accounting of Kyoto Protocol units in accordance with chapter I.E of the annex to decision 15/CMP.1, and has used the standard electronic format (SEF) tables as required by decision 14/CMP.1.

12. The national system continues to perform its required functions as set out in the annex to decision 19/CMP.1. The ERT commends the Party for having developed an inventory improvement plan. However, the ERT also reiterates the recommendations from previous ERTs that the Party review the elements of its national system in order to enable the timely submission of the national inventory report (NIR) and that the Party strengthen its quality assurance/quality control (QA/QC) procedures.

13. The national registry continues to perform the functions set out in the annex to decision 13/CMP.1 and the annex to decision 5/CMP.1, and continues to adhere to the technical standards for data exchange between registry systems in accordance with relevant decisions of the Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol (CMP).

14. The Russian Federation has reported information on the minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol, as requested in chapter I.H of the annex to decision 15/CMP.1, in a revised version of its NIR submitted on 2 July 2010. This is after 15 April, which is the deadline for annual submissions.

15. In the course of the review, the ERT formulated a number of recommendations relating to:

(a) Timeliness: to enable the timely submission of the inventory (see paras. 16 and 17 below);

(b) Accuracy: the further development of country-specific EFs and other parameters (e.g. in the energy sector) (see paras. 57, 58 and 60 below);

(c) Transparency: the provision of more detailed information on activity data (AD), methods, EFs and other parameters used, in particular for the energy (see paras. 46 and 47 below), LULUCF (see para. 107 below) and waste sectors (see para. 126 below);

(d) The improvement of the explanations for the recalculations in the industrial processes (see para. 73 below) and waste sectors (see para. 127 below);

(e) Uncertainty estimates: ensuring that changes in methods, EFs and AD are reflected in the uncertainty estimates (see para. 31 below);

(f) Strengthening QA/QC procedures (see paras. 35 and 36 below).

# II. Technical assessment of the annual submission

## A. Overview

### 1. Annual submission and other sources of information

16. The 2010 common reporting format (CRF) tables were submitted on 15 April 2010; on 25 May 2010 the Party resubmitted the CRF tables and submitted the NIR; and on 2 July 2010 the NIR was resubmitted with information under Article 3, paragraph 14, of the Kyoto Protocol. The inventory submission contains a complete set of CRF tables for the period 1990–2008. The Russian Federation also submitted information required under Article 7, paragraph 1, of the Kyoto Protocol, including information on: activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, accounting of Kyoto Protocol units, changes in the national system and in the national registry, and adverse impacts under Article 3, paragraph 14, of the Kyoto Protocol. The SEF tables were submitted on 15 April 2010. The annual submission was submitted generally in accordance with decision 15/CMP.1.

17. The ERT noted that in 2009 and 2010 the Russian Federation submitted its CRF by the deadline of 15 April but that the NIR was submitted later (14 May 2009 and 25 May 2010, respectively) which is within the six-week period as stated in decision 15/CMP.1. Although, under decision 15/CMP.1, there is a six-week period before any consequences resulting from a late submission come into effect, the ERT recommends that the Russian Federation submit its next inventory by 15 April 2011, including both CRF tables and an NIR. Further, the ERT recommends that the Russian Federation review the elements of its national system that would enable the timely submission of its annual inventory.

18. The Russian Federation officially submitted revised emission estimates, including KP-LULUCF estimates, on 13 November 2010 in response to questions raised by the ERT during the course of the review. The values in this report are based on the submission of 13 November 2010.

19. In addition, the ERT used the standard independent assessment report (SIAR), parts I and II, to review information on the accounting of Kyoto Protocol units (including the SEF tables and their comparison report) and on the national registry.[3]

20. During the review, the Russian Federation provided the ERT with additional information. The documents concerned are not part of the annual submission but are in many cases referenced in the NIR. The full list of materials used during the review is provided in annex I to this report.

Completeness of inventory

21. The inventory is largely complete in terms of years (1990–2008), sectors, categories, gases and geographical coverage. The CRF tables are complete, with the exception of CRF table 8(b) and some gaps in CRF table 9 (explanations have not been provided for all the categories reported as not estimated ("NE")). During the review, the ERT was informed that CRF table 8(b) is empty due to a problem related to the use of the CRF Reporter software. The ERT noted that some very small emission sources are reported as "NE" either because of a lack of data or because the Revised 1996 IPCC Guidelines and the IPCC good practice guidance do not provide a methodology. Categories reported as "NE" where the Revised 1996 IPCC Guidelines and the IPCC good practice guidance do provide methodologies were identified by the ERT in the industrial processes sector ($CH_4$ from other (chemical industry) (see para. 80 below), $CO_2$ from silicon metal production (see para. 81 below), and HFC-134a from aerosols/metered dose inhalers (see para. 83 below); estimates were subsequently provided by the Party in response to the list of potential problems and further questions formulated by the ERT during the in-country review (hereinafter referred to as the list of potential problems). In addition, in response to the list of potential problems, the Russian Federation also provided estimates for $CH_4$ emissions from unmanaged waste disposal sites which were previously reported as not occurring ("NO") (see para. 125 below). The ERT commends the Russian Federation for reporting $CH_4$ and $N_2O$ emissions from the use of blast furnace gas and emissions from organic soils under the forest land category in the 2010 annual submission as well as potential fluorinated gas (F-gas) emissions. The ERT recommends that the Russian Federation improve the completeness of its annual submission and provide complete information in CRF tables 8(b) and 9(a).

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

Overview

22. The ERT concluded that the national system continues to perform its required functions. The Russian Federation has put in place all mandatory requirements for a national system under Article 5, paragraph 1, of the Kyoto Protocol. The institutional arrangements are described in the NIR. During the review, the Russian Federation further clarified the institutional arrangements, including the process for official approval of the inventory, which is not described in the NIR. In response to the recommendations of the

[3] The SIAR, parts I and II, is prepared by an independent assessor in line with decision 16/CP.10 (paras. 5(a), 6(c) and 6(k)), under the auspices of the international transaction log administrator using procedures agreed in the Registry System Administrators Forum. Part I is a completeness check of the submitted information relating to the accounting of Kyoto Protocol units (including the SEF tables and their comparison report) and to national registries. Part II contains a substantive assessment of the submitted information and identifies any potential problem regarding information on the accounting of Kyoto Protocol units and the national registry.

previous ERT, the Party has prepared an inventory improvement plan; the procedure for its development was explained to the ERT during the review.

23. In the NIR, the Party reported that no changes have been made to its national system since the previous annual submission.

Inventory planning

24. During the review, the Russian Federation explained the national system for the preparation of the inventory. The Roshydromet has overall responsibility for the national inventory. The Institute of Global Climate and Ecology (IGCE) of Roshydromet and the Russian Academy of Science have responsibility for the preparation and management of the national inventory. Some parts of the management, such as the official contacts, requests for and receipts of information and obtaining approval from the government for submission, are the responsibility of Roshydromet. It collects the necessary data, performs the calculations and compiles the NIR and the CRF tables. The national system also encompasses the Russian Federal Service for State Statistics (Rosstat), other agencies that provide data and the relevant government ministries, which provide support by, for example, reviewing the NIR every year.

25. As part of the QA/QC plan, IGCE has prepared an annual timetable for the preparation of the inventory. During the review, the ERT was informed that the deadlines in the plan are not always met. The main problems in the timing arise from the late receipt of data, in particular energy balance data, and delays in the approval procedures. The ERT noted that the NIR was submitted after the due date of 15 April 2010, but within six weeks of that date, while supplementary information on Article 3, paragraph 14, of the Kyoto Protocol was submitted on 2 July 2010; therefore, it recommends that the Russian Federation intensify its efforts to provide timely annual submissions.

26. The inventory team consists of about 10 experts at IGCE and one external expert, who also have additional responsibilities, such as providing support to climate change negotiations or participating in related research activities. The experts at IGCE spend approximately two thirds of their time working on the GHG inventory. The sectoral experts within the team are responsible for the calculations and development of methodologies for their respective sectors under the supervision of their head of department. Each year, these experts discuss possible inventory improvements and their implementation with the inventory manager and the inventory team when the new inventory cycle starts.

27. An improvement plan was provided to the ERT during the review week. It is mainly based on the findings of the ERT's review reports, but the results of the key category analysis and the uncertainty analysis also feed into the improvement plan. The plan is drafted by IGCE as soon as the results of the ERT's review are available and adopted by Roshydromet. Throughout the year, meetings are held at which the implementation of the inventory improvements is discussed, but there is no final evaluation if the improvements have been implemented. The ERT recommends that the Party evaluate the implementation of the inventory improvement plan on a regular basis and document this evaluation in the documentation files.

28. Rosstat and other agencies prepare comprehensive statistics in several areas for all sectors; these are used in the inventory preparation process. The statistical data are usually published at a national level; regional data are also available in many cases. The inventory team does not, in most cases, use or have access to disaggregated data such as land-area data at the local level or agricultural management data for each climatic region. As the area of the country is so large, covering a number of climatic regions and conditions, the ERT reiterates the encouragement of the previous ERT that the Russian Federation explore ways to use more disaggregated data in the inventory in areas where this could have an impact on

the accuracy of the emission or removal estimates (e.g. data for the agriculture sector and data on land-use changes for reporting under Article 3, paragraphs 3 and 4, of the Kyoto Protocol).

Inventory preparation

*Key categories*

29. The Russian Federation has reported a key category tier 1 analysis, both level and trend assessments, as part of its 2010 submission. The key category analysis performed by the Party and that performed by the secretariat[4] produced similar results; remaining differences are due to different category splits. The Russian Federation has included the LULUCF sector in its key category analysis. The key category analysis was performed in accordance with the IPCC good practice guidance and the IPCC good practice guidance for LULUCF. In response to a recommendation of the previous ERT, one list of key categories was included in the NIR and additional categories were identified as key by adding the categories approaching the key categories (next largest in terms of emissions). The results of the key category analysis are a driving factor for the preparation of the inventory, particularly in the prioritization of resources and methodological complexity. In order to further improve the usefulness of the key category analysis in improving the accuracy of the estimates, the ERT encourages the Party to prepare a tier 2 key category analysis or to at least use the uncertainty estimates as one criterion for the qualitative key category analysis.

30. The Russian Federation has identified key categories for activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol. The key category identified by the Party is forest management.

*Uncertainties*

31. The Russian Federation provided a tier 1 uncertainty analysis; some uncertainty estimates reported in the NIR for the agriculture sector are the result of a tier 2 analysis. There are large differences in the uncertainty estimates compared to the 2009 annual submission, which are not explained in the NIR. The overall uncertainty in the 2010 submission was 9.0 per cent for the latest inventory year (compared to 40.3 per cent in the 2009 submission) and 6.3 per cent for the trend uncertainty (compared to 14.9 per cent in the 2009 submission). It is also not clear if the uncertainties in annex 5 to the NIR are expressed in standard deviations or if the 95 per cent confidence interval has been used; it is therefore not clear if the uncertainties are generally appropriate and in line with the UNFCCC reporting guidelines and the IPCC good practice guidance. In addition, the uncertainty estimates do not always reflect the changes in the methods (e.g. in the LULUCF and waste sectors). The Russian Federation informed the ERT during the review that it uses the results of the uncertainty analysis to prioritize inventory improvements. The ERT recommends that the Russian Federation: provide, in the next NIR, reasons for the large differences in uncertainty estimates compared to previous submissions; ensure that the 95 per cent confidence interval is used for all uncertainty estimates; and ensure that changes in methods, EFs and AD are reflected in the uncertainty estimates.

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

*Recalculations and time-series consistency*

32. Recalculations have been performed in the 2010 submission in accordance with the IPCC good practice guidance and have, in most cases, led to real improvements in the accuracy of the inventory. The ERT noted that recalculations reported by the Party of the time series 1990–2007 have been undertaken to take into account changes in data and methods in all sectors. The effect of the recalculations on the estimates of total emissions excluding the LULUCF sector is a 0.4 per cent increase in the emission estimates for 1990 and a 0.2 per cent increase in the emission estimates for 2007. The effect of the recalculations on the estimates of total emissions including the LULUCF sector is a 1.0 per cent increase in 1990 and a 17.6 per cent decrease in 2007. The major changes are attributable to methodological changes in the LULUCF sector in the forest land and grassland categories. The changes in the industrial processes sector (e.g. the estimate of PFC emissions from aluminium production has decreased by approximately 70 per cent for the whole time series due to the shift from a tier 1 to a tier 2 method) and in the waste sector (e.g. the estimate of $CH_4$ emissions from solid waste disposal on land has increased by approximately 15 per cent for the whole time series due to an update of the degradable organic carbon content from municipal solid waste (MSW)) are significant for the individual categories concerned but minor in terms of their impact on the total GHG emissions.

33. The rationale for the recalculations is generally provided in the sector chapters of the NIR but not in CRF table 8(b). The level of detail given in explaining the rationale for the recalculations and also in justifying the new estimates varies in different sections of the NIR; improvement is needed in particular in the industrial processes and waste sectors. A summary of the quantitative effects of the recalculations is given in NIR chapter 9 "Recalculations and improvements", but the main reasons for the recalculations are not provided. The ERT recommends that the Russian Federation complete and improve the information on recalculations in the NIR and the CRF tables in its next annual submission and, in particular, that the Party provide the main explanations in NIR chapter 9 and in CRF table 8(b).

34. In general, the Russian Federation's emission estimates are time-series consistent, although there are a few examples of time-series inconsistency in the energy (see paras. 48 and 49), agriculture (see para. 95) and LULUCF sectors (see para. 109). The ERT recommends that the Russian Federation improve the time-series consistency for these cases.

