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Report of the individual review of the greenhouse gas inventory of Monaco submitted in 2006*

* In the symbol for this document, 2006 refers to the year in which the inventory was submitted, and not to the year of publication.

CONTENTS

I. Overview

A. Introduction

1. This report covers the in-country review of the 2006 greenhouse gas (GHG) inventory submission of Monaco, coordinated by the United Nations Framework Convention on Climate Change (UNFCCC) secretariat, in accordance with decision 19/CP.8. The review took place from 15 to 19 October 2007 in Monaco, and was conducted by the following team of nominated experts from the roster of experts: Generalist and Industrial Processes – Mr. Newton Paciornik (Brazil); Energy and Waste – Ms. Erasmia Kitou (European Community); Agriculture and Land Use, Land-use Change and Forestry (LULUCF) – Mr. Walter Oyhantçabal (Uruguay). Mr. Newton Paciornik and Mr. Walter Oyhantçabal were the lead reviewers. The review was coordinated by Mr. Javier Hanna and Mr. Tomoyuki Aizawa (UNFCCC secretariat).

2. In accordance with the "Guidelines for the technical review of greenhouse gas inventories from Parties included in Annex I to the Convention", a draft version of this report was communicated to the Government of Monaco, 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 2006 submission, Monaco submitted a set of common reporting format (CRF) tables for the years 1990–2004 and a national inventory report (NIR). Where necessary the expert review team (ERT) also used the previous year's submission, additional information provided during the review and other information. The full list of materials used during the review is provided in the annex to this report.

C. Emission profiles and trends

4. In 2004, the most important GHG in Monaco was carbon dioxide (CO_2), contributing 96.1 per cent to total[1] national GHG emissions expressed in CO_2 equivalent (eq), followed by nitrous oxide (N_2O), 3.0 per cent, and methane (CH_4), 0.6 per cent. Hydrofluorocarbons (HFCs) contributed 0.3 per cent and perfluorocarbons (PFCs) contributed 0.03 per cent of the overall GHG emissions. Sulphur hexafluoride (SF_6) is reported as zero. The energy sector accounted for almost all of the total GHG emissions (98.6 per cent), followed by the waste sector (1.1 per cent) and industrial processes (0.3 per cent). Monaco does not have an agriculture sector, so emissions are zero. Emissions from solvent and other product use were not estimated. The LULUCF sector represented very small removals (0.036 Gg). Total GHG emissions[1] in 2004 amounted to 104.4 Gg CO_2 eq, a decrease of 3.1 per cent from the base year.

5. Tables 1 and 2 show GHG emissions by gas and by sector, respectively.

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

Table 1. Greenhouse gas emissions by gas, 1990–2004

GHG emissions (without LULUCF)	Gg CO_2 equivalent								Change
	Base year Convention	1990	1995	2000	2001	2002	2003	2004	BY–2004 (%)
CO_2	105.37	105.37	111.86	113.00	114.06	112.00	106.65	100.28	–4.8
CH_4	0.64	0.64	0.79	0.79	0.81	0.76	0.68	0.63	–1.2
N_2O	1.63	1.63	2.62	3.28	3.38	3.32	3.18	3.10	90.6
HFCs	0.00	0.00	0.02	0.04	0.31	0.84	0.60	0.30	NA
PFCs	0.00	0.00	0.00	0.00	0.07	0.06	0.03	0.04	NA
SF_6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	NA

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

Table 2. Greenhouse gas emissions by sector, 1990–2004

Sectors	Gg CO_2 equivalent								Change
	Base year Convention[a]	1990	1995	2000	2001	2002	2003	2004	BY–2004 (%)
Energy	107.00	107.00	114.26	116.02	117.20	115.05	109.45	102.91	–3.8
Industrial processes	0.00	0.00	0.02	0.04	0.39	0.89	0.63	0.34	NA
Solvent and other product use	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	NA
Agriculture	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	NA
LULUCF	–0.03	–0.03	–0.04	–0.04	–0.04	–0.04	–0.04	–0.04	9.5
Waste	0.64	0.64	1.00	1.05	1.04	1.03	1.07	1.10	71.9
Other	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	NA
Total (with LULUCF)	107.60	107.60	115.25	117.08	118.59	116.94	111.12	104.32	–3.1
Total (without LULUCF)	107.64	107.64	115.28	117.12	118.63	116.98	111.16	104.35	–3.1

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

[a] Monaco submitted revised estimates for the base year and 2004 in the course of the initial review on 28 November 2007. These estimates differ from the Party's GHG inventory submitted in 2006.

