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PORTUGAL

REPORT OF THE INDIVIDUAL REVIEW OF THE GREENHOUSE GAS INVENTORY SUBMITTED IN THE YEAR 2003¹

(Centralized review)

I. OVERVIEW

A. Introduction

1. In accordance with decision 19/CP.8 of the Conference of the Parties, the United Nations Framework Convention on Climate Change (UNFCCC) secretariat coordinated a centralized review of the 2003 greenhouse gas (GHG) inventory submission of Portugal. The review took place from 8 to 13 September 2003 in Bonn, Germany, and was conducted by the following team of nominated experts from the roster of experts: Generalists – Mr. William Kojo Agyemang-Bonsu (Ghana) and Mr. Jan Pretel (Czech Republic); Energy – Mr. Audace Ndayizeye (Burundi), Mr. Poorundeo Ramgolam (Mauritius) and Ms. Karen Treanton (International Energy Agency, IEA); Industrial Processes – Mr. Jamidu Katima (Tanzania) and Mr. Jos G. J. Olivier (Netherlands); Agriculture – Ms. Tajda Mekinda-Majaron (Republic of Slovenia) and Ms. Penny Reyenga (Australia); Land-use Change and Forestry (LUCF) – Mr. Daniel Martino (Uruguay) and Mr. Nijavalli H. Ravindranath (India); Waste – Ms. Tatiana Tugui (Republic of Moldova) and Ms. Irina B. Yesserkepova (Kazakhstan). Mr. William Kojo Agyemang-Bonsu and Ms. Penny Reyenga were the lead reviewers of this review. The review was coordinated by Ms. Astrid Olsson (UNFCCC secretariat).

2. In accordance with the UNFCCC “Guidelines for the technical review of greenhouse gas inventories from Parties included in Annex I to the Convention”, a draft version of this report was communicated to the Government of Portugal, which provided comments that were considered and incorporated, as appropriate, in this final version of the report.

B. Inventory submission and other sources of information

3. In its 2003 submission, Portugal submitted a complete set of common reporting format (CRF) tables for the years 1990–2001, except tables 5.B (Forest and Grassland Conversion), 5.C (Abandonment of Managed Lands) and 5.D (CO₂ Emissions and Removals from Soil). Portugal’s inventory includes also emissions from its two autonomous regions – Madeira and Azores. However, emissions from LUCF are accounted for only mainland Portugal. Portugal also submitted its first national inventory report (NIR). Notation keys were used throughout the tables. Where needed the expert review team (ERT) also used previous years’ submissions, additional information provided during the review and other information. The full list of materials used during the review is provided in annex 1 to this report.

¹ In the symbol for this document, 2003 refers to the year in which the inventory was submitted, and not to the year of publication. The number (3) indicates that this is a centralized report.

C. Emission profiles and trends

4. In the year 2001, the most important GHG was carbon dioxide (CO₂), contributing about 77.4 per cent to total² national GHG emissions expressed in CO₂ equivalent, followed by methane (CH₄) – 12.9 per cent, and nitrous oxide (N₂O) – 9.6 per cent. Perfluorocarbons (PFCs), hydrofluorocarbons (HFCs) and sulphur hexafluoride (SF₆) taken together contributed 0.08 per cent of the overall GHG emissions in the country. The Energy sector was by far the most important sector, accounting for 72.7 per cent of total GHG emissions, followed by Agriculture (14.0 per cent), Industrial Processes (6.7 per cent) and Waste (6.3 per cent). Total GHG emissions (excluding Land-use Change and Forestry (LUCF)) amounted to 83,822.53 Gg CO₂ equivalent and increased by 36.4 per cent from 1990 to 2001.

D. Key sources

5. Portugal reports a quantitative key source tier 1 analysis for both level and trend assessment as part of its 2003 submission in addition to using qualitative criteria to identify additional sources that were perceived to be significantly uncertain and insufficiently covered. The key source analyses performed by the Party and the secretariat³ produced different results. Portugal, for example, separated road transportation in terms of activity (diesel oil and gasoline). However, the sum of these two activities gives a level assessment of 21 per cent, which agrees with the secretariat's combined activity for mobile combustion—road vehicles.

