United Nations

FCCC/ARR/2013/MCO

Framework Convention on Climate Change

Distr.: General
28 May 2014

Original: English

Report of the individual review of the annual submission of Monaco submitted in 2013*

* In the symbol for this document, 2013 refers to the year in which the inventory was submitted, and not to the year of publication.

GE.14-03697

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I. Introduction and summary

1. This report covers the review of the 2013 annual submission of Monaco, coordinated by the UNFCCC secretariat, in accordance with decision 22/CMP.1. The review took place from 16 to 20 September 2013 in Monaco and was conducted by the following team of nominated experts from the UNFCCC roster of experts: generalist – Mr. Domenico Gaudioso (Italy); energy – Ms. Gherghita Nicodim (Romania); industrial processes and solvent and other product use – Mr. Menouer Boughedaoui (Algeria); land use, land-use change and forestry (LULUCF) and waste – Mr. Sabin Guendehou (Benin). Mr. Gaudioso and Mr. Guendehou were the lead reviewers. The review was coordinated by Mr. Vitor Góis Ferreira (UNFCCC secretariat).

2. In accordance with the "Guidelines for review under Article 8 of the Kyoto Protocol" (decision 22/CMP.1) (hereinafter referred to as the Article 8 review guidelines), a draft version of this report was communicated to the Government of Monaco, which provided comments that were considered and incorporated, as appropriate, into this final version of the report. All encouragements and recommendations in this report are for the next annual submission, unless otherwise specified. The expert review team (ERT) notes that the 2012 annual review report of Monaco was published after the submission of the 2013 annual submission.

3. In 2011, the main greenhouse gas (GHG) in Monaco was carbon dioxide (CO_2), accounting for 88.4 per cent of total GHG emissions[1] expressed in CO_2 equivalent (CO_2 eq), followed by hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF_6), collectively accounting for 8.0 per cent of the overall GHG emissions in the country, and nitrous oxide (N_2O) (3.0 per cent) and methane (CH_4) (0.6 per cent). The energy sector accounted for 90.7 per cent of total GHG emissions, followed by the industrial processes sector (8.0 per cent), the waste sector (1.3 per cent) and the solvent and other product use sector (0.05 per cent). The agriculture sector was reported as not occurring ("NO"). Total GHG emissions amounted to 89.58 Gg CO_2 eq and decreased by 17.7 per cent between the base year[2] and 2011. The ERT concludes that the description in the national inventory report (NIR) of the trends for the different gases and sectors is reasonable.

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

5. Additional background data on recalculations by Monaco in the 2013 annual submission, as well as information to be included in the compilation and accounting database, can be found in annex I to this report.

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

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

Table 1

Greenhouse gas emissions from Annex A sources and emissions/removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, by gas, base year[a] to 2011[b]

			Gg CO_2 eq								*Change (%)*
		Greenhouse gas	*Base year[a]*	*1990*	*1995*	*2000*	*2008*	*2009*	*2010*	*2011*	*Base year–2011*
Annex A sources		CO_2	105.38	105.38	111.84	112.81	90.07	85.40	82.42	79.19	–24.9
		CH_4	0.84	0.84	0.85	0.85	0.60	0.57	0.55	0.54	–35.9
		N_2O	1.74	1.74	2.74	3.40	3.00	2.89	2.70	2.69	54.6
		HFCs	0.72	0.29	0.72	4.92	6.31	6.35	6.25	7.00	876.2
		PFCs	IE, NA, NO	IE, NA, NE, NO	IE, NA, NO	IE, NA, NO	0.02	0.02	IE, NA, NO	IE, NA, NO	NA
		SF_6	0.19	0.18	0.19	0.19	0.16	0.16	0.16	0.16	–13.5
KP-LULUCF	Article 3.3[c]	CO_2					NA	NA	NA	NA	
		CH_4					NA	NA	NA	NA	
		N_2O					NA	NA	NA	NA	
	Article 3.4[d]	CO_2	NA				NA	NA	NA	NA	NA
		CH_4	NA				NA	NA	NA	NA	NA
		N_2O	NA				NA	NA	NA	NA	NA

Abbreviations: Annex A sources = sources included in Annex A to the Kyoto Protocol, IE = included elsewhere, KP-LULUCF = land use, land-use change and forestry emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, NA = not applicable, NE = not estimated, NO = not occurring.

[a] "Base year" for Annex A sources refers to the base year under the Kyoto Protocol, which is 1990 for CO_2, CH_4 and N_2O, and1995 for HFCs, PFCs and SF_6. The "base year" for cropland management, grazing land management and revegetation under Article 3, paragraph 4, of the Kyoto Protocol is 1990. For activities under Article 3, paragraph 3, of the Kyoto Protocol and forest management under Article 3, paragraph 4, only the inventory years of the commitment period must be reported.

[b] This table does not reflect the adjusted estimates for one category in the energy sector (see chapter II.H below) after the adjustment procedures under decision 20/CMP.1 were applied. It reflects the estimates contained in the Party's submission of 31 October 2013, which was subject to the said adjustment. The adjustment led to an increase in the estimate of total greenhouse gas emissions for 2011 of 0.491 Gg CO_2 eq.

[c] Activities under Article 3, paragraph 3, of the Kyoto Protocol, namely afforestation and reforestation, and deforestation.

[d] Elected activities under Article 3, paragraph 4, of the Kyoto Protocol, including forest management, cropland management, grazing land management and revegetation.

Table 2
Greenhouse gas emissions by sector and activity, base year[a] to 2011

			Gg CO_2 eq								*Change (%)*
		Sector	*Base year[a]*	*1990*	*1995*	*2000*	*2008*	*2009*	*2010*	*2011*	*Base year–2011*
Annex A		Energy[b]	107.20	107.20	114.27	115.84	92.49	87.57	84.38	81.22	–24.2
		Industrial processes	0.91	0.47	0.91	5.11	6.48	6.53	6.41	7.16	690.9
		Solvent and other product use	0.01	0.01	0.03	0.03	0.07	0.06	0.03	0.04	664.4
		Agriculture	NO	NO	NO	NO	NO	NO	NO	NO	NA
		Waste	0.75	0.75	1.12	1.18	1.11	1.23	1.25	1.16	53.7
		LULUCF	NA	–0.01	–0.01	–0.01	–0.01	–0.02	–0.02	–0.02	NA
		Total (with LULUCF)	**NA**	**108.41**	**116.32**	**122.15**	**100.14**	**95.36**	**92.06**	**89.56**	**NA**
		Total (without LULUCF)	**108.86**	**108.42**	**116.33**	**122.16**	**100.15**	**95.39**	**92.08**	**89.58**	**–17.7**
		Other[c]	NA	NA	NA	NA	NA	NA	NA	NA	NA
KP-LULUCF	Article 3.3[d]	Afforestation and reforestation					NA	NA	NA	NA	
		Deforestation					NA	NA	NA	NA	
		Total (3.3)					**NA**	**NA**	**NA**	**NA**	
	Article 3.4[e]	Forest management					NA	NA	NA	NA	
		Cropland management	NA				NA	NA	NA	NA	NA
		Grazing land management	NA				NA	NA	NA	NA	NA
		Revegetation	NA				NA	NA	NA	NA	NA
		Total (3.4)	**NA**				**NA**	**NA**	**NA**	**NA**	**NA**

Abbreviations: KP-LULUCF = LULUCF emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, LULUCF = land use, land-use change and forestry, NA = not applicable, NO = not occurring.

[a] "Base year" for sources included in Annex A to the Kyoto Protocol refers to the base year under the Kyoto Protocol, which is1990 for CO_2, CH_4 and N_2O, and 1995 for HFCs, PFCs and SF_6. The "base year" for cropland management, grazing land management and revegetation under Article 3, paragraph 4, of the Kyoto Protocol is 1990. For activities under Article 3, paragraph 3, of the Kyoto Protocol and forest management under Article 3, paragraph 4, only the inventory years of the commitment period must be reported.

[b] This table does not reflect the adjusted estimates for one category in the energy sector (see chapter II.H below) after the adjustment procedures under decision 20/CMP.1 were applied. It reflects the estimates contained in the Party's submission of 31 October 2013, which was subject to the said adjustment. The adjustment led to an increase in the estimate of total greenhouse gas emissions for 2011 of 0.491 Gg CO_2 eq.

[c] Emissions/removals reported in the sector other (sector 7) are not included in Annex A to the Kyoto Protocol and are therefore not included in national totals.

[d] Activities under Article 3, paragraph 3, of the Kyoto Protocol, namely afforestation and reforestation, and deforestation.

[e] Elected activities under Article 3, paragraph 4, of the Kyoto Protocol, including forest management, cropland management, grazing land management and revegetation.

II. Technical assessment of the annual submission

A. Overview

1. Annual submission and other sources of information

6. The 2013 annual inventory submission was submitted on 9 April 2013; it contains a complete set of the common reporting format (CRF) tables for the period 1990–2011 and an NIR (submitted on 15 April 2013). Monaco also submitted the information required under Article 7, paragraph 1, of the Kyoto Protocol, including information on: activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, accounting of Kyoto Protocol units, changes in the national system and in the national registry, and the minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol. The standard electronic format (SEF) tables were submitted on 10 April 2013. The annual submission was submitted in accordance with decision 15/CMP.1.

7. Monaco officially submitted revised emission estimates on 31 October 2013 in response to the list of potential problems and further questions raised by the ERT and as a result of other recalculations made by the Party. The Party submitted revised CRF tables and estimates for 2011 of CH_4 and N_2O emissions from energy industries, CH_4 fugitive emissions from oil and natural gas, and HFC and SF_6 emissions from consumption of halocarbons and SF_6 (see paras. 40, 51 and 63–67 below). The values used in this report are those submitted by Monaco on 31 October 2013.

8. The full list of materials used during the review is provided in annex II to this report.

2. Overall assessment of the inventory

9. Table 3 contains the ERT's overall assessment of the annual submission of Monaco. For recommendations for improvements related to cross-cutting issues for specific categories, please see the paragraphs cross-referenced in the table.

Table 3
The expert review team's overall assessment of the annual submission

		General findings and recommendations
The expert review team's (ERT's) findings on completeness of the 2013 annual submission		
Annex A sources[a]	Complete	Mandatory: none
		Non-mandatory: Fugitive CH_4 emissions from natural gas – other leakage (see para. 55 below). "NE" is reported for: CO_2 emissions from asphalt roofing; N_2O emissions from degreasing and dry cleaning, aerosols cans, and other (printing industry, wood preservation); and N_2O emissions from industrial wastewater
Land use, land-use change[a] and forestry	Complete	Mandatory: none
		Non-mandatory: CO_2, CH_4 and N_2O in settlements remaining settlements (losses in

		General findings and recommendations
		living biomass) (see paras. 74 and 76 below). NE is reported for: CO_2 emissions from settlements remaining settlements (dead organic matter and soil pools); and CH_4 emissions from settlements remaining settlements
KP-LULUCF	Not complete	(See para. 86 below)
The ERT's findings on recalculations and time-series consistency in the 2013 annual submission	Generally consistent	The rationale for recalculations is not provided in CRF table 8(b), but it is provided in the NIR. Recalculations have resulted in real improvements to the accuracy of the inventory
The ERT's findings on verification and quality assurance/quality control procedures in the 2013 annual submission	Not sufficient	A QA/QC plan is in place, but it is not clear how the Party has implemented this plan (see paras. 12(c) and 19(b) below). The ERT considers that the QA activities by CITEPA are not in accordance with the IPCC *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories* (see paras. 11 and 12(d) below). The ERT identified issues and recommendations for sectors and categories (see paras. 54, 58, 76 below)
The ERT's findings on the transparency of the 2013 annual submission	Not transparent	Generally, the sectoral parts of the NIR do not provide either references for activity data and emission factors or category-specific information on key categories, verification and uncertainty. The ERT recommends that the Party improve the transparency of its NIR (see paras. 24, 25, 32, 33, 34 , 35, 39, 41, 44, 45, 49, 50, 53, 59, 78 and 80 below)

Abbreviations: Annex A sources = sources included in Annex A to the Kyoto Protocol, CITEPA = Centre Interprofessionnel Technique d'Etudes de la Pollution Atmosphérique of France, CRF = common reporting format, IPCC = Intergovernmental Panel on Climate Change, KP-LULUCF = land use, land-use change and forestry emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, NE = not estimated, NIR = national inventory report, QA/QC = quality assurance/quality control.

[a] The assessment of completeness by the ERT considers only the completeness of reporting of mandatory categories (i.e. categories for which methods and default emission factors are provided in the Intergovernmental Panel on Climate Change (IPCC) *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*, the IPCC *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories*, or the IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry*).

3. Description of the institutional arrangements for inventory preparation, including the legal and procedural arrangements for inventory planning, preparation and management

Inventory planning

10. The NIR and additional information provided by the Party during the review described the national system for the preparation of the inventory. The Direction de l'Environnement, within the Département de l'Equipement, de l'Environnement et de

l'Urbanisme, has overall responsibility for the national inventory, including the collection of activity data (AD) and background information, the selection of methodologies and emission factors (EFs), the identification of key categories, the assessment of uncertainties and the establishment of quality assurance/quality control (QA/QC). Other private and public companies and government institutions are involved in the preparation of the inventory. In particular, data are collected by the Institut Monégasque de la Statistique et des Etudes Economiques (IMSEE); the Société Monégasque de l'Electricité et du Gaz (SMEG); the Société Monégasque d'Assainissement; the Service de l'Aviation Civile; and the Direction de l'Aménagement Urbain.

