



**United Nations
Environment
Programme**

Distr.: General
19 May 2009

Original: English



**Workshop for a dialogue on high global-warming-potential
alternatives to ozone-depleting substances**
Geneva, 14 July 2009

Report of the Ozone Secretariat on current control measures, limits and information reporting requirements for high global-warming-potential alternatives to ozone-depleting substances

Introduction, background and approach

1. The Twentieth Meeting of the Parties to the Montreal Protocol on Substances that Deplete the Ozone Layer adopted decision XX/8 on a workshop for a dialogue on high global-warming-potential alternatives to ozone-depleting substances. In paragraph 2 of the decision the Parties requested the Ozone Secretariat “to prepare a report that compiles current control measures, limits and information reporting requirements for compounds that are alternatives to ozone depleting substances and that are addressed under international agreements relevant to climate change”. In consultation with the Technology and Economic Assessment Panel and the secretariat of the United Nations Framework Convention on Climate Change (hereinafter referred to as the Climate Change secretariat), the Ozone Secretariat identified hydrofluorocarbons (HFCs) and perfluorocarbons (PFCs) as the high global-warming-potential alternatives to be discussed in the report.
2. The international agreements relevant to climate change referred to in decision XX/8 were identified as the Climate Change Convention and its Kyoto Protocol. Thus, the information set out in the present document on current control measures, limits and reporting requirements is compiled from the two agreements themselves, from national communications and greenhouse gas inventories submitted by the Parties thereto, and from the Climate Change Convention website. The document was reviewed by the Climate Change secretariat.
3. While the national communications and the greenhouse gas inventories of the Parties included in Annex I (Annex I Parties) of the Climate Change Convention generally provided good overview information on HFC- and PFC-related issues, information on the situation of developing countries was scarce. The Ozone Secretariat therefore sent letters to selected developing countries requesting information on whether HFCs and PFCs were being produced or consumed in their territories and, if so, in what quantities. Information was also requested on whether any national policies, measures, reporting or monitoring requirements and future plans on HFCs and PFCs existed. As of 18 May 2009 the Ozone Secretariat had received no response to its request. Any information received subsequently will be compiled and present to the Parties in an addendum to the present report.

K0951828 110509

For reasons of economy, this document is printed in a limited number. Delegates are kindly requested to bring their copies to meetings and not to request additional copies.

4. In 2005 the Intergovernmental Panel on Climate Change and the Technology and Economic Assessment Panel prepared a special joint report entitled “Safeguarding the Ozone Layer and the Global Climate System: Issues Related to Hydrofluorocarbons and Perfluorocarbons”. The Panel alone subsequently prepared a supplementary report setting out the ozone-depletion implications of the issues discussed in the special report (the Supplementary Report). In accordance with paragraph 1 of decision XX/8, the Panel is currently preparing an update of the data contained in the Supplementary Report, which will be distributed to the Parties as soon as it becomes available. To provide background information on HFCs and PFCs for the present report the Secretariat has extracted some data on current and projected ozone-depleting substance demand, emissions and banks from the Supplementary Report. The table in annex I to the present report shows global demand, emissions and banks data for HFCs, PFCs, and HCFCs for 2002 and 2015 under business-as-usual and mitigation scenarios, together with reduction potentials.

5. From the latest compilation and analysis of the national greenhouse gas inventory data of all Annex I Parties for the period 1990–2006, prepared by the Climate Change secretariat¹ (which provides emissions data for HFCs, PFCs and sulphur hexafluoride together), the combined emissions of HFCs, PFCs and sulphur hexafluoride in 2006 is estimated to be about 1.7 per cent of total greenhouse gas emissions (GWP-weighted). The compilation and analysis show that the increase in combined emissions of HFCs, PFCs and sulphur hexafluoride totalled 10.1 per cent during 1990–2006 (base year: 1990), while emissions of carbon dioxide, methane and nitrous oxide decreased by 1.3 per cent, 17.8 per cent and 23.9 per cent, respectively, during the same period. The Panel’s projections in the Supplementary Report indicate that by 2015 combined HFC and PFC emissions could increase by up to 165 per cent under the business-as-usual scenario, while under the mitigation scenario an increase in emissions could be avoided.

6. The present report has been prepared in response to the Parties’ request and in accordance with that request is limited to a compilation of information on current control measures, limits and reporting requirements. It does not contain information or analysis on the status or review of the implementation of the control measures. The report is divided into three chapters: the first summarizes control measures and limits under the Convention and the Kyoto Protocol; the second describes reporting requirements under the two instruments; and the third provides a summary of information on control measures, limits and reporting requirements at the national level drawn from the latest national communications under the Convention.

I. Control measures and limits under the United Nations Framework Convention on Climate Change and the Kyoto Protocol

A. Framework Convention on Climate Change

7. The United Nations Framework Convention on Climate Change was adopted in May 1992 and entered into force in March 1994. Its ultimate objective, as stated in article 2 of the Convention, is the “stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system”, and it is based on, among other things, the principles set out under article 3, including the principles of common but differentiated responsibilities, the precautionary approach and cost-effectiveness.

8. Parties’ commitments are set out in article 4 and can be summarized as follows:

- (a) All Parties’ commitments (article 4, paragraph 1):
 - (i) To develop, periodically update and publish national inventories of anthropogenic sources and sinks of all greenhouse gases;
 - (ii) To formulate, implement, publish and regularly update national (or regional) programmes containing measures to mitigate and adapt to climate change;
 - (iii) To promote and cooperate in various matters such as the development, application and diffusion, including transfer, of technologies in all relevant sectors; sustainable management, conservation and enhancement of sinks and

1 FCCC/SBI/2008/12.

reservoirs; preparing for adaptation; scientific, technological, technical, socio-economic and other research, systematic observation and development of data archives related to the climate system; exchange of relevant scientific, technological, technical, socio-economic and legal information related to climate change, and response strategies; and education, training and public awareness;

- (b) Commitments of Annex I Parties (developed countries, including countries with economies in transition) (article 4, paragraph 2):
- (i) To adopt national policies and measures on mitigation by limiting emissions of greenhouse gases and protecting and enhancing sinks and reservoirs of greenhouse gases;
 - (ii) To communicate, periodically, detailed information on policies and measures as well as on emissions by sources and removals by sinks of greenhouse gases with the aim of returning individually or jointly to their 1990 levels the anthropogenic emissions of carbon dioxide and other greenhouse gases not controlled by the Montreal Protocol. This information was to be reviewed by the Conference of the Parties at its first session and periodically thereafter;
 - (iii) Calculations of emissions by sources and removals by sinks of greenhouse gases should take into account the best available scientific knowledge. The methodologies for these calculations were to be agreed upon and the adequacy of the measures in subparagraphs (i) and (ii) above reviewed by the Conference of the Parties at its first session as the basis for further appropriate action by the Parties.
- (c) Commitments of countries included in Annex II (developed countries, excluding countries with economies in transition) (article 4, paragraphs 3, 4 and 5):
- (i) To provide new and additional financial resources to meet the agreed full costs incurred by developing country Parties in complying with their obligations and for the transfer of technology;
 - (ii) To assist developing country Parties that are particularly vulnerable to the adverse effects of climate change in meeting the costs of adaptation

9. In 1995, as a result of the review of Parties' obligations, the Conference of the Parties to the United Nations Framework Convention on Climate Change agreed upon the Berlin Mandate, which included an aim to adopt a protocol at its third session, in 1997. The Kyoto Protocol was then adopted at the third session of the Conference of the Parties to the Convention, in December 1997, and entered into force on 16 February 2005.