E. Main findings

6. The inventory is broadly complete; however, emissions from some categories are not estimated, for example, 5.B (Forest and Grassland Conversion), 5.C (Abandonment of Managed Lands), and 5.D CO₂ (Emissions and Removals from Soil). Portugal has provided explanations for some of the missing categories: they are not reported because of lack of activity data (AD) (table 9). The inventory conforms with the UNFCCC reporting guidelines, the *Revised 1996 Intergovernmental Panel on Climate Change (IPCC) Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the IPCC Guidelines) and the *IPCC Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories* (hereinafter referred to as the IPCC good practice guidance), even though some major improvements will be required, especially in the areas of quantitative uncertainty analysis and implementation of a quality assurance/quality control (QA/QC) plan.

F. Cross-cutting topics

Completeness

7. The inventory covers the major emission sources. Portugal provides inventory data from 1990 to 2001. Tables 5.B, 5.C and 5.D have not been completed. Emissions of N₂O from Solvent and Other Product Use and fluorinated gases (F-gases) from use in fire extinguishers and semiconductor industries are not estimated.

Transparency

8. The NIR and CRF are transparent and internally consistent. The information in the NIR is detailed enough and the choice of methodology sufficiently well documented to allow the ERT to

² In this report, the term total emissions refers to the aggregated national GHG emissions expressed in terms of CO₂ equivalent excluding LUCF, unless otherwise specified.

³ The secretariat had identified, for each individual Party, those source categories which are key sources in terms of their absolute level of emissions, applying the tier 1 level assessment as described in the IPCC good practice guidance. Key sources according to the tier 1 trend assessment were also identified for those Parties providing a full CRF for the year 1990. Where the Party has performed a key source analysis, the key sources presented in this report follow the Party's analysis. However, they are presented at the level of aggregation corresponding to a tier 1 key source assessment conducted by the secretariat.

reconstruct the inventory. The NIR indicates that Portugal has good record keeping and archiving protocols.

Recalculations and time-series consistency

9. The ERT noted that recalculations are reported by the Party of the time series 1990–2000, undertaken, especially in the Energy sector, to take into account revisions made by the national General-Directorate for Energy (DGE) in the energy balances from 1990 to 2000, the quantification of new sources, and improved activity data, for example, for SF₆. These have led to a decrease in the figures for total national CO₂ equivalent emissions for the base year (excluding LUCF) of 5.4 per cent and an increase in the figures for emissions of 0.39 per cent when LUCF is included.

Uncertainties

10. Quantitative uncertainty estimates are not reported. However, Portugal has used qualitative uncertainty estimates, which are provided in table 7 of the CRF. The NIR confirms that the Party used expert judgement in the estimations of uncertainty.

Verification and quality assurance/quality control approaches

11. Portugal has no formal QA/QC plan as outlined in the IPCC good practice guidance. However, the inventory compilation process includes a number of technical activities such as accuracy checks on data acquired and estimated, the use of recommended emission estimation procedures, information archiving and reporting, which can be regarded as to some extent addressing the issue of quality control.

Follow-up to previous reviews

12. Portugal has submitted its first NIR. It contains a tier 1 key source analysis. The major issues which still remain unresolved are the quantitative estimation of uncertainties, completion of the CRF tables for the LUCF sector (tables 5.B, 5.C and 5.D), and the establishment of formal QA/QC procedures and a QA/QC plan.

G. Areas for further improvement

Identified by the Party

13. The NIR identifies several areas for improvement. Portugal indicates that it is working to improve, among others:

- (a) Estimates of emissions from refineries through the characterization of storage tanks;
- (b) Methane emissions from the transport of natural gas;
- (c) Emissions from iron and steel production, by looking at improved activity data;
- (d) Emissions of non-methane volatile organic compound (NMVOC) from chipboard production;
- (e) The methodology and other parameters for estimating emissions of halocarbons and SF₆, especially from industrial refrigeration, aerosols and semiconductors, and to include non-quantified sources.

Identified by the ERT

14. The ERT identified the following major areas for improvement related to cross-cutting issues in the country's inventory: the provision of quantified uncertainty estimates; and the creation of a national inventory system that addresses issues such as QA/QC.

15. Recommended improvements relating to specific source/sink categories are presented in the relevant sector sections of this report.