D. Key categories

6. Monaco has not reported a key category analysis as part of its 2006 submission. However, it has included key category tier 1 analysis results, both level and trend assessment, as part of its updated NIR, which was submitted in November 2007. The key category analysis performed by the Party and the secretariat[2] produced similar results. The ERT recommends that Monaco include the full key category calculation tables in its next submission and that it perform a tier 2 key category analysis.

E. Main findings

7. The ERT acknowledges the improvements that have been made to the inventory based on the recommendations of the previous GHG inventory reviews.

8. The inventory submitted is almost complete in terms of years, sectors, source and sink categories and gases. However, several categories for which GHG emissions that were not estimated in Monaco's previous inventories have still not been estimated, namely, fugitive emissions from fuel distribution, asphalt paving, HFC emissions from aerosols, N_2O emissions from fertilizer use, and CH_4 and N_2O emissions from burning of biomass in the waste sector. The main reason for this is the lack of activity data (AD).

9. The ERT noted the need for further improvement of the transparency of reporting by including adequate documentation, descriptions and justification of the assumptions, methods and data used for estimating GHG inventory estimates in the NIR of Monaco's future submissions. The structure of the NIR does not fully conform with the "Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual inventories" (hereinafter referred to as the UNFCCC reporting guidelines, Part I).

F. Cross-cutting topics

1. Completeness

10. The inventory submitted is almost complete in terms of years, sectors, source and sink categories and gases. Some minor categories are still missing, as mentioned in paragraph 8 above.

11. The CRF tables are fairly complete, but some tables are still missing (e.g. 3.A–D (solvents), 9 (completeness) and many LULUCF tables). Many notation keys are missing or wrongly and inconsistently applied. The ERT recommends that Monaco correctly apply the notation keys in its next submission, also making appropriate use of the documentation boxes in the tables.

2. Transparency

12. The NIR is not fully transparent in the sense that it does not provide a sufficient amount of information for a full assessment of the inventory. The ERT recommends that Monaco revise the NIR structure to fully conform with the UNFCCC reporting guidelines, Part I, also providing the necessary information on methods applied, assumptions and parameters used.

[2] The secretariat identified, for each Party, those source categories that are key categories in terms of their absolute level of emissions, applying the tier 1 level assessment as described in the IPCC good practice guidance for LULUCF. Key categories according to the tier 1 trend assessment were also identified for those Parties that provided a full set of CRF tables for the base year (1990). Where the Party performed a key category analysis, the key categories presented in this report follow the Party's analysis. However, they are presented at the level of aggregation corresponding to a tier 1 key category assessment conducted by the secretariat.

3. Recalculations and time-series consistency

13. Monaco's inventory agency ensures that recalculations of previously submitted estimates of GHG emissions from sources and removals by sinks are prepared in accordance with the *IPCC Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories* (hereinafter referred to as the IPCC good practice guidance). However, recalculations are not systematically reported in the NIR.

14. The ERT noted that recalculations of the time series 1990 to 2003 had been undertaken to take into account methodological changes in fuel combustion in the residential and transportation sector. The major changes include: an increase of 53.6 per cent in emissions from fuel combustion in the residential sector in the year 1990; a reduction of 16.7 per cent in emissions from fuel combustion in the residential sector in the year 2003; a reduction of 11.6 per cent in emissions from fuel combustion in the transport sector in the year 1990; and a reduction of 28.4 per cent in emissions from fuel combustion in the transport sector in the year 2003. The methodological changes are described in the NIR but the results of the recalculations are not fully reported in the NIR, which includes a short description of the changes for the year 2003 only. The effect of the recalculations for the base year was an increase of 11.6 per cent in the estimate of total emissions. For the year 2003, the effect was a decrease of 16.9 per cent. As a result of the recalculations, the difference between the total national emissions in 1990 and in 2003 is now 3.1 per cent rather than 38.1 per cent.