*Verification and quality assurance/quality control approaches*

35. The Russian Federation has developed a QA/QC plan, which is not included in the NIR but was provided to the ERT during the review. The plan includes a timetable for the QA/QC procedures, descriptions of the quality checks and checklists of the tier 1 QC checks. Some tier 2 QC checks are also undertaken (e.g. a comparison with other data, in particular in the agriculture and LULUCF sectors). However, these checks are not systematically undertaken and the results are not always documented in the archive or in the NIR. In addition, QC checks of the NIR are performed by Rosstat and the ministries involved in the national system. The Party is planning to extend these checks to other organizations and agencies. The ERT was informed that only the NIR is reviewed by external institutions (not the CRF). The ERT commends the Russian Federation for the implementation of the QA/QC procedures. However, the ERT reiterates the recommendation of the previous review report that the Russian Federation include data sources, calculations (including assumptions used) and CRF tables, as relevant, in the material to be reviewed by external institutions and experts. In addition, the ERT recommends that the Party implement tier 2 QC procedures on a systematic basis and

document the results of these checks in the documentation file. Finally, the ERT reiterates the recommendation of the previous review report that the Russian Federation include the QA/QC plan in its next annual submission and provide more detailed descriptions of the results of the QA/QC procedures in the NIR to build further confidence in the implementation of its QA/QC procedures.

36. Tier 2 QA procedures (independent reviews) have been carried out in the past (e.g. Gazprom reviewed the fugitive emissions, the Centre for Energy Efficiency reviewed emissions from stationary combustion and the Centre for Automobile Transport reviewed emissions from transport). However, such reviews were not carried out in 2009 and 2010 because of a lack of resources. The ERT encourages the Party to enhance its collaboration with external experts, including through peer review and validation and verification.

*Transparency*

37. The NIR provides much of the information necessary to assess the inventory data. However, additional information needs to be provided in order to improve the transparency of the NIR, in particular: the provision of detailed fuel consumption data from the energy balance; the provision of more detailed descriptions of AD, methods, EFs and other parameters used in the LULUCF and waste sectors; and the improved use of notation keys (e.g. in the industrial processes sector). These issues and further examples will be covered in the relevant sector chapters of this report. In addition, the Party does not always follow the annotated outline of the NIR including reporting elements under the Kyoto Protocol. The ERT recommends that the Party provide more transparent information on AD, methods, EFs and other parameters used, in particular for the energy (i.e. the inclusion of detailed fuel consumption data from the energy balance in the NIR), industrial processes, LULUCF and waste sectors and that it improve the use of notation keys. In addition, the ERT encourages the Russian Federation to follow more closely the annotated outline of the NIR. Improved transparency of the NIR will facilitate future reviews, particularly centralized and desk reviews.

Inventory management

38. The ERT noted that data are entered manually into the inventory database at IGCE and are then transferred manually into the calculation sheets and the CRF Reporter; no software is used to enter the data into the CRF Reporter. Although quality checks are performed on the transfer of the data, the manual transfer is error-prone. The ERT therefore recommends that the Party further consider the automation of data handling.

39. The Russian Federation has a centralized archiving system in place, which includes the archiving of disaggregated EFs and AD, and documentation on the sources of the data. The archived information also includes the annual submissions, internal documentation on QA/QC procedures, external and internal reviews, and documentation on key category identification. During the review, the Russian Federation provided the ERT with the requested additional archived information.

## 3. Follow-up to previous reviews

40. In response to previous reviews, the Russian Federation made the following major improvements:

(a) The completeness and the transparency of the inventory across all sectors (e.g. in 2010 the Party reported for the first time $CH_4$ and $N_2O$ emissions from the use of blast furnace gas, emissions from organic soils under the forest land category as well as potential F-gas emissions);

(b) The preparation of an improvement plan;

(c) The comprehensive recalculation of the LULUCF inventory;

(d) The improvement of the key category analysis (one list of key categories was included in the NIR and additional categories were identified as key by adding the categories approaching the key categories.

### 4. Areas for further improvement

Identified by the Party

41. The 2010 NIR identifies some areas for improvement, in particular the further development of country-specific EFs (e.g. in the energy sector) and the reflection of revised AD (e.g. in the industrial processes sector). During the review, the Party indicated that it would improve the documentation of the QA/QC procedures.

Identified by the expert review team

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

(a) Strengthening the elements of the national system relating to timeliness of reporting;

(b) The development of country-specific EFs and other parameters (e.g. in the energy sector) in order to move to higher-tier methods;

(c) The provision of more transparent information on the AD, methods, EFs and other parameters used, in particular for the energy (i.e. the inclusion of detailed fuel consumption data from the energy balance in the NIR), LULUCF and waste sectors;

(d) The improvement of the explanations for the recalculations in the industrial processes and waste sectors;

(e) The improvement of the uncertainty estimates by: providing reasons for the large differences in uncertainty estimates compared to previous submissions; ensuring that the 95 per cent confidence interval is used for all category uncertainty estimates; and ensuring that changes in methods, EFs and AD are reflected in the uncertainty estimates;

(f) Strengthening the QA/QC procedures in order to ensure the quality of the inventory, in particular by implementing QA/QC procedures on a systematic basis and documenting all results of the checks in the archive.

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

## B. Energy

### 1. Sector overview

44. The energy sector is the main sector in the GHG inventory of the Russian Federation. In 2008, emissions from the energy sector amounted to 1,841,158.90 Gg $CO_2$ eq, or 82.2 per cent of total GHG emissions. Since 1990, emissions have decreased by 32.2 per cent. The key drivers for the fall in emissions are the decline in economic activity in the country between 1990 and 1998, resulting in lower overall fuel demand and thus a decrease in related oil and natural gas operations and fuel combustion, and a significant change in the overall fuel mix (an increase in the share of natural gas and a decrease in the shares of oil and coal), resulting in a less carbon-intensive fuel combustion. Since 1998, emissions from the energy sector have increased by 12.0 per cent. Within the sector, 49.3 per cent of the emissions were from energy industries, followed by 19.3 per cent from oil and natural

gas, 12.0 per cent from transport and 7.8 per cent from other sectors. Manufacturing industries and construction accounted for 7.1 per cent and fugitive emissions from solid fuels accounted for 2.9 per cent. The remaining 1.8 per cent was from the category other.

Completeness

45. The energy inventory of the Russian Federation is generally complete. However, some categories are reported as "NE". This mostly concerns categories where there are no methodologies provided in the Revised 1996 IPCC Guidelines and the IPCC good practice guidance. During the review, the ERT identified that the Russian Federation reports emissions of $CH_4$ and $N_2O$ from solid and gaseous fuels from national navigation as "NE". However, during the review, this was confirmed to be an error, as these fuel types are not used in national navigation in the Russian Federation. The ERT recommends that the Russian Federation review its use of notation keys for all categories and years and ensure that the choice of notation keys is correct. The ERT also noted that for earlier years (1992–2002) of the time series, the Russian Federation has reported emissions from some fuel types in individual subcategories of manufacturing industries and construction as "NE", without explanation in the CRF tables or in the NIR (e.g. consumption of liquid and solid fuels and emissions from pulp, paper and print in 1998). The ERT recommends that the Russian Federation examine whether the notation key "NE" is being properly applied. The ERT further recommends that the Party provide an explanation in the CRF tables and the NIR for all emissions reported as "NE".

Transparency

46. The NIR contains information on the trend in the form of tabular and graphical presentations. However, there is very limited discussion on the drivers of the trend, including explanations for the dips and jumps in the time series. This issue was also noted in the previous review report. The ERT notes that the transparency of the NIR needs to be improved and reiterates the recommendation of the previous ERT that the Russian Federation include more detailed discussion of the trend and the underlying drivers.

47. In the NIR, no detailed information is provided on fuel consumption – only highly aggregated information is provided in annex 2 to the NIR, which is more aggregated than the information in the CRF tables. The lack of detailed information on AD makes it exceedingly difficult to assess the correctness of the emission calculations. During the review, the Russian inventory compilers informed the ERT that the energy balance is confidential. However, this information is necessary in order to properly assess the inventory. The information should include the fuel consumption for the different fuels combusted in the individual subsectors at the level where emission calculations are performed. The ERT strongly recommends that the Russian Federation include detailed fuel consumption data in the NIR in its next annual submission, at least for all fuels used on the CRF subcategory level.

Time-series consistency

48. As noted in the previous review report, the Russian Federation, for the years 2005–2007, reported disaggregated $CO_2$ emissions from the subcategories of energy industries; however, emissions of $CH_4$ and $N_2O$ were only disaggregated for the year 2007. In the 2010 annual submission, the Russian Federation has reported disaggregated information for energy industries for the years 2005–2008. The ERT commends the Russian Federation for carrying out this improvement. The emissions from energy industries from 1990 to 2004 are still aggregated under the category public electricity and heat production. The ERT reiterates the recommendation from the previous review report that the Russian Federation explore ways of estimating the breakdown of emissions under energy industries for 1990–2004, ensuring time-series consistency, in its next annual submission.

49. The Russian Federation has improved the disaggregation of $CH_4$ and $N_2O$ emissions from manufacturing industries and construction, so that emissions from 2005 to 2008 are reported in a disaggregated way. The ERT commends the Russian Federation for this improvement. However, for the period 1990–2004, the emissions of $CH_4$ and $N_2O$ are still not fully disaggregated into CRF subcategories but reported under iron and steel, which reduces the transparency of the inventory. The ERT therefore reiterates the recommendation of the two previous review reports that the Russian Federation provide a consistent set of $CH_4$ and $N_2O$ emission estimates for the whole time series in its next annual submission.

Uncertainties

50. Based on a recommendation from the previous review report, the Russian Federation has improved the reporting of uncertainties from the energy sector, so that a quantitative uncertainty estimate is now included. The ERT commends the Russian Federation for this improvement. In line with the previous review report, the ERT notes that the energy sector accounts for the bulk of total GHG emissions and that fugitive emissions, which involve high uncertainties, are an important source of GHG emissions in the Russian Federation. Therefore, the ERT encourages the Russian Federation to investigate ways to move to a tier 2 method for estimating uncertainties.

Verification and quality assurance/quality control approaches

51. The QA procedures undertaken for the energy sector generally involve submitting the NIR to relevant external entities (e.g. Rosstat and Gazprom) for review; these reviews are not necessarily performed annually (e.g. no review from Gazprom occurred for the 2010 submission). Comments received are considered by the inventory team and implemented, if appropriate. However, the external entities primarily check that the data referenced to them are correct. In that sense, it is more a QC procedure than a QA procedure. The underlying calculation sheets and data sets are not provided to external entities. In line with the previous review report, the ERT believes that the verification of effective calculation procedures, data sets and assumptions used, going beyond the descriptions in the NIR, is an important and necessary part of QA. In line with the previous review report, the ERT encourages the Russian Federation to further improve its QA procedures in the energy sector to allow a more detailed verification of calculation procedures, data sources and assumptions by external experts, and report on the results in its next annual inventory submission.

## 2. Reference and sectoral approaches

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

52. Differences between the estimates of $CO_2$ emissions derived using the reference approach and the sectoral approach have decreased from 10.08 per cent in 1990 to 3.67 per cent in 2008, which still constitutes a significant difference. The reasons for the difference are provided in the NIR. According to the Party, the differences are mainly due to the fact that the estimates of carbon stored that were used in the reference approach were based on IPCC default carbon storage factors only, as included in the Revised 1996 IPCC Guidelines. For fuels for which no IPCC default values are available, no carbon stored was estimated by the Russian Federation in the reference approach. Other reasons for the differences between the two approaches mentioned in the NIR are potential losses during the conversion of primary fuels into secondary fuels not being accounted for in the reference approach and differences between the fuel properties (such as carbon content) used in the reference approach and the sectoral approach. These issues have been raised in previous review reports. The ERT reiterates the recommendation of the previous review report that the Russian Federation further investigate the reasons for the differences

between the approaches, especially by gaining a better understanding of (and estimating) the amounts of stored carbon attributable to non-energy use of fuels. For some fuels in the reference approach, emission estimates are not complete; for instance, for bitumen and lubricants the amount of carbon stored is estimated, whereas no value for apparent consumption is provided. During the review, the Russian Federation informed the ERT that this was a case of misuse of notation keys, and that these fuels were included under other oil. The ERT recommends that the Russian Federation correct the use of notation keys for the next annual submission.

53. In the previous review report it was identified that the energy balance contained information on losses, which was not explained in the NIR. In the 2010 submission, the Russian Federation has provided appropriate information in the NIR. The ERT commends the Party for this improvement in transparency.

*International bunker fuels*

54. The Russian Federation has developed an approach for estimating domestic and international emissions from navigation based on data on loading and unloading of dry and bulk cargo in Russian ports and on distances for different destinations. The ERT commends the Russian Federation for these efforts. Based on an assumption of fuel consumption per tonne of good transported, the fuel consumption for domestic and international journeys was estimated. For international trips, it was assumed that 50 per cent of the fuel consumed was taken on board in the Russian Federation, which corresponds to the bunker fuel consumption. Subsequently, the share of national and domestic fuel consumption is derived from these estimates and multiplied with the corresponding fuel consumption for navigation in the energy balance, yielding a figure for the fuel consumption for domestic and international navigation which is then used for estimating emissions. Following up on the previous review report, the Russian Federation has investigated the issue of whether passenger transport and river transport were taken into account in estimating the split between national and international navigation, and concluded that passenger transport and river transport for navigation are included in the basis for estimating the split between national and international navigation. This information has been provided in the NIR. The ERT commends the Russian Federation for this improvement. During the review, the Russian Federation presented the progress of the work on refining the calculation for civil and international aviation in line with previous recommendations by taking into account changes in the aircraft fleet structure, fuel efficiency and passenger capacity. The ERT recommends that the Russian Federation continue this effort and report on the progress made in the next annual submission.