B. Kyoto Protocol

10. The adoption of the Kyoto Protocol in December 1997 was a landmark achievement in establishing the obligations of Annex I Parties, i.e., developed country Parties, to limit or reduce their greenhouse gas emissions by specified amounts within a specified timeframe. Article 3 of the Protocol (see annex II to the present report) introduces emission caps and rules and requirements for such Parties to achieve and account for emission reductions. The agreed emission reductions are seen as an important first step in achieving the ultimate objective of the Convention set out in article 2 (see paragraph 7 above). The required limitation or reduction quantities are specified for developed countries in Annex B to the Protocol. Annex B of the Protocol lists 39 Parties out of the 41 Annex I Parties. Belarus and Turkey are the two Annex I Parties that are not included in Annex B. The Parties listed in Annex B as a whole are to achieve a 5 per cent reduction from the 1990 baseline. The Protocol requires Parties to make demonstrable progress in achieving their commitments by 2005.

11. The Protocol controls the six greenhouse gases listed in Annex A of the Protocol: carbon dioxide, methane, nitrous oxide, HFCs, PFCs and sulphur hexafluoride. The emission limitation or reduction target for each Party listed in Annex B is measured as a percentage of the baseline emission level of all six greenhouse gases as an aggregate total. This means that the Parties have flexibility regarding which of the controlled greenhouse gas emissions to reduce and they may even increase the emissions of some gases provided the overall target is met. The base year specified in the Protocol is 1990 but for HFCs, PFCs and sulphur hexafluoride 1995 may be used as the base year. The specified reductions are to be achieved during the five-year commitment period (2008–2012). The emissions reduction is calculated as the carbon dioxide equivalence of anthropogenic emissions by sources and

removals by sinks of the six greenhouse gases. For the purpose of calculating carbon dioxide equivalent quantities, emissions must be multiplied by the relevant global warming potential accepted by the Intergovernmental Panel on Climate Change and agreed upon by the Conference of the Parties at its third session (see annex IV to the present report).

12. Each Annex I Party listed in Annex B of the Protocol must meet the required emission limitation or reduction targets by reducing greenhouse gas emissions domestically and through flexible mechanisms known as the Kyoto mechanisms that enable Parties to achieve their targets cost-effectively through international collaboration. The use of Kyoto mechanisms must be supplementary to domestic action, which must constitute a significant proportion of a Party's effort to meet its emission reduction commitment. The Kyoto mechanisms include the Clean Development Mechanism, defined in article 12, joint implementation, defined in article 6, and emissions trading, defined in article 17. The detailed rules and modalities for the operation of the mechanisms, together with decisions on other critical matters such as compliance and a special package of measures for least developed countries, were adopted by the Conference of the Parties at its seventh session, in 2001, in a series of agreements that came to be known as the Marrakech Accords.

13. The targets for limiting or reducing emissions for Annex B Parties are expressed as levels of allowed emissions, or "assigned amount units" over the 2008–2012 commitment period. The allowed emissions are divided into assigned amount units. Each unit is equivalent to one tonne of carbon dioxide. Emissions trading allows countries that have emissions units to spare, i.e., emissions permitted but not used, to sell those units to Parties that have exceeded their targets. This trade in emissions occurs in what is broadly known as the "carbon market".

14. In addition to the actual assigned amount units, other units can also be traded under the Protocol's emissions trading scheme. Those other units, also measured in tonnes of carbon dioxide, include the following:

- (a) Removal units, on the basis of land use, land-use change and forestry activities such as reforestation;
- (b) Emission reduction units generated by joint implementation projects;
- (c) Certified emission reduction credits generated from Clean Development Mechanism project activities.

15. The Clean Development Mechanism allows an Annex B Party to earn tradable certified emission reduction credits for implementation of sustainable development projects in developing countries that result in emissions reductions. Certified emissions reduction credits may be counted toward meeting Kyoto targets. The projects must qualify through a rigorous and public registration and issuance process. Approval is given by designated national authorities. Public funding for Clean Development Mechanism project activities must not result in the diversion of official development assistance. The mechanism is overseen by the Clean Development Mechanism Executive Board, which is answerable ultimately to the Parties to the Protocol. The Mechanism has been operational since the beginning of 2006; over 4,200 projects are in the pipeline and more than 1,640 have been registered (i.e., approved). The anticipated total certified emission reductions from the 4,200 projects amount to more than 2.9 billion tonnes of carbon dioxide equivalent in the first commitment period of the Protocol (2008–2012).

16. The Joint implementation mechanism enables an Annex B Party to earn emission reduction units from an emission reduction or emission removal project in another Annex B Party, thus providing the Party with a flexible and cost-efficient means of meeting its Kyoto targets while the host Party benefits from foreign investment and technology transfer. Projects must have the approval of the host Party and participants must be authorized to participate by a Party involved in the project. Projects starting from the year 2000 may be eligible to qualify as joint implementation projects if they meet the relevant requirements but emission reduction units may only be issued for a crediting period starting after the beginning of 2008.

17. Transfers and acquisitions of all types of units, collectively referred to as Kyoto units, are tracked and recorded through the registry systems under the Protocol. Two types of registry are being implemented: national registries of Governments of the 39 Annex B Parties and the Clean Development Mechanism registry operated by the Climate Change secretariat under the authority of the Clean Development Mechanism Board. In addition to recording the holdings of Kyoto units, these registries settle emissions trades by delivering units from the accounts of sellers to those of buyers, thus forming

the backbone infrastructure for the carbon market. Domestic or regional emissions trading schemes that use Kyoto units also undertake their settlements through these registry systems. Each registry operates through a link established with the international transaction log put in place and administered by the Climate Change secretariat. The international transaction log verifies registry transactions, in real time, to ensure that they are consistent with rules agreed under the Kyoto Protocol. When the Kyoto commitment period comes to a close, the end status of the unit holdings for each Annex I Party will be compared with that Party's emissions over the commitment period 2008–2012 to assess whether it has complied with its emissions target under the Kyoto Protocol.