4. Uncertainties

15. Monaco provided an uncertainty analysis for the level assessment as part of its 2006 submission. However, it did not comply with the IPCC good practice guidance and did not cover all categories of the inventory. Following the in-country visit, Monaco included in its revised NIR submitted in November 2007 an updated uncertainty analysis for both level and trend assessments. This analysis is in accordance with the IPCC good practice guidance but relies mostly on default values for the emission factors (EFs) and does not include the LULUCF sector. The ERT recommends that Monaco assess and update these data, if possible, in accordance with its national circumstances.

5. Verification and quality assurance/quality control approaches

16. Monaco has some quality control (QC) procedures in place for some sectors, although they were not clearly described in the NIR as part of its 2006 submission. In addition, Monaco carried out an external assessment of the inventory in 2005. As part of its revised submission after the in-country visit, Monaco provided a quality assurance/quality control (QA/QC) plan, including actions to be taken to ensure proper calculations, use of methods and archiving of information. The ERT recommends that Monaco draw on the experience gained from implementing the QA/QC plan, further develop the specific checks for each category in line with its national circumstances, and implement procedures for periodic external reviews.

6. Follow-up to previous reviews

17. Many improvements have been undertaken as a result of the previous reviews, although this is not highlighted in the NIR. They include the provision of a complete time series for the CRF tables, revision of aviation- and marine-related emission estimates to properly account for bunker fuels, and estimates of actual emissions from the consumption of HFCs, PFCs and SF_6. However, some recommendations have not been implemented, such as the estimation of missing categories (e.g. fugitive emissions) and reporting of the full time series (1990–2004) for the fluorinated gases (F-gases).

G. Areas for further improvement

1. Identified by the Party

18. Many improvements have been undertaken as a result of the previous reviews, although this is not highlighted in the NIR. The NIR does not identify areas for further improvement.

2. Identified by the ERT

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

(a) Revise the NIR structure to fully reflect the requirements of the UNFCCC reporting guidelines, Part I;

(b) Improve transparency by including more information on the methods, parameters, assumptions and data collection procedures in the NIR;

(c) Fully implement and improve the QA/QC plan;

(d) Develop archiving procedures for the inventory to allow for fully centralized access to the inventory data and related information.

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

II. Energy

A. Sector overview

21. Between the base year (1990) and 2004, energy-related emissions from Monaco declined by 3.8 per cent. In 2004, GHG emissions from the energy sector constituted 98.6 per cent of Monaco's total GHG emissions. Most of the energy-related emissions in 2004 were from the category other sectors, which constituted 36.0 per cent of the sectoral emissions, while transport contributed 34.9 per cent, and energy industries 29.0 per cent. Monaco imports all of the fuel that it consumes. Fugitive emissions have not been estimated by Monaco.

22. Monaco has provided all the CRF tables but did not provide recalculations for the previous years submitted. The NIR does not fully address the issue of completeness in the fuel combustion and fugitive emissions categories in the energy sector. The ERT recommends that Monaco provide a more detailed discussion on the completeness of its estimates of emissions from fuel combustion and fugitive emissions.

23. The ERT welcomes the efforts made by Monaco to provide methodological information and information on EFs in the NIR, but recommends that Monaco also provide a detailed overview of the assumptions made and the underlying AD used. The ERT believes that the transparency of the NIR could be further improved if Monaco would, in addition, provide information on the steps followed to ensure time-series consistency as well as explanations of the trends observed.

24. Monaco has provided no specific discussion of its QA/QC and verification procedures for the energy sector. During the review, the ERT noted that some QA/QC checks were performed on an informal basis. However, these are not documented in the relevant part of the NIR. The ERT recommends that existing checks be formalized, complemented by additional checks to ensure that no mistakes are introduced into the NIR or the CRF tables, and that they be thoroughly documented.

