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# Report on the individual review of the annual submission of Monaco submitted in 2019*

## Note by the expert review team

*Summary*

Each Party included in Annex I to the Convention must submit an annual inventory of emissions and removals of greenhouse gases for all years from the base year (or period) to two years before the inventory due date (decision 24/CP.19). Parties included in Annex I to the Convention that are Parties to the Kyoto Protocol are also required to report supplementary information under Article 7, paragraph 1, of the Kyoto Protocol with the inventory submission due under the Convention. This report presents the results of the individual inventory review of the 2019 annual submission of Monaco, conducted by an expert review team in accordance with the "Guidelines for review under Article 8 of the Kyoto Protocol". The review took place from 9 to 14 September 2019 in Monaco.

* In the symbol for this document, 2019 refers to the year in which the inventory was submitted, not to the year of publication.

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# Contents

# Abbreviations and acronyms

| | |
|---|---|
| 2006 IPCC Guidelines | *2006 IPCC Guidelines for National Greenhouse Gas Inventories* |
| 2019 Refinement to the 2006 IPCC Guidelines | 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories |
| AAU | assigned amount unit |
| AD | activity data |
| Annex A source | source category included in Annex A to the Kyoto Protocol |
| AR | afforestation and reforestation |
| Article 8 review guidelines | "Guidelines for review under Article 8 of the Kyoto Protocol" |
| Bo | maximum methane producing potential |
| BOD | biochemical oxygen demand |
| C | carbon |
| $C_3F_8$ | octafluoropropane |
| CEF | carbon emission factor |
| CER | certified emission reduction |
| CFC-R12 | dichlorodifluoromethane |
| $CH_4$ | methane |
| Citepa | French Technical Reference Center for Air Pollution and Climate Change |
| CM | cropland management |
| COD | chemical oxygen demand |
| Convention reporting adherence | adherence to the "Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual greenhouse gas inventories" |
| $CO_2$ | carbon dioxide |
| $CO_2$ eq | carbon dioxide equivalent |
| CPR | commitment period reserve |
| CRF | common reporting format |
| DC | degradable carbon |
| EF | emission factor |
| EMEP/EEA | European Monitoring and Evaluation Programme/European Environment Agency |
| ERT | expert review team |
| ERU | emission reduction unit |
| FAME | fatty acid methyl ester |
| F-gas | fluorinated gas |
| $F_{IND-COM}$ | fraction of industrial and commercial protein co-discharged into the sewer system |
| $Frac_{GASF}$ | fraction of synthetic fertilizer nitrogen applied to soils that volatilizes as ammonia and nitrogen oxides |
| FM | forest management |
| FMRL | forest management reference level |
| $F_{NON-CON}$ | fraction of non-consumed protein added to wastewater |
| GHG | greenhouse gas |
| GM | grazing land management |
| HFC | hydrofluorocarbon |
| HFC-134a | tetrafluoroethane |
| HWP | harvested wood product |
| IE | included elsewhere |

| | |
|---|---|
| IEF | implied emission factor |
| IPCC | Intergovernmental Panel on Climate Change |
| IPCC good practice guidance | *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories* |
| IPPU | industrial processes and product use |
| KP-LULUCF activities | activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol |
| KP reporting adherence | adherence to the reporting guidelines under Article 7, paragraph 1, of the Kyoto Protocol |
| LULUCF | land use, land-use change and forestry |
| N | nitrogen |
| $N_2O$ | nitrous oxide |
| NA | not applicable |
| NE | not estimated |
| $N_{EFFLUENT}$ | total annual amount of nitrogen in wastewater effluent |
| $NF_3$ | nitrogen trifluoride |
| $NH_3$ | ammonia |
| NIR | national inventory report |
| NO | not occurring |
| NOx | nitrogen oxides |
| PFC | perfluorocarbon |
| QA/QC | quality assurance/quality control |
| RISQ | Referencing Information on Software Quality |
| RMU | removal unit |
| RV | revegetation |
| R600a | isobutane |
| SEF | standard electronic format |
| $SF_6$ | sulfur hexafluoride |
| SMEG | National Electricity and Gas Company of Monaco |
| TOW | total organically degradable carbon in wastewater |
| UNFCCC Annex I inventory 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 greenhouse gas inventories" |
| UNFCCC review guidelines | "Guidelines for the technical review of information reported under the Convention related to greenhouse gas inventories, biennial reports and national communications by Parties included in Annex I to the Convention" |
| WDR | wetland drainage and rewetting |
| Wetlands Supplement | *2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands* |

# I. Introduction[1]

1. This report covers the review of the 2019 annual submission of Monaco organized by the secretariat in accordance with the Article 8 review guidelines (adopted by decision 22/CMP.1 and revised by decision 4/CMP.11). In accordance with the Article 8 review guidelines, this review process also encompasses the review under the Convention as described in the UNFCCC review guidelines, particularly in part III thereof, namely the "UNFCCC guidelines for the technical review of greenhouse gas inventories from Parties included in Annex I to the Convention" (decision 13/CP.20). The review took place from 9 to 14 September 2019 in Monaco and was coordinated by Claudia do Valle (secretariat). Table 1 provides information on the composition of the ERT that conducted the review of Monaco.

Table 1
**Composition of the expert review team that conducted the review of Monaco**

| *Area of expertise* | *Name* | *Party* |
|---|---|---|
| Generalist | Melanie Hobson | United Kingdom of Great Britain and Northern Ireland |
| Energy | Michael Smith | New Zealand |
| IPPU | Philip Acquah | Ghana |
| LULUCF and KP-LULUCF activities | Melanie Hobson | United Kingdom |
| Waste | Gustavo Mozzer | Brazil |
| Lead reviewers | Philip Acquah | |
| | Melanie Hobson | |

2. The basis of the findings in this report is the assessment by the ERT of the Party's 2019 annual submission in accordance with the UNFCCC review guidelines and the Article 8 review guidelines. The ERT notes that the individual inventory review of Monaco's 2018 annual submission did not take place in 2018 owing to insufficient funding for the review process.

3. The ERT has made recommendations that Monaco resolve the findings related to issues,[2] including issues designated as problems.[3] Other findings, and, if applicable, the encouragements of the ERT to Monaco to resolve them, are also included.

4. A draft version of this report was communicated to the Government of Monaco, which provided no comments.

5. Annex I shows annual GHG emissions for Monaco, including totals excluding and including the LULUCF sector, indirect $CO_2$ emissions, and emissions by gas and by sector. Annex I also contains background data related to emissions and removals from KP-LULUCF activities, if elected by Monaco, by gas, sector and activity.

6. Information to be included in the compilation and accounting database can be found in annex II.

[1] At the time of publication of this report, Monaco had submitted its instrument of ratification of the Doha Amendment; however, the Amendment had not yet entered into force. The implementation of the provisions of the Doha Amendment is therefore considered in this report in the context of decision 1/CMP.8, para. 6, pending the entry into force of the Amendment.

[2] Issues are defined in decision 13/CP.20, annex, para. 81.

[3] Problems are defined in decision 22/CMP.1, annex, paras. 68–69, as revised by decision 4/CMP.11.

# II. Summary and general assessment of the 2019 annual submission

7. Table 2 provides the assessment by the ERT of the annual submission with respect to the tasks undertaken during the review. Further information on the issues identified, as well as additional findings, may be found in tables 3 and 5.

Table 2
**Summary of review results and general assessment of the inventory of Monaco**

| *Assessment* | | | *Issue or problem ID#(s) in table 3 and/or 5*[a] |
|---|---|---|---|
| Dates of submission | Original submission: 15 April 2019 (NIR), 15 April 2019 (CRF tables) version 2, 27 March 2019 (SEF tables)<br>Revised submission: 13 September 2019 (CRF tables) version 5<br>Unless otherwise specified, the values from the latest submission are used in this report | | |
| Review format | In country | | |
| Application of the requirements of the UNFCCC Annex I inventory reporting guidelines and Wetlands Supplement (if applicable) | Have any issues been identified in the following areas: | | |
| | (a) Identification of key categories? | No | |
| | (b) Selection and use of methodologies and assumptions? | Yes | E.18, L.7, W.7 |
| | (c) Development and selection of EFs? | Yes | L.13 |
| | (d) Collection and selection of AD? | Yes | E.6, E.10, E.11, E.13 |
| | (e) Reporting of recalculations? | Yes | G.13, W.8 |
| | (f) Reporting of a consistent time series? | No | |
| | (g) Reporting of uncertainties, including methodologies? | Yes | L.5 |
| | (h) QA/QC? | QA/QC procedures were assessed in the context of the national system (see supplementary information under the Kyoto Protocol below) | |
| | (i) Missing categories/completeness?[b] | Yes | E.21, E.22 |
| | (j) Application of corrections to the inventory? | No | |
| Significance threshold | For categories reported as insignificant, has the Party provided sufficient information showing that the likely level of emissions meets the criteria in paragraph 37(b) of the UNFCCC Annex I inventory reporting guidelines? | The Party did not report "NE" for any insignificant categories | |
| Description of trends | Did the ERT conclude that the description in the NIR of the trends for the different gases and sectors is reasonable? | No | E.19, I.4, W.1 |
| Supplementary information under the Kyoto Protocol | Have any issues been identified related to the following aspects of the national system: | | |
| | (a) Overall organization of the national system, including the effectiveness and reliability of the institutional, procedural and legal arrangements? | Yes | G.3, G.11, G.16 |
| | (b) Performance of the national system functions? | Yes | G.5, G.6, G.8, G.12 |
| | Have any issues been identified related to the national registry: | | |
| | (a) Overall functioning of the national registry? | No | |

| *Assessment* | | | *Issue or problem ID#(s) in table 3 and/or 5[a]* |
|---|---|---|---|
| | (b) Performance of the functions of the national registry and the technical standards for data exchange? | No | |
| | Have any issues been identified related to reporting of information on AAUs, CERs, ERUs and RMUs and on discrepancies reported in accordance with decision 15/CMP.1, annex, chapter I.E, in conjunction with decision 3/CMP.11, taking into consideration any findings or recommendations contained in the standard independent assessment report? | No | |
| | Have any issues been identified in matters related to Article 3, paragraph 14, of the Kyoto Protocol, specifically problems related to the transparency, completeness or timeliness of reporting on the Party's activities related to the priority actions listed in decision 15/CMP.1, annex, paragraph 24, in conjunction with decision 3/CMP.11, including any changes since the previous annual submission? | No | |
| | Have any issues been identified related to the following reporting requirements for KP-LULUCF activities: | | |
| | (a) Reporting requirements of decision 2/CMP.8, annex II, paragraphs 1–5? | Yes | KL.2 |
| | (b) Demonstration of methodological consistency between the reference level and reporting on FM in accordance with decision 2/CMP.7, annex, paragraph 14? | No | |
| | (c) Reporting requirements of decision 6/CMP.9? | Yes | KL.3 |
| | (d) Country-specific information to support provisions for natural disturbances, in accordance with decision 2/CMP.7, annex, paragraphs 33 and 34? | NA | |
| CPR | Was the CPR reported in accordance with the annex to decision 18/CP.7, the annex to decision 11/CMP.1 and decision 1/CMP.8, paragraph 18? | No | G.2 |
| Adjustments | Has the ERT applied an adjustment under Article 5, paragraph 2, of the Kyoto Protocol? | No | |
| | Did the Party submit a revised estimate to replace a previously applied adjustment? | NA | Monaco does not have a previously applied adjustment |
| Response from the Party during the review | Has the Party provided the ERT with responses to the questions raised, including the data and information necessary for the assessment of conformity with the UNFCCC Annex I inventory reporting guidelines and any further guidance adopted by the Conference of the Parties? | Yes | |
| Recommendation for an exceptional in-country review | On the basis of the issues identified, does the ERT recommend that the next review be conducted as an in-country review? | No | |
| Questions of implementation | Did the ERT list any questions of implementation? | No | |

[a] The ERT identified additional issues and/or problems in all sectors (except the agriculture and LULUCF sectors) that are not listed in this table but are included in table 5.

[b] Missing categories for which methods are provided in the 2006 IPCC Guidelines may affect completeness and are listed in annex III.

# III. Status of implementation of issues and/or problems raised in the previous review report

8. Table 3 compiles all the recommendations made in previous review reports that were included in the previous review report, published on 23 March 2018.[4] For each issue and/or problem, the ERT specified whether it believes the issue and/or problem has been resolved by the conclusion of the review of the 2019 annual submission and provided the rationale for its determination, which takes into consideration the publication date of the previous review report and national circumstances.