II. Information reporting requirements under the Framework Convention on Climate Change and the Kyoto Protocol

A. Framework Convention on Climate Change: national communications

1. Annex I Parties (developed country Parties)

18. Under the Convention, all Parties should report on the steps that they are taking to implement the Convention. The Parties' reports on their implementation are known as "national communications". Most of the 41 Parties included in Annex I submitted their first national communications in 1994 or 1995, their second during 1997–1998, their third after 30 November 2001 and their fourth in 2007. Forty communications were received by June 2008. Annex I Parties are requested to submit their fifth national communications to the Climate Change secretariat by 1 January 2010. In preparing them, Annex I Parties are requested to follow the revised reporting guidelines for the preparation of national communications adopted by the Conference of the Parties at its fifth session, in 1999.

19. The guidelines for preparing national communications promote the provision of consistent, transparent, comparable, accurate and complete information to enable a thorough review and assessment of the Convention's implementation by the Parties; the monitoring of progress made by Annex I Parties toward meeting the goals of the Convention; and assessment by the Parties of the adequacy of their commitments.

20. The list of elements of a national communication, as provided in the guidelines, is set out in annex III to the present report. Each of the elements to be included in a national communication is explained thoroughly in the guidelines, which are available on the Climate Change secretariat website for reference by the Parties.²

21. Each national communication is subject to an in-depth review conducted by an international team of experts coordinated by the Climate Change secretariat. The review, typically involving a desk-based study and an in-country visit, aims to provide a comprehensive, technical assessment of a Party's implementation of its commitments. The review results in a report, which typically expands on and updates the national communication and is intended to facilitate the work of the Conference of the Parties in assessing the implementation of commitments by Annex I Parties. In addition, although no common indicators are employed, the reports facilitate easier comparison of information submitted in Parties' national communications.

22. The Climate Change secretariat periodically prepares a compilation and synthesis report that summarizes the most important information provided in individual national communications. The latest compilation and synthesis report of Annex I Parties' communications was presented to the Subsidiary Body for Implementation of the Convention at its twenty-seventh session, held in Bali, Indonesia, in December 2007.

2. Non-Annex I (developing country Parties)

23. In accordance with the principle of common but differentiated responsibilities the required contents of the national communications and the timetable for their submission is different for non-Annex I Parties. Each such Party is required to submit its initial communication within three years of the entry into force of the Convention for that Party or of the availability of financial resources to enable it to do so. The 48 developing countries that are classified as least developed countries may prepare their national communications at their discretion.

² [http://unfccc.int/documentation/documents/advanced_search/items/3594.php?such=j&symbol="](http://unfccc.int/documentation/documents/advanced_search/items/3594.php?such=j&symbol=)
"FCCC/CP/1999/7"#beg.

24. Non-Annex I Parties have no quantitative obligations under the Convention. Their reporting requirements are therefore not as stringent as are those for Annex I Parties and financial assistance is a prerequisite for the preparation of their national communications. The revised guidelines³ for the preparation of national communications for non-Annex I Parties, adopted by the Conference of the Parties at its eighth session in 2002, define the scope of the national communication for such Parties as:

(a) A national inventory of anthropogenic emissions by sources and removal by sinks of all greenhouse gases not controlled by the Montreal Protocol, to the extent its capacities permit, using comparable methodologies to be promoted and agreed upon by the Conference of the Parties;

(b) A general description of steps taken or envisaged by the non-Annex I Party to implement the Convention;

(c) Any other information that the non-Annex I Party considers relevant to the achievement of the objective of the Convention and suitable for inclusion in its communication, including, if feasible, material relevant for calculations of global emission trends.

25. As of May 2008, 134 of 150 Parties not included in Annex I had submitted their initial national communications. The Global Environment Facility, as an operating entity of the financial mechanism of the Convention, provides financial assistance in accordance with guidance provided by the Conference of the Parties to such Parties through its implementing agencies: the United Nations Development Programme (UNDP), the United Nations Environment Programme (UNEP) and the World Bank. Bilateral agencies also provide financial and technical assistance to many such Parties for the preparation of their national communications. Mexico, the Republic of Korea and Uruguay have submitted their second national communications and other such Parties are working on updating their communications based on the revised guidelines adopted in 2002.

26. National communications from non-Annex I Parties are compiled and synthesized by the Climate Change secretariat but are not subject to in-depth review. The Climate Change secretariat has prepared compilation and synthesis reports annually since 1999 to take account of new initial communications submitted by Parties.

3. Greenhouse gas inventory

27. Since 1996, Annex I Parties have been requested to submit to the Climate Change secretariat annual inventories of anthropogenic emissions by sources and removals by sinks of all greenhouse gases not controlled by the Montreal Protocol. Guidelines for reporting and review procedures have been established for Annex I greenhouse gas inventories.

28. These annual national greenhouse gas inventories cover emissions and removals of direct greenhouse gases (carbon dioxide, methane, nitrous oxide, HFCs, PFCs and sulphur hexafluoride) classified according to six sectors (energy, industrial processes, solvents, agriculture, land use, land-use change and forestry, and waste). Emissions estimates should be reported for all years from the base year or period to the most recent year. Submission is due by 15 April each year. Under the Convention's reporting guidelines on annual inventories for Annex I Parties,⁴ inventory submissions comprise two parts:

(a) National inventory report: detailed and complete information on inventories, including a comprehensive description of the methodologies used in compiling the inventory, data sources, institutional structures and quality assurance and control procedures;

(b) Common reporting format: a series of standardized data tables containing mainly numerical information and submitted electronically.

29. According to the Convention reporting guidelines, and with regard to HFCs and PFCs, Parties are required to report on at least the 13 HFCs and 7 PFCs on a chemical-by-chemical basis unless aggregation is required to protect confidential business or military information. Annex I Parties are strongly encouraged also to report on emissions and removals of additional greenhouse gases for which 100-year global-warming-potential values are available but have not yet been adopted by the Conference of the Parties. These emissions and removals should be reported separately from national

3 <http://unfccc.int/resource/docs/cop8/07a02.pdf#page=2>.

4 FCCC/SBSTA/2006/9 <<http://unfccc.int/resource/docs/2006/sbsta/eng/09.pdf>>.

totals. The list of the HFCs and PFCs and the global warming potential for all the greenhouse gases included in the Kyoto basket are shown in the table contained in annex IV to the present report.