25. The ERT noted that the methodological descriptions provided in the main part of the NIR for road transportation do not properly reflect the information presented in the annex. The ERT recommends

that Monaco improve the consistency of the information presented in the NIR by performing the appropriate quality checks.

26. In response to the review findings, Monaco has prepared a QA/QC plan as discussed in paragraph 16 above. The ERT, having received this information, recommends that Monaco draw on experience gained from implementing the QA/QC plan and then to develop the specific checks needed for the energy sector.

27. The ERT was pleased to see that Monaco has provided some initial estimates of the uncertainties associated with the energy sector. However, the uncertainty estimates in some cases contain calculation errors, as in the case of stationary combustion, and do not follow the IPCC good practice guidance. The ERT recommends that Monaco examine its uncertainty estimates for potential calculation mistakes and report these in the relevant tables in the *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the Revised 1996 IPCC Guidelines).

28. In the key category analysis performed by Monaco the following categories were identified as key: public electricity and heat production, road transportation, domestic navigation, combustion of domestic fuel and natural gas. However, the ERT notes that this key category analysis does not follow the IPCC good practice guidance and should be corrected in the future, as necessary.

B. Reference and sectoral approaches

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

29. Monaco provided estimates for the reference approach for the years 1990–2004. The reference approach and the sectoral approach for 2004 almost correspond (–0.20 per cent difference in the CO_2 emission estimates and 0.15 per cent difference in energy consumption). The CRF tables explain that the small difference between the approaches is due to the difference in emission factors and net calorific values (NCVs) used in the two methods.

30. In estimating emissions based on the reference approach, Monaco has aggregated under "gas/diesel oil" both heating oil and diesel used for transport without, however, using the corresponding NCVs. The ERT recommends that Monaco report heating oil separately from diesel oil, preferably under "residual fuel oil", and update the NCVs accordingly.

31. Under "imports" in the reference approach, Monaco has not included a value for residual fuel oil. This was included in previous submissions, and Monaco agreed that it was omitted by mistake. The ERT recommends that Monaco include in the reference approach the value for residual fuel oil as appropriate, and implement appropriate quality checks to avoid such editorial errors in its next submission.

32. Comparison with international data has not been possible for Monaco, as Monaco-related data are included in France's submission to the International Energy Agency.

2. International bunker fuels

33. The ERT was pleased to see that Monaco followed the recommendations of previous review reports and had revised its estimates of aviation- and marine-related emissions to properly account for bunker fuel emissions. Monaco conducted a survey in 2005 to determine the ratio of international navigation-related emissions to national navigation-related emissions, based on the methods specified in the Revised 1996 IPCC Guidelines. Based on the results of this survey, Monaco estimated that about 91 per cent of navigation-related emissions are international.

34. The NCVs used by Monaco to estimate GHG emissions from navigation (43.56 GJ/t for gasoline and 42.4 GJ/t for diesel) do not correspond to those found in the Revised 1996 IPCC Guidelines. Monaco was not able to provide sufficient explanation as to why these particular NCVs were used.

The ERT recommends that Monaco use the default NCVs of the IPCC (43.5 GJ/t for gasoline and 42.4 GJ/t for diesel) to calculate emissions from navigation. As regards aviation, all flights are considered international. Monaco has not, however, reported any emissions under this source category, as it was assumed that the fuel used in these flights was bought in France. However, Monaco has discovered recently that part of the fuel used for aviation, namely jet kerosene, is also bought in Monaco. The ERT encourages Monaco to estimate the associated emissions and report these as a memo item under international aviation in its next submission.

3. Feedstocks and non-energy use of fuels

35. Monaco has not reported any emissions from feedstocks and non-energy use of fuels. However, the ERT believes that bitumen and lubricants are used in Monaco, for example for road paving and in road transportation, respectively. The ERT recommends that Monaco investigate the possibility of reporting emissions from feedstocks and non-energy use of fuels for the whole time series, especially from the use of bitumen and lubricants, using the suggested IPCC default methodologies presented in chapters 1.4 and 1.5 of the reference manual.