II. ENERGY

A. Sector overview

16. In 2001, Energy accounted for approximately 72.7 per cent of total GHG emissions in Portugal (excluding LUCF). The four largest key sources identified by the secretariat contributed 56 per cent of total emissions: CO₂ emissions from stationary sources for oil, coal and gas, and CO₂ emissions from road vehicles. Over the period 1990–2001, GHG emissions from energy increased by 51 per cent. Most of the growth occurred in transport (+81 per cent), energy industries (+39 per cent) and manufacturing industries (+36 per cent). Combined, these three sectors contributed 63.5 per cent of total GHG emissions. The Party carried out its key source analysis at the level of the sectoral breakdown defined in the CRF. According to this method, the largest sources were oil and gas used for public electricity production, and diesel and gasoline used for road transport.

17. In general, the NIR is complete and transparent for the Energy sector. Data sources for the key energy sources and the choice of methodology tier are supplied in the NIR and are consistent with the IPCC good practice guidance. The emission factors (EFs) used are a mix taken from the IPCC Guidelines, the IPCC good practice guidance, the EMEP/CORINAIR *Emission Factor Handbook* and the US EPA AP-42. They are presented in source-specific tables in the NIR, but it is not possible to identify the source for a specific factor. For transparency, the ERT recommends that Portugal try to document the sources of the individual EFs presented in the NIR.

18. Portugal has supplied detailed recalculation tables for all years with explanatory notes in CRF table 8(b) and in the NIR. For energy, most of the changes were due to a project by the DGE and the Environment Institute to improve and harmonize the national energy balance. Changes to the energy balances included a disaggregation of autoproducers (different treatment of co-generation fuel consumptions), a different treatment of feedstock, and minor revisions to the Transport and other subsectors. A few EFs were also changed to correct inconsistencies. An exception to this is the recalculation of the data for 2000, mainly because the previous data were preliminary data only. As a result of the recalculations, the figures for emissions from the Energy sector in 1990 are lower by 1.9 per cent, which maintains the “conservativeness” of the base year estimate as explained in the IPCC good practice guidance.

B. Reference and sectoral approaches

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

19. Portugal has not provided the reference approach for 2001, although it is provided for 1990–2000. In 2000, there is a difference of 6.9 per cent in the figures for CO₂ emissions between the reference and sectoral approaches, with differences of 21 per cent for natural gas and 8 per cent for liquid fuels. The explanation in the documentation box for CRF table 1.A(c) does not sufficiently explain the differences. The ERT recommends that in future Portugal provide reference approach calculations for all CRF years and try to reduce the differences between the two approaches.

20. Apparent consumption in Portugal’s reference approach for the year 2000 does not correspond closely to the IEA data: the difference is 4.3 per cent. Apparent consumption of liquid fuels is 3.8 per cent higher in the CRF and consumption of gaseous fuels is 13.9 per cent higher, while consumption of solid fuels is comparable. For liquid fuels, the trade data and the bunker data are different. For natural gas, it appears that the CRF data are given on a gross calorific value (GCV) basis, even though the EF being applied is that for the net calorific values. The ERT recommends that Portugal reconcile the two data sets and check to see if its natural gas data have been incorrectly entered as GCVs.

International bunker fuels

21. The NIR explains that neither marine nor aviation bunkers are correctly reported because the data are based on fuel consumption by companies instead of the actual share between traffic inside and outside the country. The ERT noted that Portugal has identified this as a problem that needs to be addressed in future.

Feedstocks and non-energy use of fuels

22. CRF table 1.A(d) is filled in for the years prior to 2000. However, there is no additional information in the NIR as to the relationship between the Energy sector and the Industrial Processes, Solvent and Other Product Use, and Waste sectors. The ERT recommends that more documentation be provided on this issue.

Country-specific issues

23. No emissions are reported under 1.A.5 Other, which is where military emissions should be reported. The ERT recommends that Portugal explain where (and whether) these emissions have been included.

C. Key sourcesStationary combustion: oil, coal and gas – CO₂

24. Petroleum refining contributes 4.6 per cent of CO₂ emissions from fuel combustion. The ERT noted that Portugal is planning to revise the methodology for this sector by collecting more detailed and specific information from each refinery.