30. Annex V to the present report contains an outline of the required structure of national inventory reports, showing the data and information that need to be included. Annex VI contains a list of the tables that constitute the common reporting format, showing the types or categories of data that must be reported. Further detailed annotation on the items of the national inventory report and the common reporting format may be found in the inventory guidelines, which are available on the Climate Change secretariat website.⁵

31. The Convention inventory reporting guidelines state that Annex I Parties shall use guidelines prepared by the Intergovernmental Panel on Climate Change to estimate and report on anthropogenic emissions by sources and removals by sinks of greenhouse gases not controlled by the Montreal Protocol.⁶ These guidelines provide directions for calculating emissions from the six major emission source categories and information and methods for estimation of emissions and removals. Annex I Parties are encouraged to go beyond the default methods where possible and use their own national methodologies, emission factors and activity data that they consider to be most appropriate for their national situations. These methodologies, emission factors and activity data should be developed in a manner consistent with the Panel's guidelines and good practice guidance for land use, land-use change and forestry.

32. In preparing their inventories, Parties should pursue the following general principles:

(a) *Transparency*: the assumptions and methodologies used for an inventory should be clearly explained to facilitate replication and assessment of the inventory by users of the reported information;

(b) *Consistency*: the elements of an inventory should be consistent with inventories of other years, using similar methodologies for the base and subsequent years and consistent data sets are used to estimate emissions or removals from sources or sinks;

(c) *Comparability*: estimates of emissions and removals should be comparable among Parties; thus Parties should use the methodologies and formats agreed upon by the Conference of the Parties for estimating and reporting inventories;

(d) *Completeness*: an inventory should cover all sources and sinks together with all gases included in the Intergovernmental Panel on Climate Change guidelines for national greenhouse gas inventories in addition to other existing relevant source or sink categories which are specific to individual Parties. Completeness also means full geographic coverage of sources and sinks of an Annex I Party;

(e) *Accuracy*: the relative measure of the exactness of emissions or removal estimates should not be systematically over or under true emissions or removals, as far as can be judged, and uncertainties should be reduced as far as practicable.

33. The greenhouse gas inventories are subject to mandatory technical review in accordance with the Convention's review guidelines.⁷ The review involves an initial check, a synthesis and assessment of all annual inventories of Annex I Parties and a review of individual inventories through a centralized review, a desk review or an in-country visit. The results of the various stages of the technical reviews are published on the Climate Change secretariat's website.⁸ The Climate Change secretariat maintains a database of greenhouse gas emissions and removal data. The data are taken from the annual greenhouse gas inventory submissions of Annex I Parties in addition to national communications submitted by non-Annex I Parties.

5 http://unfccc.int/documentation/documents/advanced_search/items/3594.php?rec=j&preref=600003988#beg.

6 The guidelines are set out in three documents: "Guidelines for National Greenhouse Gas Inventories", as revised in 1996; "Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories", completed in 2000; and "Good Practice Guidance for Land Use, Land-Use Change and Forestry, developed in 2004. Parties are currently discussing in the Convention's Subsidiary Body for Scientific and Technological Advice the Panel's 2006 guidelines for national greenhouse gas inventories.

7 FCCC/CP/2002/8.

8 <http://unfccc.int/national_reports/annex_i_ghg_inventories/inventory_review_reports/items/4400.php>.

4. Supplementary information under the Kyoto Protocol

34. The Kyoto Protocol requirements for national greenhouse gas inventories incorporate and build upon the requirements of the Convention. The submission of each Annex I Party covers the obligation of that Party under both the Kyoto Protocol and the Convention, and the annual greenhouse gas inventory should meet the methodological and reporting requirements established under the Convention. Annex I Parties that are also Parties to the Kyoto Protocol are required to report supplementary information under paragraph 1 of article 7 for the purposes of ensuring compliance with article 3 of the Protocol.⁹ The supplementary information is to be reported with the inventory submission due under the Convention and should include:

- (a) Information on anthropogenic greenhouse gas emissions by sources and removals by sinks from land use, land-use change and forestry activities, including afforestation, reforestation and deforestation since 1990, forest management, cropland management, grazing land management and revegetation;
- (b) Information on Kyoto units (emission reduction units, certified emission reductions, assigned amount units and removal units);
- (c) Changes in national systems for the estimation of anthropogenic emissions and removal by sinks of greenhouse gases;
- (d) Changes in national registries;
- (e) Minimization of adverse impacts.

35. The Climate Change secretariat has developed an example of a national inventory report outline with annotations that takes into account the outline of the national inventory report under the Convention and the supplementary information required under the Kyoto Protocol. Annex I Parties that are also Parties to the Protocol are encouraged to use that outline and its annotations.

III. Control measures, limits and reporting requirements at the national level

36. Annex I Parties are requested to report, in accordance with Convention reporting guidelines for national communications, on policies and measures adopted and planned, or no longer in place, for implementing commitments to mitigate climate change. Parties may give priority to policies and measures, or combinations of policies and measures, which have the most significant impact in affecting greenhouse gas emissions and removals, indicating those which are innovative or effectively replicable by other Parties. Parties need not, however, report on every policy and measure which affects greenhouse gas emissions.

37. In accordance with relevant reporting requirements, policies and measures are reported under sectors such as energy, transport, industry, agriculture, forestry and waste management and subdivided by greenhouse gas. Cross-sectoral policies and measures are also described. Policies and measures for HFCs and PFCs are reported under the “industrial processes” sector of the “non-energy” sector.

38. It has been estimated that total greenhouse gas emissions from the industrial processes sector are about 3 per cent of global total carbon dioxide equivalent emissions.¹⁰ Within the industrial processes sector, the combined carbon dioxide equivalent emissions of HFCs and PFCs in 1995 was estimated to be less than 20 per cent. The rest consists of sulphur hexafluoride, nitrous dioxide and carbon dioxide (mainly related to cement production). According to the compilation and synthesis of greenhouse gas inventories prepared by the Climate Change secretariat¹¹ the total greenhouse gas emissions in the industrial processes sector decreased from 1,430 Tg carbon dioxide equivalent in 1990 to 1,240 Tg in 2006, i.e., by 13 per cent.

39. The information on the policies and measures relevant to HFCs and PFCs in the present document has been extracted mainly from the latest compilation and synthesis report on national

9 In accordance with the guidelines set out in decision 15/CMP.1 (FCCC/KP/CMP/2005/8/Add.2).

10 Jos G.J. Olivier and Joost Bakker, Historical global emission trends of the Kyoto gases HFCs, PFCs, and sulphur hexafluoride.

11 FCCC/SBI/2008/12.

communications,¹² prepared by the Climate Change secretariat in November 2007 on the basis of the fourth round of national communications of Annex I Parties. As of October 2007 39 such Parties had submitted their national communications.