C. Key categories

Navigation: gasoline and diesel – CO_2

36. The NCVs used by Monaco to estimate GHG emissions from navigation (43.56 GJ/t for gasoline and 42.43 GJ/t for diesel oil) do not correspond to those provided in the Revised 1996 IPCC Guidelines. Monaco was not able to provide a sufficient explanation as to why these particular NCVs were used. The ERT recommends that Monaco use the IPCC default NCVs (43.5 GJ/t for gasoline and 42.4 GJ/t for diesel oil) to calculate emissions from navigation for the complete time series. During the review, it was confirmed that there are no fishing vessels in Monaco, so there is no need to further split marine-related emissions.

D. Non-key categories

1. Stationary combustion: other fuels – CH_4, N_2O

37. The one waste incineration plant in Monaco produces district heating and cooling using municipal waste originating from both Monaco and France, with the quantities varying from year to year depending on the agreements made with France. Monaco estimated emissions from this sector using the IPCC tier 1 methodology together with IPCC default values for the fuel's total carbon content and fossil fraction. The Party explained that it has not been possible to obtain plant-specific data as the plant has undergone significant improvements in the last few years. Since the new systems are now in place, the ERT recommends that Monaco determine the carbon content/fossil fraction of the waste incinerated and that it use country-specific EFs to estimate the corresponding emissions in the CRF tables. The ERT recommends that organic waste be reported under "biomass" and non-organic waste under "other fuels" in table 1.A.1.a.

38. Monaco has not included organic waste resulting from the maintenance of parks and public gardens (767 t in 2004) in the quantities of waste incinerated with energy recovery. As a result, the corresponding CH_4 and N_2O emissions were not estimated. The ERT recommends that Monaco include the emissions from organic waste from parks and gardens under "biomass" in table 1.A.1.a for the complete time series.

2. Fugitive emissions: oil refining/storage, and natural gas distribution and other leakage – CH_4

39. Monaco has not reported any fugitive emissions resulting from its natural gas network or from fuel storage tanks in Monaco. From a preliminary enquiry made with the national gas company, emissions from the distribution network were estimated to represent less than 0.02 per cent of the overall

quantity of gas distributed. The ERT recommends that Monaco further investigate these issues with the relevant authorities and provide a more detailed discussion and the corresponding fugitive emission estimates from the distribution and storage of fuel for the whole time series, as appropriate, using the IPCC default methodologies or plant-/country-specific data, if available.

III. Industrial processes and solvent and other product use

A. Sector overview

40. In 2004, emissions from the industrial processes sector accounted for 0.3 per cent of total national GHG emissions. Monaco has not estimated GHG emissions from the solvent and other product use sector. Actual emissions from the consumption of F-gases accounted for the total emissions from the industrial processes sector. In the period 1995–2004, GHG emissions from the industrial processes sector increased by 1,640.3 per cent, because of the increase in F-gas emissions from refrigeration and air-conditioning equipment.

41. Monaco's inventory covers only emissions from the consumption of HFCs, PFCs and SF_6, as most of the industrial category activities do not occur in Monaco. In spite of recommendations from previous reviews, a few categories, such as asphalt paving, are still missing. The ERT recommends that Monaco investigate the occurrence of, and possibly estimate, emissions from the categories of halocarbon and SF_6 consumption (e.g. fire extinguishers, aerosols) that have not yet been estimated. Monaco has provided estimates only for the period 1995–2004. Emissions for the period 1990–1994 should be estimated for the sake of time-series completeness, even if the choice of base year for F-gases is 1995. Monaco has reported actual emissions from the use of HFCs, PFCs and SF_6, as recommended in the previous review. However, Monaco has not reported potential emissions of HFCs. The ERT recommends that Monaco report potential emissions of F-gases in addition to actual emissions, as the latter are an important tool for quality control and quality assessment. Usage of the notation keys should be improved, together with explanations. The "NO" (not occurring) and "NE" (not estimated) keys are sometimes wrongly used.