*Feedstocks and non-energy use of fuels*

55. The amount of stored carbon that is attributable to the non-energy use of fuels or to the use of fuels as feedstocks is determined for fuels for which default storage factors from the Revised 1996 IPCC Guidelines are available. Furthermore, the use of coke as a reducing agent in the iron and steel industry is subtracted as non-energy fuel use. Process-related emissions from the iron and steel industry are included under industrial processes. This issue has been noted in the last two review reports. The ERT reiterates the recommendation that the Russian Federation improve the understanding of non-energy use of fuels and use of fuels as feedstocks that has not been covered in the estimates thus far and report the values for the corresponding carbon stored or emissions. During the review, the ERT questioned the very large consumption of natural gas for non-energy purposes, considering that if the natural gas was primarily used for, for example, ammonia production, no carbon would be stored. The Russian Federation provided information that natural gas was used for ammonia production, iron and steel production, and the production of basic chemicals (e.g. methanol). Emissions from, for example, ammonia production and

iron and steel production are accounted for in the industrial processes sector; for the production of chemicals, the fraction of carbon stored is 1. Additionally, some of the natural gas is pumped back into gas wells. The ERT recommends that the Russian Federation complete CRF table 1.A(d) with information on the allocation of emissions from non-energy use of fuels, and that the Party provide more detailed information in the NIR on this subject, including information on the allocation of emissions and the processes that use the different fuels as feedstocks or for other non-energy purposes.

## 3. Key categories

Stationary combustion: solid, gaseous and liquid fuels – $CO_2$

56. During the previous review, the Russian Federation stated that fuel consumption in the energy balance related to electricity production from industry is reported under public electricity and heat production. In response to a question raised by the ERT, the Russian Federation confirmed that this was still the case. The ERT questioned whether the country-specific EFs used in public electricity and heat production are appropriate for auto producers. The Russian Federation responded that auto producers could have a different fuel mix and that the EFs were not necessarily appropriate for these plants. During the review, it was determined that the small fuel consumption from auto producers wrongly allocated to public electricity and heat production is causing a slight overestimation of emissions. Nevertheless, the ERT recommends that the Russian Federation explore ways of allocating fuel consumption in industrial power plants to the relevant subcategories of manufacturing industries and construction in accordance with the Revised 1996 IPCC Guidelines.

57. $CO_2$ emissions from stationary combustion of fuels are calculated following a tier 1 approach using IPCC default EFs for most of the categories and fuels. Relevant data on fuel consumption are taken from the energy balance. For the energy industries category, the estimate of $CO_2$ emissions is based on country-specific EFs for black coal, brown coal, natural gas, diesel oil, residual fuel oil and oil coke, while emissions from other fuels used are calculated using IPCC defaults. The country-specific EFs were derived from plant-specific data on fuel consumption and fuel properties of power plants accounting for 90 per cent of electricity and heat production in the Russian Federation. Information used included the origin of coal (basins) and corresponding fuel properties. Plant-specific oxidation factors were incorporated in the estimates of the $CO_2$ EFs. The country-specific $CO_2$ EFs are not updated over time to reflect changes in, for example, the proportions of coal originating from different coal basins. Furthermore, country-specific $CO_2$ EFs were only used for the energy industries category. In line with recommendations of previous review reports, the ERT recommends that the Russian Federation further elaborate its approach for developing and using country-specific $CO_2$ EFs in its next annual submission. The Russian Federation should also investigate whether the country-specific $CO_2$ EFs for coal could be updated over time by considering the amount of coal originating from each basin in each year. Furthermore, the ERT recommends that the Russian Federation improve the description in the NIR on the derivation of the country-specific EFs, including specifying which fuels are covered.

Coal mining and handling: solid fuels – $CH_4$

58. The Russian Federation estimates $CH_4$ emissions from coal mining and handling using EFs which were derived using mine- and basin-specific measurements of $CH_4$ bearing capacity and historical basin-specific production data from the literature. Currently, Rosstat publishes statistical data for coal production divided by underground and surface mining, and in a separate table, coal production divided by administrative regions. To produce these two tables, it appears that coal production data divided into both

underground/surface mining and administrative regions are available at Rosstat. This information would allow the updating of the country-specific EFs from the basin-specific data. The ERT recommends that the Russian inventory team, in cooperation with Rosstat, estimate country-specific EFs from coal basin data.

59. During the review, the ERT identified that the $CH_4$ implied emission factor (IEF) in 2008 of 0.002 kg/t for post-mining activities for underground mines is by far the lowest among reporting Parties and far below the lower limit indicated in the the Revised 1996 IPCC Guidelines (0.9–4 $m^3$/t $\approx$ 0.6–2.7 kg/t). The value fluctuates slightly between years. The Russian Federation calculates a country-specific EF based on specific EFs derived for the different coal basins; these are reported in the NIR, but no explanation is provided for the very low value compared both to other Parties and to the IPCC lower limit. During the review, the ERT was provided with an example calculation. This showed an error in terms of the unit conversion, resulting in an EF a thousand times lower than the correct calculation. In the course of the review, the Russian Federation provided revised estimates. The recalculations made for coal mining and handling increased the estimate for $CH_4$ emissions from this category by 9.1 per cent (4,387.7 Gg $CO_2$ eq) for 2008.

Oil and natural gas: gaseous and liquid fuels – $CO_2$ and $CH_4$

60. The emission estimates for fugitive emissions from oil and natural gas are, to a wide extent, based on default EFs from the Revised 1996 IPCC Guidelines or the IPCC good practice guidance. This has been noted in previous review reports. During the review, the Russian Federation informed the ERT of the cooperation agreement of the IGCE with Gazprom, and that this cooperation could result in providing more country-specific information in future reporting. The ERT recognizes that the Russian Federation has made an effort to increase the cooperation of the IGCE with external experts. However, the ERT reiterates the recommendation that the Russian Federation acquire more country-specific EFs for this sector since it is a key category. When country-specific EFs are developed, the appropriateness of keeping the EFs constant throughout the time series should be evaluated.

61. During the review, the ERT identified that emissions from oil production and gas condensates are separated and different EFs are used. For oil production the IPCC good practice guidance is used, while for natural gas liquids (NGLs) the Revised 1996 IPCC Guidelines is used. For both sources, the EF is specified for oil production. This is inconsistent since it is part of the same process. The Russian Federation uses the EF from the Revised 1996 IPCC Guidelines for oil production ($2.65 \times 10^3$ kg/PJ, IEF = 111 kg/kt). This is lower than the EF for oil production in the IPCC good practice guidance ($1.45 \times 10^{-3}$ Gg/$10^3$ $m^3$, IEF = 1,611 kg/kt). Furthermore, this means that $CO_2$ is only estimated for the oil part of oil production and not from the gas condensates. This means that the emissions from the production of NGLs are underestimated. In the course of the review, the Russian Federation provided revised estimates including estimates of $CO_2$ emissions from NGL production and revised $CH_4$ emissions. Additionally, $CO_2$ and $CH_4$ emissions from venting in connection with NGL production have been included. The recalculations performed for fugitive emissions from oil, natural gas and other sources increased the estimate of $CO_2$ emissions from this category by 0.02 per cent (6.91 Gg $CO_2$ eq) for 2008 and increased $CH_4$ emissions from this category by 0.4 per cent (1,417.3 Gg $CO_2$ eq) for 2008.

## 4. Non-key categories

Stationary combustion: solid fuels, liquid fuels and biomass – $CH_4$ and $N_2O$

62. In response to a recommendation in the previous review report, the Russian Federation has estimated and reported emissions of $CH_4$ and $N_2O$ from the use of blast furnace gas under manufacturing industries and construction. The ERT commends the Russian Federation for this improvement in the completeness of the inventory.

63. During the review, the ERT noted that the $CH_4$ and $N_2O$ IEFs for liquid fuels and biomass fluctuated significantly, for example, for biomass the IEF for $CH_4$ fluctuated between 30 kg/TJ and 4,496 kg/TJ, for manufacturing industries and construction, despite the fact that, according to the NIR, the same EFs are applied for all years of the time series. The Russian Federation informed the ERT during the in-country review that this was a mistake in the calculation sheets. The ERT recommends that the Russian Federation correct these mistakes and develop additional QC checks to prevent this type of mistake from occurring.

Road transportation: liquid fuels – $CH_4$ and $N_2O$

64. During the review, the ERT identified that the Russian Federation uses a tier 1 methodology and IPCC default EFs to estimate $CH_4$ and $N_2O$ emissions from road transportation for all years of the time series. However, the tier 1 $CH_4$ and $N_2O$ EFs are not representative for the current technological situation in the Russian Federation. The use of IPCC tier 1 EFs causes an underestimation of emissions of $CH_4$ and $N_2O$ in 2008. During the review, the Russian Federation provided information on a study carried out for the year 2007 using a higher-tier approach. This study showed that the current estimates for $CH_4$ and especially for $N_2O$ are significantly underestimated. During the course of the review, the Russian Federation provided revised estimates using the country-specific EFs for 2007 and 2008 and assuming that all vehicles were uncontrolled in 1990, and then interpolating linearly between 1990 and 2007. The recalculations performed for road transportation increased the estimate of $CH_4$ emissions from this category by 5.5 per cent (33.4 Gg $CO_2$ eq) for 2008 and increased the $N_2O$ emissions from this category by 702.0 per cent (2,175.9 Gg $CO_2$ eq) for 2008.

## 5. Areas for further improvement

Identified by the Party

65. The Russian Federation identified the following areas for further improvement of the completeness and accuracy of its energy sector estimates, to be implemented in the next or future annual inventory submissions:

(a) The development of country-specific values for carbon stored in non-energy use of fuels;

(b) The refinement of the calculation of country-specific $CO_2$ EFs for solid fuels, taking into account the change in the structures of coal production and consumption;

(c) The development of country-specific $CH_4$ and $N_2O$ EFs for energy industries;

(d) The reallocation of fuel consumption and emissions by auto producers from energy industries to manufacturing industries and construction;

(e) The refinement of the calculation algorithm for civil aviation;

(f) The recalculation of the $CH_4$ emissions from coal mining based on more detailed data on coal production.

Identified by the expert review team

66. The ERT identified the following areas for improvement:

(a) The inclusion of more detailed information on the AD in the NIR;

(b) The estimation of the breakdown of emissions for the whole time series of subcategories under energy industries and under manufacturing industries and construction;

(c) The further investigation of the reasons for the differences between the results from the reference approach and the sectoral approach, the proper use of notation keys in the reference approach and the completion of information on the non-energy use of fuels in CRF table1.A(d);

(d) The further elaboration of the approach for estimating country-specific $CO_2$ EFs for all fuel types in stationary combustion.

## C. Industrial processes and solvent and other product use

### 1. Sector overview

67. In 2008, emissions from the industrial processes sector amounted to 181,869.38 Gg $CO_2$ eq, or 8.1 per cent of total GHG emissions, and emissions from the solvent and other product use sector amounted to 543.67 Gg $CO_2$ eq, or 0.02 per cent of total GHG emissions. Since the base year, emissions have decreased by 20.6 per cent in the industrial processes sector and by 3.2 per cent in the solvent and other product use sector. The key driver for the fall in emissions in the industrial processes sector is the decrease in industrial activities, reflected in the decrease in emissions from mineral products, namely from limestone and dolomite use (51.8 per cent), cement production (31.7 per cent) and lime production (29.7 per cent); from metal production, namely from iron and steel production (21.0 per cent); and from the production of halocarbons and $SF_6$, namely in by-product emissions from HFC-23 production (40.6 per cent). In 2008, within the industrial processes sector, 44.1 per cent of the emissions were from iron and steel production, followed by 13.0 per cent from cement production, 10.5 per cent from ammonia production, 9.6 per cent from limestone and dolomite use, 6.1 per cent from aluminium production, 4.9 per cent from the production of HCFC-22 and 4.7 per cent from lime production, which were the most important categories. The remaining 7.2 per cent were from all other categories of the industrial processes sector of the Party (e.g. soda ash use, nitric acid production, calcium carbide production, carbon black production, ethylene production, dichloroethylene production, styrene production, methanol production, ferroalloys production, fugitive emissions from the production of HCFC-22, and F-gas emissions from the consumption of halocarbons and $SF_6$). $CO_2$ emissions accounted for 88.2 per cent of the emissions of the sector, followed by HFCs (7.0 per cent), PFCs (2.3 per cent), $N_2O$ (1.9 per cent), $CH_4$ (0.4 per cent) and $SF_6$ (0.3 per cent).

Completeness

68. The CRF tables include estimates of most categories of emissions from the industrial processes and solvent and other product use sectors. Emissions have been reported for all gases, all years of the inventory time series, and for all geographical locations. The Russian Federation reported $CH_4$ emissions from dichloroethylene and $CO_2$ emissions from silicon metal production as "NE" in its original submission, due to the lack of AD. This issue was mentioned in the 2008 and 2009 NIRs as a potential area for improvement. During the review, the Party confirmed the probability of the occurrence of dichloroethylene production and of silicon metal production in the Russian Federation. During the review, the ERT recommended that the Russian Federation collect AD on dichloroethylene production and on silicon metal production and report $CH_4$ emissions from dichloroethylene and $CO_2$ emissions from silicon metal production within six weeks; the Russian Federation followed these recommendations by providing the ERT with revised CRF data after the in-country visit (see paras. 80 and 81).