Table 3
**Status of implementation of issues and/or problems raised in the previous review report of Monaco**

| *ID#* | *Issue and/or problem classification*[a, b] | *Recommendation made in previous review report* | *ERT assessment and rationale* |
|---|---|---|---|
| General | | | |
| G.1 | Annual submission (G.1, 2017) (G.1 and G.15, 2015) (7, 2014) Convention reporting adherence | Submit all the elements of the next inventory by 15 April as required by decision 24/CP.19. | Resolved. Monaco submitted all elements of its 2018 and 2019 inventories on time. |
| G.2 | CPR (G.18, 2017) KP reporting adherence | Improve QA/QC procedures to review the calculation of the inputs for determining the CPR, including the assigned amount and the relevant modalities in accordance with the annex to decision 18/CP.7, the annex to decision 11/CMP.1 and decision 1/CMP.8, paragraph 18. | Not resolved. The NIR (section 12.5, p.264) has not been updated and Monaco did not review the calculation of the inputs for determining its CPR. The base-year emissions were reported as 99,312 t $CO_2$ eq in the NIR. However, the base-year emissions, the assigned amount and the CPR in the initial review report (FCCC/IRR/2017/MCO) were corrected to 99,319 t $CO_2$ eq, 619,751 t $CO_2$ eq and 557,777 t $CO_2$ eq, respectively. According to decision 11/CMP.1 (annex, para. 6), Parties should compare emissions reported in their most recently reviewed inventory (Monaco's 2019 submission) with 90 per cent of their assigned amount and maintain in their registry whichever is lowest. The 2017 emissions (without LULUCF) reported in the most recently reviewed inventory amount to 86.85 kt $CO_2$ eq. This amount multiplied by eight is 694,811 t $CO_2$ eq. The correct CPR of Monaco is therefore 557,777 t $CO_2$ eq (90 per cent of the assigned amount, which is the lower of the two values). |
| G.3 | Inventory planning (G.2, 2017) (G.2, 2015) (17, 2014) (12(a), 2013) Convention reporting adherence | Strengthen cooperation with national institutions and companies in order to increase the use of available country-specific data for the preparation of the inventory so as to develop more accurate estimates. | Addressing. Monaco explained during the review that a confidential text on a legal provision that would make it mandatory for companies to forward data to national institutions is being discussed by the Government. The Party clarified that it is currently in the process of setting up formal data agreements with data providers, and it provided to the ERT, on a confidential basis, the text of the draft agreement and a list of the data suppliers to whom letters would be sent to improve the availability of the data to be used in the inventory for all sectors. |

[4] FCCC/ARR/2017/MCO. The ERT notes that the report on the individual inventory review of Monaco's 2018 annual submission has not been published yet. As a result, the latest previously published annual review report reflects the findings of the review of the Party's 2017 annual submission.

| *ID#* | *Issue and/or problem classification*[a, b] | *Recommendation made in previous review report* | *ERT assessment and rationale* |
|---|---|---|---|
| G.4 | Inventory planning (G.3, 2017) (G.3, 2015) (15, 2014) Convention reporting adherence | Amend the annex with information on the QA/QC and verification procedures implemented for each of the sectors. | Addressing. Monaco has not included annex 8 to the NIR since its 2015 submission. The ERT notes that, while providing annex 8 is not mandatory, the Party could, as recommended by the previous ERT, use it to include additional information on the QA/QC plan. Alternatively, the Party could submit its QA/QC plan as an additional document to the NIR. The ERT notes that the Party provided during the review its QA/QC plan, which describes (pp.5–6) which QC checks are undertaken for each sector, based on table 6.1 of the 2006 IPCC Guidelines (vol. 1, p.6.10). The Party incorporated this information in the NIR (section 1.2.3.2.2, pp.22–25). Monaco indicated in its QA/QC plan (p.13) that there are two Excel spreadsheets for the source-category QC checks, and that a summary of these is included in the NIR. However, there was no cross reference to the NIR sections that contain this information, and the ERT was unable to find it in the NIR. The Party also has not provided information on the verification procedures implemented in the inventory. See also ID# G.6 below. |
| G.5 | Inventory planning (G.4, 2017) (G.4, 2015) (18, 2014) Convention reporting adherence | Continue updating and improving the QA/QC plan with a view to improving the effectiveness of the QA/QC procedures. | Addressing. Monaco updated its QA/QC plan on 17 October 2018 and made it available to the ERT during the review. The ERT noted that the effectiveness of the QC plan has been improved, in particular by including the use of the new RISQ tool (see ID# G.6 below). However, further information should be provided in the QA/QC plan (as requested by the previous ERT in ID# G.17, 2017) to demonstrate the improvement of the QA/QC procedures, as follows:<br>(a) The main steps in the inventory preparation process, indicating actions and deadlines in preparing the inventory, and supplementary information as required by decision 19/CMP.1, annex, paragraph 10(d);<br>(b) A description of all QC checks, activities, tasks and procedures applied for the inventory, with an indication of the scheduled time frame for the annual QC checks and the responsible unit or person (as part of the description of the QC procedures);<br>(c) The source-category QC checks (e.g. an indication of the checklists (QC tier 1 template) used for the QC checks in accordance with annex 6A.1 to the 2006 IPCC Guidelines, vol. 1, p.6.27) and an explanation whether any issues were found. |
| G.6 | Inventory planning (G.5, 2017) (G.5, 2015) (18, 2014) (12(c), 2013) (16, 2012) Convention reporting adherence | Provide information concerning the implementation of the QA/QC plan, in particular regarding the prioritization of inventory improvements on the basis of the key category analysis and uncertainty assessment. | Not resolved. During the review, Monaco provided its QA/QC plan and demonstrated its QC RISQ tool, which is used to implement the plan and provides a log of improvement activities. However, the Party needs to update its QA/QC plan to include a description of how the RISQ tool operates and information on how inventory improvements are prioritized on the |

| ID# | Issue and/or problem classification[a, b] | Recommendation made in previous review report | ERT assessment and rationale |
|---|---|---|---|
| | | | basis of the key category analysis and uncertainty assessment, as well as the results of such prioritization. See also ID# G.5 above. |
| G.7 | Inventory planning (G.6, 2017) (G.6, 2015) (19, 2014) (12, 2013) (24, 2012) Convention reporting adherence | Revise the organization of the QA activities, 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. | Resolved. The QA/QC plan states (p.7) that the Assistant to the Director of the Department of Environment of Monaco undertakes the QA role and that they are not directly involved in the inventory compilation process. According to the 2006 IPCC Guidelines (vol. 1, chap. 6.8), if third-party reviewers who are independent from the inventory compiler are not available, persons who are at least not involved in the portion being reviewed can perform QA. In addition, the QA/QC plan (p.28) clarifies that Citepa is the external entity involved in two aspects of the QA process: the advisory mission to support the improvement of the inventory (i.e. supporting the identification of new calculations and methods for the inventory and providing EFs from the French inventory), and verification of the inventory. |
| G.8 | Inventory management (G.21, 2017) KP reporting adherence | Improve the inventory management procedures to enable it to respond to all stages of the review process, in particular the initial assessment, in order to facilitate the timely technical review by the ERT of the annual submission. | Addressing. Monaco has improved its response to the review process and provided responses to the initial assessment; however, the majority of the responses were sent only a few days before the review week. In addition, responses were very short and lacked detail. The ERT notes that the initial assessment and associated responses are a key input to the individual technical review and that timely responses facilitate the assessment by the ERT of conformity of the inventory with the UNFCCC Annex I inventory reporting guidelines. During the review, the Party indicated that an additional inventory team member will be contracted, which will help to improve its inventory management. |
| G.9 | Kyoto Protocol units (G.19, 2017) KP reporting adherence | Submit the SEF tables by 15 April 2018 as required by decision 15/CMP.1. | Resolved. Monaco submitted its SEF tables on time. |
| G.10 | National system (G.10, 2017) (G.7, 2015) (20, 2014) (12, 2013) KP reporting adherence | Implement measures to strengthen the national system (i.e. reinforcement of external contracts in order to ensure the timeliness and quality of the reporting). | Resolved. Monaco ensured the timeliness of its annual submissions in 2018 and 2019 (see ID# G.1 above). The Party took steps to strengthen its national system and an ongoing contract with Citepa is in place to help with specific aspects of the inventory development (see ID# G.7 above). |
| G.11 | National system (G.11, 2017) (G.8, 2015) (21, 2014) (12(b), 2013) KP reporting adherence | In order to improve the national system, ensure that adequate resources are allocated to the preparation of the inventory. | Addressing. Monaco explained during the review that the budget to employ a new inventory team member has been approved and interviews for the position will take place shortly. |
| G.12 | QA/QC and verification (G.14, 2017) Convention reporting adherence | Provide in the NIR explanations of changes made in response to recommendations from previous reviews, including UNFCCC technical expert reviews. | Addressing. Monaco included a table in the NIR (section 10.6) on the status of implementation of previous recommendations. However, the table lacks detail on the actions taken and does not demonstrate how the issues were resolved or where in the NIR or CRF tables relevant changes were implemented. In addition, the Party did not |

| ID# | Issue and/or problem classification[a, b] | Recommendation made in previous review report | ERT assessment and rationale |
|---|---|---|---|
| | | | report on changes made to estimation methods, AD or EFs in response to the review process. During the review, the Party provided an Excel spreadsheet with an update to table 10.6 that contains references to the pages and chapters of the NIR where information on the implementation of previous recommendations can be found. This information should be included in subsequent NIRs. |
| G.13 | Recalculations (G.8, 2017) (G.11, 2015) (13, 2014) Convention reporting adherence | Report the recalculations under each category and include a clear explanation of the reasons for the recalculations made in the course of previous reviews, clearly distinguishing them from the recalculations made for the purpose of the current submission. | Addressing. Monaco included sufficient explanation for a number of categories for which recalculations were performed for the 2019 submission, including the reasons for the recalculations, in the sectoral sections of the NIR. However, the ERT notes that not all recalculations were justified or explained in accordance with paragraphs 43–45 and 50(h) of the UNFCCC Annex I inventory reporting guidelines (see ID# W.9 in table 5). |
| G.14 | Uncertainty analysis (G.16, 2017) Convention reporting adherence | Include in the NIR explanations of the underlying assumptions used to quantify and estimate the uncertainty for all categories. | Resolved. In each sector chapter, Monaco provided explanations of the underlying assumptions used to quantify and estimate the uncertainty for all categories. For example, for heating oil and natural gas activity, an uncertainty factor of +/–5 per cent was applied in line with the 2006 IPCC Guidelines (see NIR section 3.3.1.5.4, p.83), which was deemed appropriate by the ERT. |
| Energy | | | |
| E.1 | Fuel combustion – reference approach (E.1, 2017) (E.4, 2015) (35, 2014) (29, 2013) Transparency | Explain the difficulties with the availability of information in the NIR and try to develop methods to collect data in order to complete the reference approach. | Resolved. Monaco included in the NIR (appendix 4, p.320) an energy balance for the country showing values for production, imports, bunkers and consumption. These values were considered in the reference approach (CRF table 1.A(b)), and the comparison with the sectoral approach (NIR section 3.2) shows a difference of less than 2 per cent for all years. The Party applied the results of a survey conducted in 2016 (see ID# E.8 below) to split domestic and international navigation in the reference approach. |
| E.2 | Fuel combustion – reference approach – biomass – $CO_2$ (E.11, 2017) Transparency | Explain the reason for the decreasing trend in the CEF for liquid biomass during the 1990s (from 25.47 t C/TJ in 1992 to 19.21 t C/TJ in 2001) and, if appropriate, correct the CEF. | Resolved. Monaco corrected the CEF for liquid biomass to a constant value for all years of the time series (20.00 t C/TJ), which is close to but higher than the IPCC default value of 19.3 t C/TJ (2006 IPCC Guidelines, vol. 2, table 1.3). |
| E.3 | Fuel combustion – reference approach – biomass – $CO_2$ (E.12, 2017) Convention reporting adherence | Replace the notation key "NO" with 1 for the conversion factor (TJ/unit) of liquid biomass in CRF table 1.A(b). | Resolved. The conversion factor for liquid biomass reported in CRF table 1.A(b) has been changed to 1, and therefore the apparent consumption in TJ is reported correctly for the entire time series. |
| E.4 | Fuel combustion – reference approach – biomass – $CO_2$ (E.12, 2017) Convention reporting adherence | Correct the error in total biomass consumption reported for the reference approach. | Not resolved. The total biomass consumption reported for the reference approach (605.85 TJ for 2017) does not align with that reported for the sectoral approach (593.69 TJ for 2017) in CRF table 1.A(a)s1, and differences of more than 2 per cent exist for 2008 onward. |