42. Monaco has included some methodological information in the NIR, but this information is limited, not providing details of the methods used. The ERT recommends that Monaco include more information on the methods, parameters and assumptions in the NIR in its next submission.

43. Great fluctuations in time have been identified for some categories. A possible reason for the fluctuations is missing data, as basic data are obtained from questionnaires. The ERT recommends that Monaco investigate the reasons for the fluctuations and, as appropriate, put in place gap-filling procedures in accordance with the IPCC good practice guidance in order to ensure time-series consistency.

44. Some QC procedures are in place for each category. The ERT recommends that further QC procedures be implemented to ensure accuracy and time-series consistency. It also suggests that some of the existing questionnaires be redesigned to prevent misunderstanding and facilitate the filling in and processing of the forms. The ERT recommends that cooperation with neighbouring countries be explored, with the objective of providing methodological consistency that could prevent overall gaps or duplications in sectors related to product consumption.

B. Non-key categories

1. Consumption of halocarbons

45. The ERT acknowledges the effort made in estimating the emissions in this sector, in view of the difficulties in gathering data due to the flow of products across the border with France. The ERT

recommends that the possible use of other methods described in the IPCC good practice guidance be investigated, as this could reduce the need for questionnaires (e.g. in the mobile refrigeration category).

2. SF_6 emissions from electrical equipment

46. Emissions are reported as equal to zero, based on the information that no refill of electrical equipment has occurred in Monaco. However, the background information provided to the ERT shows that the utility company has reported acquisition of SF_6 in all years of the inventory period. The ERT recommends that this disparity be investigated and corrected if necessary. The ERT also recommends that Monaco explore the possible use of other methods described in the IPCC good practice guidance.

IV. Agriculture

Sector overview

47. Monaco does not dedicate any part of its territory to agricultural activity. The whole area is urbanized, occupied by buildings, communication ways and parks. As a consequence, there are no emissions or removals of GHGs attributable to this sector.

V. Land use, land-use change and forestry

A. Sector overview

48. In 2004 the LULUCF sector was responsible for a very small percentage of Monaco's total net emissions. According to the NIR, this sector represented a net sink of 0.0365 Gg CO_2 eq, corresponding to 0.035 per cent of reported national emissions (104.35 Gg CO_2 eq). In Monaco the only land-use category that can adequately represent the LULUCF sector is settlements. According to the NIR, 42.64 ha of the territory of Monaco are occupied by public and private gardens. The total number of urban trees in parks and streets was 6,281 in 2004. Most of the trees (85 per cent) are considered mature and more than 20 years old, so gains and losses are similar and close to zero, and only 15 per cent of trees have net removals in their living biomass. From the base year, the area of settlements has increased by 9.6 per cent (38.91 ha in 1990) and the number of trees has increased by 14.3 per cent (5,496 ha in 1990).

49. Data in the NIR and CRF show that in the period 1990–2004, removals by this sector increased by 9.54 per cent. The table on page 24 of the NIR presents data on the evolution of the removals, but these data are misleading, because they do not use enough decimals to describe the real changes between years. For example, in the NIR an increase of 33 per cent can be deducted –0.03 to 0.04 and in the CRF LULUCF a wrong value of 100 per cent is reported in Table 10). The drivers of the increase throughout the time series are the increase in the area of parks and gardens and in the number of trees; however, this increase is not clearly explained in the NIR. The ERT recommends that Monaco present more accurate data and describe the trend in a more precise manner in its next submission.

50. The information on the LULUCF sector is not complete. All CRF LULUCF tables except for tables 5, 5(E) and 5(I) are empty. The ERT verified during the in-country visit that nitrogen (N) fertilizers are used in parks, and that the amount used is known in detail. Thus, N_2O emissions can be calculated and reported, and they will affect the present calculation of net removals in some way. The ERT recommends that Monaco solve these incompleteness problems in the future.