69. In addition, the actual emissions of HFCs, PFCs and $SF_6$ have been reported as "NE" for a number of subcategories and halocarbon species, including: HFCs from foam blowing**,** aerosols/metered dose inhalers, solvents, semiconductor manufacture and other

applications using ozone-depleting substance (ODS) substitutes; PFCs from other applications using ODS substitutes and semiconductor manufacture; and $SF_6$ from other applications using ODS substitutes and semiconductor manufacture. During the review, the Party clarified that, in some cases, the incorrect notation key had been used, and most of the subcategories reported as "NE" are not occurring ("NO") in the Russian Federation (this conclusion was supported by the publication *Freons Market in the Russian Federation* (Academy of Trends of Industrial Markets, 2007), provided to the ERT during the review). Concomitantly, in some specific cases, it was found that for certain halocarbon species reported as "NE", such as HFC-134a emissions from the category aerosols/metered dose inhalers, it is possible for the Party to obtain the missing AD. The ERT included this issue in the list of potential problems and recommended that the Russian Federation collect, calculate and report, within six weeks, all missing categories for which methodologies are provided in the Revised 1996 IPCC Guidelines and the IPCC good practice guidance, in order to improve the completeness of its inventory, and that the Party ensure that for all other subcategories and consumption of halocarbon species that are not occurring in the Russian Federation, their emissions should be reported as "NO" and/or "NA" (not applicable), as appropriate. The Russian Federation followed these recommendations by providing the ERT with revised CRF data after the in-country visit (see para. 83).

Transparency

70. The Russian Federation has provided justifications in the NIR for the assumptions made and the choice of data and methods used. Most categories are reported with the required level of detail in the CRF tables, with a few exceptions where AD (e.g. $CO_2$ and PFC emissions from aluminium production) have been reported as confidential ("C") to protect commercially sensitive information. The CRF tables and the NIR provide sufficient information to enable the assessment of the data used and the methodologies applied.

Recalculations and time-series consistency

71. The ERT noted that recalculations of the time series 1990–2007 have been undertaken to take into account:

(a) The use of country-specific data on the calcium oxide (CaO) content in clinker;

(b) The correction for international soda ash trade operations for the years 1990–1995 and revised AD for 2006–2007;

(c) The correction for international calcium carbide trade operations for the years 1990–1995 and revised AD for 2007;

(d) The use of the tier 2 methodology and plant-specific process data for anode effect performance to estimate PFC emissions from aluminium production;

(e) The use of the tier 2 methodology and plant-specific EFs to estimate by-product HFC-23 emissions from the production of HCFC-22;

(f) The use of revised plant-specific EFs for fugitive emissions from $SF_6$ production for 2001–2007;

(g) Revised AD for 2007 on the production of HFCs, PFCs and $SF_6$;

(h) Revised AD for 2007 on industrial and commercial refrigeration;

(i) Revised AD for the period 1992–2007 for the stationary and mobile air conditioning categories.

72. The recalculations performed by the Russian Federation have resulted in real improvements in the accuracy of the inventory and in time-series consistency.

73. The impact of the recalculations on the total national emissions is quite insignificant. In 1990 and 2007 a decrease was registered in the total aggregate GHG emissions of 0.3 and 0.7 per cent, respectively. The impact of the recalculations on the sectoral level is more evident. Thus, in 1990 and 2007 the decrease registered in the total aggregate GHG emissions was of 3.9 and 7.0 per cent, respectively. The rationale for the recalculations and changes made in response to the review process are generally not provided in the NIR or in CRF table 8(b), except for the PFC emissions from primary aluminium production. The ERT encourages the Russian Federation to provide, in the specific IPCC categories of chapter 4 of the NIR (e.g. in the section "Source-Specific Recalculations"), as well as in CRF table 8(b), explanatory information and justification for the recalculations performed, including those performed in response to the review process.

Uncertainties

74. Uncertainties in the data used for all categories within the industrial processes sector have been quantitatively discussed in a transparent manner in the NIR, except for the category consumption of halocarbons and $SF_6$. The ERT reiterates the recommendation from previous ERTs that the Russian Federation complete the discussion on uncertainties in the NIR by including all categories in its next annual submission. The uncertainty analysis was based to a large extent (for all categories except limestone and dolomite use) on the default EF uncertainties included in the IPCC good practice guidance and in the *2006 IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the 2006 IPCC Guidelines), while for AD, uncertainties were based on information obtained from Rosstat and other country-specific information obtained from ministries, industrial associations and directly from plants, as well as from expert judgement. The ERT recommends that the Russian Federation use, to a greater extent, the country-specific information available for its uncertainty assessment and ask the institutions providing AD to estimate the relevant uncertainty values.

Verification and quality assurance/quality control approaches

75. Very limited information is provided in the sectoral chapter on the QA/QC procedures applied to individual categories of the industrial processes sector. The ERT recommends that the Russian Federation report more detailed information on this in the NIR of its next annual submission, in particular for the key categories, as well as information on any external reviews undertaken and/or planned to be conducted for the industrial processes sector and key findings on the quality checks of the AD and methods used.

## 2. Key categories

Cement production – $CO_2$

76. In previous review reports, the Russian Federation was encouraged to use country-specific data for the values of the lime content of clinker and the cement kiln dust correction factor. This recommendation was followed in part. The Party applied, for the first time, country-specific data on the CaO content of clinker. During the review, the ERT clarified, however, that the plant-specific information on the CaO content of clinker refers to the most up-to-date situation that is most relevant to the years 2009–2010. The ERT appreciates the efforts made by the Party to collect the respective information (there are 51 cement plants in the Russian Federation), and further encourages the Party to follow the good practice and collect such information for other historic periods as well and to do so on

a regular basis (e.g. every five years), thereby ensuring the time-series consistency of the emission estimates calculated through the use of country-specific EFs.

Ammonia production – $CO_2$

77. In previous review reports, the ERT recommended that the Russian Federation make efforts to estimate $CO_2$ emissions from ammonia production using a tier 1a methodology, based on natural gas input and country-specific EFs based on the carbon content of natural gas, instead of a tier 1b methodology and a default EF The Russian Federation has not yet followed this recommendation in its 2010 submission. In response to a question raised during the review, the Party informed the ERT that the recalculations of $CO_2$ emissions from ammonia production based on natural gas consumption will be presented in the 2011 inventory submission. The ERT appreciates and supports the efforts of the Russian Federation to implement this methodological improvement in its next annual submission.

### 3. Non-key categories

Nitric acid production – $N_2O$

78. The official statistics of the Russian Federation take full account of data on the production of commercial weak nitric acid in monohydrate and concentrated nitric acid in monohydrate, but do not take into account the output of weak nitric acid processed into other products (e.g. nitrogen-based mineral fertilizers, such as ammonium nitrate, nitrophoska, nitroammophoska and nitroammophos). From its 2007 submission onwards, the Party has included the amount of non-concentrated nitric acid used in ammonium nitrate manufacture. However, the Party has not included the amount of non-concentrated nitric acid used in the production of other nitrogen-based mineral fertilizers (e.g. nitrophoska, nitroammophoska and nitroammophos). This means that the $N_2O$ emissions from nitric acid production are underestimated. In response to a question raised by the ERT during the review, the Party provided additional information, which confirms the occurrence of other nitrogen-based mineral fertilizer production based on nitric acid (Sokolov, 2003). The Party also provided the ERT with: disaggregated AD on other nitrogen-based mineral fertilizer production; scientifically based factors to convert the amount of nitrogen-based fertilizer produced into nitric acid; and the amount of nitric acid used as raw material for other nitrogen-based fertilizer production.

79. During the in-country review, the ERT included this issue in the list of potential problems and recommended that the Russian Federation provide a revised estimate for $N_2O$ emissions from nitric acid production based on the additional information provided to the ERT and any other information to be identified within six weeks. Following the recommendation of the ERT, after the in-country review, the Russian Federation revised its estimates for $N_2O$ emissions and included weak nitric acid processed in nitrogen-based mineral fertilizers such as nitrophoska, nitroammophoska and nitroammophos. The ERT agreed with the approach used. As a result of the revision, the $N_2O$ emissions from this category increased by 4.7 per cent for the year 1990 (from 3,566.70 to 3,734.54 Gg $CO_2$ eq) and by 12.1 per cent for the year 2008 (from 3,071.73 to 3,443.00 Gg $CO_2$ eq).

Other (chemical industry) – $CH_4$

80. $CH_4$ emissions from dichloroethylene production, reported under other (chemical industry) have been reported as "NE" for the whole time series, due to the lack of AD. This issue was mentioned in the NIRs of the 2008 and 2009 submissions as a potential area for improvement. During the review, the Party confirmed the probability of the occurrence of dichloroethylene production in the Russian Federation, which means that $CH_4$ emissions from the category other (chemical industry) are underestimated. The ERT included this

issue in the list of potential problems and recommended that the Russian Federation collect AD on dichloroethylene production, and calculate and report the $CH_4$ emissions from dichloroethylene production by using the AD and default EF provided in the Revised 1996 IPCC Guidelines. Following the recommendation of the ERT, after the in-country review, the Russian Federation provided estimates of $CH_4$ emissions from the category other (chemical industry). The ERT agreed with the approach used. As a result of the revision, the $CH_4$ emissions from this category increased by 0.03 per cent for the year 1990 (from 415.23 to 415.34 Gg $CO_2$ eq) and by 0.003 per cent for the year 2008 (from 390.96 to 390.97 Gg $CO_2$ eq).

Ferroalloys production – $CO_2$

81. $CO_2$ emissions from silicon metal production (the category ferroalloys production) have been reported as "NE" for the whole time series, due to the lack of AD. This issue was mentioned in the NIRs of the 2008 and 2009 submissions as a potential area for improvement. During the review, the Party confirmed the probability of the occurrence of silicon metal production in the Russian Federation, the assumption being based, in part, on information provided by the RUSAL company. This means that $CO_2$ emissions from the category ferroalloys production are underestimated. The ERT included this issue in the list of potential problems and recommended that the Russian Federation collect AD on silicon metal production, and calculate and report the $CO_2$ emissions from ferroalloys production by using the AD and default EF provided in the Revised 1996 IPCC Guidelines. Following the recommendation of the ERT, after the in-country review, the Russian Federation provided estimates of $CO_2$ emissions from the category ferroalloys production. The ERT agreed with the approach used. As a result of the revision, the $CO_2$ emissions from ferroalloys production increased by 8.6 per cent for the year 1990 (from 2,408.11 to 2,614.51 Gg $CO_2$ eq) and by 8.7 per cent for the year 2008 (from 2,816.94 to 3,062.04 Gg $CO_2$ eq).

Aluminium production – PFCs

82. In previous review reports, the ERT recommended that the Russian Federation make efforts to apply a tier 2 methodology to estimate PFC emissions from the key category aluminium production, as recommended by the IPCC good practice guidance. In the 2010 inventory submission, the Party has performed, for the first time, the evaluation of perfluoromethane ($CF_4$) and perfluoroethane ($C_2F_6$) emissions from primary aluminium production using a tier 2 method, which is based on plant-specific process data for anode effect performance. During the period 2006–2008, the PFC emissions have been calculated for all facilities and technologies used at each of the 13 aluminium plants operating on the territory of the Russian Federation. As no data on the frequency and duration of anode effect in aluminium plants are available for the period 1990–2005, in order to create a consistent time series following the tier 2 methodology, the inventory team calculated the PFC emissions for the respective period using one of the techniques provided by the IPCC good practice guidance (surrogate method); the IEFs specific to the year 2006 have been used to calculate PFC emissions for the rest of the time series (1990–2005). The ERT took note of the Party's difficulties in relation to the impossibility of using the same method and consistent data sets for all years due to the lack of plant-specific process data for anode effect performance for some years (1990–2005). The ERT agrees with the approach used by the Party to determine the missing values and further encourages the Russian Federation to make efforts to collect the missing information for the remaining years of the time series and to better document and demonstrate in the next annual submission that the time series is consistent as a result of using the techniques provided by the IPCC good practice guidance.

Consumption of halocarbons and $SF_6$ – HFCs and PFCs

83. The Russian Federation in its 2010 submission reported HFC-134a emissions from the category aerosols/metered dose inhalers as "NE" for the whole time series, due to the lack of AD. The Party confirmed the occurrence in the Russian Federation of HFC-134a consumption in aerosols/metered dose inhalers (it is not produced, only imported in products), which is supported by the publication *Freons Market in the Russian Federation* (Academy of Trends of Industrial Markets, 2007). This means that HFC emissions from the category aerosols/metered dose inhalers are underestimated. The ERT included this issue in the list of potential problems and recommended that the Russian Federation collect AD on the imports of HFC-134a propellant-based metered dose inhalers and/or on the consumption of metered dose inhalers which use HFC-134a as a propellant and calculate and report the HFC-134a emissions from aerosols/metered dose inhalers by using the tier 2 methodology provided in the IPCC good practice guidance with collected AD. Following the recommendation of the ERT, after the in-country review, the Russian Federation undertook recalculations of the HFC emissions from the category aerosols/metered dose inhalers. The ERT agreed with the approach used. As a result of the revision, the HFC emissions from aerosols/metered dose inhalers increased by 177.9 per cent for the year 2008 (from 65.77 to 182.77 Gg $CO_2$ eq).