| *ID#* | *Issue and/or problem classification*[a, b] | *Recommendation made in previous review report* | *ERT assessment and rationale* |
|---|---|---|---|
| E.5 | Fuel combustion – reference approach – other fossil fuels – $CO_2$ (E.13, 2017) Consistency | Explain why the CEF for municipal waste (non-biomass fraction) (16.57 t C/TJ) is lower than the IPCC default value (25.0 t C/TJ, within a range of 20.0–33.0 t C/TJ) and, if appropriate, correct the CEF. | Resolved. The CEF for municipal waste reported as a non-biomass fraction in CRF table 1.A(b) is still below the lower end of the IPCC default range for 2013–2017. However, Monaco applied a tier 2 method for the sectoral approach, using data disaggregated to waste subcomponents, as demonstrated in the NIR (section 3.3.1.3.1, tables, pp.72–75, and appendix 3, p.291). This explains the national circumstances for the lower CEF for the non-biomass fraction (18.88 t C/TJ for 2017). The Party applied the same CEF in the reference approach. As the 2006 IPCC Guidelines (vol. 2, chap. 6.5, p.6.7) state that the default values for carbon content given in the introduction chapter of the energy volume are suggested only if country-specific values are not available, the ERT considered this issue to have been resolved. |
| E.6 | Feedstocks, reductants and other non-energy use of fuels (E.3, 2017) (E.6, 2015) (37, 2014) (35, 2013) (39, 2012) Comparability | Revise the reporting of feedstocks and non-energy use of fuels in CRF table 1.A(d) in a consistent manner under the energy and industrial processes sectors. | Not resolved. Monaco reported "NO" for bitumen and lubricants in CRF table 1.A(d), even though it reported emissions from road paving with asphalt and lubricant use under the industrial processes sector (in CRF table 2(I).A-Hs2), which indicates that bitumen and lubricants are used in Monaco. |
| E.7 | Feedstocks, reductants and other non-energy use of fuels (E.3, 2017) (E.6, 2015) (37, 2014) (35, 2013) (39, 2012) Transparency | Explain in the NIR the use and disposal of lubricants in the country. | Not resolved. Monaco did not include in the NIR an explanation of its use and disposal of lubricants. During the review, the Party clarified that the used lubricants are collected as special waste at all automobile repair shops, and also in special tanks located close to the two harbours. The Party also clarified that various companies are involved in this process and the disposal or recycling of all waste oil is carried out in France. |
| E.8 | International bunkers and multilateral operations (E.2, 2017) (E.5, 2015) (36, 2014) (31, 2013) (37, 2012) Accuracy | Repeat the survey on international and domestic navigation on a regular basis to enhance the accuracy of the allocation of emissions between international and domestic navigation. | Resolved. Monaco repeated the survey in 2016 and reported the results in the NIR (section 19.2.3.1, p.304). The results indicate that the domestic share of navigation for diesel oil has remained steady at around 11 per cent, while for gasoline the domestic share decreased from around 33 per cent in 2005 to 29 per cent in 2016 (see table on p.305 of the NIR). |
| E.9 | 1.A.1.a Public electricity and heat production – liquid fuels – $CH_4$ and $N_2O$ (E.14, 2017) Accuracy | Explain in the NIR why the EFs for gas/diesel oil boilers were applied instead of those for residual fuel oil/shale oil boilers for estimating $CH_4$ and $N_2O$ emissions from public electricity and heat production (1.A.1.a) and correct them, if appropriate. | Resolved. Monaco used the IPCC default EFs for residual fuel oil/shale oil boilers ($CH_4$ EF of 0.8 kg/TJ and $N_2O$ EF of 0.3 kg/TJ) taken from the 2006 IPCC Guidelines (vol. 2, table 2.6). |
| E.10 | 1.A.2 Manufacturing industries and construction – all fuels – $CO_2$, $CH_4$ and $N_2O$ (E.16, 2017) Comparability | Disaggregate emissions from categories 1.A.2, 1.A.4.a and 1.A.4.b. | Addressing. During the review, the ERT and the Party identified that disaggregated data for natural gas consumption (for 2015, 2016 and 2017) were reported in the annual reports of SMEG. The Party decided to revise and resubmit its emission estimates using the AD from SMEG for 2015, 2016 and 2017 and extrapolate data for the other years of the time series (see ID# E.19 in table 5). The Party disaggregated data on natural |

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| | | | gas and emissions for categories 1.A.2.g.viii (other), 1.A.4.a (commercial/institutional) and 1.A.4.b.i (residential – stationary combustion). For liquid fuels, AD and emissions were still reported aggregated under category 1.A.4.b.1, and the notation key "IE" was reported for categories 1.A.2.g.viii and 1.A.4.a. See also ID#s E.11, E.12 and E.13 below. |
| E.11 | 1.A.2 Manufacturing industries and construction – all fuels – $CO_2$, $CH_4$ and $N_2O$ (E.16, 2017) Comparability | Conduct a survey on fuel consumption of manufacturing industries and construction (1.A.2) and report in the NIR on the progress made in conducting such a survey. | Addressing. While Monaco did not report in the NIR on progress in conducting a survey on fuel consumption for manufacturing industries and construction, the Party did report (section 3.3.4, p.85) that discussions will be held with SMEG with a view to disaggregating natural gas consumption between the categories 1.A.2.g.viii, 1.A.4.a and 1.A.4.b.1. However, during the review, Monaco resubmitted emission estimates and disaggregated emissions of natural gas calculated on the basis of a SMEG report, where data were available for 2015, 2016 and 2017 (see ID# E.10 above). The ERT is of the view that discussions with SMEG should continue with a view to obtaining natural gas data for the other years of the time series. The Party explained during the review that disaggregation of data for liquid fuels will be enabled by new data collection provisions (see ID# G.3 above). |
| E.12 | 1.A.2 Manufacturing industries and construction – all fuels – $CO_2$, $CH_4$ and $N_2O$ (E.16, 2017) Comparability | Report the emissions from manufacturing industries and construction (1.A.2) as "IE" until the completion of the survey on fuel consumption of manufacturing industries and construction (1.A.2). | Resolved. Monaco reported liquid fuels as "IE" under category 1.A.2.g.viii. For gaseous fuels, AD (natural gas) and emissions were estimated (see ID# E.10 above). |
| E.13 | 1.A.4 Other sectors – all fuels – $CO_2$, $CH_4$ and $N_2O$ (E.6, 2017) (E.10, 2015) (42, 2014) (44, 2013) (44, 2012) (35, 2011) (37, 2010) (46, 2009) (34, 2008) Comparability | Make efforts to report emissions from categories 1.A.4.a (commercial/institutional) and 1.A.4.b.i (residential – stationary combustion) separately. | Addressing. Monaco disaggregated the AD for natural gas and estimated emissions separately for categories 1.A.4.a (commercial/institutional) and 1.A.4.b.i (residential – stationary combustion). Monaco has not yet disaggregated the emissions from liquid fuels, and indicated to the ERT that more work is required to do this. See ID#s E.10 and E.11 above. |
| E.14 | 1.B.2.b Natural gas – gaseous fuels – $CH_4$ (E.7, 2017) (E.11, 2015) Comparability | Use natural gas utility sales expressed in $m^3$ as AD in the CRF tables. | Resolved. Monaco reported AD in units of metres of pipeline length of the distribution network instead of AD in $m^3$. The Party used a country-specific methodology, with EFs for high-density polyethylene and cast iron pipelines taken from the American Petroleum Institute 2009 *Compendium of Greenhouse Gas Emissions Methodologies for the Oil and Natural Gas Industry* (see NIR section 3.4.3.1.1). The ERT is of the view that this country-specific methodology is in accordance with the 2006 IPCC Guidelines regarding choice of method for estimating fugitive emissions from oil and natural gas systems (vol. 2, chap. 4, section 4.2.2.1). Monaco also provided justification for the conservative nature of its chosen EFs by drawing |

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| | | | a comparison with France and the IPCC default tier 1 method (see NIR section 3.4.3.1.3). |
| IPPU | | | |
| I.1 | 2.D.1 Lubricant use – $CO_2$ (I.11, 2017) Completeness | Estimate $CO_2$ emissions from lubricant use and report on the method and EFs used and the quality checks performed. | Resolved. Monaco reported AD and $CO_2$ emissions for lubricant use in CRF table 2(I).A–H. The Party applied country-specific AD based on distance travelled. These country-specific AD result from the model used for calculating road transport emissions, which considers different types of vehicle by age. The Party reported the method used in the NIR (section 4.2.4.2.2, p.155). See also ID# I.8 in table 5. |
| I.2 | 2.D.2 Paraffin wax use – $CO_2$ (I.12, 2017) Completeness | Report emissions from paraffin wax, for example by investigating data used by France, as done for other sources. | Resolved. Monaco reported AD and $CO_2$ emissions for paraffin wax use in CRF table 2(I).A-Hs2. The Party collaborated with Citepa to estimate Monaco's paraffin consumption on the basis of the consumption-to-population ratio data of France. The consumption patterns of paraffin in Monaco and France were assumed to be very similar (see NIR section 4.2.4.3.2, p.157). |
| I.3 | 2.D.2 Paraffin wax use – $CO_2$ (I.12, 2017) Completeness | Report temporarily the notation key "NE" for paraffin wax use, in the event that data are not available to estimate the emissions for this category. | Resolved. Monaco reported AD and $CO_2$ emissions for this category. See ID# I.2 above. |
| I.4 | 2.F Product uses as substitutes for ozone-depleting substances – PFCs (I.4, 2017) (I.4, 2015) (49, 2014) (62, 2013) Transparency | Include information on the trend in the use of PFCs (under categories 2.F.1.a and 2.F.1.f) and ensure that the information collected on PFCs is complete and, even if no emissions from manufacturing are occurring, ensure that all emissions from stock and disposal are included or an explanation for the lack of emissions is provided. | Addressing. Monaco reported emissions from PFCs ($C_3F_8$) only for stocks for 2001–2009 under categories 2.F.1.a (commercial refrigeration) and 2.F.1.f (stationary air conditioning). For before 2001 and after 2009, "NO" was reported for category 2.F.1.f in CRF table 2(II)B-Hs2, while for category 2.F.1.a (commercial refrigeration) $C_3F_8$ emissions from stocks were reported as "IE" for the entire time series with the explanation (in CRF table 9) that emissions were included in category 2.F.1.f. However, for $C_3F_8$, "IE" should be reported only for 2001–2009, and the ERT considers that for the other years of the time series the reporting of "IE" in CRF table 9 is related to HFCs (see ID# I.5 below) and the Party should correct the information accordingly. The Party stated in the NIR (section 4.2.6.3.2, p.190) that refrigeration and air conditioning companies in Monaco undergo an annual survey, ensuring that all AD and emissions, including PFCs, are reported in the inventory. The Party indicated that disposal or recycling is carried out in France. However, it did not include in the NIR information on the trend in PFC use; an explanation that PFC emissions occurred from 2001 to 2009 but were replaced with HFCs after 2009; and where emissions for category 2.F.1.a are included for the years before 2001 and after 2009. Although the Party provided a graph in the NIR (p.190) showing the emissions of F-gases related to stationary air conditioning and included a reference to $C_3F_8$, it did not explain the trend in the NIR. |