25. For the iron and steel industry, which contributes 1.5 per cent of Portugal's CO₂ emissions from energy, the implied emission factors (IEFs) for liquid fuels and solid fuels are the highest of the Annex I Parties. In the NIR, Portugal presents the activity data used for this source and the EFs, which are taken from CORINAIR, IPCC and US EPA (although it is not indicated which EF comes from which source). It appears that the values chosen for the EFs for coke oven gas and blast furnace gas are part of the reason for the higher IEFs for solid fuels. For the activity data, there is a note to the effect that, for confidentiality reasons, large point sources in the iron and steel industry, the petrochemical industry and carbon black units are presented together and include other sources within each of these sectors. For transparency reasons, the ERT recommends that Portugal look into the reasons for the high IEFs.

Mobile combustion – CO₂ and N₂O

26. For road emissions, which represent 29.4 per cent of CO₂ emissions from the Energy sector, Portugal has applied a tier 2 country-specific methodology that is based extensively on the EMEP/CORINAIR methodology and emission factors. In the NIR, Portugal mentions that it is planning to improve this methodology by: updating its information on fleet composition, including introducing more categories of vehicle; adjusting the EFs on the basis of age of vehicles; and reviewing driving characteristics, including those of vehicles which run on natural gas and diesel oil mixed with vegetable oil.

27. For aviation, Portugal has raised the issue of military aircraft and is planning to identify whether this consumption is included under transportation in the national energy balance. The ERT recommends that this issue be addressed, along with the issue of separating domestic and international consumption, in Portugal's next submission.

Fugitive emissions: oil and gas operations – CH₄

28. The NIR indicates that Portugal is planning to move to a tier 2 or 3 approach for calculating CH₄ emissions from the transport and distribution of natural gas.

D. Non-key sources

29. No activity data or emissions have been provided for solid fuels in residential or commercial/public services. Very small amounts of consumption are reported to the IEA for these two sectors. The ERT recommends that Portugal clarify whether these emissions have been included elsewhere or see if it is possible to provide them separately in future.
30. The emission factor presented in the NIR for CH₄ emissions from biogas for agriculture (NIR table 3.37) is much lower than the EFs for other Parties. The ERT recommends that Portugal re-evaluate the emission factor for this item.

III. INDUSTRIAL PROCESSES AND SOLVENT USE

A. Sector overview

31. In 2001, Industrial Processes accounted for 6.7 per cent of total CO₂ equivalent emissions. CO₂ emissions represented 88 per cent of the sector's emissions (mostly from mineral production, which accounted for 78 per cent). N₂O emissions from nitric acid production accounted for 11 per cent and actual emissions of F-gases for 1.2 per cent. In the period 1990–2001, Industrial Processes CO₂ equivalent emissions increased by 18.7 per cent. CO₂ emission levels increased by 20 per cent, and N₂O emissions remained almost the same over the period, whereas emissions of halocarbons and SF₆ showed a sharp increase of over 1,000 per cent compared to 1995 (when HFC, PFC and SF₆ emissions were first reported). For 2001, Portugal reports only actual emissions of F-gases; no potential emissions are reported. CO₂ emissions from the Solvent and Other Product Use sector increased by 3 per cent from 1990 to 2001.
32. For Industrial Processes, in addition to three key sources identified by the secretariat, the Party also found CO₂ from road paving with asphalt and from "other" (i.e., glass production), HFCs from refrigeration and from foam blowing, and SF₆ from electrical equipment to be key sources (on the basis of qualitative criteria in the case of the F-gases).
33. Major improvements have been made in the reporting of F-gas emissions by the addition of HFC emissions, the removal of incorrectly reported PFC emissions from secondary aluminium production and consequent recalculation, and the recalculation of SF₆ emissions.
34. Regarding completeness, Portugal reports that F-gas emissions from the use of these gases are only partly estimated (they are not estimated for fire extinguishers or semiconductor manufacture), and that CO₂ emissions from asphalt roofing and N₂O from Solvent and Other Product Use are not estimated. In addition to the acknowledged sources of CO₂, Portugal also reports CO₂ emissions from phthalic anhydride production.
35. The transparency of the reporting for this technological sector could be improved by limiting the descriptions of methodologies and selection of emission factors to GHG emissions, and indicating to which IPCC tier the methods Portugal uses (IPCC default methods or CORINAIR) correspond. In cases where IEFs and/or EFs change significantly over time, the ERT recommends that Portugal provide summary information in the NIR that support this trend. This would also make a contribution to quality control of reported trends.