### 4. Areas for further improvement

Identified by the Party

84. The NIR identified the following areas for further improvement of the completeness and accuracy of the industrial processes sector, to be implemented in the next or future annual submissions:

(a) Accounting the $CO_2$ emissions from the use of magnesite for the manufacture of bricks used in ferrous and non-ferrous metallurgy;

(b) The recalculation of HFC, PFC and $SF_6$ emissions from consumption of halocarbons and $SF_6$ to reflect revised AD (e.g. from stationary and mobile refrigeration, as well as from other consumption of halocarbons).

Identified by the expert review team

85. The ERT identified the following areas for improvement:

(a) Ensuring time-series consistency in the industrial processes sector (see, for example, paras.76 and 82 above);

(b) The provision, in the NIR, of more detailed explanatory information and justifications for the recalculations performed, including those performed in response to the review process (see para.73 above);

(c) The avoidance of the incorrect use identified in the CRF tables on the use of notation keys (especially for the category consumption of halocarbons and $SF_6$) through a better implementation of QA/QC and verification checks (see para. 75 above).

## D. Agriculture

### 1. Sector overview

86. In 2008, emissions from the agriculture sector amounted to 144,092.10 Gg $CO_2$ eq, or 6.4 per cent of total GHG emissions. Since 1990, emissions have decreased by 54.8 per cent. The key drivers for the fall in emissions are a reduction in the number of animals for

all animal categories, and a decrease in the cultivated land area and in the amount of applied mineral fertilizer as a result of the economic transformation in the country during the period 1990–2008. Within the sector, 54.7 per cent of the emissions were from agricultural soils, followed by 27.8 per cent from enteric fermentation and 16.8 per cent from manure management. The remaining 0.6 per cent were from rice cultivation.

Completeness

87. Emissions from the agriculture sector have been reported for all gases, all years of the inventory time series, and for all geographical locations. The burning of agricultural residues is reported as "NO", since this is prohibited by law.

88. Some examples of incompleteness and inconsistency, which did not influence the emission figures, were found in the CRF tables:

(a) The additional information table for CRF table 4.B(a) provides an incorrect allocation between the different animal waste management systems (AWMS) for dairy and non-dairy cattle for the years 2005–2008;

(b) In CRF table 4.F, the dry matter fraction of residues under pulses (not specified) and tubers and roots (not specified) is reported as "NE", while it should be "NO" since field burning of agricultural residues is reported as "NO".

89. The ERT recommends that the Party correct these errors in its next annual submission.

Transparency

90. An English translation of the NIR was made available to the ERT two weeks before the review. The translated version covered the sector-specific chapters, but background information for the uncertainty estimates was only available in Russian. The transparency in the translated NIR is satisfactory, and includes descriptions of the country-specific methods and EFs used. The ERT welcomes the efforts of the Party to make the inventory transparent.

Recalculations and time-series consistency

91. In 2006, Rosstat conducted a national agricultural census, the first full census since 1920. Results from this census have heightened the data quality of the last years' submissions. In the 2010 annual submission recalculations based on results from the census have improved the accuracy of the inventory for the number of poultry and the estimates for area and harvest data for different crops. Recalculations have been performed in accordance with the IPCC good practice guidance. Descriptions of, and the rationale for, the recalculations undertaken is provided in the NIR, but not in CRF table 8(b). The populations of dairy and non-dairy cattle, swine, sheep and goats have been recalculated to better reflect the annual average number with the help of correction factors based on monthly data for the animal population. The ERT welcomes this effort to enhance the accuracy of the inventory. The recalculations in the 2010 submission have increased the total GHG emissions from the agriculture sector by 3 per cent for both 1990 and 2007 compared with the 2009 submission.

Uncertainties

92. A description of the uncertainty estimates for the agriculture sector is given in the NIR, and background data with uncertainty estimates for the AD and EFs used are given in annex 3.1 to the NIR (only in Russian). For the agriculture sector, a tier 2 uncertainty analysis has been performed for the 2004 inventory. The same uncertainty estimates are used in the 2010 inventory, except for the categories where the methodologies have changed; in such cases, the estimates are calculated based on tier 1 estimations. National

uncertainty estimates are given for the AD and the country-specific EFs. For the sources where IPCC default EFs have been used, the uncertainty estimates from the IPCC good practice guidance have also been used in the analysis.

Verification and quality assurance/quality control approaches

93. A description of the QA/QC procedures performed is included in the NIR. The AD for emissions from the use of synthetic fertilizers are compared with the balance of mineral fertilizers as a QC procedure. The difference between the sold amount of domestic fertilizer in the balance and the statistics over applied fertilizer amounts are briefly described in the NIR. For crop residues, the results of the country-specific method are compared with the results using the IPCC good practice guidance method and the method provided in the 2006 IPCC Guidelines. The comparison shows that the country-specific method gives higher emissions than the IPCC methods for all years except for 1990, when the IPCC good practice guidance method gives the highest emission figure. The reasons for the different results are explained in the NIR, and underestimations seem unlikely. The ERT welcomes the efforts of the Party to establish these QC procedures relating to the inventory data for synthetic fertilizers and crop residues.

## 2. Key categories

Enteric fermentation – $CH_4$

94. The Russian Federation uses a country-specific method consistent with the IPCC tier 2 method for dairy and non-dairy cattle and the IPCC tier 1 method for the other animal categories. This is in line with the IPCC good practice guidance.

95. The Russian Federation has enhanced the accuracy of the emission estimates for cattle by using disaggregated data by region. EFs for enteric fermentation in cattle are obtained through regional estimations of the gross energy input (GE) of fodder consumed and fodder digestion factors for 2002–2008. For 1990–2001, estimates based on national data are used, due to a lack of regional data for these years. In the NIR, the Party has reported that the difference between the results based on national and regional data amounts to no more than 1–2 per cent. The ERT welcomes this effort to improve the accuracy of the inventory for the significant animal categories “cows” and “other cattle”, and recommends that the Russian Federation recalculate the 1990–2001 EFs for cattle based on the trend for regional factors (average weighted) for 2002–2008, to ensure time-series consistency

Manure management – $N_2O$

96. The Russian Federation uses the default IPCC good practice guidance method to estimate $N_2O$ emissions from manure management. Country-specific nitrogen (N) excretion rates (Nex) are estimated for cattle, swine and poultry, reindeer, rabbits and fur animals. Default IPCC Nex rates were used for the other animal categories.

97. The split of manure managed in liquid and solid storage systems is constant for the whole time series and based on one study (Gitarskiy et al, 2001). It is likely that the significant decline and changes in the agricultural sector since 1990 have also given rise to changes in storage systems. The fraction of the manure that goes to pasture range and paddock is also constant throughout the time series for all animal categories, except for cattle, where the annual changes are based on statistics of types of feed consumed. There were no manure storage questions in the 2006 national agricultural census. The ERT recommends that the Party collect expert estimates or survey data which can help it to record the changes over time in storage systems used.

Agricultural soils – $N_2O$

98. The Russian Federation uses tier 1a and tier 1b IPCC good practice guidance methods when estimating $N_2O$ emissions from agricultural soils. For the estimation of emissions from crop residues, a country-specific method is used, which also includes the emissions from N fixed by crops. Country-specific EFs for different soil types are also used for the estimation of emissions from the application of synthetic fertilizers.

99. The Russian Federation is one of few Parties which have statistics on the amount of fertilizer applied. A QC procedure is undertaken which compares the results from the balance of fertilizers (BAL=Production+Import–Export) and the statistics for applied fertilizer. Statistics on the domestic sale of fertilizer to the agriculture sector compared to statistics on the applied amount of fertilizer provide information about the storage of fertilizer. A large part of the domestic sale of fertilizer is used in the chemical industry; consumption figures for the amount of fertilizer used in this industry, or production trends and an expert estimate from the industry of corresponding fertilizer consumption trends could clarify the statistics on the domestic use of fertilizer (BAL) even further. The difference between the sold amount of domestic fertilizer in the balance and the statistics on applied fertilizer amounts is briefly described in the NIR and was also discussed during the review. Statistics on the amount of fertilizer sold to agriculture were made available to the ERT during the in-country review, and trends in production data from the chemical industry using fertilizer were also given to the ERT during the in-country review. The ERT found, based on the information given, that it seems that the Party uses the most reliable data source available for the amount of fertilizer applied (Rosstat) and that the information given about fertilizer sold and production trends in the chemical industry makes the figures seem reasonable. To make the comparison between the domestic use of fertilizer (BAL) and the statistics on applied fertilizer more useful, the ERT encourages the Party to include the information given during the review in the NIR, and to collect an expert estimate from the chemical industry about fertilizer consumption trends.

## 3. Areas for further improvement

Identified by the Party

100. The NIR states that the improvement of calculation methodologies and the adjustment of recalculation factors in the inventory of the GHG emissions in the agriculture sector of the Russian Federation will be conducted in the future in accordance with new scientific data in the agriculture field.

Identified by the expert review team

101. The ERT identified the following areas for improvement:

(a) To make the QC comparison between the domestic fertilizer balance and the statistics on the applied amount of synthetic fertilizer more useful and to enhance the transparency of reporting, the ERT encourages the Party to include more information about the domestic use of fertilizer in the NIR;

(b) The provision of more detailed information about the AWMS used over time and information about pasture times to better reflect the real manure management systems used in the time series;

(c) A recalculation of the EFs for enteric fermentation in cattle for the years 1990–2001, based on the trend for EFs for 2002–2008 (based on regional data) to ensure time-series consistency.

# E. Land use, land-use change and forestry

## 1. Sector overview

102. In 2008, net removals from the LULUCF sector amounted to 638,342.63 Gg $CO_2$ eq, offsetting 28.5 per cent of total GHG emissions. In 2008, net removals from forest land remaining forest land and for land converted to forest land amounted to 599,036.52 and 4,093.60 Gg $CO_2$ eq, respectively, and grassland remaining grassland and land converted to grassland accounted, respectively, for removals of 1,367.23 and 77,874.24 Gg $CO_2$ eq. On the other hand, cropland remaining cropland and land converted to settlements were responsible for net emissions of 15,484.31 and 28,447.28 Gg $CO_2$ eq, respectively, while wetlands were a relatively small source of emissions, amounting to 97.36 Gg $CO_2$ eq. Emissions and removals from other land categories were not reported.

103. Since 1990 – when the sector was a net source of emissions, amounting to 63,693.79 Gg $CO_2$ eq – net emissions have decreased by –1,102.2 per cent. This decrease is the result of a decreasing trend in net emissions, with a combination of very high decreases in the periods 1991–1997, 1998–2002 and 2007–2008, and a more stable trend between 2002 and 2007. The high decreases in the periods 1991–1993, 1998–2001 and 2007–2008, as explained in the NIR, were mainly influenced by: a decrease in emissions from cropland by 59.7, 37.1 and 84.8 per cent, respectively; the cessation of the cultivation and transfer of large areas of cropland into grassland in the early 1990s, as well as a reduction of fertilizer treatment during the following years; and the comparatively high output yield of crop plants in 2008. In addition, the high decrease in net emissions between 1993 and 1998 is mostly explained by a significant reduction in emissions, of 55.0 per cent, in timber harvesting in the late 1990s.

104. During the in-country review, the ERT made recommendations to improve: consistency in the time series of AD; the comparability of methods applied for estimating carbon stock changes; and completeness in the reporting of biomass burning emissions. In response to these recommendations, the Russian Federation submitted revised AD and emission/removal estimates for forests, settlements and other land categories. The revisions resulted in an increase in net removals in 2008, from 538,591 to 638,343 Gg $CO_2$ eq (by 18.5 per cent or 99,752 Gg $CO_2$ eq).

Completeness

105. The completeness of the national inventory of the LULUCF sector has been improved with the 2010 submission: carbon stock changes in organic soils in forests, $CO_2$ and $N_2O$ emissions from the drainage of organic soils in forests and peatland; and carbon stock changes in mineral soils in land converted to grassland, in soils in wetlands remaining wetlands and for peat extraction were reported in the 2010 submission for the first time. Non-$CO_2$ emissions due to biomass burning in land converted to forest land and all carbon pools in land converted to settlements were submitted, for the first time, after the in-country review in response to the recommendations formulated by the ERT. The ERT recognizes the efforts made by the Russian Federation towards improving the completeness of its GHG inventory, and encourages the Party to continue working on these improvements, since some of the mandatory subcategories are still not reported (e.g. living biomass and organic soils are reported as "NE" and "NO" in land converted to grassland).

106. The Russian Federation has reported estimates of carbon stock changes for the subdivision managed forest land under the category forest land converted to settlements in CRF table 5.E. However, the associated emissions are reported as "NE" in the "Information item" forest land converted to other land-use categories in the CRF sectoral report table 5. The ERT recommends that the Russian Federation improve the consistency in the CRF tables for the LULUCF sector in the next annual submission.

Transparency

107. In response to recommendations from the previous review report, the 2010 NIR provides information in sections 7.2.1, 7.3 and 7.4.1.1, on data sources and procedures followed to process forest data for calculating emissions and removals. The ERT recognizes this improvement; however, it encourages the Russian Federation to make additional efforts to provide more disaggregated background data used for calculating biomass stock changes, namely, the average values of biomass stocks/age class/predominant tree species, and the biomass expansion factors which should be disaggregated in the expansion factor for above-ground biomass, below-ground biomass and wood density. The ERT also encourages the Party to improve accuracy by reporting disaggregated estimates at a regional level and by providing more detailed information on how statistical data on biomass carbon stocks, harvesting, forest fires and other disturbances are linked to each other to estimate carbon stock changes at a regional level. Moreover, considering the wealth and quality of the data available in the State Forest Registry (Forest Fund), the ERT recommends that the Russian Federation provide, in an annex to the NIR, an exhaustive and concise description of the data available in the State Forest Registry, as well as its quality, quantity, availability and methodological characteristics.