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| I.5 | 2.F.1 Refrigeration and air conditioning – HFCs (I.13, 2017) Transparency | Provide information on effects of recalculations on emissions estimated separately for each recalculation, for example for the change in EF and for the change in AD. | Resolved. Monaco recalculated HFC emissions separately for each subcategory: 2.F.1.b (domestic refrigeration); 2.F.1.e (mobile air conditioning) and 2.F.1.f (stationary air conditioning) (see NIR section 4.2.6, p.171). The Party reported in the NIR (p.190) that category 2.F.1.a (commercial refrigeration) is included under category 2.F.1.f but this information is not included in CRF table 9 for HFCs (see ID# I.4 above). The Party provided information on the effect of the recalculations on the emission estimates (NIR pp.176, 188 and 192). For domestic refrigeration the Party included in the NIR (section 4.2.6.1.1, p.175) information on the share of refrigerants of new equipment put on the market with the progressive replacement of CFC R-12 with HFC-R134a and the subsequent phasing out of HFC-R134a and its replacement with R600a (a gas with lower global warming potential). |
| I.6 | 2.F.1 Refrigeration and air conditioning – HFCs (I.14, 2017) Transparency | Include information in the NIR to describe observed fluctuations in HFC emissions from stationary air conditioning, for example by explaining that the trends are due to sales fluctuations from one year to the next. | Resolved. Monaco explained in the NIR (section 4.2.6.3.2, pp.190–191) that the peak use of HFC-R134a in 2000 corresponds to the F-gas load of one convention centre's air-conditioning system. Inter-annual variation in the time series is related to the replacement and change in the use of HFCs, and this could explain the inter-annual variations for 2004, 2007 and 2009, as pointed out by the previous ERT. The Party clearly explained the trends for 2015–2017. |
| I.7 | 2.G.3 $N_2O$ from product uses – $N_2O$ (I.8, 2017) (I.6, 2015) (54, 2014) Accuracy | Justify the application of the EF for aerosol cans and verify the applicability of constant emissions across the time series for $N_2O$ emissions from aerosol cans. | Resolved. The methodology for estimating emissions for category 2.G.3.b (other), in which $N_2O$ emissions from aerosol cans are reported, was developed in partnership with Citepa on the basis of the consumption patterns and EF applied for France. Total $N_2O$ consumption was calculated from an estimate of the number of food aerosols sold (obtained from a population ratio between metropolitan France and Monaco). As AD are constant for France, they are also considered to be constant throughout the time series in Monaco's inventory (13,297 units across the time series). The constant EF (6 g $N_2O$/unit) was provided by one of the two largest cream aerosol packers in France (see NIR section 4.2.7.1.4, p.201). The ERT concluded that Monaco does not have country-specific data available and applies the same methodology used in France to estimate emissions for this category. As this is not a key category and the emissions are below the threshold of significance (0.03 per cent of Monaco's total GHG emissions without LULUCF), this issue is considered to have been resolved. See also ID# I.9 in table 5. |
| Agriculture | | | |
| | | No agricultural practices occur in Monaco. | |

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| LULUCF | | | |
| L.1 | 4. General (LULUCF) (L.1, 2017) (L.1, 2015) (61, 2014) (74, 2013) Transparency | Provide more transparent information on the calculation of emissions from the burning of biomass of green waste to ensure the consistency of the information reported, and on the allocation of emissions and carbon stock changes between the LULUCF, waste and energy sectors. | Addressing. Monaco reported "NO" for AD; "NE" for $CO_2$ emissions; and "IE" for $CH_4$ and $N_2O$ emissions from biomass burning in settlements (the only land-use category occurring in Monaco) in CRF table 4(V) (see ID# L.8 below). Monaco provided in its NIR the total amount of woody and non-woody green waste in parks and gardens for both energy (p.291) and LULUCF (p.212) sectors. The Party added more information to the NIR (p.212) by explaining that the amount of green waste incinerated in recent years has been estimated at around 3,000 t/year and that emissions from the burning of biomass are accounted for under category 1.A.1.a (public electricity and heat production). The Party also explained in the NIR that the amount of green waste incinerated cannot be correlated with the loss of woody materials related to tree pruning in the territory, and during the review the Party clarified that it happens because the total waste includes other waste from French municipalities bordering the territory as well as other non-woody materials. However, the ERT is of the view that more clarity on the information reported among the sectors and on the allocation of emissions and carbon stock change between LULUCF, waste and energy is needed. During the review, Monaco explained that there are improvements planned for reporting the AD for green waste resources in the waste sector and that this will be addressed for the next NIR. |
| L.2 | 4. General (LULUCF) (L.2, 2017) (L.4, 2015) Comparability | Report fully completed CRF tables and resolve the inconsistent use of the notation keys (e.g. in CRF table 4(IV), for indirect $N_2O$ emissions from managed soils, "NO" is reported instead of "NE"). | Addressing. As noted in the previous review report, Monaco has addressed the previous inconsistencies in the use of the notation keys in CRF tables 4.D, 4(II) and 4(III). In addition, for CRF table 4(IV), the Party estimated indirect $N_2O$ emissions for category 4(IV).1 (atmospheric deposition). Monaco still reports "NO" for category 4(IV).2 (N leaching and run-off), but minor leaching might occur (from inorganic fertilizers in parks and gardens) and therefore this should be reported as "NE" (with an accompanying explanation in CRF table 9). The Party explained in the NIR (p.219) that, according to the 2006 IPCC Guidelines (vol. 4, chap. 11.2.2.2), emissions related to leaching are negligible, considering that leaching is zero in Monaco's green spaces because precipitation is lower than evapotranspiration throughout most of the year. However, the ERT is of the view that if leaching and run-off do not occur in Monaco, the Party should provide evidence in the NIR that precipitation is lower than evaporation and that no irrigation (other than drip irrigation) is used, and include a cross reference to the NIR in the documentation box of CRF table 4(IV). |
| L.3 | Land representation – $CO_2$ | Complete CRF table 4.1 with the land area for settlements remaining settlements. | Resolved. Monaco included in CRF table 4.1 the area of settlements remaining settlements (0.20 kha) for the entire time series. |

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| | (L.9, 2017) Comparability | | |
| L.4 | 4.E.1 Settlements remaining settlements – $CO_2$ (L.6, 2017) (L.7, 2015) Transparency | Include aerial/satellite information to transparently demonstrate that any increase in biomass from growing crown cover is not a land-use change to settlements; to demonstrate that any increase in crown cover does not meet the forest definition; and to improve the accuracy of the measurement of crown cover. | Addressing. Monaco included in the NIR (p.211) an example of an aerial photograph providing data and information on the Fontvieille area. The Party no longer reports in the NIR the table mentioned by the previous ERT indicating the area of crown cover changes (NIR 2017, p.168). An analysis of the time series of spatial information to demonstrate the area of crown cover changes is also not provided. During the review, Monaco provided a copy of a 2017 report undertaken by Citepa that shows the changes in green cover over time. The Party explained that it is in the process of setting up a geographical information system to improve the accuracy of the information and that this has been added to the improvement plan (see NIR section 6.6.1, p.222). |
| L.5 | 4.E.1 Settlements remaining settlements – $CO_2$ (L.7, 2017) (L.8, 2015) Transparency | Include the right uncertainty values for AD (an incorrect value of 50 per cent uncertainty was applied) and document the methodology by which expert judgment is used to determine uncertainty values for this category. | Addressing. The uncertainty values for the AD (crown cover of growing trees) were corrected. Monaco explained in the NIR (section 6.3, p.222) that the uncertainties had been reassessed as part of the reporting. For carbon stock (category 4.E.1), the uncertainty of the AD is 30 per cent, and for the EF 25 per cent. For $N_2O$ (category 4(I)), the uncertainty applied for the AD is 5 per cent, and for the EF 128 per cent. However, in NIR annex 2 (p.289), the reported uncertainty of the EF for $N_2O$ (category 4(I)) is 489.9 per cent instead of 128 per cent. The Party did not document in the NIR the methodology by which expert judgment was used to determine uncertainty values for this category. The transparency of the reporting could be improved if the expert judgment were conducted in accordance with the 2006 IPCC Guidelines (vol. 1, chap. 3, section 3.2.1.3) and the protocol for expert elicitation (vol. 1, chap. 2, annex 2A.1). |
| L.6 | 4.E.1 Settlements remaining settlements – $CO_2$ (L.10, 2017) Transparency | Include in the NIR information on the area of crown cover change, in particular the definition of the "tree crown cover" land-use category and the related threshold criteria for conversion from "tree crown cover" to "other settlements", together with a clear explanation of any fluctuations. | Addressing. Monaco provided additional information in the NIR (section 6.1.2, pp.208–211), including a graphic and a table showing the evolution of the green space surface. During the review, Monaco clarified that it is in the process of collecting the information required and that this is included in the improvement plan and a report on progress will be provided in future NIRs. |
| L.7 | 4.E.1 Settlements remaining settlements – $CO_2$, $CH_4$ and $N_2O$ (L.11, 2017) Accuracy | Include information in the NIR on how losses are calculated using allometric equations. | Not resolved. During the review, Monaco explained that inclusion of this information has been added to the improvement plan and that information on progress will be provided in the next NIR. |
| L.8 | 4.E.1 Settlements remaining settlements – $CO_2$, $CH_4$ and $N_2O$ (L.11, 2017) Accuracy | Use the correct notation key in CRF table 4(V) for $CO_2$ emissions from green waste collection ("NE" instead of | Resolved. Monaco applied the notation keys according to the previous review recommendation in CRF table 4(V): "NE" for $CO_2$ emissions from green waste collection and |

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| | | "NO"), and "IE" for $CH_4$ and $N_2O$ emissions. | "IE" for $CH_4$ and $N_2O$ emissions. See also ID# L.1 above. |
| L.9 | 4.E.1 Settlements remaining settlements – $CO_2$ (L.12, 2017) Transparency | Describe the underlying assumptions regarding the definitions of other settlements and tree crown cover with respect to the shape of trees. | Not resolved. The ERT could not find in the NIR a description of the underlying assumptions or an explanation of why the AD (area) applied by the Party for other settlements and tree crown cover in the 2017 submission are more accurate than those in the 2016 submission (the carbon stock change for tree crown cover reported for 2014 changed from –0.019 kt $CO_2$ (2016 submission) to –0.040 kt $CO_2$ (2017 submission) and $CO_2$ emissions decreased by 154.77 per cent for 2014). |
| L.10 | 4.E.1 Settlements remaining settlements – $CO_2$ (L.12, 2017) Transparency | Fully describe the reason for any recalculations in the section on recalculations in the NIR. | Resolved. Monaco reported in the NIR (section 6.5, p.222) that no recalculations were performed for the 2019 submission for this category. |
| L.11 | 4(I) Direct $N_2O$ emissions from N inputs to managed soils – $N_2O$ (L.14, 2017) Transparency | Include the EFs used for synthetic fertilizer in the NIR. | Resolved. Monaco included the EFs used for inorganic N fertilizers in the NIR (p.219). |
| L.12 | 4(I) Direct $N_2O$ emissions from N inputs to managed soils – $N_2O$ (L.15, 2017) Transparency | Document the AD and EFs used to estimate direct emissions from managed soils in the NIR and ensure that any methodological changes are reported in the relevant sections of the NIR on recalculations. | Resolved. Monaco reported in the NIR (pp.208–210) the AD and EFs used to estimate direct emissions from managed soils. No methodological changes have occurred since the previous submission. |
| L.13 | 4(IV).1 Atmospheric deposition – $N_2O$ (L.16, 2017) Accuracy | Report the values of AD in the correct cells of CRF tables 4(I) and 4(IV) to ensure comparability and consistency between the estimates of direct and indirect $N_2O$ emissions from soils. | Not resolved. AD reported in the NIR (p.220) and in CRF table 4(I) for inorganic fertilizers are 2,055.16 kg N/year for 2017. The AD reported in CRF table 4(IV) are still 1,000 times smaller than the value reported in CRF table 4(I). The $N_2O$ IEF reported in CRF table 4(IV) is 1 kg $N_2O$-N/kg N, which is high in comparison with the default EF (0.01 kg $N_2O$-N/kg $NH_3$-N + $NO_X$-N volatilized) from the 2006 IPCC Guidelines (vol. 4, chap. 11, table 11.3). The ERT noted that the AD in CRF table 4(IV) should be the N volatilized of N input from fertilizers (2,055.16 kg N multiplied by $Frac_{GASF}$ of 0.10 kg ($NH_3$-N+$NO_X$-N)/kg N). The $N_2O$ emissions reported in CRF table 4(IV) are correct (0.00000323 kt $N_2O$); however the $N_2O$ emissions reported in CRF table 4(I) should be revised (Monaco reported emissions that were 10 times higher). |
| L.14 | 4.G HWP – $CO_2$ (L.13, 2017) Accuracy | Implement a tier 1 method to estimate whether the HWP contribution is significant. In case it is significant, report the HWP contribution and the volumes of imported wood products in CRF tables 4.Gs1 and 4.Gs2, respectively. | Addressing. Monaco explained in the NIR (section 6.2.3, p.221) that it has explored this issue and concluded that estimates remain very difficult to achieve in the absence of data on imports and exports of HWP other than those recorded for waste management. In addition, the Party explained that it is not a major importer or exporter of wood and that this category is unlikely to significantly influence the emissions and removals estimated for the LULUCF sector. |