B. Key sources

Cement production – CO₂

36. In response to the ERT's observation that the activity data in 2001 are 30 per cent lower than those reported in 2000, and about 34 per cent lower than those reported to the United Nations, Portugal explained that the AD in the CRF for 2001 contain an error (correct data are used in the NIR) and that activity data used for the calculation are based on clinker production, thereby differing from the cement

production reported by the UN. This also explains why the IEF for CO₂ increased substantially in 2001 compared to previous years.

Limestone and dolomite use / other (glass production) – CO₂

37. Use data are only available for 1990 and 1991, while the average of those two years is used as the activity data for subsequent years, excluding consumption that is included and reported in other sectors (glass production, iron and steel production, and production of food and drinks). For CO₂ from lime use in glass production, production data are also estimated for most years. According to the NIR, CO₂ from lime use is also reported under paper pulp production. However, the CRF does not provide an option for reporting CO₂ emissions under 2.D.1. In addition, the IEF of 0.32 t/t was identified as an outlier compared to reporting Parties' IEFs and the IPCC default range. The Party explained that this was due to an error, which will be corrected in the next NIR. Moreover, CO₂ emissions from lime production are reported to be included elsewhere, but no information is provided as to how and where they are reported. The ERT encourages the Party to improve the consistency of its reporting by collecting relevant AD and to improve transparency by documenting the references for the emission factors, by reporting emissions in the recommended subcategory for lime use if possible, and by providing more detailed information on how emissions are estimated for both lime production and use.

Ammonia production – CO₂

38. The IEF for CO₂ decreases by about 5 per cent in 1996 and remains constant thereafter. The Party explained that it used fuel consumption data to calculate emissions for 1990–1994, whereas for the other years they are calculated on the basis of the relation between ammonia production and fuel consumption established for the earlier years. Activity data for 1995–2001 are not available and are therefore estimated and held constant. The Party also explained that in the NIR the EF for CO₂ is wrongly expressed per ton ammonia (NH₃) instead of per kg feedstock. Since the resulting emissions decrease substantially after 1990, the ERT recommends that Portugal provide more specific information in its next NIR about how the activity data were established and on the methodology, as the Party has indicated it will do.

Nitric acid production – N₂O

39. N₂O emissions decreased in 1993 by 17 per cent and in 1994 by 25 per cent, and this was followed by an increase in 1995 of 59 per cent, while emissions in later years were reported as constant over time. Since N₂O from nitric acid production is a key source, the ERT recommends that the Party provide an explanation for the large inter-annual changes and more specific documentation on the emission factor. In addition, the ERT recommends Portugal to improve the AD time series.

Refrigeration and air conditioning – HFCs

40. In the CRF background table on refrigeration, for some subcategories the IEFs seem to reflect the fraction of stock emitted instead of the percentage, which may be due to a unit error in either amount in stock or emissions. The ERT recommends the Party to check these data.

C. Non-key sources

Iron and steel production – CO₂

41. Portugal reports an IEF of 0.04 t/t, which is identified as an outlier. The NIR provides some information on which emissions are included, among others emissions from limestone production. The ERT recommends Portugal to improve the transparency and consistency of the information provided, for example, by explaining how the EF is derived and how combustion and non-combustion emissions are accounted for and allocated, and by describing source-specific QA/QC procedures in place that guarantee that no double counting or omission occurs with CO₂ emissions reported under Fuel Combustion. Moreover, the ERT encourages the Party to try to allocate the emissions from the iron and steel industry

and from lime production and use as recommended by the IPCC good practice guidance. If this is not possible, it should be clearly indicated in the CRF and the NIR.

Consumption of halocarbons and SF₆ – HFCs, PFCs and SF₆

42. Actual emissions of PFCs are not reported, notably since no emissions from fire extinguishers and from semiconductor manufacture are estimated. Potential emissions of HFCs, PFCs and SF₆ are not reported, so that the potential to actual emissions (P/A) ratios could not be determined. The ERT recognizes the effort needed to collect activity data in order to estimate actual and potential emissions of halocarbons and SF₆, but nevertheless encourages the Party to report all actual and potential emissions in its subsequent submissions, focusing on actual emissions of relatively large sub-sources (including minor sources when these can be added without disproportionate effort).