Recalculations and time-series consistency

108. The ERT noted that, in response to recommendations provided in the previous review report, the Russian Federation has undertaken recalculations of the time series 1990–2007 to take into account: the inclusion of organic soils under the forest land category, mineral soils under land converted to grassland and all carbon pools under forest land converted to settlements.

109. During the in-country review, the ERT determined that a consistent time series of AD, since 1971, has not been reported. Indeed: the total national land area is not constant; when excluding forest-related land-use categories; changes in areas of land remaining land categories are not justified by corresponding changes in areas of land converted to land categories and vice versa; areas reported under the land-use change categories do not correspond to the aggregate area of annual land-use changes that have occurred in the last 20 years. In its response to the questions formulated by the ERT during the review, the Russian Federation submitted a revised time series of AD and emissions/removals since 1990 for forests, settlements and other land. The revised time series seems to be more consistent; however, the areas in table 1 of the document submitted by the Russian Federation in response to the list of potential problems, do not fully correspond to the areas of forest land remaining forest land, land converted to forest land and forest land converted to other land uses provided in the revised CRF tables 5.A and 5.E. The ERT recommends that the Russian Federation build a consistent time series of AD for all land use and land-use change categories since 1971 as a better basis for the time series to be reported in the next annual submission, together with a set of land use and land-use change matrices,[5] one for each year.

Uncertainties

110. The Russian Federation has provided a tier 1 uncertainty estimate for the LULUCF sector for the year 2008. The overall uncertainty for the LULUCF sector was estimated to be around 13 per cent for the year 2008. The ERT was informed during the in-country review that uncertainty estimates are mainly based on expert judgement; the ERT therefore recommends that the Russian Federation make additional efforts when estimating uncertainties.

[5] See, for instance, table 2.A.1.1 at page 2.23 of the IPCC good practice guidance for LULUCF.

Verification and quality assurance/quality control approaches

111. In response to recommendations from the previous review report, the Russian Federation has implemented notable improvements in documenting land definitions: a table showing the correspondence between national land types and IPCC land-use categories has been included in the NIR (table 7.4); and forest land remaining forest land and grassland remaining grassland are now divided into "managed" and "unmanaged" in the CRF tables. While the ERT recognizes these efforts, several inconsistencies have been found in the identification of lands, for example: "fallow lands" in table 7.4 is included in "other land", but is considered "agricultural" land in several places in chapter 7; and the conversion of forest land to other land categories (deforestation) was reported in CRF table 5.F "forest land converted to other land", without differentiating the final land use. In response to recommendations included in the list of potential problems, after the in-country review the Russian Federation submitted revised estimates of forest conversion to settlements in CRF table 5.E, instead of forest conversion to other land in CRF table 5.F. The ERT recognizes the efforts of the Party and recommends that the Russian Federation continue revising and improving consistency in land-use definitions; in particular, shrubs, currently reported under forest land, but not included in the area under forest management (Kyoto Protocol reporting).

112. The ERT still considers that several of the issues found during the in-country review could have been avoided with the use of more comprehensive QA/QC procedures. While recognizing the improvements made since the previous review, the ERT reiterates the recommendation from the previous review report that the Russian Federation further strengthen its QA/QC procedures in the LULUCF sector.

113. For the future annual submissions, the ERT encourages the Party to use verification data for AD from independent sources (i.e. remote sensing) and for carbon gains and losses, where data are available at the local level, applying the stock change method.

## 2. Key categories

Forest land remaining forest land – $CO_2$

114. Following a recommendation from the previous review report, the Russian Federation changed the method used to estimate carbon stock changes. However, some inconsistencies and inaccuracies were identified in the estimation of carbon stock changes in forests, such as: an asynchrony between the equations used for estimating carbon stock gains in living biomass and deadwood pools, which were applied throughout the rotation period, and those used for estimating carbon gains in litter and soil organic matter, which were estimated only for the first 20 years of the rotation period; and the double counting of carbon losses due to non-stand-replacing disturbances, since they were added in the method applied even though they had already been included as a net effect in the input data from the forest inventory statistics. In response to recommendations included in the list of potential problems, after the in-country review the Russian Federation submitted revised estimates for carbon stock changes and $CO_2$ emissions due to forest fires, thereby addressing these issues. The revisions resulted in an increase in net removals, in 2008, from 468,878 to 599,037 Gg $CO_2$ eq (by 27.8 per cent or 130,158 Gg $CO_2$ eq). The ERT recognizes the efforts of the Party and recommends that the Russian Federation continue revising and improving the consistency and accuracy of its estimates of carbon stock changes in forests for the next annual submission.

115. The methodology implemented by the Party estimates emissions from "stand-replacing disturbances" using AD averaged among a number of following years, which varies among forest types and regions, for areas subject to these disturbances and carbon stock change factors averaged throughout the Russian Federation. The ERT recommends

that the Russian Federation use alternative available annual AD to estimate areas subject to such disturbances, using, where possible, the averaged data as verification and that it use regional averages for carbon stock change factors; in particular, for clear-cut areas, carbon stock change factors should result from the averaging of the per ha carbon stock of mature and over-mature classes of forest land.

Cropland remaining cropland – $CO_2$

116. The area of cropland remaining cropland, as reported in the CRF tables, shows a steadily decreasing trend, with a total reduction of 31.1 per cent between 1990 and 2008; however, associated net $CO_2$ emissions display a decreasing trend but with high variability before 2001 and a high decrease in 2007–2008, producing a total reduction in net $CO_2$ emissions of 94.2 per cent between 1990 and 2008. This decrease in $CO_2$ emissions is mostly driven by mineral soils, where the same trend pattern is observed; the IEF for mineral soils has a value of –0.53 Mg C/ha in 1990, the highest among Parties with similar circumstances (e.g. Canada, Finland, Sweden, Norway and Ukraine) for the same year; and it falls to –0.04 Mg C/ha in 2008, which represents a total reduction of 92.3 per cent for the IEF between 1990 and 2008. In response to a question raised by the ERT during the review, the Russian Federation indicated that the relatively high IEF in 1990 could be explained by the type of agricultural management used during the Soviet era (around 1990), when large territories were ploughed with initially poor soil fertility and organic fertilizers were more popular than mineral ones; after 1990, large territories of ploughed soils were abandoned or converted to other land use, and the amount of organic (and mineral) fertilizers applied decreased rapidly (by more than 80 per cent in the case of organic fertilizers). This led to a decrease in respiration rates in these soils. The ERT acknowledges this explanation but recommends that the Russian Federation provide more detailed information for the relatively high value of the IEF in 1990 and for the strong decreasing trend in emissions from mineral soils in the NIR of its next annual submission.

117. The Russian Federation uses a tier 1 default EF to estimate emissions from organic soils in cropland remaining cropland. As already noted in the previous review report, if a tier 2 EF similar to that used by Parties with similar circumstances (e.g. Finland, Latvia or Sweden) were used, organic soils would become a significant pool within this key category. The ERT encourages the Russian Federation to develop country-specific EFs for organic soils in cropland in its future annual submissions, if relevant AD become available.

### 3. Non-key categories

Biomass burning – $CH_4$ and $N_2O$

118. $N_2O$ and $CH_4$ emissions due to forest fires have been estimated using a tier 1 methodology. Considering that the IEFs reported by the Russian Federation for $CH_4$ (0.09938 Mg/ha) and $N_2O$ (0.00068 Mg/ha) were 50 and 80 per cent, respectively, lower than the average IEFs from all Annex I reporting Parties, the ERT noted that the use of the tier 1 methodology would cause an underestimation of emissions from forest land remaining forest land. In response to recommendations included in the list of potential problems, after the in-country review the Russian Federation submitted revised estimates for $CH_4$ and $N_2O$ emissions due to forest fires, thereby addressing these issues.The revisions resulted in a combined increase in emissions of $CH_4$ and $N_2O$ in 2008, from 5,827 to 35,733 Gg $CO_2$ eq (by 513.3 per cent or 29,906 Gg $CO_2$ eq). The ERT acknowledges the efforts of the Party and recommends that the Russian Federation make additional efforts to use a higher-tier method and improve its estimation of $CH_4$ and $N_2O$ emissions due to biomass burning in forests for the next annual submission.

Land converted to forest land – $CO_2$, $CH_4$ and $N_2O$

119. The Russian Federation has applied a model for estimating carbon stock changes and non-$CO_2$ emissions from land converted to forest land under management based on yield tables, which do not encompass the impact of disturbances on carbon stocks (e.g. fire, pest, drought, harvesting, etc.). Thus, the model does not fully represent the real conditions under which forest plantations are developing, and, therefore, losses of carbon stocks and non-$CO_2$ emissions are underestimated. In response to recommendations included in the list of potential problems, after the in-country review the Russian Federation submitted revised estimates for land converted to forest land for all GHGs, applying factors based on methods used by other Parties, to include losses of carbon and non-$CO_2$ emissions due to disturbances.The revisions resulted in a decrease in net removals in 2008, from 6,451 to 4,094 Gg $CO_2$ eq (by –36.5 per cent or –2,357 Gg $CO_2$ eq). The ERT recognizes this improvement and recommends that the Russian Federation further develop the model used by including losses due to disturbances so that the model is able to produce more accurate estimates for the next annual submission.

Forest land converted to settlements – $CO_2$, $CH_4$ and $N_2O$

120. The ERT noted that although deforestation AD have been collected at the regional level in the Russian Federation, for each pool, the relevant national average per ha value of carbon stock has been applied as the carbon stock change factor. Moreover, the litter and soil organic matter carbon stocks have been assumed not to be completely oxidized as a consequence of the land-use change to settlements. Finally, losses in carbon stocks of soil organic matter have been reported in the year of conversion only, although the IPCC good practice guidance for LULUCF advises Parties to report carbon stock changes for the whole period of conversion (20 years by default) until a new equilibrium of carbon stocks is achieved. The ERT during the in-country review recommended that the Russian Federation revise the applied methodology in order to resolve those inconsistencies and report the estimates disaggregated per year of conversion. In response to these recommendations, the Russian Federation provided revised AD and estimates for forest land converted to settlements. The revisions resulted in an increase in net emissions in 2008 from 398 to 28,447 Gg $CO_2$ eq (by 7,042.0 per cent or 28,049 Gg $CO_2$ eq). The ERT recognizes this effort and recommends that the Party continue improving the methodology used to estimate emissions due to forest conversion.

## 4. Areas for further improvement

Identified by the Party

121. The NIR mentions the following recommendations, proposed by the Federal Forestry Agency, to further improve the calculation procedures applied to forests:

(a) Using annual data on disturbance (harvestings and destructive forest fires) levels from forest management statistics instead of mean values derived from the detection of areas harvested and burnt over a number of years;

(b) Disaggregating input and reported data of the carbon budget per region;

(c) Moving away from expert judgement to estimate uncertainties.

Identified by the expert review team

122. The ERT identified the following areas for improvement:

(a) The further revision and improvement of consistency in the Party's reporting of land uses and land-use changes;

(b) The strengthening of the QA/QC procedures, paying special attention to the correspondence between national and IPCC land definitions and to the consistency of the time series of AD and associated estimates of emissions and removals;

(c) The provision in the NIR of more disaggregated background data used for calculating biomass stock changes and more detailed information on how statistical data on different land management practices and disturbances are linked to each other to estimate carbon stock changes and emissions/removals.

## F. Waste

### 1. Sector overview

123. In 2008, emissions from the waste sector amounted 72,288.98 Gg $CO_2$ eq, or 3.2 per cent of total GHG emissions. Since 1990, emissions have increased by 22.9 per cent. The key drivers for the rise in emissions are increased solid waste disposal on land (SWDL) and industrial wastewater treatment. Within the sector, 63.4 per cent of the emissions were from SWDL, followed by 36.6 per cent from wastewater handling. Waste incineration is used for energy purposes and emissions from waste incineration are reported in the energy sector, in line with the Revised 1996 IPCC Guidelines.

Completeness

124. The emissions from the waste sector have been reported for all gases and years of the time series in the CRF tables. The Russian Federation estimated and included the emissions from industrial SWDL for the first time in the 2010 submission, as recommended by the previous review report. The ERT welcomes the efforts made by the Russian Federation in improving the completeness of the inventory. However, information on the amount and composition of industrial solid waste disposed to SWDL was not provided in the NIR. During the in-country review, the Party provided these data to the ERT. The ERT recommends that the Russian Federation include this information in the NIR of its next annual submission.

125. In the 2010 submission, $CH_4$ emissions from unmanaged waste disposal sites were reported as "NO". During the in-country review, the ERT included this issue in the list of potential problems and recommended that the Russian Federation estimate the $CH_4$ emissions from unmanaged waste disposal sites and submit revised estimates for all years of the inventory time series. In response to this recommendation, the Russian Federation reported that unmanaged waste disposal sites are shallow and provided revised estimates for the entire time series 1990–2008. The inclusion of $CH_4$ emissions from unmanaged waste disposal sites increased $CH_4$ emissions from the SWDL category by 668.53 Gg $CO_2$ eq, or 2.4 per cent in 1990 and 1,633.35 Gg $CO_2$ eq, or 3.7 per cent in 2008. The ERT identified that the revised estimates are in line with the IPCC good practice guidance and recommends that the Russian Federation include $CH_4$ emissions from unmanaged waste disposal sites in the next and future annual submissions.