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| | | | The ERT considers that this information needs to be provided in the NIR, including proper justifications and documentation. |
| L.15 | 4.G HWP – $CO_2$ (L.13, 2017) Transparency | For any case of the above (see ID# L.14 above), provide an explanation of the application of the tier 1 assessment in the NIR. | Resolved. See ID# L.14 above. |
| Waste | | | |
| W.1 | 5.D.1 Domestic wastewater – $CH_4$ (W.2, 2017) Transparency | Include explanations for any large inter-annual changes in the total organic product in the NIR. | Addressing. Monaco did not include in the NIR an explanation that directly addressed this recommendation, that is, it did not provide the reasons for the inter-annual changes consistently with the trends observed in the AD (total organic products). In the 2019 submission the values given for total organic products (in kt DC) include outliers for the same years noted by the previous ERT: 2008 (1.50), 2009 (1.28) and 2011 (1.46).<br>The ERT found in the NIR some information under different sections that could explain the reasons for the inter-annual changes in TOW, namely intense operations due to load pressure that has exceeded plant operational capacity over the last couple of years (section 7.4.1.1); shutdown of the plant necessary to maintain and improve its operations in 2005, 2010 and 2011 (section 7.4.3.1); and upgrade of the plant operations, which resulted in an increased sludge removal capacity from 2008 onward (section 7.4.3.2.1).<br>During the review the Party explained that for the 2019 submission TOW was estimated directly on the basis of monitoring data from the wastewater treatment plant (see ID# W.8 in table 5) and the outliers still observed can be explained by the large amount of data missing from the daily database. However, the ERT considers that, although the Party explained the reasons for the outliers in 2008, 2009 and 2011 (inclusion of untreated wastewater, missing data from the daily database), the explanation is not in accordance with the trends observed, considering that, although the largest volumes of untreated wastewater occurred in 2008 and 2011 (see figure on NIR p.230), the outliers for total organic products for these years are opposite in terms of trend: while for 2008 the outlier is a peak, for 2011 it is a valley.<br>A more specific description and an evaluation of the AD values and trends with a consistent identification of the causes of the outliers are needed to address this recommendation. The ERT notes that a table with the values of treated and untreated wastewater, the amount of sludge removed and the TOW values for some relevant years of the time series would greatly increase transparency. See also ID# W.8 in table 5. |

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| W.2 | 5.D.1 Domestic wastewater – $CH_4$ (W.2, 2017) Transparency | Ensure that the total organic product reported in CRF table 5.D contains all DC, including the biochemical oxygen demand discharged to the sea. | Resolved. Monaco updated the AD and the total DC discharged in the sea was included in CRF table 5.D: in the 2017 submission, the value reported was 1.70 kt DC, and in the 2019 submission, the value reported was 1.72 kt DC for 2015. |
| W.3 | 5.D.1 Domestic wastewater – $N_2O$ (W.3, 2017) Comparability | Include the AD for $N_{EFFLUENT}$ in CRF table 5.D. | Resolved. Monaco included the AD for $N_{EFFLUENT}$ (0.20 kt N in 2017) in CRF table 5.D. Emissions are correct and were calculated in accordance with equations 6.7 and 6.8 of the 2006 IPCC Guidelines (vol. 5, chap. 6). |
| W.4 | 5.D.1 Domestic wastewater – $N_2O$ (W.4, 2017) Convention reporting adherence | Report in the additional information table of CRF table 5.D the correct population and the actual values of $F_{NON-CON}$ and $F_{IND-COM}$ used in the calculations. | Resolved. Monaco included in the additional information table of CRF table 5.D the correct population (38,300 inhabitants in 2017) and the correct values of $F_{NON-CON}$ (1.10) and $F_{IND-COM}$ (1.25). |
| W.5 | 5.D.2 Industrial wastewater – $CH_4$ (W.6, 2017) Comparability | Use the notation key "IE" instead of "NO" in CRF table 5.D for industrial wastewater and describe in CRF table 9 that these emissions are included together with domestic wastewater. | Addressing. Monaco corrected the notation key and reported $CH_4$ emissions in CRF table 5.D as "IE". The Party also included information in CRF table 9 explaining that the emissions are reported under category 5.D.1. However, AD were still reported as "NO". According to the 2006 IPCC Guidelines (vol. 5, chap. 6.2.3, pp.6.18–6.19), industrial wastewater may be treated on site or released into domestic sewer systems. If it is released into the domestic sewer system, the emissions are to be included with domestic wastewater emissions. Therefore, Monaco should report the AD for and $CH_4$ emissions from industrial wastewater as "IE". |
| KP-LULUCF activities | | | |
| KL.1 | General (KP-LULUCF activities) – $CO_2$ (KL.1, 2017) (KL.1, 2015) Completeness | Use the appropriate notation keys in the CRF tables for KP-LULUCF activities to report on all mandatory activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol. | Resolved. Monaco reported notation keys in the CRF tables for KP-LULUCF activities. |
| KL.2 | General (KP-LULUCF activities) – $CO_2$ (KL.2, 2017) Accuracy | Include a comprehensive time-series analysis of land areas in the NIR. | Not resolved. Monaco did not provide in the NIR a time-series analysis of the land areas (see also ID#s L.4 and L.9 above). During the review, the Party explained that this issue would only apply to green areas. For other settlements this issue is not applicable as there is no green area in that land category, and therefore the identification of areas of land subject to KP-LULUCF activities does not apply. |
| KL.3 | General (KP-LULUCF activities) – $CO_2$ (KL.3, 2017) Comparability | Report the FM cap in the CRF accounting table. | Not resolved. The FM cap was provided in the CRF accounting table (3.489 kt $CO_2$ eq). However, the ERT noted that the value should be the one included in the report on the review of the report to facilitate the calculation of the assigned amount for the second commitment period (FCCC/IRR/2017/MCO) (i.e. 3.476 kt $CO_2$ eq). |

[a] References in parentheses are to the paragraph(s) and the year(s) of the previous review report(s) in which the issue and/or problem was raised. Issues are identified in accordance with paras. 80–83 of the UNFCCC review guidelines and classified as per

para. 81 of the same guidelines. Problems are identified and classified as problems of transparency, accuracy, consistency, completeness or comparability in accordance with para. 69 of the Article 8 review guidelines in conjunction with decision 4/CMP.11.

[b] The report on the review of the 2018 annual submission of Monaco was not available at the time of the 2019 review. Therefore, the previous recommendations reflected in table 3 are taken from the 2017 annual review report. For the same reason, 2018 is excluded from the list of review years in which the issue could have been identified.

# IV. Issues identified in three successive reviews and not addressed by the Party

9. In accordance with paragraph 83 of the UNFCCC review guidelines, the ERT noted that the issues included in table 4 have been identified in three successive reviews, including the review of the 2019 annual submission of Monaco, and have not been addressed by the Party.

Table 4
**Issues and/or problems identified in three successive reviews and not addressed by Monaco**

| *ID#* | *Previous recommendation for the issue identified* | *Number of successive reviews issue not addressed*[a] |
|---|---|---|
| General | | |
| G.3 | Strengthen cooperation with national institutions and companies in order to increase the use of available country-specific data for the preparation of the inventory so as to develop more accurate estimates | 5 (2013–2019) |
| G.4 | Amend the annex with information on the QA/QC and verification procedures implemented for each of the sectors | 4 (2014–2019) |
| G.6 | Provide information concerning the implementation of the QA/QC plan, in particular regarding the prioritization of inventory improvements on the basis of the key category analysis and uncertainty assessment | 6 (2012–2019) |
| G.11 | In order to improve the national system, ensure that adequate resources are allocated to the preparation of the inventory | 5 (2013–2019) |
| G.13 | Report the recalculations under each category and include a clear explanation of the reasons for the recalculations made in the course of previous reviews, clearly distinguishing them from the recalculations made for the purpose of the current submission | 4 (2014–2019) |
| Energy | | |
| E.6 | Revise the reporting of feedstocks and non-energy use of fuels in CRF table 1.A(d) in a consistent manner under the energy and industrial processes sectors | 6 (2012–2019) |
| E.7 | Explain in the NIR the use and disposal of lubricants in the country | 6 (2012–2019) |
| E.13 | Make efforts to report emissions from categories 1.A.4.a (commercial/institutional) and 1.A.4.b.i (residential – stationary combustion) separately | 10 (2008–2019) |
| IPPU | | |
| I.4 | Include information on the trend in the use of PFCs under categories 2.F.1.a and 2.F.1.f and ensure that the information collected on PFCs is complete and, even if no emissions from manufacturing are occurring, ensure that all emissions from stock and disposal are included or an explanation for the lack of emissions is provided | 5 (2013–2019) |
| Agriculture | No agricultural practices occur in Monaco | |
| LULUCF | | |

| *ID#* | *Previous recommendation for the issue identified* | *Number of successive reviews issue not addressed*[a] |
|---|---|---|
| L.1 | Provide more transparent information on the calculation of emissions from the burning of biomass of green waste to ensure the consistency of the information reported, and on the allocation of emissions and carbon stock changes between the LULUCF, waste and energy sectors | 5 (2013–2019) |
| L.2 | Report fully completed CRF tables and resolve the inconsistent use of the notation keys (e.g. in CRF table 4(IV), for indirect $N_2O$ emissions from managed soils, "NO" is reported instead of "NE") | 3 (2015–2019) |
| L.4 | Include aerial/satellite information to transparently demonstrate that any increase in biomass from growing crown cover is not a land-use change to settlements; to demonstrate that any increase in crown cover does not meet the forest definition; and to improve the accuracy of the measurement of crown cover | 3 (2015–2019) |
| L.5 | Include the right uncertainty values for AD (an incorrect value of 50 per cent uncertainty was applied) and document the methodology by which expert judgment is used to determine uncertainty values for this category | 3 (2015–2019) |
| Waste | No issues identified | |
| KP-LULUCF activities | No issues identified | |

[a] The reports on the reviews of the 2016 and 2018 annual submissions of Monaco have not yet been published. Therefore, 2016 and 2018 were not included when counting the number of successive years in table 4.

# V. Additional findings made during the individual review of the 2019 annual submission

10. Table 5 contains findings made by the ERT during the individual review of the 2019 annual submission of Monaco that are additional to those identified in table 3.

Table 5
**Additional findings made during the individual review of the 2019 annual submission of Monaco**

| *ID#* | *Finding classification* | *Description of the finding with recommendation or encouragement* | *Is finding an issue and/or a problem?*[a] |
|---|---|---|---|
| General | | | |
| G.15 | National system | Monaco did not include in the NIR a description (e.g. a national system diagram with narrative) of the overall institutional arrangements for Monaco's inventory preparation with detailed information on the roles and responsibilities of the relevant ministries, agencies and organizations, including private consultant companies, in the inventory preparation process, including the preparation and management of the inventory development process, as requested by the previous ERT. During the review, the Party provided information on the annual inventory process, and the ERT concluded that, although a national system is in place, the Party should clearly demonstrate in the NIR the institutional, legal and procedural arrangements that are in place to support inventory planning, preparation and management.<br><br>The ERT recommends that Monaco provide in the NIR a national system diagram with a narrative of the overall institutional arrangements that support inventory planning, preparation and management. | Yes. Transparency |
| G.16 | National system | The previous ERT identified a potential problem with the performance of the national system functions related to language of a mandatory nature that also influences the fulfilment of commitments (see ID# G.17 in the 2017 annual review report). The ERT identified it as a question of implementation in accordance with decision 22/CMP.1 in conjunction with decision 4/CMP.11 (see https://unfccc.int/process-and-meetings/the-kyoto-protocol/compliance-under-the-kyoto-protocol/questions-of-implementation-monaco). The Compliance Committee determined that Monaco was not in compliance with the "Guidelines for the preparation of the information required under Article 7 of the Kyoto Protocol" (annex to decision 15/CMP.1 in conjunction with decision 3/CMP.11) in conjunction with the "Guidelines for national systems for the estimation of anthropogenic greenhouse gas emissions by sources and removals by sinks under Article 5, paragraph 1, of the Kyoto Protocol" (annex to decision 19/CMP.1 in conjunction with decision 3/CMP.11) (see Compliance Committee documents CC-2018-1-2/Monaco/EB, CC-2018-1-3/Monaco/EB and CC-2018-1-4/Monaco/EB). In response, Monaco developed a plan (see Compliance Committee document CC-2018-1-5/Monaco/EB) setting out clear measures to address non-compliance and providing a specific implementation timetable for the measures, enabling the progress of their implementation to be assessed. Progress reports are required every four months. During the review, the ERT evaluated all the issues identified in the six areas of the plan (see (a–f) below) and the methodological improvements (see (g) below) and concluded that Monaco has made good progress since the last review:<br><br>(a) Reinforcement of the inventory team: as identified in ID# G.11 in table 3, the budget to employ a new inventory team member has been allocated and interviews for the position will take place shortly. However, the Party did not indicate the time frame for the conclusion of this task;<br><br>(b) Expertise of the inventory team: external training has been provided to the inventory team and a list of training sessions with dates was provided during the review week to the ERT, as follows: training on road transport and calculation file (18 October 2018); F-gases, training on tier 2a methodologies (21 March 2019); national system, 2006 IPCC Guidelines and improvements to be made to Monaco's inventory (4 October 2018); wastewater, and training on the 2006 IPCC Guidelines and the 2019 Refinement to the 2006 IPCC Guidelines (10 October 2018); | Yes. Transparency |