40. In addition to the overview provided in the present report, more detailed summaries of the extracts of the policies and measures for HFCs and PFCs reported by Parties included in Annex I in their fourth national communications have been compiled in an information document for the workshop (UNEP/OzL.Pro/Workshop.4/INF/1). Parties to the Montreal Protocol are invited to share any further information on their policies and measures at the workshop or to submit it to the Ozone Secretariat prior to the workshop to enable its distribution in advance of the workshop.

41. In general, policies and measures directed at HFCs and PFCs seek:

- (a) Limitations (bans) on the use of certain HFCs and PFCs used as substitutes for ozone-depleting substances;
- (b) Improved manufacturing, handling, use and end-of-life recovery of fluorine-containing gases used as substitutes for ozone-depleting substances;
- (c) Reduced PFC and HFC emissions in semiconductor manufacture, PFC emissions in aluminium production and HFC emissions from miscellaneous sources.

42. An overview of the key HFC and PFC measures of the Parties is provided in the paragraphs below. Where available, the mitigation effects of the individual policies and measures and their contribution to the Parties' emission reduction portfolios are given. The national communications contain little information on the reduction targets or limits of the individual policies and measures for HFCs and PFCs alone; the available data on mitigation effects provide some idea of the reductions that are expected but it should be kept in mind that those reduction targets may not be specific to HFC and PFC reductions and may also include other greenhouse gases.

43. The European Union uses regulations to control the emissions of F-gases (including HFCs and PFCs). The Directive on F-gases contains mandates for the containment and recovery of F-gases; requirements for the training and certification of personnel involved in maintaining equipment containing F-gases; restrictions on the marketing and use of specific F-gases in specified applications; provisions to strengthen the monitoring of emissions through reporting requirements; and requirements for labelling of appliances containing F-gases, indicating the chemical names and the quantity of the chemicals and stating that they are covered by the Kyoto Protocol (European Community, 23 Tg CO₂eq, 2.1 to 2.4 per cent). The Mobile Air-Conditioning Directive prohibits the use of certain HFCs in mobile air-conditioning systems in new vehicles. Gases with a global warming potential of greater than 150 will be prohibited from use in air-conditioning units in new model cars from 2011 and in all new cars from 2017. The directive also provides for harmonized leak detection tests and limits on the retrofitting and refilling of mobile air conditioning units. The directive amends the European Whole Vehicle Type Approval Directive, which sets out obligations to achieve compliance with technical requirements before vehicles are marketed.

44. The European Union member States are expected to adopt national policies and measures in accordance with these F-gas directives.

45. Regulations used in other countries include, for example, the following:

- (a) Australia controls end use of HFCs and PFCs in the fire protection, refrigeration and air conditioning sectors through consistent minimum standards for all people who work with fluorinated gases in these industry sectors, licensing of technicians and other staff and rules for acquiring the gases (greenhouse gases controlled by regulations: 4.7 Tg CO₂eq., 7.0 per cent);
- (b) The United States of America's Significant New Alternatives Programme provides for the phase-out of the use of ozone-depleting substances; research on and identification and implementation of climate- and ozone-friendly alternatives; and the monitoring and minimization of emissions of global-warming gases such as HFCs and PFCs (150 Tg CO₂eq. in 2012);
- (c) Japan had planned to implement the recovery and destruction of HFCs in the refrigerant sector through laws and regulations including laws for the recycling of specified home appliances, recovery and destruction of fluorocarbons and recycling of end-of-life vehicles (Target: total F-gas

12 FCCC/SBI/2007/INF.6/Add.1.

emissions of +0.1 per cent relative to the base year (1995) level (approximately 51 million tonnes CO₂eq.);

(d) Switzerland, through climate-related amendments to its Ordinance relating to Environmentally Hazardous Substances, adopted in April 2003, together with a number of other regulations, implements restrictions on the use of compressed gas containers and sprays; limits synthetic greenhouse gas emissions from plastic foams; limits or bans the use of solvents and refrigerants; and bans the supply and import of fire extinguishing agents made of synthetic greenhouse gases and appliances containing such agents;

(e) The by-law of Turkey on air pollution caused by industry requires industrial plants, and especially power plants, to obtain "emission permits" and specifies the limits and controls on the application of F-gases;

(f) A number of countries including Australia, Croatia and Japan have also incorporated some F-gas controls into existing laws and regulations on gases controlled under the Montreal Protocol.

46. Voluntary enterprise challenges and partnerships are used in a number of countries. For example, in the United States such programmes are used to limit emissions of HFCs, PFCs and sulphur hexafluoride in semiconductor production, electric power distribution and magnesium production; to reduce PFC emissions in aluminium production; to reduce trifluoromethane (HFC-23) emissions; and improve the environmental performance of mobile air conditioners (Environmental Stewardship, 35.6 Tg CO₂eq, 8.8 per cent; HFC-23 Partnership, 16.5 CO₂eq, 4.1 per cent; Mobile Air Conditioning Climate Protection Partnership, 5.5 Tg CO₂eq, 1.4 per cent).

47. Fiscal measures have also been mentioned, for example taxes on the import and production of HFCs and PFCs in Norway and Denmark. In the case of Norway the tax is supplemented with a reimbursement scheme, which prescribes a refund of the tax when the gas is destroyed.

48. Programmes and activities on research and development and awareness raising and education have been reported by a few countries. Japan, for example, noted research on and development of alternatives to fluorinated gases and associated information dissemination and education. A "no-loss campaign" in New Zealand is a voluntary educational programme aimed at improving the awareness of refrigeration and air conditioning engineers about the greenhouse gas risks associated with fluorocarbon refrigerants.

49. Tradable emissions allowance systems also play a role in reducing emissions of HFCs and PFCs. The systems are used primarily in the European Union and are the premier means for reducing carbon dioxide emissions from energy production and use. The European Union's Emission Trading System is the largest and best known, but there are two others in operation: the New South Wales Greenhouse Gas Abatement Scheme in Australia and the Chicago Climate Exchange in the United States. Many others are being developed in Australia, Canada, Japan, New Zealand, Norway, Switzerland and the United States.

50. Voluntary sectoral commitments that are industry-led have been reported in a few instances to reduce industrial processes emissions. For example, an industry-led initiative seeks to reduce PFC emissions in aluminium production worldwide and there are also commitments at the national level (United States of America: Voluntary Aluminium Industry Partnership, 10.3 Tg CO₂eq, 2.5 per cent; Netherlands, Low PFC Aluminium Production, 1.1 Tg CO₂eq, 4.2 per cent; Norway, Climate Change Agreement with the Aluminium Industry, 1.4 to 4.1 Tg CO₂eq, 16.5 to 37.3 per cent).