Transparency

126. In general, the descriptions of trends and country-specific EFs and parameters in the NIR are transparent. However, the ERT considers that the descriptions of the weighted average of the treatment coefficient for municipal wastewater and the weighted average of the methane conversion factor (MCF) for industrial wastewater are insufficient. The ERT recommends that the Russian Federation provide more detailed explanation of these parameters in the NIR of its next annual submission.

Recalculations

127. Recalculations have performed for the years 1990–2007 due to the update of the degradable organic carbon (DOC) content in municipal solid waste (MSW) to take into account changes in waste composition over time, as recommended in the previous review report. Overall recalculations have resulted in an 8.0 per cent and 12.4 per cent increase in $CH_4$ emissions from the waste sector in 1990 and 2007, respectively, compared to the 2009 submission. The ERT welcomes the efforts made by the Russian Federation in implementing the recommendations of the previous review report. However, although the rationale for the recalculations is provided in the NIR, relevant explanations are not provided in CRF table 8(b). The ERT therefore recommends that the Russian Federation provide explanatory information in the CRF tables of its next annual submission.

128. The Russian Federation has estimated and included $CH_4$ emissions from industrial solid waste disposed to SWDL for the first time in the 2010 submission. However, the ERT noted that the recalculations due to the inclusion of industrial solid waste were not documented and reported in the NIR and the CRF tables. The ERT recommends that the Russian Federation provide explanations for any recalculations performed in the NIR and relevant information in the CRF tables of its next and subsequent annual submissions.

Uncertainty

129. The ERT noted that the details of the uncertainty analysis for the waste sector are not provided in the NIR and reiterates the recommendation from the previous review report that the Russian Federation provide an explanation for how the uncertainties are estimated in the NIR of its next annual submission.

Verification and quality assurance/quality control approaches

130. The Russian Federation implements internal QC procedures including checks of input data, calculations, time-series consistency and IEFs. During the in-country review, the ERT found errors in the calculation of the weighted average of DOC in industrial solid waste in the NIR. The ERT recommends that the Russian Federation correct these errors and enhance the QC procedures.

## 2. Key categories

Solid waste disposal on land – $CH_4$

131. The Russian Federation applied the IPCC tier 2 first order decay method to estimate $CH_4$ emissions from MSW disposed to managed waste disposal sites. The AD on MSW disposal were taken from the report published by the Academy of Public Services for 1960–1990, and from a Rosstat publication and database for 1999–2008. Data for the years 1991–1998 were interpolated. Country-specific DOC values and IPCC default parameters (e.g. methane generation rate constant (k) and fraction of DOC dissimilated ($DOC_F$)) were used in the estimation. The ERT strongly encourages the Russian Federation to consider developing and using country-specific k values, which is one of the key parameters in estimating $CH_4$ emissions from SWDL. This could also improve the accuracy of the estimates.

132. The ERT noted that the $CH_4$ emissions from industrial solid waste disposed to managed waste disposal sites have been estimated for the first time in the 2010 submission and the IPCC tier 1 default method has been applied. The AD were provided by the Russian Federal Service for Ecological, Technical and Atomic Supervision (Rostekhnadzor) for 2006–2008 and data for 1990–2005 were estimated using the gross domestic product (GDP) of the Russian Federation as a driver. The IPCC default parameters and country-specific DOC values were used in the estimation. The Party identified, in its inventory

improvement plan, the assessment of the possibility of applying the IPCC tier 2 method to estimate $CH_4$ emissions from industrial solid waste to managed waste disposal sites. The ERT welcomes this effort and encourages the Russian Federation to apply the IPCC tier 2 method to estimate $CH_4$ emissions from industrial solid waste in future annual submissions.

133. The ERT noted that the Russian Federation revised the DOC content of MSW to take into account a change in waste composition over time, as recommended in the previous review report. The ERT welcomes this effort.

### 3. Non-key categories

Wastewater handling – $CH_4$ and $N_2O$

134. The ERT noted that $CH_4$ recovery from industrial wastewater sludge treatment is reported as "NE" in the CRF tables. During the in-country review, the Party explained that $CH_4$ recovery from industrial wastewater and sludge treatment is not occurring in the Russian Federation and the notation key will be changed to "NO". The ERT recommends that the Russian Federation use the appropriate notation key in the CRF tables of its next annual submission.

### 4. Areas for further improvement

Identified by the Party

135. The Russian Federation identified the areas for further improvement and reported the activities that it is planning to undertake in the NIR, such as:

(a) The assessment of the possibility of using the IPCC tier 2 method to estimate $CH_4$ emissions from industrial solid waste disposal;

(b) The specification of an average biochemical oxygen demand (BOD) content of wastewater treated to standard quality;

(c) The collection of data to specify a share of the sewage treatment system with methane digesters in the total biological treatment system as well as a share of methane digesters equipped with systems for burning biogas in the total amount of methane digesters.

Identified by the expert review team

136. The ERT identified the following areas for improvement:

(a) The enhancement of QC procedures for the waste sector;

(b) The improvement of uncertainty estimates for the waste sector by using the country-specific estimates of uncertainties associated with AD, EFs and parameters, where possible;

(c) The improvement of the transparency of the documentation of the country-specific data used in the emission estimates and trends.

# G. Supplementary information required under Article 7, paragraph 1, of the Kyoto Protocol

## 1. Information on activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol

Overview

137. In 2008, the Party reported net emissions of 22,513.62 Gg $CO_2$ eq for activities under Article 3, paragraph 3, of the Kyoto Protocol, and net removals of 462,469.01 Gg $CO_2$ eq, for activities under Article 3, paragraph 4. In response to recommendations from the ERT during the in-country review, the Russian Federation submitted revised AD and emission/removal estimates for activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol. The revisions resulted in an increase in net emissions in 2008, from a net sink of 6,052.90 Gg $CO_2$ eq to a net source of 22,513.62 Gg $CO_2$ eq (by 471.9 per cent or 28,567.52 Gg $CO_2$ eq), for activities under Article 3, paragraph 3, combined with an increase in net removals in 2008, from 428,117.57 to 462,469.01 Gg $CO_2$ eq (by 8.0 per cent or 34,351.44 Gg $CO_2$ eq), for activities under Article 3, paragraph 4.

138. The Party reported emissions and removals from afforestation/reforestation, deforestation and the elected activity forest management according to the requirements set out by decision 15/CMP.1 and decision 16/CMP.1. The total area subjected to activities under Article 3, paragraph 3, of the Kyoto Protocol covers around 0.06 per cent of the territory of the Russian Federation and the total net removals from these activities amount to less than 1.3 per cent of total national emissions. AD for afforestation/reforestation refer only to plantations registered as subsidized plantations where the geographical location is identified in the correspondent registry. AD for deforestation result from forest cadastral data that are revised annually; however, because of the minimal occurrence of forest land conversion, which is significantly smaller than the uncertainty of the land data, the ERT encourages the Russian Federation to use alternative independent data (i.e. from remote sensing) to verify the deforestation statistics.

Activities under Article 3, paragraph 3, of the Kyoto Protocol

*Afforestation and reforestation – $CO_2$, $CH_4$ and $N_2O$*

139. The Russian Federation has applied a model for estimating carbon stock changes and non-$CO_2$ emissions from afforested/reforested lands (land converted to forest land under management) based on yield tables, which do not encompass the impact of disturbances on carbon stocks (e.g. fire, pest, drought, harvesting, etc.). Thus, the model does not fully represent the real conditions under which forest plantations are developing, and, therefore, losses of carbon stocks and non-$CO_2$ emissions are underestimated. In response to recommendations included in the list of potential problems, after the in-country review the Russian Federation submitted revised estimates for land converted to forest land for all GHGs, applying factors based on methods used by other Parties, to include losses of carbon and non-$CO_2$ emissions due to disturbances.The revisions resulted in a decrease in net removals in 2008, from 6,451 to 4,094 Gg $CO_2$ eq (by –36.5 per cent or –2,357 Gg $CO_2$ eq). The ERT recognizes this improvement and recommends that the Russian Federation further develop the model used by including losses due to disturbances so that the model is able to produce more accurate estimates for the next annual submission.

*Deforestation – $CO_2$*

140. The ERT noted that although deforestation AD have been collected at the regional level in the Russian Federation, for each pool, the relevant national average per ha value of carbon stock has been applied as the carbon stock change factor. Moreover, the litter and

soil organic matter carbon stocks have been assumed not to be completely oxidized as a consequence of the land-use change to settlements. Finally, losses in carbon stocks of soil organic matter have been reported in the year of conversion only, although the IPCC good practice guidance for LULUCF advises Parties to report carbon stock changes for the whole period of conversion (20 years by default) until a new equilibrium of carbon stocks is achieved. During the in-country review, the ERT recommended that the Russian Federation revise the applied methodology in order to resolve those inconsistencies and report the estimates disaggregated per year of conversion. In response to recommendations included in the list of potential problems, after the in-country review the Russian Federation provided revised AD and estimates for forest land converted to settlements. The revisions resulted in an increase in net emissions in 2008 from 398 to 26,607 Gg $CO_2$ eq (by 6,580.1 per cent or 26,209 Gg $CO_2$ eq). The ERT recognizes this effort and recommends that the Party continue improving the methodology used to estimate emissions due to forest conversion.

Activities under Article 3, paragraph 4, of the Kyoto Protocol

*Forest management – $CO_2$, $CH_4$ and $N_2O$*

141. Following a recommendation from the previous review report, the Russian Federation changed the method used to estimate carbon stock changes. However, some inconsistencies and inaccuracies were identified in the estimation of carbon stock changes in forests, such as: an asynchrony between the equations used for estimating carbon stock gains in living biomass and deadwood pools, which were applied throughout the rotation period, and those used for estimating carbon gains in litter and soil organic matter, which were estimated only for the first 20 years of the rotation period; and the double counting of carbon losses due to non-stand-replacing disturbances, since they were added in the method applied even though they had already been included as a net effect in the input data from the forest inventory statistics. In response to recommendations included in the list of potential problems, after the in-country review the Russian Federation submitted revised estimates for carbon stock changes and $CO_2$ emissions due to forest fires, thereby addressing these issues. The revisions resulted in an increase in net removals, in 2008, from 428,118 to 462,469 Gg $CO_2$ eq (by 8.0 per cent or 34,351 Gg $CO_2$ eq). The ERT recognizes the efforts of the Party and recommends that the Russian Federation continue revising and improving the consistency and accuracy of its estimates of carbon stock changes in forests for the next annual submission.

142. $N_2O$ and $CH_4$ emissions due to forest fires have been estimated using a tier 1 methodology. Considering that the IEFs reported by the Russian Federation for $CH_4$ (0.09938 Mg/ha) and $N_2O$ (0.00068 Mg/ha) were 50 and 80 per cent, respectively, lower than the average IEFs from all Annex I reporting Parties, the ERT noted that the use of the tier 1 methodology would cause an underestimation of emissions from forest land remaining forest land. In response to recommendations included in the list of potential problems, after the in-country review the Russian Federation submitted revised estimates for $CH_4$ and $N_2O$ emissions due to forest fires, thereby addressing these issues. The revisions resulted in a combined increase in emissions of $CH_4$ and $N_2O$ in 2008, from 5,827 to 35,505 Gg $CO_2$ eq (by 509.3 per cent or 29,678 Gg $CO_2$ eq). The ERT acknowledges the efforts of the Party and encourages the Russian Federation to make additional efforts to use a higher-tier method and improve its estimation of $CH_4$ and $N_2O$ emissions due to biomass burning in forests for the next annual submission.

## 2. Information on Kyoto Protocol units

Standard electronic format and reports from the national registry

143. The Russian Federation has reported information on its accounting of Kyoto Protocol units in the required SEF tables, as required by decisions 15/CMP.1 and 14/CMP.1. The ERT took note of the findings included in the SIAR on the SEF tables and the SEF comparison report.[6] The SIAR was forwarded to the ERT prior to the review, pursuant to decision 16/CP.10.

144. Information on the accounting of Kyoto Protocol units has been prepared and reported in accordance with chapter I.E of the annex to decision 15/CMP.1, and reported in accordance with decision 14/CMP.1 using the SEF tables. This information is consistent with that contained in the national registry and with the records of the international transaction log (ITL) and the clean development mechanism registry and meets the requirements set out in paragraph 88 (a–j) of the annex to decision 22/CMP.1. No discrepancy has been identified by the ITL and no non-replacement has occurred. The national registry has adequate procedures in place to minimize discrepancies.

Accounting of activities under Article 3, paragraph 3, of the Kyoto Protocol and any elected activities under Article 3, paragraph 4, of the Kyoto Protocol

145. The Russian Federation has reported information on its accounting of KP-LULUCF in the accounting table, as included in the annex to decision 6/CMP.3. The accounting table was revised during the course of the review due to revised estimates submitted in response to the list of potential problems. Information on the accounting of KP-LULUCF has been prepared and reported in accordance with decisions 16/CMP.1 and 6/CMP.3.

146. Table 4 shows the accounting quantities for KP-LULUCF as reported by the Party and the final values after the review.