51. In general, the information reported under the LULUCF sector is not fully transparent. In particular, the method used to calculate removals is not clearly described. The ERT recommends that the Party include all necessary data and methodological procedures to explain how calculations were done in its next submissions so that an external reader can reconstruct the same outcomes.

52. The LULUCF sector was reported as a net source of GHG emissions in Monaco's 2005 submission, and as a net sink in its 2006 submission. The reason for this is a change in the methodology of calculation after the inventory review in 2005. The time series for settlement areas has been recalculated for 2004 (table 7.2.1 of the NIR). The ERT recommends that the Party report all recalculations in its next submission.

53. The ERT encourages Monaco to prepare some simple category-specific procedures for QA/QC in this sector and to continue working on the implementation of a QA/QC plan following the recommendations of the IPCC. The ERT also recommends that the Party improve the QC of the data reported in the CRF to ensure that all data and notation keys are correctly and consistently reported, avoiding missing data.

54. Even if the volume of removals is small, the uncertainties of the estimates might be important, because of the uncertainty of the AD and the use of default EF for crown cover area-based growth (CRW). According to the IPCC, the default value provided has an uncertainty mean of +/–50 per cent.

B. Non-key categories

1. Settlements – CO_2

55. Following the recommendation of the previous review, Monaco has allocated areas of parks and gardens to the settlements category. As a result, one of the two methodologies provided by the IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry* (hereinafter referred as the IPCC good practice guidance for LULUCF) was selected: "T1a", which estimates removals from growing trees using as AD the area of land covered by tree crowns (Equation 3a.4.3A). These specific methodologies are provided by the IPCC good practice guidance for LULUCF in Appendix 3A.4, "Settlements", page 3.296. Countries may use country-specific parameters for CRW or the default value of 2.9 t carbon (ha crown cover)$^{-1}$ yr^{-1}. Monaco does not have a country-specific value for CRW, and its parks contain many different tree species, which makes developing them difficult and costly. Given the circumstances and the small contribution of the LULUCF sector to the national GHG emissions in the inventory, the ERT considers the use of a default value is considered an appropriate choice.

56. Monaco does not explain clearly how this "tier 1a" method was applied, but it is nevertheless clear that the application is not fully in line with the recommendation of the IPCC good practice guidance for LULUCF. Crown areas were not estimated by using aerial photography, but by using the number of trees and average surface of a hemisphere simulating the shape of a tree. This method of estimation does not strictly reflect the area covered by crowns in a vertical projection, owing to the overlapping of crowns. During the in-country review, the ERT verified that Monaco has good resolution aerial photography that would allow the estimation of the vertical projection of the area covered by trees. The ERT recommends the Party to estimate these AD using aerial photographs and to recalculate the time series of removals by settlements.

57. The maintenance of parks produces a certain amount of biomass every year (mainly grass). In 2004 this amount is reported as 767 t. No figures are provided for the base year and the time series. Once removed, this waste is taken to the incineration plant. CO_2 emissions from this biomass burning should not be accounted for, but associated emissions of CH_4 and N_2O should be accounted for in the energy sector in table 1.A (a). However, Monaco has instead reported "NO".

2. Settlements – N_2O

58. N fertilizer is used in settlements. The ERT recommends that Monaco include the calculation of N_2O emissions from N fertilizer use in its next submission.

VI. Waste

A. Sector overview

59. Since 1990, waste-related emissions from Monaco have increased by 71.9 per cent. In 2004, Monaco's total GHG emissions from the waste sector constituted 1.1 per cent of total GHG emissions. Emissions from wastewater handling accounted for 63.7 per cent of this, and emissions from waste incineration for the remaining 36.3 per cent. Both CH_4 and N_2O emissions are reported for this sector. In Monaco, all GHG emissions from the incineration of municipal solid waste are reported under the energy sector. Emissions from the incineration of sewage sludge are reported in the waste sector from 1991 onwards. Prior to 1991, sewage sludge was processed in France.