| ID# | Finding classification | Description of the finding with recommendation or encouragement | Is finding an issue and/or a problem?[a] |
|---|---|---|---|
| | | solid waste, and implementation of waste characterization (10 October 2018); training in the RISQ tool (1 February 2019); and the UNFCCC courses related to GHG inventories;<br><br>(c) Legal provision for data collection: as identified in ID# G.3 in table 3, a confidential text on a legal provision that would make it mandatory for companies to forward data to national institutions for the purpose of inventory preparation is being discussed by the Government. While this legal provision has not been implemented, Monaco's inventory team is in the process of setting up formal data agreements with data providers and provided to the ERT, on a confidential basis, the text of the draft agreement and a list of the data suppliers that would be contacted in order to improve the availability of the data to be used in the inventory for all sectors;<br><br>(d) Information technology shared storage space: a shared storage space has been developed and was demonstrated to the ERT during the review week. It includes AD, calculation files, QC files, the QA/QC plan, UNFCCC and IPCC guidelines, review reports and documents, and reports used as reference for the GHG inventory;<br><br>(e) Implementation of the RISQ tool: the QC RISQ tool, which provides support for QC as well as a space for logging improvements, has been developed. The main uses of the RISQ tool include compiling data from Excel calculation files; generating graphics; carrying out QC; and following up on non-conformities and planned improvements. However, the ERT considers that the Party should include in the NIR a more detailed explanation of how the RISQ tool operates and specify which results obtained from the tool will be used to improve the inventory (see ID# G.6 in table 3);<br><br>(f) External support: Monaco has an ongoing contract with Citepa, which provides specific ad hoc expertise and performs a general QA role. According to the Party, the following activities were carried out to improve its inventory: improving the calculations for emissions from road transport, navigation, urea and lubricant use, consolidating the QA/QC plan (for the 2018 submission) and consolidating the reference approach for the energy sector; developing calculation tools for waste incineration; capacity-building in relation to the reference approach for road transportation; estimating emissions relating to the use of paraffin wax; and improving and consolidating estimation methodologies for F-gases (according to the availability of new data sets) and wastewater emissions. The QA contract for the 2019 GHG inventory submission with Citepa was postponed until 2020. A more detailed description of the ongoing support provided, the tasks involved and the scope of the collaboration, including time frames and deadlines, should be included in the NIR;<br><br>(g) Methodological improvements: Monaco made methodological improvements in the 2019 submission and some improvements are planned for the next submission (e.g. for wastewater and F-gases). Monaco should include in the NIR a list of the improvements already made and those planned for the next submission that resulted from the plan submitted to the Compliance Committee.<br><br>The ERT commends Monaco for the improvements made to its GHG inventory. The ERT recommends that Monaco include in the NIR more transparent information (e.g. in tabular format) on the above-listed steps taken to address the actions presented in the plan submitted to the Compliance Committee ((a–f) above), including the action proposed in the plan, a clear description of what was and was not implemented, along with time frames and accompanying explanations of the status of implementation. This should also include, as highlighted in (e–f) above, a more detailed explanation of how the RISQ tool operates and a description of the ongoing external support provided, the tasks involved and the scope of the collaboration, including time frames and deadlines. In addition, | |

| ID# | Finding classification | Description of the finding with recommendation or encouragement | Is finding an issue and/or a problem?[a] |
|---|---|---|---|
| | | the ERT recommends that the Party report on the improvements and changes to methodologies made for the inventory that resulted from its plan ((g) above). | |
| G.17 | NIR | Monaco provided in the NIR graphics, figures and tables that are not numbered, which made it difficult for the ERT to correctly reference them during the question and answer phase with the Party and when explaining its rationale in table 3 or listing new findings in table 5 of this report.<br>The ERT encourages Monaco to add numbers to the graphics, figures and tables in the NIR to facilitate the review process. | Not an issue/problem |
| G.18 | Notation keys | Monaco did not update CRF table 9 to reflect the explanation related to the reporting of "IE" for $CH_4$ and $N_2O$ emissions from biomass burning in CRF table 4(V) (category 4.E) or for losses in carbon stock in living biomass for tree crown cover in CRF table 4.E (category 4.E.1). Moreover, the Party did not update CRF table 9 to explain the reporting of "NE" for a number of categories: $CO_2$ emissions from biomass burning in CRF table 4(V); net carbon stock change in mineral soils and net carbon stock change in dead organic matter in CRF table 4.E (category 4.E.1); and indirect emissions under waste, energy and IPPU (CRF table 6).<br>The ERT recommends that Monaco update CRF table 9 to reflect the explanations for reporting "IE" and "NE" in the inventory. | Transparency |
| Energy | | | |
| E.15 | 1.A Fuel combustion – sectoral approach – liquid fuels – $CO_2$ | Monaco imports from France liquid fuels pre-blended with biofuels, including gasoline containing bioethanol and diesel oil containing biodiesel. The ERT noted that liquid biofuel supply chains can extend through multiple countries and, without strict certification practices along the way, the authenticity of the delivered product can be uncertain. The ERT has identified a number of international reports that reveal inaccurate blending practices or fraud, where the actual biofuel fraction is lower than the advertised composition (e.g. Reddy et al., 2008), and provided references to the Party during the review. The ERT also noted that the 2006 IPCC Guidelines (vol. 2, p.3.17) explain that, to avoid double counting or over- or underreporting of $CO_2$ emissions, it is important to assess the biofuel origin, and, if national consumption of these fuels is commercially significant, the biogenic and fossil carbon streams need to be accurately accounted for. During the review, the Party explained that data on the biofuel content of fuel blends are provided to the Party by Citepa, and that the biofuel content of fuels is controlled by customs officers in accordance with national decree 2006-127 of 6 February 2006 (on the modalities for the application of the Customs Code). Monaco also explained that biofuel import certificates are not provided from France to Monaco due to the customs union between the two countries.<br>The ERT recommends that Monaco provide in the NIR a description of the biofuel authenticity assurance system to demonstrate the verifiability of biofuels delivered from France to Monaco, and consequently the accuracy of the assumptions made regarding the shares of biogenic and fossil carbon in liquid biofuels. The ERT encourages the Party to investigate the possibility of testing fuel using carbon-14 dating or a similar suitable method to verify the biofuel fraction in the fuels pre-blended with biofuels sold in Monaco. | Yes. Transparency |
| E.16 | 1.A Fuel combustion – | Monaco reported in CRF table 1.A(a)s3 emissions from biomass used in road transportation for 1992–2017. However, for other fossil fuels the Party reported "NO" for AD and emissions. Considering that the NIR (p.106) states that the percentage of biomass contained in fuel (FAME biodiesel for diesel and ethanol for gasoline) is | Yes. Transparency |

| ID# | Finding classification | Description of the finding with recommendation or encouragement | Is finding an issue and/or a problem?[a] |
|---|---|---|---|
| | sectoral approach – liquid fuels – $CO_2$ | supplied by Citepa and that the NIR (section 19.2.1) contains a table with the share of biofuel in gasoline and diesel for each year, it was not clear to the ERT how emissions from the fossil fraction of biodiesel FAME were reported in the inventory. During the review, the Party confirmed that FAME biodiesel is sold in Monaco and that the respective $CO_2$ emissions were reported as biomass in CRF table 1.A(a)s3 and therefore the fossil fraction of the biodiesel was not included in the emission estimates.<br><br>In addition, the Party confirmed that biodiesel was included under categories 1.A.2.g.vii (off-road vehicles and other machinery), 1.A.3.b.i (cars), 1.A.3.b.ii (light-duty trucks), 1.A.3.b.iii (heavy-duty trucks) and 1.A.3.d (domestic navigation), and provided the ERT with a table showing the total quantity reported as biodiesel. The ERT noted that the 2006 IPCC Guidelines (vol. 2, chap. 3, p.3.17, section "$CO_2$ emissions from biofuels") state that, to avoid double counting or over- or underreporting $CO_2$ emissions, it is important to assess the biofuel origin so as to identify and separate fossil from biogenic feedstocks, and, in a footnote on the same page, that biodiesel produced using methanol as feedstock will contain fossil carbon if the methanol is produced from a fossil fuel (e.g. natural gas). The ERT also noted that worldwide almost all methanol is made through steam reforming of natural gas (2006 IPCC Guidelines, vol. 3, chap. 3, p.3.58, section "Methanol"). The ERT further noted that measurements based on radiocarbon analysis performed on a range of pure (B100) FAME biodiesels found that 5.4 per cent of the carbon was of fossil origin (see table 2 in Reddy et al., 2008).<br><br>During the review, Monaco resubmitted the CRF tables (on 13 September 2019) and revised its estimates, assuming that 5.4 per cent of the biodiesel's carbon content was of fossil origin. For 2017, the revised estimates led to an increase in the estimated $CO_2$ emissions by 0.37 per cent for category 1.A.2.g.vii, 0.56 per cent for category 1.A.3.b.i, 1.86 per cent for category 1.A.3.b.ii, 1.94 per cent for category 1.A.3.b.iii and 0.30 per cent for category 1.A.3.d. The $CO_2$ emissions were reported under other fossil fuels under each of these categories. As a result, the estimated total national emissions without LULUCF increased from 86.59 to 86.65 kt $CO_2$ eq for 2017. The ERT agrees with the estimates and considers this potential issue to have been resolved.<br><br>The ERT recommends that Monaco include in the NIR a description of the methodology, assumptions and AD used to estimate the $CO_2$ emissions from the fossil fraction of biodiesel. The ERT encourages Monaco to provide an explanation on the reasons for the revised estimates made during the 2019 review (i.e. that they were due to the resubmission of estimates in the 2019 review cycle), the years affected and the impact of the revised estimates. | |
| E.17 | 1.A Fuel combustion – sectoral approach – liquid fuels – $CO_2$ | The $CO_2$ EF for diesel under category 1.A.3.b (road transport) was reported constant (73.22 t/TJ) for all years in the CRF table 1.A(a)s3. However, in the NIR (section 19.2.2.1, p.299), the Party reported that fuel sold in Monaco has the same characteristics as fuel sold in France and gave the $CO_2$ EF for diesel as 75.59 t/TJ. The ERT checked the values applied by France in its inventory and noted that the reported $CO_2$ EF for diesel under category 1.A.3.b (road transport) is 75.59 t/TJ for all years. In response to a question raised during the review, the Party explained that there was a mistake in the value provided by Citepa for the content of $CO_2$/g fuel, which was used to derive the EF in t/TJ, and that the correct value is 3.175 g $CO_2$/g fuel instead of 3.126 g $CO_2$/g fuel.<br><br>During the review, Monaco resubmitted the CRF tables (on 13 September 2019) and revised its emission estimates using the content value of 3.175 g $CO_2$/g fuel, which provides a value of 74.36 t/TJ instead of 75.59 t/TJ (as reported in the NIR). As a result, the estimated emissions from diesel oil for category 1.A.3.b increased from 10.17 to 10.33 kt $CO_2$ for 2017. | Yes. Transparency |