11. The Centre Interprofessionnel Technique d'Etudes de la Pollution Atmosphérique (CITEPA) of France provides important technical support to the Direction de l'Environnement for the preparation of the inventory, including the provision of AD and EFs from the French inventory that are used by Monaco as default values, and exchange of information on emission estimation methodologies and on review activities. CITEPA makes periodic visits to Monaco to control the quality of the entire inventory (visits occurred in 2005 and 2009; the next one is expected to take place in 2014).

12. The ERT found the following instances where the national system could be improved:

(a) Although agreements for the provision of AD are in place with a number of institutions and companies, estimates are often based on the use of tier 1 methodologies and default EFs and/or parameters. The ERT recommends that cooperation with these institutions and companies, and in particular with the recently established Statistical Institute, be strengthened to increase the use of available country-specific data for the preparation of the inventory;

(b) The Direction de l'Environnement performs all the functions of the national system. However, given the limited number of personnel engaged in the preparation of the inventory and additional tasks they have to carry out related to other environmental issues, it is not always easy for the inventory team to ensure the improvements of the quality and accuracy of the estimates, the continuity of inventory activities, the transparency of submissions and the timely implementation of recommendations made in previous review reports. The ERT recommends that Monaco ensure that resources allocated for inventory work are adequate, and that the personnel have enough opportunities for capacity-building through participation in international activities;

(c) A QA/QC plan has been elaborated and revised in order to take into account changes in institutional arrangement, and information on the plan is available in the annual submission. However, there is no information concerning the annual implementation of the plan and whether the key category analysis and the uncertainty assessment are taken into account for the prioritization of improvements in emission estimates. Therefore, the ERT recommends that the Party provide in its annual submission information concerning the implementation of this plan;

(d) In addition, the ERT notes that the NIR refers to the fact that CITEPA is providing the QA for the inventory, which the ERT considers not to be in line with the Intergovernmental Panel on Climate Change (IPCC) *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories* (hereinafter referred to as the IPCC good practice guidance) considering that CITEPA is also involved in the preparation of the inventory of Monaco: Monaco has an agreement of cooperation with CITEPA to ensure support for its inventory. The ERT therefore recommends that the organization of QA activities be revised, taking into account that, in principle and in accordance with the IPCC good practice guidance, these should not be carried out by experts involved in the preparation of the inventory.

13. The ERT also encourages Monaco to consider, as part of its inventory planning, ways to improve the quality of its estimates through an appropriate improvement plan and, in particular, to report on how the use of the key category analysis and the uncertainty assessment is used for the prioritization of emission estimates.

Inventory preparation

14. Table 4 contains the ERT's assessment of Monaco's inventory preparation process. For improvements related to specific categories, please see the paragraphs cross-referenced in the table.

Table 4
Assessment of inventory preparation by Monaco

		General findings and recommendations
Key category analysis		
Was the key category analysis performed in accordance with the Intergovernmental Panel on Climate Change (IPCC) *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories* (hereinafter referred to as the IPCC good practice guidance) and the IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry* (hereinafter referred to as the IPCC good practice guidance for LULUCF)?	Yes	See paragraph 19(a) below
Approach followed?	Tier 1	
Were additional key categories identified using a qualitative approach?	No	
Has the Party identified key categories for activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol following the guidance on establishing the relationship between the activities under the Kyoto Protocol and the associated key categories in the UNFCCC inventory?	No	Monaco has not identified key categories for activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, because emissions and removals from such activities were reported as "NA"
Does the Party use the key category analysis to prioritize inventory improvements?	No	See paragraph 16 below
Are there any changes to the key category analysis in the latest submission?	No	
Assessment of uncertainty analysis		
Approach followed?	Tier 1	
Was the uncertainty analysis carried out in accordance with the IPCC good practice guidance and the IPCC good practice	No	See paragraphs 15 and 60 below

	General findings and recommendations
guidance for LULUCF?	
Quantitative uncertainty (including LULUCF)	Level = 7.3% Trend = 1.9%
Quantitative uncertainty (excluding LULUCF)	Not provided

Abbreviations: LULUCF = land use, land-use change and forestry, NA = not applicable.

15. Monaco presents the uncertainties as standard deviations, rather than using the 95 per cent confidence interval as recommended in the IPCC good practice guidance. The ERT again reiterates recommendations made in previous review reports that Monaco use the 95 per cent confidence interval to report uncertainties, as recommended in the IPCC good practice guidance, to ensure comparability with the reporting of other Parties.

16. The ERT also noted that the Party does not provide information in the NIR regarding use of the key category and uncertainty analysis to prioritize and improve the inventory activities. The ERT recommends that Monaco use the key category and uncertainty analyses to prioritize its efforts in improving the inventory in order to achieve a higher level of accuracy.

Inventory management

17. Monaco has a centralized archiving system, which includes the archiving of disaggregated EFs and AD, and documentation on how these factors and data have been generated and aggregated for the preparation of the inventory. The archived information also includes internal documentation on QA/QC procedures, external and internal reviews, and documentation on annual key categories and key category identification. The centralized archiving system is managed by the Direction de l'Environnement. During the review, the ERT was provided with the requested additional archived information.

4. Follow-up to previous reviews

18. The 2013 annual submission includes a number of improvements, recalculations and new estimates carried out by Monaco on the basis of the recommendations made in the last two annual review reports, namely regarding the industrial processes and other product use sectors (see para. 57 below), and the LULUCF sector (see para. 76 below). Furthermore, Monaco included in its 2013 annual submission detailed information on green areas and parks, aiming to show that deforestation is not occurring in the Principality.

19. Other recommendations have not been implemented by Monaco, and the ERT reiterates the following recommendations made in previous review reports:

(a) Include the full list of categories considered in the key category analysis in the NIR, instead of only the list of identified key categories;

(b) Provide in the NIR a report with conclusions from QC studies, in particular those conducted by CITEPA, and comprehensive information on QA/QC procedures implemented for all sectors;

(c) Improve the consistency between the NIR and the CRF tables (see para. 23 below);

(d) Use the 95 per cent confidence interval to report uncertainty (see para. 15

above);

(e) Show how the results of the uncertainty analysis are used to improve the accuracy of the inventory (see para. 16 above);

(f) Make all non-confidential information on the national registry available on a functional public website (see para. 96 below).

5. Areas for further improvement identified by the expert review team

20. During the review, the ERT identified a number of areas for improvement, including some related to specific categories. These are listed in the relevant chapters of this report and in table 11.

B. Energy

1. Sector overview

21. The energy sector is the main sector in the GHG inventory of Monaco. In 2011, emissions from the energy sector amounted to 81.22 Gg CO_2 eq, or 90.7 per cent of total GHG emissions. Since 1990, emissions have decreased by 24.2 per cent. The key driver for the fall in emissions is the 40.9 per cent reduction in GHG emissions from residential (other sectors) between 1990 (45.42 Gg CO_2 eq) and 2011 (26.83 Gg CO_2 eq), caused by the decrease in energy use and the shift from consumption of liquid to gaseous fuels. Within the sector, 34.2 per cent of emissions were from energy industries, followed by 33.0 per cent from other sectors (residential and commercial/institutional, with agriculture/forestry/fisheries reported as "NO"), 32.8 per cent from transport, and less than 0.1 per cent from fugitive emissions and other (energy).

22. In response to the list of potential problems and further questions raised by the ERT, Monaco provided revised estimates of CH_4 fugitive emissions from distribution of natural gas (category oil and natural gas) (see para. 51 below). However, the ERT noted that, in comparison with its original submission of 9 April 2013, Monaco also made recalculations for 2011 regarding CH_4 and N_2O emissions from energy industries that were not requested by the ERT but it did not provide any comment or justification for the changes made (see para. 40 below, for further details). Other recalculations were made for previous years other than 2011 that were also not related to the list of potential problems and further questions by the ERT. For instance, in its submission of 31 October 2013, Monaco reported AD and emissions from the use of biomass and gasoline under road transport and navigation (and also for biomass used in navigation reported under other mobile) which, for 2010, are lower values than in comparison with the values reported in the original 2013 annual submission: GHG emissions were reduced by 0.013 Gg CO_2 eq for gasoline use in road transportation (0.1 per cent), by 0.008 Gg CO_2 eq in biomass use in road transportation (0.4 per cent), and by quantities that are smaller than 0.001 Gg CO_2 eq for navigation and biomass used in navigation. The ERT also noted that in the submission of 31 October 2013, Monaco reported the use of diesel oil fuel in road transport and navigation with higher values for 2010 in comparison with the original submission: GHG emissions were increased by 0.018 Gg CO_2 eq for diesel oil use in road transportation (0.2 per cent) and by 0.003 Gg CO_2 eq in gas/diesel oil use in navigation (0.2 per cent). The Party did not provide any explanation for the recalculations made. Nevertheless, overall for transport the revised emission values for 2010 are higher in the submission of 31 October 2013 in comparison with the original submission by 0.0085 Gg CO_2 eq (0.03 per cent), showing that there is no underestimation of emissions. However, the ERT strongly recommends that, in its next annual submission, Monaco clearly document the rationale and impact of all recalculations made in October 2013.

23. The previous review report identified several instances where the information on methodologies and EFs contained in CRF table summary 3 was not consistent with information in the NIR. The ERT commends the Party for having revised, in the 2013 annual submission, the reporting of the methodology used for CH_4 and N_2O emissions from transport (currently correctly reported as "T1, T2" in CRF table summary 3) and for the revision of the methodology and EF used for CH_4 emissions from fugitive emissions from oil and natural gas activities (currently correctly reported as "T2 and CS" in CRF table summary 3). However, other inconsistencies still occur, for example: the methodology for estimating CH_4 and N_2O emissions from road transportation (reported in CRF table summary 3 as "T1", although the actual methodology is consistent with a tier 2 approach); and the Party uses country-specific EFs to estimate CO_2 emissions from biodiesel and bio-gasoline consumption in domestic navigation and road transport activities, CO_2 emissions from consumption of natural gas (Monaco uses a country-specific EF for natural gas provided by CITEPA to estimate emissions of CO_2 from public electricity and heat production (56.72 t/TJ) and residential) and CH_4 emissions from natural gas distribution (fugitive emissions), but "D" is reported for all energy categories in CRF table summary 3. The ERT reiterates the recommendation made in previous review reports that Monaco continue to improve the consistency between the NIR and CRF table summary 3.

24. The ERT welcomes the improvements made to transparency in the 2013 annual submission by providing explanatory information on the emissions trends for several categories (see paras. 34, 42 and 47 below). However, the ERT noted there was still a lack of transparency in the Party's reporting in the NIR, including: information on the sources of AD; the description of the composition of the fleet of road vehicles; documentation on the country-specific EFs; and an incomplete reference for the default EFs (the NIR only mentions IPCC or the name of the institution providing national data, but the necessary details are not provided); and specific QA/QC procedures performed for the energy sector. The ERT recommends that Monaco continue to improve the transparency of its reporting by providing in its NIR more detailed information on the above-mentioned issues.

25. The ERT also noted that Monaco did not provide in the NIR the uncertainty values for the country-specific EFs. The ERT recommends that Monaco provide such information in the NIR.

26. The Party declared in the improvement plan in the NIR that it is planning to allocate a budget value for the 2014 year in order to facilitate the improvement of the preparation and reporting of the GHG inventory, particularly for establishing a country-specific CO_2 EF for the use of waste in electricity and heat production (page 24 of the NIR 2013). The ERT commends Monaco for this initiative and, considering that this is a category accounting for 31.0 per cent of total emissions, recommends that Monaco make all efforts to conclude the work on this area and use country-specific EFs.

2. Reference and sectoral approaches

27. Table 5 provides a review of the information reported under the reference approach and the sectoral approach, as well as comparisons with other sources of international data. Issues identified in table 5 are more fully elaborated in paragraphs 28–30 below.

Table 5
Review of reference and sectoral approaches

	Paragraph cross-references
Difference between the reference approach and the sectoral	Energy consumption: none

		Paragraph cross-references
approach	CO_2 emissions: –0.26 Gg CO_2, –0.32%	
Are differences between the reference approach and the sectoral approach adequately explained in the NIR and the CRF tables?	No	The differences are less than 0.4 per cent (in absolute values) for all years in the period 1990–2011 and are due to small differences between the EFs used for each approach, since the AD used in both approaches is the same (see para. 29 below)
Are differences with international statistics adequately explained?	Not applicable	30
Is reporting of bunker fuels in accordance with the UNFCCC reporting guidelines?	Yes	31–34
Is reporting of feedstocks and non-energy use of fuels in accordance with the UNFCCC reporting guidelines?	No	35

Abbreviations: AD = activity data, CRF = common reporting format, EF = emission factor, NIR = national inventory report, UNFCCC reporting guidelines = "Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual inventories".

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

28. As already identified in the previous review report, the ERT noted that Monaco reported the apparent consumption of municipal solid waste (MSW) for incineration as "NO" in CRF table 1.A(b) under "other solid fossil fuel" for the entire time series, but included corresponding emission estimates in CRF table 1.A(c) under other fuel. The ERT noted that MSW should not be classified as "other solid fossil fuel". The ERT reiterates the recommendation made in the previous review report that Monaco report the consumption of MSW and related emissions in a consistent way in CRF tables 1.A(b) and 1.A(c), by not reporting MSW as "other solid fossil" fuel type.