60. The ERT notes that Monaco has provided limited information on methodologies used, assumptions made and underlying AD and EFs in the NIR for the waste sector. The ERT believes that the transparency of the NIR could be further improved if Monaco provided, in addition, information on the steps taken to ensure time-series consistency as well as explanations of the trends observed.

61. In response to the review findings, Monaco has prepared a QA/QC plan as discussed in paragraph 16 above. The ERT, having received this information, recommends that Monaco draw on experience gained from implementing the QA/QC plan and then to develop the specific checks needed for the waste sector.

62. The uncertainty estimates provided by Monaco for the waste sector are based on the information and default factors provided in the IPCC good practice guidance. The ERT recommends that Monaco provide in its next submission detailed information on why the particular uncertainty values shown in the annex were chosen, especially in the case where the IPCC good practice guidance provides ranges, and not just one specific value. The ERT would also encourage Monaco to obtain, through contact with local authorities, country-specific uncertainty estimates for waste incineration and wastewater treatment for its next submission.

B. Non-key categories

Wastewater handling – N_2O

63. Monaco has used the default IPCC methodology as presented in chapter 6.5, Vol. 2, of the Revised 1996 IPCC Guidelines to estimate N_2O emissions from wastewater handling. Monaco includes emissions from industrial wastewater together with those from domestic and commercial wastewater, as all wastewater is collected in the one main sewer of the city. Monaco reports in the NIR that more than 90 per cent of wastewater is treated aerobically; the remaining wastewater is not treated at all. The Party also informed the ERT that electric energy is used for the aerobic treatment of the wastewater.

VII. Conclusions and recommendations

64. The ERT concludes that the information provided by Monaco in its submission and in the update to the original submission is complete and was submitted in accordance with UNFCCC reporting guidelines, Part I, the Revised 1996 IPCC Guidelines and the IPCC good practice guidance.

65. The GHG inventory is in line with the Revised 1996 IPCC Guidelines and the IPCC good practice guidance. However, the NIR is not fully transparent and its structure does not fully conform with the UNFCCC reporting guidelines, Part I. During the review, the Party and the ERT agreed on some changes to be made to some categories in the energy sector.

66. In the course of the review, the ERT formulated a number of recommendations relating to the completeness and transparency of the information presented in Monaco's initial report. The key recommendations[3] are that Monaco:

(a) Improve the transparency of the inventory by revising the report structure and increasing the amount of information included in the NIR;

(b) Improve and fully implement its QA/QC plan;

(c) Develop the archiving procedures for the inventory to allow for fully centralized access to the inventory data and related information;

(d) Review the level of resources provided for the national inventories and consider their adequacy.

67. The Party responded to the requests of the ERT and clarified potential problems in a timely and very professional manner.

68. The recommendations in this report should be followed up in its future reviews. In particular, Monaco should improve the transparency of the NIR and fully implement and improve its QA/QC plan.

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

Annex

Documents and information used during the review

A. Reference documents

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

IPCC. Good practice guidance for land use, land-use change and forestry, 2003. Available at: <http://www.ipcc-nggip.iges.or.jp/public/gpglulucf/gpglulucf.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>.

UNFCCC. Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual inventories. FCCC/SBSTA/2004/8. Available at <http://unfccc.int/resource/docs/2004/sbsta/08.pdf>.

UNFCCC. 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. Annual status report of the greenhouse gas inventory of Monaco. 2006. Available at: <http://unfccc.int/resource/docs/2006/asr/mco.pdf>.

UNFCCC secretariat. Synthesis and assessment report on the greenhouse gas inventories submitted in 2006. FCCC/WEB/SAI/2006. Available at: <http://unfccc.int/resource/docs/webdocs/sai/sa_2006.pdf>.

UNFCCC secretariat. Report of the individual review of the greenhouse gas inventory of Monaco submitted in 2005. FCCC/WEB/IRI/2005/MCO. Available at: <http://unfccc.int/resource/docs/2006/arr/mco.pdf>.

B. Additional information provided by the Party

Responses to questions during the review were received from Mr. Veglia (Division/Compilation National d'Inventaire), including additional material on the methodology and assumptions used.

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