51. With regard to reporting requirements for HFCs and PFCs at the national level, not much description or explanation could be identified in the fourth national communications. It is quite likely, however, that reporting requirements and systems exist within most countries because they are an important basis for the implementation of national and international measures, e.g., taxes and regulations targeting specifically HFCs and PFCs. In addition, such reporting requirements and systems are enabling the Parties to prepare their national communications and annual greenhouse-gas emission inventories.

Annex I¹³

Demand, emissions and banks in respect of HFCs and PFCs in 2002 and 2015, estimated for business-as-usual and mitigation scenarios with reduction potential

Demand												
	Product (ktonnes)				ODP (kt yr⁻¹ ODP)				GWP (MtCO₂-eq yr⁻¹)			
	2002	BAU-2015	MIT-2015	Red-2015	2002	BAU-2015	MIT-2015	Red-2015	2002	BAU-2015	MIT-2015	Red-2015
HCFCs	496	551	391	160	32	31	24	8	761	905	623	282
HFCs	207	663	466	197					449	1 323	889	434
PFCs	0.11	0.02	0.02						1.0	0.2	0.2	
Emissions												
HCFCs	271	492	292	200	15	26	16	10	448	828	484	344
HFCs	124	415	184	231					434	1 153	416	737
PFCs	0.11	0.02	0.02						1	0.2	0.2	
Banks												
HCFCs	2 651	3 317	3 017	300	194	247	232	15	3 841	4 871	4 352	520
HFCs	544	2 950	2 613	337					1 103	5 227	4 527	700
PFCs	1	1	1						5	4	4	

Explanatory notes

“Demand” refers to the net use of fluorocarbons and their alternatives. Owing to reuse, demand data may exceed annual production data.

“Banks” are the total amount of substances contained in existing equipment, chemical stockpiles, foams and other products not yet released to the atmosphere or destroyed in destruction facilities.

“Emissions” refers to direct emissions only. Indirect energy-related greenhouse gas emissions are not included in the tables.

13 The information contained in the annexes has not been formally edited.

BAU-2015: Projections for 2015 in the business-as-usual scenario

MIT-2015: Projections for 2015 in the mitigation scenario

Red-2015: Reduction potential in 2015: difference between the projections for the business-as-usual and the mitigation scenario.

Annex II

Kyoto Protocol: Article 3

1. The Parties included in Annex I shall, individually or jointly, ensure that their aggregate anthropogenic carbon dioxide equivalent emissions of the greenhouse gases listed in Annex A do not exceed their assigned amounts, calculated pursuant to their quantified emission limitation and reduction commitments inscribed in Annex B and in accordance with the provisions of this Article, with a view to reducing their overall emissions of such gases by at least 5 per cent below 1990 levels in the commitment period 2008 to 2012.
2. Each Party included in Annex I shall, by 2005, have made demonstrable progress in achieving its commitments under this Protocol.
3. The net changes in greenhouse gas emissions by sources and removals by sinks resulting from direct human-induced land-use change and forestry activities, limited to afforestation, reforestation and deforestation since 1990, measured as verifiable changes in carbon stocks in each commitment period, shall be used to meet the commitments under this Article of each Party included in Annex I. The greenhouse gas emissions by sources and removals by sinks associated with those activities shall be reported in a transparent and verifiable manner and reviewed in accordance with Articles 7 and 8.
4. Prior to the first session of the Conference of the Parties serving as the meeting of the Parties to this Protocol, each Party included in Annex I shall provide, for consideration by the Subsidiary Body for Scientific and Technological Advice, data to establish its level of carbon stocks in 1990 and to enable an estimate to be made of its changes in carbon stocks in subsequent years. The Conference of the Parties serving as the meeting of the Parties to this Protocol shall, at its first session or as soon as practicable thereafter, decide upon modalities, rules and guidelines as to how, and which, additional human-induced activities related to changes in greenhouse gas emissions by sources and removals by sinks in the agricultural soils and the land-use change and forestry categories shall be added to, or subtracted from, the assigned amounts for Parties included in Annex I, taking into account uncertainties, transparency in reporting, verifiability, the methodological work of the Intergovernmental Panel on Climate Change, the advice provided by the Subsidiary Body for Scientific and Technological Advice in accordance with Article 5 and the decisions of the Conference of the Parties. Such a decision shall apply in the second and subsequent commitment periods. A Party may choose to apply such a decision on these additional human-induced activities for its first commitment period, provided that these activities have taken place since 1990.
5. The Parties included in Annex I undergoing the process of transition to a market economy whose base year or period was established pursuant to decision 9/CP.2 of the Conference of the Parties at its second session shall use that base year or period for the implementation of their commitments under this Article. Any other Party included in Annex I undergoing the process of transition to a market economy which has not yet submitted its first national communication under Article 12 of the Convention may also notify the Conference of the Parties serving as the meeting of the Parties to this Protocol that it intends to use an historical base year or period other than 1990 for the implementation of its commitments under this Article. The Conference of the Parties serving as the meeting of the Parties to this Protocol shall decide on the acceptance of such notification.
6. Taking into account Article 4, paragraph 6, of the Convention, in the implementation of their commitments under this Protocol other than those under this Article, a certain degree of flexibility shall be allowed by the Conference of the Parties serving as the meeting of the Parties to this Protocol to the Parties included in Annex I undergoing the process of transition to a market economy.
7. In the first quantified emission limitation and reduction commitment period, from 2008 to 2012, the assigned amount for each Party included in Annex I shall be equal to the percentage inscribed for it in Annex B of its aggregate anthropogenic carbon dioxide equivalent emissions of the greenhouse gases listed in Annex A in 1990, or the base year or period determined in accordance with paragraph 5 above, multiplied by five. Those Parties included in Annex I for whom land-use change and forestry constituted a net source of greenhouse gas emissions in 1990 shall include in their 1990 emissions base

year or period the aggregate anthropogenic carbon dioxide equivalent emissions by sources minus removals by sinks in 1990 from land-use change for the purposes of calculating their assigned amount.

8. Any Party included in Annex I may use 1995 as its base year for hydrofluorocarbons, perfluorocarbons and sulphur hexafluoride, for the purposes of the calculation referred to in paragraph 7 above.

9. Commitments for subsequent periods for Parties included in Annex I shall be established in amendments to Annex B to this Protocol, which shall be adopted in accordance with the provisions of Article 21, paragraph 7. The Conference of the Parties serving as the meeting of the Parties to this Protocol shall initiate the consideration of such commitments at least seven years before the end of the first commitment period referred to in paragraph 1 above.

10. Any emission reduction units, or any part of an assigned amount, which a Party acquires from another Party in accordance with the provisions of Article 6 or of Article 17 shall be added to the assigned amount for the acquiring Party.

11. Any emission reduction units, or any part of an assigned amount, which a Party transfers to another Party in accordance with the provisions of Article 6 or of Article 17 shall be subtracted from the assigned amount for the transferring Party.