29. During the review week the ERT found that the reference approach method used by the Party is based on the same AD used for the sectoral approach, which is not in line with the *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the Revised 1996 IPCC Guidelines). This has the consequence that the comparison between both approaches does not provide any information about the accuracy of the inventory. In addition, the ERT concluded during the review week that the preparation of the energy balance by IMSEE does not follow the regulations set by the International Energy Agency (IEA) or the statistical office of the European Union (Eurostat). IMSEE provides only the output energy quantities (in MWh) which are consumed on the territory of the Principality obtained from different information sources (combustion of the different fuels, renewables resources, imported electricity). The ERT notes that, in order to prepare a reference approach in accordance with the Revised 1996 IPCC Guidelines, CO_2 emissions should be estimated for different type of fuels, using information on production, import, export, bunkers and stock changes. However, this

information is not available in Monaco. Therefore, the ERT recommends that Monaco explain the country-specific factors that create the difficulties for the calculation of the reference approach and develop methods to collect data from different sources in order to complete the reference approach in accordance with the Revised 1996 IPCC Guidelines and the IPCC good practice guidance, in order to enhance the QC and verification of the energy balance and sectoral emission estimates.

30. The comparison of Monaco's estimates with international data from the IEA was not possible, because data for Monaco are included as part of the French submission to IEA and not reported separately. The ERT encourages Monaco to contact the French GHG inventory compiler and verify whether the values corresponding to the Monaco consumption are subtracted from the French inventory and use that information to compare the energy balance to IEA data as a verification action.

International bunker fuels

31. As stated in the NIR (page 41) and mentioned in the previous review report, Monaco used a survey performed in 2005, targeting owners of boats in the ports of Monaco, to separate emissions from international and domestic navigation. The results of the survey showed that 91.0 per cent of the total fuel consumption was due to international navigation. In response to a question raised by the ERT during the review, Monaco clarified that the separation of emissions between international and national navigation is based on the 2005 survey results for the whole time series and reiterated the information that fishing vessels do not exist in Monaco. The ERT reiterates the recommendation made in the previous review report that Monaco repeat the survey regularly in order to confirm or update the percentage identified in 2005, to enhance the accuracy of the allocation of emissions between international and domestic navigation.

32. In addition, in response to questions raised by the ERT during the review, Monaco stated that the port area is included in the city and no specific off-road activities take place and the used gasoline and diesel fuels are included in the road transportation category. The ERT recommends that Monaco include this information in the NIR.

33. The ERT noted a number of inter-annual changes in the time series of CO_2 emissions from international marine bunkers (CRF table 1.C) that are very significant and not explained in the NIR, such as: 1990/1991 (29.3 per cent increase); 1996/1997 (39.4 per cent increase); 1998/1999 (41.3 per cent increase); 1999/2000 (40.2 per cent increase); 2000/2001 (an increase by 38.2 per cent). Overall, CO_2 emissions in 2011 (21.11 Gg CO_2 eq) are 397.2 per cent higher than in 1990 (4.24 Gg CO_2 eq). The ERT recommends that the Party provide explanations regarding these large fluctuations, in the NIR.

34. As Monaco is a small country with no airports, the emissions reported for international aviation bunkers result from the movement of helicopters, occurring mainly between the city of Nice (France) and Monaco. These emissions have increased by 21.1 per cent between 1990 and 2011 (CRF table 1.C). In line with findings in previous review reports, the current ERT identified large inter-annual changes in the time series of CO_2 emissions from international aviation (ranging from a decrease of 21.0 per cent between 2008 and 2009 to an increase of 15.8 per cent between 1999 and 2000). The ERT commends the Party for having provided in the NIR information explaining the above inter-annual changes, in response to a recommendation made in the previous review report. In addition, in response to questions raised by the ERT during the review, Monaco stated that off-road activities do not take place on the heliport or in the harbour area and that no underestimates occur for this category. The ERT recommends that Monaco report the above-mentioned information in the NIR in order to improve the transparency of the inventory.

Feedstocks and non-energy use of fuels

35. In CRF table 1.A(d) Monaco reports the fuel quantity for lubricants as "NE" (not estimated) and reported the notation key "NO" for all other fuel types. In all other columns of this table (fraction of carbon stored, carbon stored in non-energy uses of fuel, carbon subtracted from the energy sector and associated CO_2 emissions in other categories) the Party has reported "NO" for all fuels, including lubricants. Nevertheless, the Party estimates and reports emissions from road paving with asphalt in the industrial processes sector, which could indicate that bitumen is used in the country. In addition, no explanatory information is provided in the NIR or in CRF table 1.A(d). This issue has been raised in previous review reports and, responding to the questions raised by previous ERTs, Monaco had stated that the notation keys used to report the use of lubricants and bitumen would be checked in the next annual submission. However, in its 2013 annual submission, Monaco continued to use the notation key "NE" for lubricants and "NO" for bitumen and the current ERT concluded that reporting remains not transparent and not consistent. Therefore, the ERT reiterates the recommendations made in previous review reports that Monaco revise its reporting of feedstocks and non-energy uses of fuel and explain, in the NIR, the use and disposal of lubricants in the country, as well the associated allocation of emissions, and report emissions in a consistent way between table CRF 1.A(d) and the industrial processes sector.

3. Key categories

Stationary combustion: liquid, gaseous and other fuels – CO_2, CH_4 and N_2O[3]

36. CO_2 emissions from the incineration of MSW with energy recovery were reported under the category public electricity and heat production. In its original 2013 annual submission of 9 April 2013, Monaco reported that emissions were estimated using the tier 1 method and default values for the fossil fraction and carbon content from the IPCC good practice guidance: Monaco used default values for total carbon content (40 per cent), fossil carbon content (40 per cent) and combustion efficiency (95 per cent). Given that emissions from waste incineration reported in public electricity and heat production – other fuels is a key category, the ERT noted that Monaco could use a tier 2 method including country-specific data on carbon content, fossil carbon content and combustion efficiency to be in line with the IPCC good practice guidance. In the NIR (page 35), Monaco stated that it had tried to conduct a survey to review the waste composition, but it was unsuccessful. The NIR also explains that the Party was analysing the possibility of evaluating the characteristics of MSW on the basis of the components of the waste and their characteristics. In fact, the Party stated that, since the beginning of 2009, a new monitoring system categorizing urban waste into 12 categories has started at the waste incineration plant.

37. In response to questions raised by the ERT during the review week, Monaco provided the quantities and type of waste incinerated in the period January 2008 to August 2013, as provided by the Société Monégasque d'Assainissement. Also, Monaco provided the measurements of CO_2 emissions and other indirect GHGs collected at the incineration plant. Further, representatives from the incinerator plant informed the ERT that the actual waste incinerated has a higher calorific value than that reported in the inventory and that the combustion efficiency could be considered as 97 per cent. All this information provided to the ERT was insufficient for the ERT to conclude whether the emission estimates provided by the Party were underestimated or overestimated, and the ERT therefore invited Monaco

[3] Not all emissions related to all gases under this category are key categories, particularly CH_4 and N_2O emissions. However, since the calculation procedures for issues related to this category are discussed as a whole, the individual gases are not assessed in separate sections.

to verify whether using the country-specific information and a higher-tier approach to estimate emissions from the wastes incinerated would result in lower emission estimates than those reported in the annual submission.

38. During the review week, in response to the questions raised by the ERT, Monaco provided a revised estimate of emissions from the incineration of waste, based on the information of waste types and the available documentation on waste characteristics, such as: the per cent of the dry content matter (where applicable); the carbon content; the fossil carbon content; and the burning efficiency in the incineration of different types of waste. Monaco also considered the following information: a study performed in France by CITEPA,[4] and a comparison with data reported by Italy for MSW; the *2006 IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the 2006 IPCC Guidelines) (volume 5, chapter 5, table 5.2) for clinical waste; and information on the contents of the inputs to the incinerator. The Party assumed conservative allocations of the waste by type of waste, based on expert judgement and the 2006 IPCC Guidelines (tables 2.4 and 2.6) for the ordinary industrial waste ("déchet industriels banals") and bulk waste ("encombrants"). The CO_2 emissions obtained by Monaco using the above methodology and assumptions demonstrated that the estimates in the submission of 9 April 2013, as reported under the category public electricity and heat production – other fuels, did not result in an underestimation of emissions. The ERT recommends that Monaco continue the efforts to collect information on the composition of the MSW incinerated for the entire time series, determine country-specific EFs to calculate emissions from this source and use these data to provide revised estimates.

39. During the review week, Monaco also informed the ERT that the biomass removed by the trimming of trees in parks and streets was included in the category public electricity and heat production – other fuels, but the ERT considers that this allocation is not transparently documented in the NIR. Therefore, the ERT recommends that Monaco provide information in its NIR about where the energy from the use of individual fuels is allocated in the CRF tables. In addition, the ERT recommends that Monaco subtract the biomass fraction in MSW from other fuel and report it under the corresponding biomass fuel use for the same category.

40. The ERT noted that in the Party's submission of 31 October 2013, in response to the list of potential problems and further questions by the ERT, Monaco reported the notation key "IE" (included elsewhere) for the GHG emissions from biomass use under the category public electricity and heat production and did not provide any explanation regarding the category where these emissions are included, whereas in the original 2013 submission of 9 April 2013 quantities of biomass use under this category were reported for the periods 1990–2000 and 2006–2011. This modification in the Party's reporting has resulted in a decrease of emissions for the category and for the total GHG inventory: for 2011, CH_4 emissions were reduced by 0.76 t and N_2O emissions by 0.10 t. The ERT strongly recommends that Monaco explain in the next annual submission the reasons for the modification in its reporting, and in particular where emissions are included, and provide evidence that estimates are not underestimated.

41. Sludge from wastewater treatment is incinerated together with MSW wastes in the same incineration plant. Nevertheless, emissions from incineration of this sludge are reported under the category waste incineration (biogenic) in the waste sector. In response to questions raised by the ERT during the review, Monaco provided information about the incineration of the sludge from wastewater handling and explained the allocation process by the fact that this type of waste has too low a net calorific value (NCV) to be incinerated (due to its high water content) and actually it requires net energy to be burnt: overall, no

[4] Referred to as the "RECORD 2007" report.

energy recovery is obtained (see para. 81 below). The ERT agrees with the justification provided by the Party for its reporting of these emissions under the waste sector and recommends that Monaco provide this information in the NIR in order to enhance transparency.

42. In line with what was identified in previous review reports, the ERT noted significant inter-annual changes in the estimated CO_2 emissions from the incineration of MSW, ranging from –27.5 per cent (2005/2006) to 36.6 per cent (2006/2007). Overall, the emissions increased by 1.1 per cent between 1990 and 2011, but not following a simple trend: emissions increased by 66.9 per cent between 1990 and the maximum value in 2001 and thereafter decreased by 39.4 per cent (2011 in comparison with the maximum 2001 value). The ERT commends the Party for having followed the recommendations made in the previous review report and having included in the 2013 NIR transparent explanatory information on the emission trends.

43. In response to questions raised by the ERT during the review regarding the country-specific EF for natural gas provided, Monaco provided documentation (Houllier and Crozet, 1992) obtained from CITEPA on the country-specific CO_2 EF for natural gas usage. Also, Monaco informed the ERT that the EF for the natural gas is the same as that used in France and that the variation of the implied emission factor (IEF) in the French inventory time series is due to the sectors covered by the European Union Emissions Trading System (EU ETS). The ERT recommends that Monaco provide additional explanatory information on the country-specific EF for natural gas combustion.

44. The previous review reports identified that Monaco had not reported separate data on fuel consumption (for liquid and gaseous fuels, other fuels being reported as "NO") for the subcategory commercial/institutional, but instead reported "IE" and included the corresponding emissions under residential. Responding to questions raised during previous reviews, Monaco had informed the ERT that it had investigated the possibility of a split between the emissions from residential and commercial/institutional, but it concluded that the split would have no impact on the total quantity of emissions estimated and that it preferred to focus its resources on other issues. During the current review, in response to questions raised by the ERT, Monaco informed the ERT that currently it is not able to provide separate data for these subcategories. The ERT acknowledges that the split would not have an impact on the total sectoral emission estimates, but notes that it would improve the transparency of the inventory in relation to these important subcategories and would enhance comparability with other Parties. Therefore, the ERT reiterates the recommendation made in previous review reports that Monaco make efforts to report emissions from the commercial/institutional and residential subcategories separately.

Road transportation: liquids fuels – CO_2, CH_4 and N_2O[5]

45. Monaco estimated CO_2, CH_4 and N_2O emissions from road transportation on the basis of the amount of fuel sold and used default EFs and NCVs from the Revised 1996 IPCC Guidelines for gasoline and diesel oil. Monaco uses vehicle numbers per type of vehicle/technology to allocate total fuel sold in the country. For biofuels, the EFs and NCVs were provided by CITEPA. During the review, in response to questions raised by the ERT, Monaco provided the ERT with documentation regarding the methodology, the country-specific CO_2 EFs and the NCVs for biofuels. The ERT concluded that this approach is consistent with the tier 2 approach from the IPCC good practice guidance for CH_4 and N_2O. The ERT recommends that the Party provide documentation and references for the country-specific EFs for biofuels in the NIR.

[5] Not all emissions related to all gases under this category are key categories, particularly CH_4 emissions. However, since the calculation procedures for issues related to this category are discussed as a whole, the individual gases are not assessed in separate sections.