Solvent and other product use – CO₂, N₂O

43. CO₂ emissions from Solvent and Other Product Use are reported, but no emissions from N₂O use. The ERT recommends that, for all feedstock/non-energy product use sources of CO₂, the Party provide information to explain in which categories these emissions are reported, how they are checked for completeness and how double counting is avoided in the national inventory.

IV. AGRICULTURE

A. Sector overview

44. The Agriculture sector contributed 14.0 per cent of Portugal's total CO₂ equivalent emissions in 2001. Emissions from all sources in the sector decreased between 1990 and 2001 with the sole exception of N₂O emissions from manure management, which increased by 7.5 per cent over this period. All changes are due to changes in animal populations. There is no change in emissions from 2000 because activity data for 2001 were not available at the time when calculations were done. Activity in 2001 was assumed to be the same as for the year 2000. Portugal will update these data in its next submission.

45. Emissions for 2001 are reported in the CRF tables and are complete. Prescribed burning of savannas (4.E) is reported as "not occurring" ("NO"). Emissions from rabbits are included, the EFs being based on emissions from horses scaled according to size using the IPCC good practice guidance method. According to the NIR the horse is the animal whose digestive system is most similar to that of the rabbit.

46. The NIR is well organized and very transparent. All data are available in the report, all sources of data are presented and all methods are explained in detail. The Party has identified a number of areas requiring further improvement. Key areas include moving to tier 2 methods for the calculation of enteric fermentation for some animals; corrections to sheep numbers; updating of the allocations of manure management systems; a review of country-specific manure excretion rates; and the exclusion of ammonia before N₂O emissions from manure management are estimated.

47. There are no recalculations for the Agriculture sector. Some interpolations in activity data have been made to fill gaps in the time series, and the same methods were used for calculation of emissions. Only qualitative estimates of uncertainty based on expert judgment are available at present. Portugal has no QA/QC system, but its plans for the future are presented in the NIR.

B. Key sources

Enteric fermentation – CH₄

48. Activity data for sheep are 35.8 per cent lower in the CRF than those reported to the Food and Agriculture Organization of the United Nations (FAO). Portugal explains the difference in the NIR: the emission calculations do not include lambs. For accuracy, the whole animal population must be included in the calculations. The Party has identified this as an area for future improvement.

Manure management – CH₄

49. The IEFs for most animals differ significantly from the IPCC default values for temperate Western Europe. This is due to the use of country-specific manure excretion rates and the allocation of wastes to the different manure management systems. The country-specific data and differences from the IPCC defaults are well documented in the NIR. However, the key reference document (Seixas et al. 2000) has not been included in the bibliography. In its response to the draft of this report Portugal explained that the referenced document (Seixas et al. 2000) is in fact document "GASA-DCEA-FCT, 2000. Emissão e Controlo de Gases om Efeito de Estufa em Portugal. Ministério do Ambiente e Ordenamento do Território, Março 2000" mentioned in the bibliography.

50. In defining the climate region for Portugal the Party indicated that there were some problems because average annual temperature is on the margin between cool and temperate climate. Portugal has used the temperate climate emission factors but plans to review this assumption for future submissions. The ERT encourages Portugal to separate animals according to different climatic regions and to calculate emissions using the appropriate region CH₄ correction factors or emission factors.

Manure management – N₂O

51. The formula used for estimating N₂O emissions differs from that recommended in the IPCC good practice guidance in that the fraction of nitrogen (N) that is lost to the atmosphere as ammonia during housing and manure storage is subtracted before the IPCC default EF for animal waste management systems (AWMS) is applied. Given the format of the default IPCC formula, it must be presumed that the default EFs are based on total N excreted. The ERT recommends that the Party apply the IPCC methodology as recommended if it uses the IPCC default EFs. The Party has identified this in its NIR as an area requiring review. The method for estimating agricultural soil emissions from wastes excreted in pasture range or paddock should also be reviewed and modified in a consistent manner.

52. The values for nitrogen excretion per AWMS in table 4.B(b) are presented in ton N/yr instead of kg N/yr– the units that should be reported in the CRF. This change is indicated in the documentation box, and changes have also been made in the CRF formula for calculating the IEFs. In the interest of transparency and consistency, the ERT recommends that the Party report the numbers in the CRF tables in the prescribed form and units.