| ID# | Finding classification | Description of the finding with recommendation or encouragement | Is finding an issue and/or a problem?[a] |
|---|---|---|---|
| | | The ERT recommends that Monaco include in the NIR a description of the methodology, including the correct data and EF, used for the inventory. | |
| E.18 | 1.A Fuel combustion – sectoral approach – gaseous fuels – $CO_2$, $CH_4$ and $N_2O$ | During the review, Monaco resubmitted the CRF tables in response to the issues raised by the ERT under ID#s E.16 and E.17 above. As the ERT and the Party had identified disaggregated data for natural gas in response to a previous recommendation (see ID# E.10 in table 3), Monaco decided to update the emission estimates and disaggregate the AD and emissions for natural gas under categories 1.A.2.g.viii (other), 1.A.4.a (commercial/institutional) and 1.A.4.b.i (residential-stationary combustion). The Party used the disaggregated data for natural gas consumption included in the SMEG annual reports for 2015, 2016 and 2017. The amount of natural gas was disaggregated on the basis of the ratio of energy use reported by SMEG for those years (i.e. for 2017, 6,220 MWh industry; 13,381 MWh residential; and 48,576 MWh commerce/institutional). For earlier years (1990–2014), the Party used the same ratio as for 2015. | Yes. Accuracy |
| | | Comparing the original submission with the resubmission, the aggregated AD and the total $CO_2$ emissions for all three categories for 2017 remained the same at 213.97 TJ and 12.06 kt $CO_2$, respectively, while the reported $CH_4$ and $N_2O$ emissions both increased from 0.21 to 0.39 t. The ERT notes that the increase in the estimated $CH_4$ and $N_2O$ emissions reported in the CRF tables is due to the estimates for category 1.A.4.b.i (cells H33 and I33, CRF table 1.A(a)s4) not being revised (0.21 t), while new $CH_4$ and $N_2O$ estimates were added for categories 1.A.2.g.viii and 1.A.4.a. | |
| | | The ERT recommends that Monaco describe in the NIR the method and assumption used to derive the AD for gaseous fuels under categories 1.A.2.g.viii (other), 1.A.4.a (commercial/institutional) and 1.A.4.b.i (residential-stationary combustion), including the ratio used for 2015, 2016 and 2017 and for 1990–2014. The ERT also recommends that the Party revise the $CH_4$ and $N_2O$ emission estimates for these categories to reflect the correct values resulting from the disaggregation of the AD for natural gas. | |
| E.19 | 1.A.1.a Public electricity and heat production – other fossil fuels – $CO_2$ | The trend in the $CO_2$ IEF for other fossil fuels (fossil fraction of waste being incinerated) is nearly constant from 1990 to 2007, and then drops from 77.11 t/TJ in 2007 to 69.12 t/TJ in 2016. The drivers of this change are not explained in the NIR. During the review, the Party provided detailed and transparent tables and charts of waste composition data. It was clear to the ERT that the decrease in the $CO_2$ IEF was due mainly to the increased share of non-classified combustibles (carbon content of 0.03) and the associated decrease in the share of plastics (carbon content 0.75) in the waste stream across the time series. The ERT noted that the Party did not include in the documentation box information on which fuels were included under other fossil fuels, in accordance with footnote 4 to CRF table 1.A(a)s, with a reference to the section of the NIR where further information is provided. | Yes. Transparency |
| | | The ERT recommends that Monaco include in the NIR an explanation of the drivers of the change in the $CO_2$ IEF from 2007 onward, including a description of the change in the relative energy contribution from waste components, for example accompanied by a chart illustrating the trend. The ERT also recommends that the Party include in the documentation box of CRF table 1.A(a)s information in accordance with footnote 4 to that table. | |
| E.20 | 1.A.3.b.i Cars – biomass – $CO_2$ | Monaco resubmitted emission estimates for biodiesel, as explained in ID# E.16 above. When checking the new estimates in the CRF tables, the ERT identified a change from the original submission in relation to the $CO_2$ emissions reported for biomass for category 1.A.3.b.i (cars), which are higher than expected following the assumptions and method described in ID# E.16 above. While the reported AD for biomass remained the same in | Yes. Accuracy |

| *ID#* | *Finding classification* | *Description of the finding with recommendation or encouragement* | *Is finding an issue and/or a problem?*[a] |
|---|---|---|---|
| | | CRF table 1.A(a)s3, reported $CO_2$ emissions for biomass under this category (cell G33) went from 0.70 to 0.20 kt $CO_2$ (–71 per cent) for 2017.<br><br>The ERT recommends that Monaco check and correct the AD and $CO_2$ emission estimates reported for biomass under category 1.A.3.b.i, including the values reported in the memo items. | |
| E.21 | 1.A.3.b.iii Heavy-duty trucks and buses – liquid fuels – $CO_2$, $CH_4$ and $N_2O$ | Monaco reported in the NIR (p.116) that the entire Monegasque bus fleet runs on diester (30 per cent biodiesel, 70 per cent diesel). Given that the other diesel used in Monaco contains around 10 per cent biodiesel, it was not clear to the ERT how the different blends were sourced and how emissions from the fuel blend were accounted for in the inventory, including for the fossil fraction of the biodiesel. During the review, the Party explained that the fuel consumption of city buses was not included in the national emissions inventory because the diester is not sold by retailers in Monaco. However, the Party clarified that there is a tank in Monaco for the refuelling of buses. The ERT requested AD for the quantity of fuel used by buses from the tank in Monaco and the Party provided an average fuel consumption value per km based on a hypothetical distance travelled by the buses (36,000 km). The ERT performed a first-order estimate and the potential emissions calculated totalled approximately 1.2 kt $CO_2$. The Party clarified that, because of the customs union between France and Monaco, the fuel transfer from France to Monaco is considered neither an export nor an import, and that tax is paid on the fuel when it is sold in France (see also ID# E.15 above related to the customs union). The ERT notes that the 2006 IPCC Guidelines (vol. 2, section 3.2.1.4) state that where cross-border transfers take place in vehicle tanks, emissions from road vehicles should be attributed to the country where the fuel is loaded into the vehicle. The ERT considers that, in view of the customs union between France and Monaco, attributing emissions to France on the basis of bulk pre-sales of exported fuel is not appropriate, and instead the principle of attributing emissions to the country where the fuel is loaded into the fuel tank of the end user should be followed. The ERT considers that Monaco should explain in the NIR how diester is imported, stored and loaded into the fuel tanks of end users in the country, and how emissions from this fuel are accounted for. The ERT believes that this issue should be considered further in future reviews to confirm there is no underestimation of emissions.<br><br>The ERT recommends that Monaco obtain AD for the quantity of diester loaded into the fuel tanks of vehicles in Monaco, and estimate emissions in line with the 2006 IPCC Guidelines (vol. 2, section 3.2.1.4). | Yes. Completeness |
| E.22 | 1.A.4.a Commercial/ institutional – liquid fuels – $CO_2$, $CH_4$ and $N_2O$ | Monaco holds an annual motorcar racing festival called the Grand Prix. The types of motorcar used for this racing, which are in the 'Formula' class, are not road-legal. During the Grand Prix, normal traffic is blocked and the country's roads are closed and used as a racetrack. The activity is clearly not road transport, but rather a type of off-road vehicle use within the commercial sector (category 1.A.4.a), similar in concept to the use of mobile equipment at a port or airport (see the 2006 IPCC Guidelines, vol. 2, section 3.3 on off-road transport). The fuel used for the Grand Prix is a type of gasoline, with tight specifications imposed by the sport's governing body. It is imported into Monaco in bulk containers from other parts of the world. The fuel is loaded into the racing cars in Monaco. The racing cars combust the fuel in Monaco. In response to a question raised by the ERT, the Party explained that emissions from this activity are not estimated, and that the gasoline used is neither sold by Monegasque retailers nor mentioned in fuel data published by the national statistics institute. The Party also explained that it is not clear whether the fuel used for Grand Prix racing has been included in the fuel sales statistics of other countries or their GHG inventories. | Yes. Completeness |

| ID# | Finding classification | Description of the finding with recommendation or encouragement | Is finding an issue and/or a problem?[a] |
|---|---|---|---|
| | | The ERT considers that a first-order estimate of the emissions associated with motorcar racing during the Monaco Grand Prix can be performed by the Party. Some basic assumptions from public information could be considered, such as the fuel consumption per lap (1.5 kg/lap), the number of laps (78 for the Formula One final race), the race duration (including free practice sessions, qualifying races and finals), the different series (Formula 1, Formula 2, Formula Renault 2.0 Series and Porsche Mobil 1 Supercup) and the number of cars (20 for Formula 1). The ERT performed a first-order estimate and the total emissions from this activity could be approximately 45 t $CO_2$.<br><br>The 2006 IPCC Guidelines (vol. 2, chap. 1, section 1.6.4) indicate that, for mobile emissions sources, emissions should be estimated on the basis of fuel sold. The ERT considers that this concept generally only applies to fuel sold and loaded into vehicles and to small sales of fuel such as in jerrycans. The 2006 IPCC Guidelines (vol. 2, section 3.2.1.4) reinforce this point by referring to fuels moving across borders in vehicle fuel tanks. The fuel used for the Grand Prix does not move across national borders in the tanks of vehicles, but rather in bulk containers, and so should be considered as an export/import. The current exemption from duties and taxes when entering France applies to the fuel contained in the standard tank of a private motor vehicle and in a spare jerrycan with a maximum capacity of 10 l (Customs and Indirect Taxes, 2016). Owing to the customs agreement between France and Monaco, goods moved across the France–Monaco border are not considered as imports or exports by Monaco (see also ID# E.21 above related to the customs union). The ERT is of the view that, owing to the customs union between France and Monaco, attributing emissions to another Party on the basis of bulk pre-sales of exported fuel is not appropriate, and instead the principle of attributing emissions to the country where the fuel is loaded into the fuel tank of the end user should be followed.<br><br>The ERT recommends that Monaco identify how the fuels used in the Grand Prix are marketed (whether they are imported by France, imported in bulk by the race companies to Monaco and/or accounted for in the country that produced and sold them to the race companies) and calculate the emissions to be accounted for in Monaco's inventory. The ERT encourages the Party to contact the governing body of the Monaco Grand Prix to determine whether it can provide the AD (amount of fuel consumption during the event). | |
| E.23 | 1.B.2.a Oil – liquid fuels – $CO_2$ and $CH_4$ | Monaco reported the AD for category 1.B.2.a.5 (distribution of oil products) as "NO" in CRF table 1.B.2. However, according to the 2006 IPCC Guidelines (vol. 2, chap. 4, table 4.2.1, p.4.34), this category comprises fugitive emissions (excluding venting and flaring) from the transport and distribution of refined products, including those at bulk terminals and retail facilities (evaporation losses from storage, filling and unloading activities, and fugitive equipment leaks are the primary sources of the emissions).<br><br>During the review, Monaco provided an Excel spreadsheet with the total quantity of oil products sold in the country and explained that fugitive emissions from the distribution of oil products were considered marginal because few gas stations exist for road transport in the country, with one station for navigation and one for aviation. The Party explained that the gas stations are built with double walls and equipped with closed valves and that refuelling involves petrol vapour recovery (mandatory); in addition, vapour recovery devices at the volumeter spouts were also installed at three major stations, which are therefore equipped with 'stage 1' and 'stage 2' recovery devices. The ERT noted that there is no method provided in the 2006 IPCC Guidelines.<br><br>The ERT recommends that Monaco report the total quantity of distribution of oil products as AD in CRF table 1.B.2 for this category. The ERT also recommends that the Party report "NE" for $CO_2$ and $CH_4$ emissions with a | Yes. Comparability |