46. In response to a request by the ERT during the review that Monaco provide information on whether or not the quantities of biofuels bought in France but used by Compagnie des Autobus de Monaco (CAM) buses are or are not considered in the inventory, Monaco responded that the emissions reported in the inventory cover only the use of biofuels which are bought in the Principality of Monaco. The ERT agrees that this is in accordance with the "Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual inventories" (hereinafter referred to as the UNFCCC reporting guidelines). The ERT encourages Monaco to establish communication with the French inventory compiler to continue to ensure that the allocation of fuel consumption is in accordance with the area where these are sold.

47. The trend in the estimated CO_2 emissions from road transportation shows an overall decrease of 27.1 per cent, from 32.34 Gg in 1990 to 23.58 Gg in 2011. The Party explained in the NIR (page 40) the measures that have been taken which could have resulted in the decrease of emissions in this category, namely: an increase in the use of public transportation; the use of biodiesel in two hybrid buses after 2011; an incentive tariff; a requirement for all buses to function with a mix of 30 per cent biodiesel (biofuels consumption increased from 0.096 TJ in 1990 to 21.41 TJ in 2011); investments in electric railway transport; and improvements of walking connections. The ERT commends the Party for providing the above-mentioned explanation in the NIR as recommended in the previous review report.[6]

48. The N_2O IEF for road transportation using motor gasoline in Monaco has increased by 668.5 per cent from 1.70 kg/TJ in 1990 to 13.06 kg/TJ in 2011. This increase in the IEF was due to an increase in the share of passenger cars running on gasoline equipped with a catalytic converter (the IEF for this type of vehicle is 0.05 g/km, or 20 kg/TJ, according to table 1-36 of the Revised 1996 IPCC Guidelines). The ERT informed the Party during the review that equivalent trends for neighbouring counties, such as France and Italy, are different: for France, the maximum value of the IEF was in 1998 (8.78 kg/TJ) and a decrease was observed thereafter towards 2011 (2.16 kg/TJ); for Italy, the IEF has a descending trend since 1999, from 10.11 kg/TJ to 1.61 kg/TJ in 2011. In response to questions raised by the ERT during the review, Monaco provided information to show that the fleet in Monaco is different from that of France and Italy and the comparatively high country-specific EF is explained by the higher number of vehicles having three-way catalysts, which have the highest N_2O EF from gasoline usage. The ERT understands that Monaco's fleet is not a typical one and, by comparison with the above trends, the ERT concluded that N_2O emissions from gasoline usage in road transport are not underestimated. Nevertheless, the ERT encourages Monaco to obtain complete data about the fleet composition, collect specific data on the consumption and mileages per type of vehicle/technology and take into consideration the use of a more accurate methodology to estimate emissions, for instance the COPERT[7] model. The ERT also reiterates the recommendation made in the previous review report that Monaco include more information on the underlying reasons for the trend in the N_2O emissions from road transportation in the NIR.

49. The ERT noted that Monaco reports "NO" for other transportation. In response to questions raised by the ERT during the review regarding emissions that are typically included under this subcategory (e.g. combustion emissions from all remaining transport activities, such as earthmoving and construction equipment, ground activities in airports, parks and so on), Monaco informed the ERT that all those activities are already included under other transport subcategories in accordance with the inclusion of emissions from all

[6] FCCC/ARR/2012/MCO, paragraph 46.

[7] Information on the model is available at <http://www.emisia.com/copert/>.

fuel sales in the country. Also, Monaco informed the ERT that emissions due to military activities, which comprise 100 guards of the Prince's company and 150 professional firemen using classical tourism vehicles or fire trucks, are also already accounted elsewhere under transport. The ERT recommends that Monaco include this information in the NIR to enhance transparency and demonstrate complete reporting consistent with the IPCC good practice guidance.

4. Non-key categories

Fugitive emissions from oil and natural gas – CH_4

50. In its original 2013 annual submission of 9 April 2013, Monaco reported in the NIR that fugitive emissions from distribution of natural gas were estimated on the basis that 0.02 per cent of the quantity of gas distributed is emitted. The ERT could not replicate the reported emissions using this EF or the AD reported in CRF table 1.B.2 (805.85 m^3 in 2011). Responding to questions raised by the ERT during the review, Monaco informed the ERT that the figures reported as AD in the CRF reporter represented the fugitive emissions from distribution of natural gas (instead of the distributed quantity) and confirmed that AD and the IEF, as reported, were incorrect. In addition, the Party was unable to provide documentation for the 0.02 per cent factor that was used. Therefore the ERT concluded that there was a lack of transparency in reporting on how fugitive emissions were estimated and, being unable to verify whether emissions were overestimated or underestimated, included this issue in the list of potential problems and further questions raise by the ERT. The ERT recommended that the Party provide transparent and detailed information on the underlying methodology used to estimate emissions, or recalculate CH_4 fugitive emissions from natural gas distribution for the complete time series using a methodology consistent with the IPCC good practice guidance.

51. In response to the list of potential problems and further questions raised by the ERT, Monaco recalculated fugitive CH_4 emissions from natural gas distribution. The revised estimates were based on detailed information on the length of the distribution network, including disaggregated yearly data on the length of the network that is operating under high pressure (4 bar) and medium pressure (20 mbar) and by type of material: older cast iron network and high-density polyethylene (HDPE) that has been replacing the older cast iron network. The Party also considered revised EFs. The EF for HDPE (37.05 Nm^3/km or 24.46 kg CH_4/km) was based on measurement surveys during the replacement of old pipelines or other works and after the application of a conservative factor of 1.5. For the old pipelines the Party used the average EF from table 2.16 in the IPCC good practice guidance (615.00 kg CH_4/km or 861.00 Nm^3/km). Monaco reported that other fugitive emissions were not detected by SMEG over all the years. As a result of the revised methodology, emission estimates for 2011 have increased from 575.60 kg CH_4 to 995.11 kg CH_4. The revised methodology was explained in documentation provided by the Party.[8]

52. The ERT concluded that the response by Monaco was insufficient to solve the identified issue and concluded that the recalculated values could represent an underestimate of emissions. The ERT concluded that the country-specific EF for HDPE was not documented with sufficient data on measurements nor sufficient information on QA/QC actions carried out to show that it was representative of the full network in line with the requirements for country-specific EFs in the IPCC good practice guidance. In addition, the EF used by Monaco considered only emissions from maintenance, system disruptions and accidents but did not cover other important emission sources such as normal operations (equipment leaks and pipeline leaks due to corrosion, valves, fittings and connectors), which are usually the major source of emissions. Finally, the Party did not document the

[8] Document reference: JBB/DE-2013-039a.

reasons behind the use of the 1.5 conservativeness factor. The ERT also compared the revised 2011 IEF expressed in emissions per volume of gas distributed (215.61 g/m^3) with those for Italy (5,148.27 g/m^3) and the EF expressed in kg/km (26.46 kg/km) with those for France (181.53 kg CH_4/km) and concluded that the EF used by Monaco is lower than these countries.

53. Therefore, the ERT calculated and recommended adjustments for CH_4 emissions from distribution of natural gas (see paras. 99–112 below). The ERT strongly recommends that Monaco submit revised emissions estimates for this category. For that purpose, Monaco could use the appropriate default EFs provided in the IPCC good practice guidance together with the corresponding AD and taking into consideration the characteristics of the country's network. Alternatively, the ERT recommends that Monaco collect detailed data on the distribution network structure, including penetration of control technologies, and use it in accordance with international methodologies that are in accordance with the IPCC good practice guidance to implement a higher-tier method. The ERT also recommends that the Party provide detailed and transparent information on the underlying methodology used to collect AD and estimate emissions for this category and clearly document and completely reference the usage of the EFs and other specific parameters in the NIR.

54. The ERT strongly recommends that the Party enhance the QA/QC and verification procedures in order to avoid the occurrence of the above-mentioned errors in its reporting.

55. In addition, the ERT noted that fugitive CH_4 emissions from other leakage of natural gas at industrial plants and power stations and in the subcategories residential and commercial are reported as "NO". Although the Revised 1996 IPCC Guidelines and the IPCC good practice guidance do not provide default EFs for western Europe in the concerned activities, the ERT encourages Monaco to provide estimates or explain the reporting procedure in the NIR.

C. Industrial processes and solvent and other product use

1. Sector overview

56. In 2011, emissions from the industrial processes sector amounted to 7.16 Gg CO_2 eq, or 8.0 per cent of total GHG emissions, and emissions from the solvent and other product use sector amounted to 0.04 Gg CO_2 eq, or 0.05 per cent of total GHG emissions. Since the base year, emissions have increased by 690.9 per cent in the industrial processes sector, and increased by 664.4 per cent in the solvent and other product use sector. The key driver for the rise in emissions in the industrial processes sector is the increased in emissions of fluorinated gases (F-gases) from consumption of halocarbons and SF_6, mainly HFCs and PFCs from air-conditioning equipment and SF_6 from electrical equipment. Within the industrial processes sector, nearly 100.0 per cent of the emissions were from consumption of halocarbons and SF_6, followed by a small amount (0.001 per cent) from mineral products (road paving and asphalt). Within the category consumption of halocarbons and SF_6, 95.1 per cent of GHG emissions were from refrigeration and air-conditioning equipment, followed by 2.5 per cent from aerosols/metered dose inhalers (MDIs), 2.3 per cent from electrical equipment and 0.3 per cent from foam blowing.

57. Following recommendations made in previous review reports, Monaco made many improvements to the accuracy of the inventory by including estimates of: CO_2 emissions from road paving with asphalt (in previous years only non-methane volatile organic compounds (NMVOCs) were reported); HFC emissions from aerosols/MDIs and foam blowing, and by revising upwards HFC emissions from refrigeration and air-conditioning equipment (domestic refrigeration); and CO_2 emissions from the solvent and other product use sector (for paint application, degreasing and dry cleaning and other, while in previous

annual submissions only NMVOC emissions were provided). For the first time, Monaco has also provided estimates of actual emissions from refrigeration and air-conditioning equipment and SF_6 emissions from electrical equipment for the period 1990–1994 (see para. 62 below).

58. The ERT notes, however, that there is room to enhance the quality of the inventory and its accuracy. For some subcategories (such as HFC emissions from aerosols/MDIs, foam blowing and domestic refrigeration) Monaco is relying on its collaboration with CITEPA to provide EFs and parameter proxies from France and these may be not representative of the conditions in Monaco. During the in-country review, the ERT had access to the inventory database and archive system and learned that for other subcategories (HFC and PFC emissions from mobile air-conditioning equipment and commercial refrigeration) data are collected based on questionnaires sent to all operators in Monaco. The ERT considers that the necessary verification procedures are not in place to ensure the accuracy of data; for example there is no cross-check of this data with other data providers. The ERT recommends that the Party continue to improve the accuracy of the inventory for the industrial processes sector, by ensuring that appropriate QA/QC procedures on background data are in place.

59. The ERT concluded that reporting in the NIR is not yet fully transparent and that a detailed description of the methodologies, EFs and parameters for the several subcategories of consumption of halocarbons and SF_6 are not adequately described in annex 3 to the NIR. The ERT also noted that questionnaires are used to collect data from data providers but the Party did not provide sufficient information on these questionnaires (e.g. information collected, verification procedures) in the NIR. Therefore, the ERT recommends that the Party enhance the description of data collection (including QA/QC procedures), methodologies and documentation of parameters and EFs with sufficient detail to ensure transparency.

60. Monaco did not estimate uncertainty values for all categories of the industrial processes sector and, based on responses to questions raised by the ERT during the review, the ERT learned the Party has no plans to include these uncertainties. Therefore, the ERT recommends that Monaco elaborate a plan to ensure the inclusion of all categories in the uncertainty analysis.

2. Key categories

Consumption of halocarbons and SF_6 – HFC and SF_6

61. In its original 2013 annual submission, Monaco has provided revised estimates of HFC emissions from foam blowing and domestic refrigeration in order to replace the adjustments that were applied to these categories in the 2012 review. The ERT concluded that the revised estimates together with the recalculations made in response to the list of potential problems and further questions by the ERT (see para. 65 below) solved the issues identified in the previous review report. Following the recommendations made in the previous report Monaco did report in CRF table 2(II)F emissions of HFCs, PFCs and SF_6 for relevant subcategories. The ERT commends the Party for the improvements made.

62. However, the ERT still found gaps in the AD time series for Monaco for some categories, with no explanations provided in the NIR. For example, “NE” was reported for C3F8 emissions for 1990–1994 and HFC emissions from stocks for stationary air-conditioning equipment (i.e. HFC-125, HFC-134a, HFC-143a and HFC-32, for 1990–1993 and HFC-143a and HFC-32 for 1994). The ERT recommends that Monaco complete the time series and improve its data collection and QA/QC actions to ensure completeness and consistency of AD and emissions.

63. The information that Monaco provided in the NIR (page 46) shows that, in its original submission of 9 April 2013, it used a tier 2b methodology and a default EF to estimate emissions for SF_6 emissions from electrical equipment, while AD were collected from the only plant operating in Monaco (data provided by SMEG). However, the ERT noted that the EF used by Monaco is 1 per cent, which is not the default EF from the IPCC good practice guidance (which is 2 per cent of the total charge of SF_6 contained in the existing stock of equipment in operation in each year[9]). Thus, the ERT considered that Monaco's emission estimates could be underestimated and requested, in the list of potential problems and further questions by the ERT, that Monaco provide transparent information to justify the EF used; or provide revised estimates of SF_6 emissions from electrical equipment using the IPCC default EF for the whole time series. In response to the list of potential problems and further questions raised by the ERT, Monaco provided, in its submission of 31 October 2013, revised estimates of SF_6 emissions using the default EF of 2 per cent for the whole time series. The Party also collected information from SMEG to explain a trend in the time series: the quantity exported for destruction in 2004 (90.7 kg) was due to the replacement of gas in all the electrical equipment located in "poste source de Sainte Dévote" (voltage transformer), and the fact that new equipment uses less SF_6. As a result of the recalculations, emissions for 2011 have increased by 0.08 Gg CO_2 eq (97.4 per cent). The ERT considered the issue to be resolved and recommends that Monaco update the methodology used and explanations on trends in the NIR.