12. Any certified emission reductions which a Party acquires from another Party in accordance with the provisions of Article 12 shall be added to the assigned amount for the acquiring Party.

13. If the emissions of a Party included in Annex I in a commitment period are less than its assigned amount under this Article, this difference shall, on request of that Party, be added to the assigned amount for that Party for subsequent commitment periods.

14. Each Party included in Annex I shall strive to implement the commitments mentioned in paragraph 1 above in such a way as to minimize adverse social, environmental and economic impacts on developing country Parties, particularly those identified in Article 4, paragraphs 8 and 9, of the Convention. In line with relevant decisions of the Conference of the Parties on the implementation of those paragraphs, the Conference of the Parties serving as the meeting of the Parties to this Protocol shall, at its first session, consider what actions are necessary to minimize the adverse effects of climate change and/or the impacts of response measures on Parties referred to in those paragraphs. Among the issues to be considered shall be the establishment of funding, insurance and transfer of technology.

Annex III

Structure of the national communication

- I. Executive summary**
- II. National circumstances relevant to greenhouse gas emissions and removals**
Flexibility in accordance with article 4.6 and 4.10
- III. Greenhouse gas inventory information**
 - A. Summary tables (or as an annex to the national communication)
 - B. Descriptive summary
- IV. Policies and measures**
 - A. Policy-making process
 - B. Policies and measures and their effects
Table 1
 - C. Policies and measures no longer in place
- V. Projections and the total effect of policies and measures**
 - A. Projections
Diagrams
 - B. Assessment of aggregate effects of policies and measures
 - C. Methodology
Table 2
- VI. Vulnerability assessment, climate change impacts and adaptation measures**
 - A. Expected impacts of climate change
 - B. Vulnerability assessment
 - C. Adaptation measures
- VII. Financial resources and transfer of technology**
 - A. Provision of “new and additional” resources
 - B. Assistance to developing country parties that are particularly vulnerable to climate change
 - C. Provision of financial resources
 - D. Activities related to transfer of technology
Tables 3–6
- VIII. Research and systematic observation**
 - A. General policy on research and systematic observation
 - B. Research
 - C. Systematic observation
- IX. Education, training and public awareness**

Annex IV

List of HFCs and PFCs and global warming potential of all the greenhouse gases controlled under the Kyoto Protocol

1995 IPCC global warming potential (GWP) values^a based on the effects of greenhouse gases over a 100-year time horizon

Greenhouse gas	Chemical formula	1995 GWP	IPCC
Carbon dioxide	CO ₂		1
Methane	CH ₄		21
Nitrous oxide	N ₂ O		310
Hydrofluorocarbons (HFCs)			
HFC-23	CHF ₃		11 700
HFC-32	CH ₂ F ₂		650
HFC-41	CH ₃ F		150
HFC-43-10mee	C ₅ H ₂ F ₁₀		1 300
HFC-125	C ₂ HF ₅		2 800
HFC-134	C ₂ H ₂ F ₄ (CHF ₂ CHF ₂)		1 000
HFC-134a	C ₂ H ₂ F ₄ (CH ₂ FCF ₃)		1 300
HFC-152a	C ₂ H ₄ F ₂ (CH ₃ CHF ₂)		140
HFC-143	C ₂ H ₃ F ₃ (CHF ₂ CH ₂ F)		300
HFC-143a	C ₂ H ₃ F ₃ (CF ₃ CH ₃)		3 800
HFC-227ea	C ₃ HF ₇		2 900
HFC-236fa	C ₃ H ₂ F ₆		6 300
HFC-254ca	C ₃ H ₃ F ₅		560
Perfluorocarbons			
Perfluoromethane	CF ₄		6 500
Perfluoroethane	C ₂ F ₆		9 200
Perfluoropropane	C ₃ F ₈		7 000
Perfluorobutane	C ₄ F ₁₀		7 000
Perfluorocyclobutane	c-C ₄ F ₈		8 700
Perfluoropentane	C ₅ F ₁₂		7 500
Perfluorohexane	C ₆ F ₁₄		7 400
Sulphur hexafluoride			
Sulphur hexafluoride	SF ₆		23 900

^a As provided by IPCC in its second assessment report.

Source: FCCC/SBSTA/2006/9, page 15

Annex V

Structure of the national inventory report

Executive summary

- ES.1. Background information on greenhouse gas inventories and climate change (e.g., as it pertains to the national context, to provide information to the general public)
- ES.2. Summary of national emission and removal related trends
- ES.3. Overview of source and sink category emission estimates and trends
- ES.4. Other information (e.g., indirect greenhouse gases)

Chapter 1: Introduction

- 1.1. Background information on greenhouse gas inventories and climate change (e.g., as it pertains to the national context, to provide information to the general public)
- 1.2. A description of the institutional arrangement for inventory preparation
- 1.3. Brief description of the process of inventory preparation (e.g., data collection, data processing, data storage)
- 1.4. Brief general description of methodologies and data sources used
- 1.5. Brief description of key categories
- 1.6. Information on the QA/QC plan including verification and treatment of confidentiality issues where relevant
- 1.7. General uncertainty evaluation, including data on the overall uncertainty for the inventory totals
- 1.8. General assessment of the completeness (with reference to annex 5 of the structure of the national inventory report (NIR))

Chapter 2: Trends in greenhouse gas emissions

Information should be provided in this chapter that provides an overview of emission trends, but it is not necessary to repeat information that is provided in the sector chapters and in the common reporting format (CRF) trend tables.

- 2.1. Description and interpretation of emission trends for aggregated greenhouse gas emissions
- 2.2. Description and interpretation of emission trends by gas
- 2.3. Description and interpretation of emission trends by category
- 2.4. Description and interpretation of emission trends for indirect greenhouse gases and SO₂

Chapters 3–9: (e.g. sector name (CRF sector number))

The structure outlined below should be followed in each of the following sectoral chapters. The information should be reported following the IPCC sectors.

- 3.1. Overview of sector (e.g., quantitative overview and description)
- 3.2. Source category (CRF source category number)

For each IPCC source category (i.e., at the level of the table Summary 1.A of the CRF, or the level at which IPCC methods are described, or at the level that the Annex I Party estimates its greenhouse gas emissions) the following information should be provided:

- 3.2.1. Source category description (e.g., characteristics of sources)
- 3.2.2. Methodological issues (e.g., choice of methods/activity data/emission factors, assumptions, parameters and conventions underlying the emission and removal estimates – the rationale for their selection, any specific methodological issues (e.g. description of national methods))
- 3.2.3. Uncertainties and time-series consistency
- 3.2.4. Source-specific QA/QC and verification, if applicable
- 3.2.5. Source-specific recalculations, if applicable, including changes made in response to the review process

3.2.6. Source-specific planned improvements, if applicable (e.g., methodologies, activity data, emission factors, etc.), including those in response to the review process

Parties included in Annex I may report some of the information requested above in an aggregate form for some/several source categories if the same methodology, activity data and/or emission factors are used, in order to avoid repetition of information. For key categories, the information should be detailed in order to enable a thorough review of the inventory.