53. The IEFs reported in the CRF for anaerobic lagoons and for liquid systems are three times higher than the IPCC defaults used. This appears to be an error, as the exclusion of N lost as ammonia prior to the application of the default EFs would be expected to cause a lower IEF to be reported, not a higher one. The Party should check the reporting of emissions and the modifications made to the IEF calculations.

Agricultural soils – N₂O

54. Some values for FRAC and the IEF differ from the IPCC defaults, although Portugal reports using IPCC defaults. The NIR indicates that the FRAC_{GASM} is different from the default because an EF for ammonia volatilization from EMEP/CORINAIR is used. The FRAC_{NCRBF} and FRAC_{NCRO} are also country-specific for some crops. As all other values are supposed to be defaults, the reporting of emissions and activity data should be checked.

V. LAND-USE CHANGE AND FORESTRY**A. Sector overview**

55. The LUCF sector is a small net sink, offsetting 2,152 Gg CO₂, or 2.6 per cent of total GHG emissions in 2001. The magnitude of this sink has increased from only 3 Gg CO₂ in 1990. This increase is due to the combined effect of an 8 per cent increment in removals by forest biomass and an 11 per cent reduction in emissions due to harvesting.

56. The inventory is not complete, since:

- (a) Tables 5.B, 5.C and 5.D are not filled in and notation keys are generally not used;
- (b) Within subcategory 5.A, only removals due to forest growth and emissions due to wood harvest are reported;
- (c) Non-CO₂ emissions, which may be of a significant magnitude, are not reported at all in the LUCF sector;
- (d) Emissions and removals occurring in the autonomous territories of Madeira and the Azores are not reported. The Party has expressed its intention to make improvements in this regard for its future reporting.

57. Emissions from forest fires are not included in the inventory, although they are reported as additional information in table 9. The decision to exclude these emissions was based on the fact that “it is very difficult to determine when they are man-induced or not”. This argument is not appropriate, since it is not the cause of the fires that is relevant but rather where they occur (i.e., in managed or unmanaged forest land). Non-CO₂ greenhouse gas emissions reported in table 9 were equivalent to 52 per cent of net removals in the LUCF sector in 2001 and therefore constituted a relevant source. The ERT encourages the Party to identify and report fires occurring in managed forests.

B. Sink and source categories

Changes in forest and other woody biomass stocks

58. There is an inconsistency between the description in the NIR of methods used and the data reported in CRF table 5.A. According to the NIR, because their growth characteristics are different, calculations were performed separately for mature forests and new plantations. Activity data and EFs for these calculations are included in chapter 7. However, only a single entry is provided in table 5.A for all forests. Averaging out data for very different forest types may result in estimation errors. The ERT recommends that the Party provide disaggregated data for different forest types in its future submissions. In its response to the draft of this report Portugal explains that CRF table 5.A present total figures and that the data in the NIR are more detailed. However, the data are the same and the totals presented in the CRF tables correspond to data presented in the NIR.

59. Emissions from firewood consumed domestically are not included in the CRF. It was explained that this was due to “firewood being considered a forest sub-product resulting from forest clearing and not real forest depletion”. However, this is correct for CO₂ emissions only. The use of firewood also causes non-CO₂ GHG emissions which do not re-enter the carbon cycle of the forests, and should be accounted for. The ERT recommends that the Party include these emissions in its future submissions.

60. As the Party recognizes in its NIR, the wood harvest data are both incomplete (i.e., they are based on only two tree species) and inaccurate (i.e., they are based on data on wood consumption). Since wood consumption is expected to be lower than wood harvest, even after multiplying by biomass expansion factor, it is likely that emissions due to wood harvesting are underestimated. Portugal expressed its intention to improve the statistics on wood harvesting in the future.

61. The data reported in table 5.A for the years 2000 and 2001 are identical. The Party does not provide any explanation for this, but it is highly unlikely that the volume of wood harvest was exactly the same for both years. The ERT recommends that the wood harvest data be updated on an annual basis and, if this is not possible, that the assumptions made be indicated.

VI. WASTE

A. Sector overview

62. The Waste sector contributed 6.3 per cent of national total CO₂ equivalent emissions (excluding LUCF) in 2001. Emissions from Waste increased steadily from 1990 to 2001 – by 42.3 per cent. Methane emissions increased by 32.5 per cent over the period. The increase in emissions in the sector over the period 1990–2001 is explained by economic growth, population growth and the introduction of new waste incineration plants since 1999. However, this increase of 42 per cent seems excessive.