64. In its original submission of 9 April 2013, Monaco reported emissions of HFC-134a from domestic refrigeration based on the ratio of per capita emissions of France (1.69 g/capita HFC-134a) for the time series 1994–2011. The ERT considered that the ratio used from France may not be representative for Monaco, given the difference in national circumstances between the two countries in relation to: climate; the high level of tourism in Monaco; Monaco is a city state; and social and economic conditions. During the review week, the ERT calculated for 2010 the per capita ratios for Spain (3.16 g/capita HFC-134a) and Greece (2.50 g/capita HFC-134a) – countries with conditions which could also be close to Monaco – and noticed a great discrepancy between these ratios and the ratio used by Monaco, and concluded that the emissions reported by Monaco could be underestimated.

65. Based on these results, the ERT included this issue in the list of potential problems and further questions raised by the ERT and recommended that Monaco reconsider the methodology used for this subcategory and prepare revised estimates for the whole time series. In particular, the ERT recommended that Monaco either: obtain country-specific data on equipment and F-gas content; or, use a cluster of countries with similar climate conditions and social and economic situations such as Spain, Greece and France to generate a weighted ratio, in order to achieve a more representative ratio to estimate emissions. In response to the list of potential problems and further questions raised by the ERT, Monaco provided revised estimates in its submission of 31 October 2013, including a revised estimate for domestic refrigeration using country-specific data (numbers of household equipment) based on a bottom-up tier 2 approach in accordance with the IPCC good practice guidance. These country-specific data were made available by IMSEE based upon two population censuses made in 2000 and 2008, which were extrapolated for the whole time series 1990–2011. According to these AD, in 2008, the number of items of equipment per household calculated in Monaco was 1.278, which is larger than the number for France in 2011 (0.992).[10] Other parameters used in the revised estimates are the median values of the default ranges in accordance with the IPCC good practice guidance (table 3.22): the initial charge was 0.275 kg/equipment; the EF for lifetime emissions was 0.3 per cent. As a

[9] IPCC good practice guidance eq. 3.17 and table 3.12, pages 3.57–58.

[10] GIFAM. 2013. Groupement interprofessionel des fabriquants d'appareil s d'équipement ménagers GIFAM - 16-09-2013.

consequence of the recalculations made, the emissions in 2011 for domestic refrigeration increased by 0.02 t HFC-134a. The ERT appreciated and agreed with the efforts made by Monaco to improve the accuracy of its inventory for this category, and recommends that it report on the methodology used in its NIR.

66. In its original submission of 9 April 2013, Monaco reported emissions of HFC-134a from mobile refrigeration, calculated based on an average initial charge of F-gas in the vehicle of 600 g per vehicle. However, the ERT noted that this value is neither documented nor justified in the NIR, and also noted that Monaco could have a specific vehicle fleet stock. In addition, the ERT noted that the IPCC default charge of HFC-134a, which is 800 g/vehicle, is higher than the initial charge used by Monaco. The ERT concluded that the emissions reported by Monaco could be underestimated and included this issue in the list of potential problems and further questions raised by the ERT. The ERT recommended that the Party provide revised estimates of HFC-134a for this subcategory for the complete time series, either by using more specific data on the vehicle fleet and the average content of HFCs for each category of vehicles existing in Monaco, or by using an alternative methodology in accordance with the IPCC good practice guidance.

67. In response to the list of potential problems and further questions raised by the ERT, Monaco provided revised estimates in its submission of 31 October 2013 using country-specific data on the vehicle fleet and default parameters from the IPCC good practice guidance, in accordance with the tier 2 bottom-up approach from the IPCC good practice guidance. The total number of vehicles in Monaco is collected from the vehicle registration office, Service des Titres de Circulation (STC). The share of vehicles equipped with mobile air-conditioning systems for personal and light duty vehicles is based on the French vehicle fleet modelling, which considers that the rate of vehicles equipped with air conditioning starts from 8 per cent in 1990 and reaches 91 per cent in 2011.[11] The ERT noted that the modelling of the fleet by France could be outdated, given that since the time of these results, more recent results were published in other reports (ADEME, 2012 and André et al., 2013).[12,13] The ERT considers that the model of the French fleet is not representative of the situation occurring in Monaco and encourages the Party to either consider recent studies published by France or develop its own database in order to have a more representative share of vehicles used. The annual stock of HFC-134a was calculated for each year using these rates and a charge of 0.8 kg/vehicle for passenger cars and 1.2 kg/vehicle for light commercial vehicles, which are the defaults in the IPCC good practice guidance (table 3.24). The lifetime EF was the median value (15 per cent) in the range of defaults in the IPCC good practice guidance (table 3.23). The ERT considers that the new estimates are in accordance with the IPCC good practice guidance, and recommends that the Party include this information in the NIR. The Party also informed the ERT that work with IMSEE and STC has been initiated to develop better information on the Monaco fleet and enhance accuracy in future annual submissions. The ERT welcomes these efforts.

[11] ADEME – La climatisation automobile – Impact Energétique et Environnemental – données et référence Mai 2003; and Evolution du parc automobile français entre 1970 et 2020.- Béatrice BOURDEAU - Projet de Thèse, Doctorat et Ingénierie de l'Environnement.

[12] Ademe. (2012). Vision Ademe 2020-2030, Technologies / Carburants pour les véhicules particuliers neufs. Document de travail Ademe. 26p.

[13] André, M., A.L. Roche, L. Bourcier. (2013). Traffic statistics for the calculation of pollutant emissions from road transports in France. Statistiques de parcs et trafic pour le calcul des émissions de polluants des transports routiers pour la France. In French. Rapport IFSTTAR-LTE, Bron (France), 132p.

3. Non-key categories

Asphalt roofing – CO_2

68. CO_2 emissions from asphalt roofing are reported as "NE". The ERT considers that data could be collected in a small country such as Monaco and emissions could be estimated. Therefore, the ERT encourages Monaco to estimate emissions from this category.

Solvent and other product use – N_2O

69. N_2O emissions are reported as "NE" for solvent and other product use. In response to questions raised by the ERT during the review, the Party stated that data are not available to estimate these emissions. The ERT encourages the Party to consider collecting this information in its annual survey and estimate these emissions in the future annual submission to increase the completeness of the inventory.

D. Agriculture

1. Sector overview

70. Monaco has indicated in its NIR that there is no livestock production, pasture management or farmland for agriculture in the country. The Party has reported all categories in this sector as "NO" in the CRF tables.

E. Land use, land-use change and forestry

1. Sector overview

71. In 2011, net removals from the LULUCF sector amounted to 0.02 Gg CO_2 eq. Since 1990, net removals have increased by 62.2 per cent. The key driver for the rise in removals is the net increase in urban green areas since 1990. However, a decrease in removals by 0.1 per cent was observed between 2010 and 2011 and this decrease, as indicated by Monaco, was attributable to the decrease in area of public green parks (from 27.55 ha to 27.53 ha) and in trees (from 6,537 trees to 6,533 trees) due to construction of infrastructure (buildings, road). The category settlements remaining settlements was the only category reported by Monaco with estimates for emissions/removals, while emissions and removals from all other categories were reported as "NO".

72. The reporting in the LULUCF sector is not complete. As indicated in the previous review report,[14] the ERT found that the information reported in the NIR was not transparent enough to understand how the biomass burned (incineration of green waste) was considered in the inventory and how the associated emissions were allocated between the energy, LULUCF and waste sectors. In response to questions raised by the ERT during the review, Monaco provided clarifications on this issue (see para. 74 below), and the Party acknowledged that the loss of biomass due to tree pruning in parks and gardens was not included in the inventory. In line with previous review reports, the ERT encourages Monaco to enhance the completeness of its inventory (see para. 75 below). No category was identified as a key category in the LULUCF sector.

[14] FCCC/ARR/2012/MCO, paragraph 65.

2. Non-key categories

Settlements remaining settlements – CO_2, CH_4 and N_2O

73. Monaco applied the tier 1a option described in appendix 3a.4 of the IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry* (hereinafter referred to as the IPCC good practice guidance for LULUCF) to estimate the increase in carbon stocks in living biomass in settlements remaining settlements. Monaco used country-specific data on total crown cover area and default values for the parameter crown cover area-based growth rate (2.9 tonnes carbon (C)/area crown cover per year) from the IPCC good practice guidance on LULUCF. The crown cover was derived from the total number of trees and the area of green parks in Monaco. According to the previous review reports, Monaco has been considering the use of aerial photographs to improve the estimation of crown cover. However, in response to a question raised by the ERT during the review with regard to the implementation of this improvement, Monaco indicated that it does not have a concrete plan to apply this remote-sensing approach in the near future for the LULUCF sector. Therefore, the ERT encourages Monaco to develop plans to use aerial photographs to improve the accuracy of crown cover data for a future annual submission.

74. Monaco reported gains in living biomass due to tree growth and used the notation key "NA" (not applicable) for losses, as indicated in CRF table 5.E. The Party acknowledged that some quantity of wood resulting from tree pruning is included in the 'green waste' generated by the maintenance of public parks and gardens, as indicated in the previous review report. Since the green waste is burned for energy purposes, and the CO_2 emissions resulting from this incineration are reported as a memo item in the energy sector, the ERT encourages Monaco to include the loss of biomass in the inventory in order to improve the carbon balance in the sector.

75. Monaco reported the changes in carbon stocks in dead organic matter and soil as "NE", as also identified in the previous review report. As the IPCC good practice guidance for LULUCF does not provide a basic methodology and default data to estimate the changes in carbon stocks in these pools in settlements, the ERT encourages Monaco to include the changes in carbon stock, to the extent possible, in its next annual submission.

76. To estimate N_2O emissions resulting from the application of fertilizer in parks and gardens, which are included for the first time in the current annual submission, Monaco applied the tier 1 method and the default EF from the IPCC good practice guidance for LULUCF. However, the ERT noted that emissions although were reported in CRF table 5 with values, "NO" was reported in CRF table 5(I). The ERT reiterates the recommendation made in the previous review report that Monaco improve the consistency in the CRF tables by incorporating information, including AD and the IEFs, in CRF table 5(I). In addition, the ERT recommends that the Party enhance the QA/QC procedures to identify and correct similar findings.

F. Waste

1. Sector overview

77. In 2011, emissions from the waste sector amounted to 1.16 Gg CO_2 eq, or 1.3 per cent of total GHG emissions. Since 1990, emissions have increased by 53.7 per cent, although a decrease in emissions by 7.3 per cent was reported between 2010 and 2011. The key drivers for the rise in emissions are the increase in emissions from wastewater handling and waste incineration. Within the sector, 73.6 per cent of the emissions were from wastewater handling, followed by 26.4 per cent from waste incineration. Emissions from solid waste disposal on land were reported as "NO".

78. The information provided in the NIR together with the information provided by the Party during the in-country review was generally sufficiently transparent for the ERT to understand how the emissions were estimated in the waste sector. However, the ERT considers that some issues could be improved, such as information on the pathways of the wastewater system (see para. 80 below).

2. Non-key categories

Wastewater handling – CH_4 and N_2O

79. Regarding N_2O emissions from wastewater handling, Monaco only estimated and reported N_2O emissions from human sewage; the Party did not estimate N_2O emissions from industrial and commercial wastewater handling. The wastewater treated originates from Monaco and neighbouring municipalities of France. The Party applied the method contained in the IPCC good practice guidance together with country-specific data on population, protein consumption (documentation provided during the review) and the default EF. The wastewater treatment system, as described by Monaco in response to questions raised by the ERT during the review, indicated that a non-negligible amount of untreated or pretreated wastewater (up to 7.8 per cent) is discharged every year directly into the sea and on the ground during heavy rainfall. The ERT identified that this discharge adds nitrogen (N) to the aquatic system, increasing the amount of N available for nitrification and denitrification processes leading ultimately to indirect N_2O emissions from human sewage that is discharged into rivers or estuaries. Given that the method provided by the IPCC good practice guidance to estimate these indirect emissions also uses as input data population and protein consumption and given that Monaco has applied the method considering the total population of the country, the ERT concluded that there would be no potential underestimation of emissions. The ERT encourages Monaco to estimate N_2O emissions from industrial and commercial wastewater.

80. Monaco indicated in the NIR and confirmed to the ERT, in response to questions raised by the ERT during the review, that more than 90 per cent of wastewater is treated in aerobic conditions. In addition, Monaco indicated that the remaining wastewater corresponds to the amount discharged into the sea. The ERT reiterates the recommendation made in the previous review report that Monaco include this information in the NIR to improve the transparency of its reporting. The Party stated that no CH_4 emissions occur (reported as "NO"), owing to the full treatment of wastewater in aerobic conditions. The sludge resulting from the treatment of the wastewater is sent to the incinerator where it is burned or sent to France where it is applied to agricultural soils. The ERT recommends that Monaco describe in the NIR the pathways of wastewater in order to enhance the transparency of its reporting on the wastewater management system.