Table 4
**Accounting quantities for activities under Article 3, paragraph 3, and, if any, activities under Article 3, paragraph 4, of the Kyoto Protocol, in t $CO_2$ eq**

| *Activity* | *Accounting quantity* | |
|---|---|---|
| | As reported | Final |
| Afforestation and reforestation | –6 451 211 | –4 093 685 |
| Deforestation | 398 310 | 26 607 307 |
| Forest management | –428 117 571 | –462 469 007 |
| Article 3.3 offset[a] | 0 | 22 513 623 |
| Forest management cap | 605 000 000 | 605 000 000 |
| Cropland management | NA | NA |
| Grazing land management | NA | NA |
| Revegetation | NA | NA |

*Abbreviations*: NA = not applicable

[a] Article 3.3 offset: for the first commitment period, a Party included in Annex I that incurs a net source of emissions under the provisions of Article 3, paragraph 3, may account for anthropogenic greenhouse gas (GHG) emissions by sources and removals by sinks in areas under forest management under Article 3, paragraph 4, up to a level that is equal to the net source of emissions under the

[6] The SEF comparison report is prepared by the ITL administrator and provides information on the outcome of the comparison of data contained in the Party's SEF tables with corresponding records contained in the ITL.

provisions of Article 3, paragraph 3, but not greater than 9.0 megatonnes of carbon times five, if the total anthropogenic GHG emissions by sources and removals by sinks in the managed forest since 1990 is equal to, or larger than, the net source of emissions incurred under Article 3, paragraph 3.

147. Based on the information provided in table 4, the Russian Federation shall issue 439,955,384 removal units in its national registry.

National registry

148. The ERT took note of the SIAR and its finding that the reported information on the national registry is complete and has been submitted in accordance with the annex to decision 15/CMP.1. The ERT further noted from the SIAR and its finding that the national registry continues to perform the functions set out in the annex to decision 13/CMP.1 and the annex to decision 5/CMP.1, and continues to adhere to the technical standards for data exchange between registry systems in accordance with decisions 16/CP.10 and 12/CMP.1. The national registry also has adequate security, data safeguard and disaster recovery measures in place.

149. The ERT notes and thanks the Party for the effort required to translate the relevant sections of the NIR into English and for submitting the SIAR R2-R5 reports to facilitate the SIAR assessment process. The ERT encourages the Party to submit a similar translation with or shortly after the NIR submission on April 15 via the submission portal to improve the timeliness of the assessment.

Calculation of the commitment period reserve

150. The Russian Federation has reported its commitment period reserve (CPR) in its 2010 annual submission. The Party reported its CPR to be 11,147,825,745 t $CO_2$ eq based on the national emissions in its most recently reviewed inventory (2,229,565.15 Gg $CO_2$ eq). The ERT disagreed with this figure. After the in-country review, in response to list of potential problems, the Russian Federation revised the estimates in its most recently reviewed inventory to be 2,239,953.04 Gg $CO_2$ eq and reported its calculation of the CPR to be 11,199,765,202 t $CO_2$ eq based on the national emissions in its most recently reviewed inventory. The ERT agrees with this figure.

### 3. Changes to the national system

151. The Russian Federation reported that there have been no changes in its national system since the previous annual submission. The ERT concluded that the Party's national system continues to be in accordance with the requirements of national systems outlined in decision 19/CMP.1.

### 4. Changes to the national registry

152. The Russian Federation has reported changes to its national registry in the 2010 annual submission. These changes are in relation to: the availability of publicly accessible information by means of a user interface to the national registry (the website of the Russian Registry of Carbon Units was revised, in particular official reports on the accounts; holdings and transactions in the Russian Registry of Carbon Units were also published); and the description of the 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 (e.g. special additional modules generating electronic versions of data logs (the transaction log, reconciliation log and notification log) were installed). The ERT concluded that the Russian Federation's national registry continues to perform the functions set out in the annex to decision 13/CMP.1 and the annex to decision 5/CMP.1, and continues to

adhere to the technical standards for data exchange between registry systems in accordance with relevant CMP decisions.

### 5. Minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol

153. The Russian Federation has reported information on the minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol, as requested in chapter I.H of the annex to decision 15/CMP.1, in its 2010 annual submission. The Party submitted this information on 2 July 2010; however, the ERT notes that the submission due date is 15 April.

154. The information provided by the Russian Federation refers, inter alia, to the activities on the professional training of students, and postgraduate and post-doctoral students from developing countries and studying at universities in the Russian Federation (e.g. 46 foreign students specialized their studies on "Meteorology" in 2010). The ERT noted that most of the information presented in chapter 10.5 of the NIR "Minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol" is not directly related to the commitments mentioned in Article 3, paragraph 14, of the Kyoto Protocol.

## III. Conclusions and recommendations

155. The Russian Federation made its annual submission on 15 April 2010 (CRF tables only); on 25 May 2010 the Party resubmitted the CRF tables and submitted the NIR; and on 2 July 2010 the NIR was resubmitted with information under Article 3, paragraph 14, of the Kyoto Protocol. The annual submission contains the GHG inventory (comprising CRF tables and an NIR) and supplementary information under Article 7, paragraph 1, of the Kyoto Protocol (information on: activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, Kyoto Protocol units, changes to the national system and the national registry and minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol). This is generally in line with decision 15/CMP.1.

156. The ERT concludes that the inventory submission of the Russian Federation has been prepared and reported generally in accordance with the UNFCCC reporting guidelines, the Revised 1996 IPCC Guidelines, the IPCC good practice guidance and the IPCC good practice guidance for LULUCF. The 2010 inventory submission is generally of a high quality and shows significant improvements in the major issues (e.g. recalculations in the LULUCF sector). However, the ERT identified a need for further improvements, in particular the further development of country-specific EFs and other parameters (e.g. in the energy sector) in order to move to higher-tier methods. Other improvements needed are reflected in the recommendations.

157. The inventory submission is largely complete and the Party has submitted a complete set of CRF tables for the years 1990–2008 and an NIR; these are complete in terms of gases, geographical coverage, years and sectors. Some very small emission categories are reported as "NE" either because of a lack of data or because the Revised 1996 IPCC Guidelines and the IPCC good practice guidance do not provide a methodology. Categories reported as "NE" where these guidelines do provide methodologies, or "NO" where emissions are known to occur were identified by the ERT in the industrial processes and waste sectors, respectively; the Party subsequently provided these estimates to the ERT during the review.

158. The submission of information required under Article 7, paragraph 1, of the Kyoto Protocol has been prepared and reported in accordance with decision 15/CMP.1.

159. The Russian Federation has reported information on its accounting of Kyoto Protocol units in accordance with chapter I.E of the annex to decision 15/CMP.1, and used the required reporting format tables as required by decision 14/CMP.1.

160. The Party has elected forest management and has chosen annual accounting. During the review, the Party substantially revised its estimates for activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol which, jointly with some revisions of emission estimates for Annex A sources, significantly improved the accuracy of the inventory.

161. The national system continues to perform its required functions as set out in the annex to decision 19/CMP.1. The ERT commends the Party for having developed an inventory improvement plan. However, there are still problems concerning the timely submission of the inventory and the QA/QC procedures need further strengthening.

162. The national registry continues to perform the functions set out in the annex to decision 13/CMP.1 and the annex to decision 5/CMP.1, and continues to adhere to the technical standards for data exchange between registry systems in accordance with relevant CMP decisions.

163. The Russian Federation has reported the information requested in chapter I.H of the annex to decision 15/CMP.1, "Minimization of adverse impacts in accordance with Article 3, paragraph 14" as part of its 2010 annual submission. The information was provided on 2 July 2010. This is after 15 April which is the due date for annual submissions.

164. In the course of the review, the ERT formulated a number of recommendations relating to the completeness and transparency of the information presented in the annual submission, QA/QC and verification procedures, as well as methodological issues. The key recommendations are that the Russian Federation:

(a) Review the elements of its national inventory system that would enable the timely submission of its inventory report, and submit its next report by 15 April 2011;

(b) Further develop country-specific EFs and other parameters (e.g. in the energy sector) in order to move to higher-tier methods;

(c) Provide more transparent information on the AD, methods, EFs and other parameters used, in particular for the energy (i.e. the inclusion of detailed fuel consumption data from the energy balance in the NIR), LULUCF and waste sectors;

(d) Improve the explanations for the recalculations in the industrial processes and waste sectors;

(e) Improve the uncertainty estimates by providing reasons for the large differences in the uncertainty estimates compared to previous submissions, ensuring that the 95 per cent confidence interval is used for all category uncertainty estimates, and ensuring that changes in methods, EFs and AD are reflected in the uncertainty estimates;

(f) Strengthen the QA/QC procedures in order to ensure the quality of the inventory, in particular by implementing QA/QC procedures on a systematic basis and documenting all results of the checks in the archive;

(g) Further improve the completeness and transparency of information on the minimization of adverse impacts, in accordance with Article 3, paragraph 14, of the Kyoto Protocol.

# IV. Questions of implementation

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

# Annex I

## Documents and information used during the review

### A. Reference documents

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

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

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

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

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

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

"Guidelines for national systems under Article 5, paragraph 1, of the Kyoto Protocol". Decision 19/CMP.1. Available at <http://unfccc.int/resource/docs/2005/cmp1/eng/08a03 .pdf# page=14>.

"Guidelines for the preparation of the information required under Article 7 of the Kyoto Protocol". Decision 15/CMP.1. Available at <http://unfccc.int/resource/docs/2005/cmp1/ eng /08a02.pdf#page=54>.

"Guidelines for review under Article 8 of the Kyoto Protocol". Decision 22/CMP.1. Available at <http://unfccc.int/resource/docs/2005/cmp1/eng/08a03.pdf#page=51>.

Annual status report of the annual inventory of the Russian Federation. Available at <http://unfccc.int/resource/docs/2010/asr/rus.pdf>.

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

FCCC/ARR/2009/RUS. Report of the individual review of the greenhouse gas inventory of the Russian Federation submitted in 2009. Available at <http://unfccc.int/resource/docs/2010/arr/rus.pdf>.

UNFCCC. *Standard Independent Assessment Report*, Parts I and II. Available at <http://unfccc.int/kyoto_protocol/registry_systems/independent_assessment_reports/items/ 4061.php>.

## B. Additional information provided by the Party

Responses to questions during the review were received from the review team, in particular from Mr. Alexander Nakhutin (Institute of Global Climate and Ecology), including additional material on the methodologies and assumptions used. The following documents[1] were also provided by the Russian Federation:

Dedikov JV, Akopova GS, Gladkaja NG, Piotrovskij AS, Markellov VA, Salichov SS, Kaesler H, Ramm A, Müller von Blumencron A and Lelieveld J. 1999. *Estimating methane releases from natural gas production and transmission in Russia.* Atmospheric Environment. 33: pp.3291-3299.

Grabar V.A, Gytarsky M.L, Dmitrieva T.M., Gluhovskaya E.P., Hor'kova N.I. & Kirichkov S.V., 2010: *The assessment of greenhouse gases emission from civil aviation of the Russian Federation.*

R. S. Sokolov (2003), *Chemical Technology*, V.1, Moscow, 2003, pp 296 – 303 [P.C. Соколов, Химическая технология, Том 1, Химическое производство в антропогенной деятельности. Основные вопросы химической технологии. Производство неорганических веществ. Гуманитарный Издательский Центр «Владос», Москва, 2003, стр. 296-303].

A.N. Tsoy, V.V. Arkhipov (2007), *Modern approach to the treatment of patients with bronchial asthma*, 2007 [А.Н. Цой, В.В. Архипов Современный подход к ведению больных бронхиальной астмой, 2007].

*Academy of trends of industrial markets* (2007) (http://www.akpr.ru/). [Академия конъюктуры промышленных рынков, 2007 (http://www.akpr.ru/)].

[1] Reproduced as received from the Party.

# Annex II

## Acronyms and abbreviations

| | |
|---|---|
| AD | activity data |
| AWMS | animal waste management systems |
| BAL | balance of fertilizers |
| BOD | biochemical oxygen demand |
| $C_2F_6$ | perfluoroethane |
| C | confidential |
| CaO | calcium oxide |
| $CF_4$ | perfluoromethane |
| $CH_4$ | methane |
| CMP | Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol |
| $CO_2$ | carbon dioxide |
| $CO_2$ eq | carbon dioxide equivalent |
| CPR | commitment period reserve |
| CRF | common reporting format |
| DOC | degradable organic carbon |
| $DOC_F$ | degradable organic carbon fraction |
| EF | emission factor |
| ERT | expert review team |
| F-gas | fluorinated gas |
| GE | gross energy input |
| GDP | gross domestic product |
| 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 |
| HFCs | hydrofluorocarbons |
| IEF | implied emission factor |
| IGCE | Institute of Global Climate and Ecology |
| IPCC | Intergovernmental Panel on Climate Change |
| ITL | international transaction log |
| Kg | kilogram (1 kg = 1,000 grams), |
| KP | Kyoto Protocol |
| KP-LULUCF | land use, land-use change and forestry emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol |
| Kt | kilotonne (1 kilotonne = 1,000 tonnes) |
| LULUCF | land use, land-use change and forestry |
| MCF | methane conversion factor |
| Mg | megagram (1 Mg = 1 tonne) |
| MSW | municipal solid waste |
| N | nitrogen |
| NA | not applicable |
| NE | not estimated |
| NGL | natural gas liquid |
| NO | not occurring |
| $N_2O$ | nitrous oxide |
| ODS | ozone-depleting substance |
| NIR | national inventory report |
| PFCs | perfluorocarbons |
| PJ | petajoule (1 PJ = $10^{15}$ joule) |

| | |
|---|---|
| QA/QC | quality assurance/quality control |
| SEF | standard electronic format |
| $SF_6$ | sulphur hexafluoride |
| SIAR | standard independent assessment report |
| SWDL | solid waste disposal on land |
| TJ | terajoule (1 TJ = $10^{12}$ joule) |
| UNFCCC | United Nations Framework Convention on Climate Change |