63. The information contained in the NIR ensures transparency. Recalculations are reported and table 8(b) includes an explanation regarding changes in method; EF and activity data. The uncertainty is assessed qualitatively, as indicated in table 7. No sector-specific QA/QC procedures have been established. Further improvements by the Party may include better quantification of the amount of CH₄ recovered and burned or flared, and annual updating of the data on waste composition according to information from waste management systems.

B. Key sources

Solid waste disposal on land – CH₄

64. The first-order decay (FOD) tier 2 method is applied in the 2003 submission instead of the IPCC default tier 1 method which was used previously. Methodologies used are appropriate and in line with the IPCC good practice guidance. Default and country-specific values of parameters are used. Activity data are obtained from national statistics. The methane correction factor for industrial waste is 1.2, which should be explained or corrected. In response to this the Party explained that the 1.2 is not the MCF value. It should refer to categories 1. (Managed Waste Disposal on Land) and 2. (Unmanaged Waste Disposal Sites), where values of MCF are 1.0 and 0.6 respectively. The CH₄ IEFs seem to be too low and too high for managed waste disposal on land and for unmanaged waste disposal sites, respectively, when compared to those of other reporting Parties.

Waste-water handling – CH₄ and N₂O

65. The 2001 value of the CH₄ IEF from industrial waste water is the lowest and the N₂O IEF is the highest among the reporting Parties. Limited information is provided in the additional information box. For domestic waste water, maximum methane-producing capacity (B₀) was changed from the default value of 0.25 to 0.6 kg CH₄/kg BOD (biochemical oxygen demand) in 2001 (see table 8(b)). N₂O emissions from human sewage per capita (0.18 kg/year) are the highest among the reporting Parties (0.01-0.18 kg/year).

Waste incineration – CO₂

66. The estimate of CO₂ emissions increased by 3,698 per cent between 1990 and 2001 (by 376 Gg) because a new practice was introduced in waste management.

ANNEX 1: MATERIALS USED DURING THE REVIEW

A. Support materials used during the review

- 2003 submission including CRF for years 2001 and an NIR.
2002 submission including CRF for year 2000.
UNFCCC secretariat. “Report of the individual review of the greenhouse gas inventory of Portugal submitted in the year 2001 (Desk review).” FCCC/WEB/IRI(1)2001/PRT (available at <http://unfccc.int/program/mis/ghg/countrep/pordeskrev.pdf>).
UNFCCC secretariat. “2003 Status report for Portugal” (available at <http://unfccc.int/program/mis/ghg/statrep2003.html/>).
UNFCCC secretariat. “Synthesis and assessment report of the greenhouse gas inventories submitted in 2003. Part I.” FCCC/WEB/SAI/2003 (available at http://unfccc.int/program/mis/ghg/s_a2003.html) and Part II – the section on Portugal (unpublished).
UNFCCC secretariat. Review findings for Portugal (unpublished).
UNFCCC secretariat. “Handbook for review of national GHG inventories.” Draft 2003 (unpublished).
UNFCCC secretariat. “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/CP/1999/7 (available at <http://www.unfccc.int/resource/docs/cop5/07.pdf>).
UNFCCC secretariat. “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>).
UNFCCC secretariat. Database search tool – *Locator* (unpublished).
IPCC. *IPCC Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories, 2000* (available at <http://www.ipcc-nggip.iges.or.jp/public/gp/gpgaum.htm>).
IPCC/OECD/IEA. *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories, volumes 1–3, 1997* (available at <http://www.ipcc-nggip.iges.or.jp/public/gl/invs1.htm>).
IISI 2002. “World steel in figures.” 2002 edition (available at <http://www.worldsteel.org/media/wsif/wsif2002.pdf>).

B. Additional materials

Responses to questions during the review were received from Ms. Teresa Costa-Pereira (Institute for the Environment (Instituto do Ambiente)/ Ministry for Urban Affairs, Land-Use Planning and the Environment (Ministério das Cidades, Ordenamento do Território e Ambiente)) and Mr. Vitor Gois, consultant on behalf of the Institute for the Environment / Ministry for Urban Affairs, Land-Use Planning and the Environment, including additional material on the methodology and assumptions used.