Waste incineration – CO_2, CH_4 and N_2O

81. Monaco reported CO_2, CH_4 and N_2O emissions from incineration of biogenic waste in CRF table 6.C. Emissions from other types of waste (e.g. household waste, municipal solid waste and clinical waste) are reported in the energy sector, because they are incinerated for energy purposes (see paras. 36–40 above). In response to a question raised by the ERT during the review, Monaco clarified that this biogenic part included only sludge resulting from wastewater treatment and that emissions are reported under the waste sector only, as the sludge has a low calorific value and high water content and is burned only for elimination purposes (see para. 41 above). Monaco also showed that CO_2 emissions occurring from the incineration of sludge were not accounted for in the total emissions, because the carbon is assumed to be of biogenic origin. This information was not reported in the NIR, and the ERT reiterates the recommendation made in the previous review report that Monaco include all the information above in the NIR.

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

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

Overview

82. Table 6 provides an overview of the information reported and parameters selected by the Party under Article 3, paragraphs 3 and 4, of the Kyoto Protocol.

Table 6
Supplementary information reported under Article 3, paragraphs 3 and 4, of the Kyoto Protocol

		Findings and recommendations
Has the Party reported information in accordance with the requirements in paragraphs 5–9 of the annex to decision 15/CMP.1?	Not sufficient	The Party did not ensure that areas of land subject to KP-LULUCF activities are identifiable (see para. 86 below)
Identify any elected activities under Article 3, paragraph 4, of the Kyoto Protocol	None	
Identify the period of accounting	Annual accounting	
Assessment of the Party's ability to identify areas of land and areas of land-use change	Not sufficient	Monaco did not provide sufficient information to demonstrate that it has identified areas under afforestation/reforestation and deforestation in accordance with its definition of forest (see paras. 84–86 below)

Abbreviation: KP-LULUCF = land use, land-use change and forestry emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol.

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

Afforestation and reforestation and deforestation – CO_2, CH_4 and N_2O

83. During the in-country review Monaco provided documentation on time-series data for green areas and the number of trees since 1990. Between 1990 and 2011, the green areas increased from 38.91 ha to 44.35 ha and the number of trees increased from 5,733 to 6,533 trees. Monaco stated that there are no areas in Monaco that meet the definition of forest, since potential areas include only public parks and public and private gardens, which are not forests but settlements.

84. The ERT noted that, between 2010 and 2011, the green areas decreased from 44.38 to 44.35 ha and the number of trees from 6,537 to 6,533 trees. Owing to the lack of transparent information on the geographic distribution of land in the annual submission and analysis upon it, it was not possible for the ERT to conclude whether afforestation, reforestation and deforestation occur in Monaco. However, Monaco reported in the NIR and confirmed in response to questions raised by the ERT during the review that these activities do not occur in the country and used the notation "NO" in CRF table NIR-1.

85. In response to questions raised during the 2012 review, Monaco provided copies of several official maps for the time series 1991, 1995, 1999, 2004 and 2009 and explained that the succession of aerial photographs showed that the total surface of green areas has always been the same and only small changes in the planted areas can be observed. Some of these maps were included in the 2013 annual submission. Monaco also made reference to the law protecting trees in the country.[15]

86. The ERT agrees that it is probable that the information provided by the Party is correct, but considering that a constant land area is not sufficiently good evidence to justify that deforestation has not occurred, because a decrease in green area can be balanced by creation, and noting that geographical analysis of the maps is not provided, the ERT strongly recommends that Monaco revise its reporting and implement a comparison of time-series geographic distributions to demonstrate that no afforestation, reforestation and deforestation occurs in the country using the forest definition to identify these units of land, and confirm that these do not occur. If such units of land are identified, the ERT recommends that Monaco prepare and report estimates of carbon stock changes for all pools, in accordance with the IPCC good practice guidance for LULUCF. The ERT also recommends that, if Monaco identifies that none of the KP-LULUCF activities occur in the territory, further explanation be provided in the NIR and areas and carbon stock changes be reported as "NO".

2. Information on Kyoto Protocol units

Standard electronic format and reports from the national registry

87. Monaco has reported information on its accounting of Kyoto Protocol units in the required SEF tables, as required by decisions 15/CMP.1 and 14/CMP.1. The ERT took note of the findings and recommendations included in the standard independent assessment report (SIAR) on the SEF tables and the SEF comparison report.[16] The SIAR was forwarded to the ERT prior to the review, pursuant to decision 16/CP.10. The ERT reiterated the main findings and recommendations contained in the SIAR.

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

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

89. Monaco has reported information on its accounting of KP-LULUCF in the accounting table, as included in the annex to decision 6/CMP.3. Information on the accounting of KP-LULUCF has been prepared and reported in accordance with decisions 16/CMP.1 and 6/CMP.3. The ERT noted that Monaco has reported all activities as "NA" in the accounting table of the KP-LULUCF tables.

90. Table 7 shows the accounting quantities for KP-LULUCF as reported by the Party and the final values after the review.

[15] Article 56 of Sovereign Order No. 3.647 of 9 September 1966.

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

Table 7
Accounting quantities for activities under Article 3, paragraph 3, and, if any, activities under Article 3, paragraph 4, of the Kyoto Protocol, in t CO_2 eq

	2013 submission[a]			*2010, 2011 and 2012 submissions*[b]	*Net accounting quantity*[c]
	As reported	*Revised estimates*	*Final*	*Final*	
Afforestation and reforestation	NA		NA	NA	NA
Non-harvested land	NA		NA	NA	NA
Harvested land	NA		NA	NA	NA
Deforestation	NA		NA	NA	NA
Forest management	NA		NA	NA	NA
Article 3.3 offset[d]	NA		NA	NA	NA
Forest management cap[e]	NA		NA	NA	NA
Cropland management	NA		NA	NA	NA
Grazing land management	NA		NA	NA	NA
Revegetation	NA		NA	NA	NA

Abbreviation: NA = not applicable.

[a] The values included under the 2013 submission are the cumulative accounting values for 2008, 2009, 2010 and 2011, as reported in the accounting table of the KP-LULUCF CRF tables for the inventory year 2011.

[b] The values included under the 2010, 2011 and 2012 submissions are the final accounting values as a result of the 2012 review and are included in table 11 of the 2012 annual review report (FCCC/ARR/2012/MCO, page 32) in the column "2012 annual submission", "Final".

[c] The "net accounting quantity" is the quantity of Kyoto Protocol units that the Party shall issue or cancel under each activity under Article 3, paragraph 3, and paragraph 4, if relevant, based on the final accounting quantity in the 2013 submission and where the quantities issued or cancelled based on the 2012 annual review report have been subtracted ("net accounting quantity" = final 2013 – final 2012 annual review report).

[d] "Article 3.3 offset": For the first commitment period, a Party included in Annex I to the Convention that incurs a net source of emissions under the provisions of Article 3, paragraph 3, of the Kyoto Protocol may account for anthropogenic greenhouse gas emissions by sources and removals by sinks in areas under forest management under Article 3, paragraph 4, up to a level that is equal to the net source of emissions under the provisions of Article 3, paragraph 3, but not greater than 9.0 megatonnes of carbon times five, if the total anthropogenic greenhouse gas emissions by sources and removals by sinks in the managed forest since 1990 is equal to, or larger than, the net source of emissions incurred under Article 3, paragraph 3.

[e] In accordance with decision 16/CMP.1, annex, paragraph 11, for the first commitment period only, additions to and subtractions from the assigned amount of a Party resulting from forest management under Article 3, paragraph 4, of the Kyoto Protocol after the application of decision 16/CMP.1, annex, paragraph 10, and resulting from forest management project activities undertaken under Article 6, shall not exceed the value inscribed in the appendix of the annex to decision 16/CMP.1, times five.

91. Based on the information provided in table 7 for the activity afforestation/reforestation, Monaco shall not issue or cancel any Kyoto Protocol units in its national registry.

92. Based on the information provided in table 7 for the activity deforestation, Monaco shall not issue or cancel any Kyoto Protocol units in its national registry.

Calculation of the commitment period reserve

93. Monaco has reported its commitment period reserve in its 2013 annual submission. Monaco reported its commitment period reserve to be 426,535 t CO_2 eq based on the national emissions in its most recently reviewed inventory, which the Party reported as

being 85.31 Gg CO_2 eq. The ERT disagrees with the figure presented in the NIR, since it is based on total emissions including LULUCF instead of total emissions excluding LULUCF. During the review, the Party presented a revised calculation, based on total emissions excluding LULUCF taking into consideration the revised estimates in accordance with the list of potential problems and further questions raised by the ERT (89.58 Gg CO_2 eq): the revised calculation of the commitment period reserve is 445,699 t CO_2 eq, which is based in the initial review report. The ERT agrees with this figure.

3. Changes to the national system

94. Monaco has reported changes in its national system, including the renovation of the contract of assistance with CITEPA (France) for the elaboration of the inventory. The ERT concluded that the Party's national system continues to be in accordance with the requirements of national systems outlined in decision 19/CMP.1.

4. Changes to the national registry

95. Monaco reported that there are no changes in its national registry since the previous annual submission. During the review, Monaco informed the ERT that the responsibility for the registry had been recently changed, and that Mr. Bastien Nicaise had been replaced by Mr. Chhayavuth Kheng. The ERT concluded that the Party's national registry continues to perform the functions set out in the annex to decision 13/CMP.1 and the annex to decision 5/CMP.1 and continues to adhere to the technical standards for data exchange between registry systems in accordance with relevant decisions of the Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol (CMP).

96. The ERT noted the reiterated recommendations in the SIAR that Monaco make available the public information pursuant to paragraphs 45, 46, 47 and 48 of the annex to decision 13/CMP.1 as detailed in the SIAR,[17] and report, in its next annual submission, on any changes to that public information. The ERT also noted the recommendation in the SIAR that Monaco include reports R-2 through to R-5 in its next annual submission.

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

97. Monaco provided information relating to how it is striving, under Article 3, paragraph 14, of the Kyoto Protocol, to implement its commitments 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. Monaco did not provide information on changes in its reporting. However, in response to questions raised by the ERT during the review, the Party acknowledged the following change in its reporting under Article 3, paragraph 14: provision of support to the Republic of Tunisia in the formulation of the Nationally Appropriate Mitigation Actions (NAMA) in 2012, in order to take into account advances in intergovernmental climate negotiations in Cancun and Durban, a third complementary activity was initiated by Monaco under the framework agreement with Tunisia. This activity consists of supporting Tunisia in the definition of a national strategy and an initial portfolio of projects at national level for the formulation of the NAMA.

98. The ERT concluded that, taking into account the confirmed changes in the reporting, the information provided is complete and transparent. The ERT recommends that the Party report any change in its information provided under Article 3, paragraph 14, in accordance with decision 15/CMP.1, annex, chapter I.H.

[17] In the NIR, Monaco reports that that information is available at <https://www.registre-monaco.mc>.

H. Adjustments

99. The ERT identified underestimations in the emission estimates and recommended an adjustment in the energy sector for 2011.

100. The underestimation leading to adjustment in the energy sector in 2011 includes fugitive CH_4 emissions from natural gas distribution (1B2b.iv) and is presented in table 8.

Table 8
Summary information on adjustments[a]

	2011	
	As reported (Gg CO2 eq)	*Calculated by the ERT (Gg CO2 eq)*
Energy sector-level emissions	81.218	81.709
Total Annex A sources	89.579	90.071

Abbreviations: Annex A sources = sources included in Annex A to the Kyoto Protocol, ERT = expert review team.

[a] In accordance with the guidance for adjustments under Article 5, paragraph 2, of the Kyoto Protocol (decision 20/CMP.1), the adjustment to the energy sector was prepared by the ERT in consultation with Monaco. In addition, in accordance with the Article 8 review guidelines, the ERT officially notified Monaco of the calculated adjustment.

101. In its response to the draft annual review report, Monaco notified the secretariat of its intention to accept the calculated adjustment.

1. Fugitive emissions from natural gas (distribution) – CH_4

Original estimate

102. In its original 2013 annual submission of 9 April 2013, Monaco reported a quantity of 575.60 kg CH_4 for fugitive CH_4 emissions from natural gas distribution in 2011. During the review the ERT found out that this value did not represent the actual fugitive emissions due to errors in reporting AD and emissions (see para. 50 above).

103. In addition, the ERT noted that Monaco was unable to provide documentation for the EF reported (0.02 per cent of the quantity of gas distributed is emitted as CH_4) (see para. 50 above). Therefore, the ERT concluded that there was a lack of transparency in reporting on how fugitive emissions were estimated and, being unable to verify whether emissions were overestimated or underestimated, included this issue in the list of potential problems and further questions raised by the ERT, recommending that the Party provide revised and corrected CRF tables for the complete time series and provide transparent and detailed information on the underlying methodology to estimate emissions or recalculate CH_4 fugitive emissions from natural gas distribution for the complete time series using a methodology consistent with the IPCC good practice guidance.

104. In response to the list of potential problems and further questions raised by the ERT, Monaco submitted revised emission estimates, using a different methodology to estimate emissions and provided transparent explanations[18] on the method used and the calculation of the country-specific EF (see para. 51 above). In comparison with the original submission, the revised estimates were based on disaggregated yearly data on the length and type of the distribution network. The Party used a country-specific EF for new HDPE

[18] Explanations are provided in the document JBB/DE-2013-039a.

pipelines and used, for old pipelines, the average EF from table 2.16 in the IPCC good practice guidance. In accordance with the revised methodology, Monaco reported 995.11 kg CH_4 in 2011.