Chapter 3: Energy (CRF sector 1)

In addition, the energy information should include the following:

Fuel combustion (CRF 1.A), including detailed information on:

- Comparison of the sectoral approach with the reference approach
- International bunker fuels
- Feedstocks and non-energy use of fuels
- CO₂ capture from flue gases and subsequent CO₂ storage
- Country-specific issues

Fugitive emissions from solid fuels and oil and natural gas (CRF 1.B)

Chapter 4: Industrial processes (CRF sector 2)

Chapter 5: Solvent and other product use (CRF sector 3)

Chapter 6: Agriculture (CRF sector 4)

Chapter 7: LULUCF (CRF sector 5)

In addition, the LULUCF information should include the following:

- *Information on approaches used for representing land areas and on land-use databases used for the inventory preparation;*
- *Land-use definitions and the classification systems used and their correspondence to the LULUCF categories.*

Chapter 8: Waste (CRF sector 6)

Chapter 9: Other (CRF sector 7) (if applicable)

In addition, information previously included in the additional information and the documentation boxes of the CRF version for the trial period (FCCC/CP/1999/7) should be included and expanded in the NIR, where relevant, as specified in the appendix to this proposed structure.

Chapter 10: Recalculations and improvements

Information should be provided in this chapter that provides an overview of recalculations and improvements made to the inventory, but it is not necessary to repeat information that is provided in the sector chapters, specifically the category-specific information to be provided, and in particular, Parties included in Annex I should cross-reference information provided in the sector chapters.

10.1. Explanations and justifications for recalculations

10.2. Implications for emission levels

10.3. Implications for emission trends, including time series consistency

10.4. Recalculations, including in response to the review process, and planned improvements to the inventory (e.g., institutional arrangements, inventory preparation)

References

Annexes to the national inventory report

Annex 1: Key categories

- Description of methodology used for identifying key categories
- Reference to the key category tables in the CRF
- Information on the level of disaggregation
- Tables 7.A1 - 7.A3 of the IPCC good practice guidance¹

Annex 2: Detailed discussion of methodology and data for estimating CO₂ emissions from fossil fuel combustion

Annex 3: Other detailed methodological descriptions for individual source or sink categories (where relevant)

Annex 4: CO₂ reference approach and comparison with sectoral approach, and relevant information on the national energy balance

Annex 5: Assessment of completeness and (potential) sources and sinks of greenhouse gas emissions and removals excluded

Annex 6: Additional information to be considered as part of the NIR submission (where relevant) or other useful reference information

Annex 7: Tables 6.1 and 6.2 of the IPCC good practice guidance²

Annex 8: Other annexes - (Any other relevant information – optional).

1 This item has been added for consistency with the provisions in paragraph 30 of these guidelines.

2 This item has been added for consistency with the provisions in paragraphs 32 and 41 (f) of these guidelines.

Annex VI

Common reporting formats

Energy

Table 1 Sectoral Report for Energy

Sectoral Background Data for Energy

- Table 1.A(a) Fuel Combustion Activities – Sectoral Approach
- Table 1.A(b) CO₂ from Fuel Combustion Activities – Reference Approach
- Table 1.A(c) Comparison of CO₂ Emissions from Fuel Combustion
- Table 1.A(d) Feedstocks and Non-Energy Use of Fuels
- Table 1.B.1 Fugitive Emissions from Solid Fuels
- Table 1.B.2 Fugitive Emissions from Oil, Natural Gas and Other Sources
- Table 1.C International Bunkers and Multilateral Operations

Industrial processes

Table 2(I) Sectoral Report for Industrial Processes

Sectoral Background Data for Industrial Processes

- Table 2(I).A-G Emissions of CO₂, CH₄ and N₂O
- Table 2(II) Sectoral Report for Industrial Processes – Emissions of HFCs, PFCs and SF₆
- Table 2(II).C, E Metal Production; Production of Halocarbons and SF₆
- Table 2(II).F Consumption of Halocarbons and SF₆

Solvent and other product use

- Table 3 Sectoral Report for Solvent and Other Product Use
- Table 3.A-D Sectoral Background Data for Solvent and Other Product Use

Agriculture

Table 4 Sectoral Report for Agriculture

Sectoral Background Data for Agriculture

- Table 4.A Enteric Fermentation
- Table 4.B(a) CH₄ Emissions from Manure Management
- Table 4.B(b) N₂O Emissions from Manure Management
- Table 4.C Rice Cultivation
- Table 4.D Agricultural Soils
- Table 4.E Prescribed Burning of Savannas
- Table 4.F Field Burning of Agricultural Residues

Land use, land-use change and forestry

Table 5 Sectoral Report for Land Use, Land-Use Change and Forestry

Sectoral Background Data for Land Use, Land-Use Change and Forestry

- Table 5.A Forest land
- Table 5.B Cropland
- Table 5.C Grassland
- Table 5.D Wetlands
- Table 5.E Settlements
- Table 5.F Other land
- Table 5(I) Direct N₂O emissions from N fertilization of Forest Land and Other

Table 5(II) Non-CO2 emissions from drainage of soils and wetlands
Table 5(III) N2O emissions from disturbance associated with land-use conversion to cropland
Table 5(IV) CO2 emissions from agricultural lime application
Table 5(V) Biomass burning

Waste

Table 6 Sectoral Report for Waste

Sectoral Background Data for Waste

Table 6.A Solid Waste Disposal
Table 6.C Waste Incineration
Table 6.B Waste-water Handling

Summary tables

Summary 1.A Summary Report for National Greenhouse Gas Inventories (IPCC Table 7A)
Summary 1.B Short Summary Report for National Greenhouse Gas Inventories (IPCC Table 7B)
Summary 2 Summary Report for CO2 Equivalent Emissions
Summary 3 Summary Report for Methods and Emission Factors Used

Other tables

Table 7 Summary Overview for Key Categories
Table 8(a) Recalculation – Recalculated Data
Table 8(b) Recalculation – Explanatory Information
Table 9(a) Completeness – Information on Notation Keys
Table 9(b) Completeness – Information on Additional Greenhouse Gases
Table 10 Emissions Trends (CO2)
Table 10 Emissions Trends (CH4)
Table 10 Emissions Trends (N2O)
Table 10 Emissions Trends (HFCs, PFCs and SF6)
Table 10 Emissions Trends (Summary)