Underlying problem

105. Further to Monaco's submission of revised emission estimates and response to the list of potential problems and further questions raised by the ERT, the ERT concluded that the response by Monaco was insufficient to solve the identified issue because the country-specific EF for HDPE was not documented with sufficient data with respect to measurements undertaken and QA/QC carried out, and therefore was not in accordance with the IPCC good practice guidance. Further, the country-specific EF developed by the Party considered only certain emission sources (e.g. from maintenance, system disruptions and accidents but not covering other important emission sources, such as normal operations, which are usually the major source of emissions) (see para. 52 above for further details). Responding to the ERT, Monaco stated that it considers that the use of the default EF in the IPCC good practice guidance does not reflect the improvements made to the distribution network in the country and may lead to significant overestimations of emissions. It also informed the ERT that it would make efforts to collect more information from SMEG, and consider alternative ways to take the evolution of the network into account, in accordance with the IPCC good practice guidelines.

106. The ERT concluded that the original and revised methodologies prepared by Monaco, and in particular the determination of the country-specific EF, was not in line with the IPCC good practice guidance, and that the estimate of fugitive CH_4 emissions from natural gas distribution could be underestimated for 2011.

Rationale for adjustment

107. The ERT assessed the information provided by Monaco with respect to the revised methodology used in its response to the list of potential problems and further questions raised by the ERT and, by comparing the Party's country-specific CH_4 EF with the default EFs in the Revised 1996 IPCC Guidelines, the IPCC good practice guidance and other international publications referred to by the IPCC, and also by comparing this with the EF used by neighbouring Parties (France and Italy) (see para. 52 above). The ERT therefore concluded that the information and emission estimates provided by Monaco could be an underestimation of emissions because the method employed by Monaco was not in accordance with the IPCC good practice guidance by not including emissions from all sources (i.e. CH_4 leakages from normal operations of the natural gas distribution network). The ERT also concluded that the information provided by the Party on the derivation of the country-specific EF is not transparently documented. The ERT concludes that these are sufficient reasons to calculate and recommend adjustments in accordance with decision 20/CMP.1.

Recommendation to the Party

108. The ERT recommends that Monaco recalculate fugitive CH_4 emissions from natural gas distribution for the complete time series using a methodology consistent with the IPCC good practice guidance (chapter 2.7). For example, Monaco could use the appropriate default EFs provided in the IPCC good practice guidance together with the corresponding AD and taking into consideration the characteristics of the country network. Alternatively, the ERT recommends that Monaco collect detailed data on the distribution network structure, including penetration of control technologies, and use it in accordance with international methodologies that are in accordance with the IPCC good practice guidance to implement a higher-tier method. The ERT also recommends that the Party provide detailed

and transparent information on the underlying methodology used to collect AD and estimate emissions for this category and clearly document and completely reference the usage of the EF values and other specific parameters.

Assumptions, data and methodology used to calculate the adjustment

109. In accordance with the Technical Guidance for Adjustments, the ERT calculated the adjustment at the level at which the problem was identified: the problem was identified in relation to the CH_4 EF for fugitive emissions from natural gas distribution. In accordance with the Technical Guidance for Adjustments, the ERT calculated the adjustment using the default IPCC tier 1 method.

110. The AD, comprising the length of the mains pipelines, were provided by Monaco on 22 January 2014 in the updated document submitted in response to the list of potential problems and further questions raised by the ERT.[19] The ERT considered the range of the EFs provided in table 2.16 of the IPCC good practice guidance (chapter 2.7, page 2.86) and opted for the consideration of the median value in the range (from 5.20×10^{-4} to 7.10×10^{-4} Gg per year and per km of distribution mains), taking into consideration that Monaco is an urban dense area, with an improved structure of the gas network in respect of material pipelines.

Adjusted estimate

111. Table 9 shows the steps for the calculation of the adjustment.

Table 9
Description of the calculation of adjustments for Annex A sources

Parameter/estimate	*Value*	*Unit*	*Source*
Category: fugitive emissions – natural gas distribution – CH_4			
Party's estimate of: CH_4 fugitive emissions from natural gas distribution	2.650×10^{-5}	Gg CH_4/km/year	Document submitted by Monaco in response to the list of potential problems and further questions by the ERT: "Note de calcul – Emissions fugitives-v1.3"
Party's emission estimate from CH_4 fugitive emissions from natural gas distribution	0.001	Gg CH_4	CRF table 1.B.2
Input data/activity data – length of the distribution mains network	28.950	km	Information submitted by Monaco in response to the list of potential problems and further questions by the ERT: "2013-RESEAU GAZ"
Input parameter for calculation of	6.15×10^{-4}	Gg CH_4 per	IPCC *Good Practice*

[19] Document "2013-RESEAU GAZ".

Parameter/estimate	*Value*	*Unit*	*Source*
adjustment: EF CH_4		year and per km of distribution mains	*Guidance and Uncertainty Management in National Greenhouse Gas Inventories* (table 2-16) – median value of the range
Calculated estimate for CH_4 fugitive emissions from natural gas distribution	0.018	Gg CH_4	Calculated by the ERT
Conservativeness factor	1.37	-	Table 2 of appendix III to decision 20/CMP.1
Adjusted conservative estimate for CH_4 fugitive emissions from natural gas distribution	0.024	Gg CH_4	Calculated by the ERT
Total aggregated GHG emissions (excluding LULUCF) as reported by the Party	89.579	Gg CO_2 eq	CRF table10
Total aggregated GHG emissions (excluding LULUCF) after application of adjustment	90.071	Gg CO_2 eq	Calculated by the ERT
Difference between original and adjusted total aggregated GHG emissions	0.491	Gg CO_2 eq	Calculated by the ERT
	0.5	%	Calculated by the ERT

Abbreviations: Annex A sources = sources included in Annex A to the Kyoto Protocol, CRF = common reporting format, EF = emission factor, ERT = expert review team, GHG = greenhouse gas, IPCC = Intergovernmental Panel on Climate Change, LULUCF = land use, land-use change and forestry.

Conservativeness of the expert review team's calculation of the adjustment

112. In line with decision 20/CMP.1, paragraph 54, conservativeness was ensured by applying a conservativeness factor of 1.37 (CH_4 EFs for fugitive emissions from fuels – oil and natural gas) from table 2 of appendix III to decision 20/CMP.1. The ERT therefore considers that the resulting adjusted values are conservative.

III. Conclusions and recommendations

A. Conclusions

113. Table 10 summarizes the ERT's conclusions on the 2013 annual submission of Monaco, in accordance with the guidelines for review under Article 8 of the Kyoto Protocol.

Table 10
Expert review team's conclusions on the 2013 annual submission of Monaco

		Cross-references
The ERT concludes that the inventory submission of Monaco is complete (categories, gases, years and geographical boundaries and contains both an NIR and CRF tables for 1990–2011)		
Annex A sources[a]	Complete	
LULUCF[a]	Complete	
KP-LULUCF	Not complete	
The ERT concludes that the inventory submission of Monaco has been prepared and reported in accordance with the UNFCCC reporting guidelines	Yes	Table 5
The submission of information required under Article 7, paragraph 1, of the Kyoto Protocol has been prepared and reported in accordance with decision 15/CMP.1	Yes	
The Party's inventory is in accordance with the *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*, the IPCC *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories* and the IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry*	No	12(a), table 4, 15, 29, 52–53
Monaco has reported information on Article 3, paragraph 3 and 4, of the Kyoto Protocol?	Yes	83–86
Monaco has reported information on its accounting of Kyoto Protocol units in accordance with decision 15/CMP.1, annex, chapter I.E, and used the required reporting format tables as specified by decision 14/CMP.1	Yes	
The national system continues to perform its required functions as set out in the annex to decision 19/CMP.1	Yes	
The national registry continues to perform the functions set out in the annex to decision 13/CMP.1 and the annex to decision 5/CMP.1 and continues to adhere to the technical standards for data exchange between registry systems in accordance with relevant CMP decisions	Yes	95–96
Did the Party provide information in the NIR on changes in its reporting of the minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol?	No	97–98

Abbreviations: Annex A sources = sources included in Annex A to the Kyoto Protocol, CMP = Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol, CRF = common reporting format, ERT = expert review team, IPCC = Intergovernmental Panel on Climate Change, KP-LULUCF = LULUCF emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, LULUCF = land use, land-use change and forestry, NIR = national inventory report, UNFCCC reporting guidelines = "Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual inventories".

[a] The assessment of completeness by the ERT considers only the completeness of reporting of mandatory categories (i.e. categories for which methods and default emission factors are provided in the Intergovernmental Panel on Climate Change (IPCC) *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*, the IPCC *Good Practice Guidance and Uncertainty*

Management in National Greenhouse Gas Inventories, or the IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry*).

114. The ERT concludes, based on the review of the 2013 inventory, that for the following category CH_4 from fugitive emissions from natural gas distribution the EF used is not fully in line with the Revised 1996 IPCC Guidelines and the IPCC good practice guidance as required by Article 5, paragraph 2, of the Kyoto Protocol. The ERT, following the review of the additional information provided by Monaco during and after the review, concluded that it did not satisfactorily correct the problem through the submission of acceptable revised estimates and decided to calculate and recommend an adjustment in accordance with the guidance for adjustments under Article 5, paragraph 2, of the Kyoto Protocol (decision 20/CMP.1).

115. Monaco, in its communication of 14 May 2014, accepted the calculated adjustment. In accordance with the Article 8 review guidelines, the ERT applied the calculated adjustment.

B. Recommendations

116. The ERT identified the issues for improvement listed in table 11. All recommendations are for the next annual submission, unless otherwise specified.

Table 11
Recommendations identified by the expert review team

Sector	*Category*	*Recommendation*	*Paragraph reference*
Cross-cutting	Transparency	Improve the transparency of the NIR	Table 3, paras. 24, 25, 32, 33, 34, 35, 39, 41, 44, 45, 49, 50, 53, 59, 78 and 80
	Inventory planning	Strengthen the cooperation with institutions and companies providing AD	12(a)
		Ensure that resources allocated for inventory work are adequate, and that the personnel have enough opportunities for capacity-building	12(b)
	QA/QC	Provide annually information on the implementation of the QA/QC plan	12(c), 19(b)
		Revise the organization of QA activities	12(d)
		Enhance the QA/QC and verification procedures in order to avoid the occurrence of errors (energy sector) in its reporting	54
	Consistency and QA/QC	Improve the consistency between the NIR and the CRF tables	19(c), 23
	Key categories analysis	Include the full list of categories considered in the key category analysis in the NIR	19(a)
	Uncertainty	Use the 95 per cent confidence interval to report uncertainties	15, 19(d)
	Key categories	Use the key category and uncertainty analyses to	16, 19(e)

Sector	*Category*	*Recommendation*	*Paragraph reference*
	analysis and uncertainty	prioritize its efforts in improving the inventory	
	National registry	Make all non-confidential information on the national registry available on a functional public website	19(f)
Energy	Recalculations	Document the rationale and impact of all recalculations made in October 2013	22
	Consistency and QA/QC	Improve the consistency between NIR and CRF table summary 3	23
	Transparency	Improve transparency by providing information on sources of AD, the composition of the fleet of road vehicles, documentation on country-specific EFs, complete reference for default EFs, and specific QA/QC procedures performed for the energy sector	24
	Uncertainty	Provide uncertainty values for the country-specific EFs	25
	Improvement plan	Make efforts to conclude the planned improvements to establish a country-specific CO_2 EF for the use of waste in electricity and heat production	26
	Reference approach	Report the consumption of MSW and related emissions in a consistent way in CRF tables 1.A(b) and 1.A(c) and complete the calculation of the reference approach	28 29
	International bunker fuels	Repeat the survey used to separate emissions from international and domestic navigation regularly	31
		Include information in the NIR clarifying that consumption of fuels in the port area is included in road transportation and that off-road activities do not take place on the heliport or in the harbour area	32, 34
		Provide explanations for inter-annual changes in the time series of CO_2 emissions from international marine bunkers	33
	Feedstocks and non-energy use of fuels	Revise the reporting of feedstocks and non-energy uses of fuel	35
	Stationary combustion: liquid, gaseous and other fuels – CO_2, CH_4 and N_2O	Continue the efforts to collect information and determine country-specific EFs to calculate emissions from incineration of MSW	38
		Provide information in the NIR on the allocation of individual fuels in the CRF tables	39
		Subtract the biomass fraction in MSW from other fuel and report it under biomass	39
		Explain in the next annual submission the reasons for reporting “IE” for the GHG emissions from biomass	40

Sector	*Category*	*Recommendation*	*Paragraph reference*
		use under the category public electricity and heat production	
		Explain in the NIR the reasons that emissions from incineration of sludge are reported under waste incineration	41
		Provide additional explanatory information on the country-specific EF for natural gas combustion	43
		Report emissions from the commercial/institutional and residential subcategories separately	44
	Road transportation: liquids fuels – CO_2, CH_4 and N_2O	Provide documentation and references for the country-specific EFs for biofuels	45
		Include more information on the underlying reasons for the trend in the N_2O emissions from road transportation	48
		Include information in the NIR on the allocation of emissions potentially reported under other transportation	49
	Fugitive emissions from oil and natural gas – CH_4	Submit revised emissions estimates for this category using the default EFs provided in the IPCC *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories* together with the corresponding AD and taking into consideration the characteristics of the country network. Alternatively, collect detailed data on the distribution network structure and implement a higher-tier method.	53, 108
		Provide detailed and transparent information on the underlying methodology used to collect AD and estimate emissions for this category and provide references of the EF and parameters used	
Industrial processes and solvent and other product use	QA/QC	Continue to improve the accuracy of the inventory by ensuring that appropriate QA/QC procedures on background data are in place	58
	Transparency	Enhance the description of data collection, including QA/QC procedures, methodologies, parameters and EFs	59
	Uncertainty	Ensure the inclusion of all categories of the industrial processes sector in the uncertainty analysis	60
	Consumption of halocarbons and SF_6 – HFC and SF_6	Complete the time series for specific categories, by including estimates for the gaps identified in the period 1990–1994	62
		Update the NIR regarding the methodologies revised in response to the list of potential problems and	63, 65, 67

Sector	*Category*	*Recommendation*	*Paragraph reference*
		further questions raised by the ERT in 2013	
LULUCF		Improve the consistency in the CRF tables, by incorporating information in CRF table 5(I), and enhance QA/QC procedures to identify similar situations	76
Waste	Wastewater handling – CH_4 and N_2O	Enhance the information in the NIR regarding the pathways of wastewater, including information on the quantities treated or discharge	80
	Waste incineration – CO_2, CH_4, N_2O	Enhance explanations in the NIR regarding the allocation of emissions from incineration of sludge from wastewater treatment	81
KP-LULUCF	Afforestation and reforestation and deforestation – CO_2, CH_4 and N_2O	Revise its reporting to demonstrate that no afforestation, reforestation and deforestation occurs in the country using the forest definition to identify these units of land, or prepare and report estimates of carbon stock changes for all pools for these activities. If none of the KP-LULUCF activities occur in the territory, provide in the NIR further explanation, and report areas and carbon stock changes as "NO"	86
National registry		Make all non-confidential information on the national registry available on a functional public website	96
Minimization of adverse impacts		Report any change in the information provided under Article 3, paragraph 14, of the Kyoto Protocol	98

Abbreviations: AD = activity data, CRF = common reporting format, EF = emission factor, ERT = expert review team, GHG = greenhouse gas, IE = included elsewhere, IPCC = Intergovernmental Panel on Climate Change, LULUCF = land use, land-use change and forestry, MSW = municipal solid waste, NIR = national inventory report, QA/QC = quality assurance/quality control.

IV. Questions of implementation

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

Annex I

Background data on recalculations and information to be included in the compilation and accounting database

Table 12
Recalculations in the 2013 annual submission for the base year and the most recent year

	1990	*2010*	*1990*	*2010*	
Greenhouse gas source and sink categories	*Value of recalculation (Gg CO_2 eq)*		*Per cent change*		*Reason for the recalculation*
1. Energy	0.176	–0.022	0.16	–0.03	Change in methods and EFs
A. Fuel combustion (sectoral approach)	–0.014	–0.033	–0.01	–0.04	
1. Energy industries	–0.014	–0.041	–0.05	–0.16	
2. Manufacturing industries and construction					
3. Transport	0.000	0.009	0.00	0.03	
4. Other sectors	0.000	0.000	0.00	0.00	
5. Other		0.000		–1.34	
B. Fugitive emissions from fuels	0.191	0.011	1 919.50	79.40	
1. Solid fuels					
2. Oil and natural gas	0.191	0.011	1 919.50	79.40	
2. Industrial processes					Change in methods and EFs
A. Mineral products					
B. Chemical industry					
C. Metal production					
D. Other production					
E. Production of halocarbons and SF_6					
F. Consumption of halocarbons and SF_6	0.465	4.175	NA	186.64	
G. Other					
3. Solvent and other product use	0.006	0.034	NA	NA	
4. Agriculture					
A. Enteric fermentation					
B. Manure management					
C. Rice cultivation					
D. Agricultural soils					
E. Prescribed burning of savannas					
F. Field burning of agricultural residues					
G. Other					

Greenhouse gas source and sink categories	*1990*	*2010*	*1990*	*2010*	*Reason for the recalculation*
	Value of recalculation (Gg CO_2 eq)		*Per cent change*		
5. Land use, land-use change and forestry					
A. Forest land					
B. Cropland					
C. Grassland					
D. Wetlands					
E. Settlements					
F. Other land					
G. Other					
6. Waste					
A. Solid waste disposal on land					
B. Wastewater handling					
C. Waste incineration					
D. Other					
7. Other					
Total CO_2 equivalent without LULUCF	0.182	0.012	0.17	0.01	
Total CO_2 equivalent with LULUCF	0.182	0.012	0.17	0.01	

Abbreviations: EF = emission factor, LULUCF = land use, land-use change and forestry, NA = not applicable.

Table 13
Information to be included in the compilation and accounting database in t CO_2 eq for 2011, including the commitment period reserve

	As reported	*Revised estimates*	*Adjustment*[a]	*Final*[b]
Commitment period reserve	426 535	445 699		445 699
Annex A emissions for 2011				
CO_2	79 189			79 189
CH_4	546	539	491	1 030
N_2O	2 723	2 692		2 692
HFCs	2 787	6 997		6 997
PFCs	IE, NA, NO			IE, NA, NO
SF_6	82	163		163
Total Annex A sources	**85 328**	**89 579**	**491**	**90 071**
Activities under Article 3, paragraph 3, for 2011				
3.3 Afforestation and reforestation on non-harvested land for 2011	NA			NA
3.3 Afforestation and reforestation on harvested land for 2011	NA			NA
3.3 Deforestation for 2011	NA			NA
Activities under Article 3, paragraph 4, for 2011[c]				
3.4 Forest management for 2011				
3.4 Cropland management for 2011				
3.4 Cropland management for the base year				
3.4 Grazing land management for 2011				
3.4 Grazing land management for the base year				
3.4 Revegetation for 2011				
3.4 Revegetation in the base year				

Abbreviations: Annex A sources = sources included in Annex A to the Kyoto Protocol, IE = included elsewhere, NA = not applicable, NO = not occurring.

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

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

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

Table 14
Information to be included in the compilation and accounting database in t CO_2 eq for 2010

	As reported	*Revised estimates*	*Adjustment*[a]	*Final*[b]
Annex A emissions for 2010				
CO_2	82 414	82 422		82 422
CH_4	549	545		545
N_2O	2 729	2 702		2 702
HFCs	2 213	6 251		6 251
PFCs	IE, NA, NO			IE, NA, NO
SF_6	81	161		161
Total Annex A sources	**87 987**	**92 082**		**92 082**
Activities under Article 3, paragraph 3, for 2010				
3.3 Afforestation and reforestation on non-harvested land for 2010	NA			NA
3.3 Afforestation and reforestation on harvested land for 2010	NA			NA
3.3 Deforestation for 2010	NA			NA
Activities under Article 3, paragraph 4, for 2010[c]				
3.4 Forest management for 2010				
3.4 Cropland management for 2010				
3.4 Cropland management for the base year				
3.4 Grazing land management for 2010				
3.4 Grazing land management for the base year				
3.4 Revegetation for 2010				
3.4 Revegetation in the base year				

Abbreviations: Annex A sources = sources included in Annex A to the Kyoto Protocol, IE = included elsewhere, NA = not applicable, NO = not occurring.

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

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

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

Table 15
Information to be included in the compilation and accounting database in t CO_2 eq for 2009

	As reported	*Revised estimates*	*Adjustment*[a]	*Final*[b]
Annex A emissions for 2009				
CO_2	85 401			85 401
CH_4	571			571
N_2O	2 913	2 887		2 887
HFCs	2 397	6 349		6 349
PFCs	16			16
SF_6	82	163		163
Total Annex A sources	**91 380**	**95 386**		**95 386**
Activities under Article 3, paragraph 3, for 2009				
3.3 Afforestation and reforestation on non-harvested land for 2009	NA			NA
3.3 Afforestation and reforestation on harvested land for 2009	NA			NA
3.3 Deforestation for 2009	NA			NA
Activities under Article 3, paragraph 4, for 2009[c]				
3.4 Forest management for 2009				
3.4 Cropland management for 2009				
3.4 Cropland management for the base year				
3.4 Grazing land management for 2009				
3.4 Grazing land management for the base year				
3.4 Revegetation for 2009				
3.4 Revegetation in the base year				

Abbreviations: Annex A sources = sources included in Annex A to the Kyoto Protocol, NA = not applicable.
[a] "Adjustment" is relevant only for Parties for which the expert review team has calculated one or more adjustment(s).
[b] "Final" includes revised estimates, if any, and/or adjustments, if any.
[c] Activities under Article 3, paragraph 4, are relevant only for Parties that elected one or more such activities.

Table 16
Information to be included in the compilation and accounting database in t CO_2 eq for 2008

	As reported	*Revised estimates*	*Adjustment*[a]	*Final*[b]
Annex A emissions for 2008				
CO_2	90 067			90 067
CH_4	596	600		600
N_2O	3 025	3 004		3 004
HFCs	2 851	6 306		6 306
PFCs	16			16
SF_6	82	162		162
Total Annex A sources	**96 637**	**100 155**		**100 155**
Activities under Article 3, paragraph 3, for 2008				
3.3 Afforestation and reforestation on non-harvested land for 2008	NA			NA
3.3 Afforestation and reforestation on harvested land for 2008	NA			NA
3.3 Deforestation for 2008	NA			NA
Activities under Article 3, paragraph 4, for 2008[c]				
3.4 Forest management for 2008				
3.4 Cropland management for 2008				
3.4 Cropland management for the base year				
3.4 Grazing land management for 2008				
3.4 Grazing land management for the base year				
3.4 Revegetation for 2008				
3.4 Revegetation in the base year				

Abbreviations: Annex A sources = sources included in Annex A to the Kyoto Protocol, NA = not applicable.
[a] "Adjustment" is relevant only for Parties for which the expert review team has calculated one or more adjustment(s).
[b] "Final" includes revised estimates, if any, and/or adjustments, if any.
[c] Activities under Article 3, paragraph 4, are relevant only for Parties that elected one or more such activities.

Annex II

Documents and information used during the review

A. Reference documents

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

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

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

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

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

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

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

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

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

Status report for Monaco 2013. Available at <http://unfccc.int/resource/docs/2013/asr/mco.pdf>.

Synthesis and assessment report on the greenhouse gas inventories submitted in 2013. Available at <http://unfccc.int/resource/webdocs/sai/2013.pdf>.

FCCC/ARR/2012/MCO. Report of the individual review of the annual submission of Monaco submitted in 2012. Available at <http://unfccc.int/resource/docs/2013/arr/mco.pdf>.

Standard independent assessment report, parts 1 and 2. Available at <http://unfccc.int/kyoto_protocol/registry_systems/independent_assessment_reports/items/4061.php>.

B. Additional information provided by the Party

Responses to questions during the review were received from Mr. Philippe Antognelli (Ministry of the Environment of Monaco), including additional material on the methodology and assumptions used. The following documents[1] were also provided by Monaco:

ADEME/DIREM. 2002. *Bilans énergétiques et gaz à effet de serre des filières de production de biocarburants. Apport technique.* Price water-house Coopers

D-1-13, 25 mars 2013. *Projet de Loi Prononçant la Desaffectation de Parcelles de Terrain, Rue des Giroflees, dependant du domaine public de L'Etat.*

IMSEE. 2013. *Monaco en Chiffres.* Institut Monégasque de la Statistique et des Etudes Economiques

JBB/DE-2013-039a. *Note de calculs sur les émissions fugitives du réseau de distribution de gaz de la Principauté de Monaco*

Houllier C and Crozet B. 1992. *The French study 'Analyse critique des méthodes utilisées par différents pays pour établir leurs inventaires nationaux d'émissions de dioxyde de carbone*'

[1] Reproduced as received from the Party.

Annex III

Acronyms and abbreviations

AD	activity data
C	carbon
CH_4	methane
CMP	Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol
CO_2	carbon dioxide
CO_2 eq	carbon dioxide equivalent
CRF	common reporting format
EF	emission factor
ERT	expert review team
EU	European Union
EU ETS	The European Union Emissions Trading System
F-gas	fluorinated gas
GHG	greenhouse gas; unless indicated otherwise, GHG emissions are the sum of CO_2, CH_4, N_2O, HFCs, PFCs and SF_6 without GHG emissions and removals from LULUCF
ha	hectare
HDPE	high-density polyethylene
HFCs	hydrofluorocarbons
IE	included elsewhere
IEA	International Energy Agency
IEF	implied emission factor
IPCC	Intergovernmental Panel on Climate Change
ITL	international transaction log
kg	kilogram (1 kg = 1,000 grams)
KP-LULUCF	land use, land-use change and forestry emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol
LULUCF	land use, land-use change and forestry
m^3	cubic metre
MDI	metered dose inhalers
MSW	municipal solid waste
N	nitrogen
N_2O	nitrous oxide
NA	not applicable
NCV	net calorific value
NE	not estimated
NIR	national inventory report
NMVOC	non-methane volatile organic compounds
NO	not occurring
PFCs	perfluorocarbons
PJ	petajoule (1 PJ = 10^{15} joule)
QA/QC	quality assurance/quality control
SEF	standard electronic format
SF_6	sulphur hexafluoride
SIAR	standard independent assessment report
TJ	terajoule (1 TJ = 10^{12} joule)
UNFCCC	United Nations Framework Convention on Climate Change