| *ID#* | *Finding classification* | *Description of the finding with recommendation or encouragement* | *Is finding an issue and/or a problem?*[a] |
|---|---|---|---|
| | | justification in the documentation box that the activity occurs in Monaco but that no estimation method (EF) is provided in the 2006 IPCC Guidelines. | |
| IPPU | | | |
| I.8 | 2.D.1 Lubricant use – $CO_2$ | Monaco reported in the NIR (section 4.2.4.2, p.155) that, for estimating $CO_2$ emissions for this category, lubricant consumption is calculated on the basis of distance travelled (which results from the COPERT software tool for calculating road transport emissions) and lubricant consumption factors proposed in the *EMEP/EEA air pollutant emission inventory guidebook 2016* (table 3.30, p.52, sectoral guidance chapters, energy, category 1.A.3.b.i). The ERT noted that the Party reported the use of the tier 1 method in accordance with equation 5.2 of the 2006 IPCC Guidelines (vol. 3, chap. 5, p.5.7). The ERT also noted that, on the basis of this equation and from the explanation in the NIR, it seems that Monaco does not apply the fraction of lubricant oxidized during use in its estimates, and therefore $CO_2$ emissions may have been overestimated. The EF reported by the Party in the NIR is 73.3 kg $CO_2$/GJ. However, according to the tier 1 method, the $CO_2$ EF should be equal to carbon content (20 t C/TJ) multiplied by the fraction of lubricant oxidized during use (0.2) multiplied by 44 and divided by 12 t $CO_2$/t C, resulting in 14.67 kg $CO_2$/GJ. During the review, the Party explained that the AD applied in the inventory are already the total oxidized consumption of lubricant (total lubricant consumption multiplied by the fraction of lubricant oxidized during use) and that the emissions reported in CRF table 2(I).A-Hs2 are correct.<br><br>The ERT recommends that Monaco update the description of the methodology used in the NIR by explaining that it used parameters and default values according to equation 5.2 of the 2006 IPCC Guidelines and that the AD used are the amount of lubricant oxidized during use (total lubricant consumption multiplied by the fraction of lubricant oxidized during use). The ERT also recommends that the Party include in the NIR an explanation of how the AD are derived and a table showing the consumption of lubricant across the time series. The ERT further recommends that the Party update the description of CRF table 2(I).A-Hs2 (cell B24) to reflect the fact that the AD used relate to the consumption of lubricant oxidized, and verify that the unit of the IEF is consistent with the AD used. | Yes. Transparency |
| I.9 | 2.G.3 $N_2O$ from product uses – $N_2O$ | During the review, Monaco provided sufficient justification of the use of constant AD and a constant EF for category 2.G.3.b (other), which results in a constant value for $N_2O$ emissions across the time series (see ID# I.7 in table 3). However, transparency should be improved in the NIR (section 4.2.7.1.4) by clarifying that category 2.G.3.b (in which aerosol cans are reported) is not a key category and that the emissions are below the threshold of significance for the entire time series (0.03 per cent of Monaco's total GHG emissions without LULUCF) in accordance with paragraph 37(b) of the UNFCCC Annex I inventory reporting guidelines. Together with an explanation of why the AD are constant, how the EF was derived and why the AD of France are applicable (see the rationale provided under ID# I.7 in table 3), this would give an accurate overview of the impact and relevance of this category in the inventory. The ERT noted that $N_2O$ emissions are correctly reported in CRF table 2(I).A-Hs2 for category 2.G.3.b, although in the locator review tool, the $N_2O$ emissions for category 2.G.3.b are the sum of the $N_2O$ emissions from categories 2.G.3.a and 2.G.3.b.<br><br>The ERT recommends that Monaco update the explanation provided in the NIR (section 4.2.7.1.4) to reflect that category 2.G.3.b (other) is not a key category and that the associated emissions are below the threshold of | Yes. Transparency |

| *ID#* | *Finding classification* | *Description of the finding with recommendation or encouragement* | *Is finding an issue and/or a problem?*[a] |
|---|---|---|---|
| | | significance for the entire time series (0.03 per cent of Monaco's total GHG emissions without LULUCF) in accordance with paragraph 37(b) of the UNFCCC Annex I inventory reporting guidelines. | |
| Agriculture | | | |
| A.1 | 3. General (agriculture) | Monaco reported in its NIR that no agricultural practices occur in the country. During the review, the ERT confirmed this. Monaco is a city State of 2 $km^2$ and is completely urbanized. The Party explained that agricultural produce comes mainly from France and Italy. | Not an issue/problem |
| LULUCF | | | |
| | | No findings additional to those contained in table 3 were made by the ERT for LULUCF activities during the 2019 individual inventory review. | |
| Waste | | | |
| W.6 | 5. General (waste) – $CO_2$ and $CH_4$ | Monaco reported in the NIR (section 7.1, p.224) that no solid waste landfill is operated on its territory. The Party explained in the NIR (section 7.3, p.224) that a thermal treatment (incineration) is applied to a fraction of solid waste (household waste, ordinary industrial waste, green waste and wastewater sludge) and this contributes to the production of electricity and hot and cold energy for public consumption. Emissions were reported for the energy sector under category 1.A.1.a.ii (combined heat and power generation). The Party also explained that recyclable waste and hazardous waste are exported for treatment in France. During the review, Monaco further explained the key actions it is taking to reduce emissions. Regarding waste, the Party clarified the national policies for increasing understanding of the share of solid waste components and the regulations for improving waste management, increasing selective recycling, increasing the share of reusable material and banning plastic utensils.<br><br>The ERT is of the view that, although there are no emissions from the solid waste sector in Monaco, a description and characterization of the sector (i.e. total amount of waste generated, amount of waste incinerated and amount of waste exported across the time series) would improve the transparency of the NIR (section 7.1) and facilitate understanding of waste production; the share of solid waste incinerated and reported in the energy sector; and the fraction exported. In addition, the Party should include (in NIR section 7.1) information on its national policies for improving waste management practices, which would explain the observed trends referred to in ID# E.18 above.<br><br>The ERT encourages Monaco to include in the NIR a description of the characterization of the solid waste sector (i.e. total amount of waste generated, amount of waste incinerated and amount of waste exported) across the time series. The ERT also recommends that the Party include in the NIR information on the actions taken to improve waste management practices, which will explain emission trends in relation to the changes in waste composition across the time series. | Not an issue/problem |
| W.7 | 5.D.1 Domestic wastewater – $CH_4$ | Monaco estimated emissions from domestic wastewater using the tier 1 approach and applying the IPCC default value for $B_o$ (0.6 kg $CH_4$/kg BOD) (from the 2006 IPCC Guidelines, vol. 5, table 6.2). However, the ERT noted that this is a key category and, according to the 2006 IPCC Guidelines (vol. 5, section 6.2.2.2 and decision tree in | Yes. Accuracy |

| *ID#* | *Finding classification* | *Description of the finding with recommendation or encouragement* | *Is finding an issue and/or a problem?*[a] |
|---|---|---|---|
| | | figure 6.2), it is good practice to use country-specific data for $B_o$, expressed in kg $CH_4$/kg BOD removed. The ERT notes that $B_o$ is a fundamental parameter used by wastewater treatment plants for the operation of their activities, and considering that Monaco's wastewater treatment pathway consists of a single plant in operation, plant-level data are probably available. During the review, Monaco shared a relevant Excel spreadsheet and the ERT concluded that data are available (e.g. on volumes and wastewater characteristics, such as BODCOD) to evaluate annual TOW and a specific aggregated methane correction factor, which will allow Monaco to calculate a country-specific $B_o$ using the tier 3 method. The Party informed the ERT that it plans to update the method and recalculate $CH_4$ emissions using the tier 3 approach for the next submission.<br><br>The ERT recommends that Monaco use the available plant-level volumes and water characteristics such as BOD-COD to apply a higher-tier method in accordance with the 2006 IPCC Guidelines. In addition, the ERT recommends that Monaco report in the NIR the methods and data used, as well as the recalculation performed in accordance with paragraphs 43–45 of the UNFCCC Annex I inventory reporting guidelines. | |
| W.8 | 5.D.1 Domestic wastewater – $CH_4$ | When checking the possible reasons for the inter-annual changes identified by the previous ERT (see ID# W.1 in table 3), the ERT noted that the amount of total organic products (in kt DC) fluctuates and shows outliers for 2008 (1.50), 2009 (1.28) and 2011 (1.46) in the 2019 submission. The ERT also noted that these outliers appear in all three of the last inventory submissions (for 2017, 2018 and 2019), but with different values. In the 2017 submission, the values are 1.35 (2008), 1.27 (2009) and 1.12 (2011), and in the 2018 submission, they are 1.58 (2008), 1.28 (2009) and 1.33 (2011). The changes between submissions were particularly marked for 2011, where a variation of 30.4 per cent was observed between the data provided in the 2017 submission (1.12) and those in the 2019 submission (1.46). In NIR section 7.8 (p.235) the Party did not explain the recalculation in accordance with paragraphs 43–45 of the UNFCCC Annex I inventory reporting guidelines. Although the Party included graphs in the NIR showing the impact of the recalculation between the 2018 and 2019 submissions (no explanation for the recalculation was provided in the 2018 NIR), there was no explanation of which parameters, AD or EFs were recalculated and why. Moreover, there was no explanation as to why, when comparing the time series across the three submissions, there was a significant change between the values for 2008 and 2011. The ERT also noted that the recalculations led to a reduction in the estimated $CH_4$ and $N_2O$ emissions for 2012–2017 but no qualitative explanation on the impact of the recalculation was provided in the NIR.<br><br>During the review, Monaco explained that the differences in the values for 2008 and 2011 across the three inventory submissions are because the 2018 and 2019 submissions included the TOW of untreated wastewater (generated due to shutdown for service or repair) in the total organic products, while the 2017 submission did not include this information. The Party also explained that the difference between the 2018 and 2019 submissions for 2008 and 2011 arose because, for the 2018 submission, TOW for untreated wastewater was calculated on the basis of total value of treated TOW and percentage of time of shutdown, while, for the 2019 submission, TOW was estimated directly on the basis of monitoring data from the wastewater treatment plant (bottom-up approach and acquisition of data at the plant level on a daily basis). The implementation of direct monitoring data is considered an improvement in the inventory, as it enables the adoption of a higher-tier method, and the outliers still observed in the 2019 submission can be explained by the large amount of data missing from the daily database. The Party | Yes. Transparency |

| ID# | Finding classification | Description of the finding with recommendation or encouragement | Is finding an issue and/or a problem?[a] |
|---|---|---|---|
| | | mentioned that the volumes of untreated wastewater considered in the AD were reported in the NIR (section 7.4.3.1, p.230). | |
| | | The ERT commends the Party for the improvement to its TOW estimate using direct measurements and recommends that Monaco explain in the NIR the improvements made in the collection of the AD (volume of treated and untreated wastewater) to the calculation of total organic products and how the Party ensures the consistency of the time series for the years (i.e. 2008 and 2011) in which large amounts of data are missing from the daily database. The ERT also recommends that Monaco explain in the NIR why estimated $CH_4$ and $N_2O$ emissions decreased as a result of improved AD collection (on volume of wastewater treated). The ERT further recommends that, should the Party perform recalculations for the next submission, it should include an explanation of those recalculations in the NIR in accordance with paragraphs 43–45 of the UNFCCC Annex I inventory reporting guidelines. | |
| KP-LULUCF activities | | | |
| | | No findings additional to those contained in table 3 were made by the ERT during the 2019 individual inventory review for KP-LULUCF activities. | |

[a] Recommendations made by the ERT during the review are related to issues as defined in para. 81 of the UNFCCC review guidelines, or problems as defined in para. 69 of the Article 8 review guidelines.

## VI. Application of adjustments

11. The ERT did not identify the need to apply any adjustments to the 2019 annual submission of Monaco.

## VII. Accounting quantities for activities under Article 3, paragraph 3, and, if any, activities under Article 3, paragraph 4, of the Kyoto Protocol

12. Monaco has elected commitment period accounting and therefore the issuance and cancellation of units for KP-LULUCF activities is not applicable to the 2019 review.

## VIII. Questions of implementation

13. No questions of implementation were identified by the ERT during the individual review of the Party's 2019 annual submission.

# Annex I

## Overview of greenhouse gas emissions and removals for Monaco for submission year 2019 and data and information on activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, as submitted by Monaco in its 2019 annual submission

1. Tables 1–4 provide an overview of total GHG emissions and removals as submitted by Monaco.

Table 1
**Total greenhouse gas emissions for Monaco, base year[a]–2017**
(kt $CO_2$ eq)

| | *Total GHG emissions excluding indirect $CO_2$ emissions* | | *Total GHG emissions including indirect $CO_2$ emissions[b]* | | *Land-use change (Article 3.7 bis as contained in the Doha Amendment)[c]* | *KP-LULUCF activities (Article 3.3 of the Kyoto Protocol)[d]* | *KP-LULUCF activities (Article 3.4 of the Kyoto Protocol)* | |
|---|---|---|---|---|---|---|---|---|
| | *Total including LULUCF* | *Total excluding LULUCF* | *Total including LULUCF* | *Total excluding LULUCF* | | | *CM, GM, RV, WDR* | *FM* |
| FMRL | | | | | | | | NA |
| Base year | 101.76 | 101.76 | NA | NA | NA | | NO | |
| 1990 | 101.60 | 101.59 | NA | NA | | | | |
| 1995 | 104.62 | 104.64 | NA | NA | | | | |
| 2000 | 108.75 | 108.78 | NA | NA | | | | |
| 2010 | 87.64 | 87.69 | NA | NA | | | | |
| 2011 | 85.71 | 85.76 | NA | NA | | | | |
| 2012 | 88.52 | 88.56 | NA | NA | | | | |
| 2013 | 90.27 | 90.31 | NA | NA | | NO | NO | NO |
| 2014 | 84.10 | 84.13 | NA | NA | | NO | NO | NO |
| 2015 | 89.13 | 89.06 | NA | NA | | NO | NO | NO |
| 2016 | 87.89 | 87.89 | NA | NA | | NO | NO | NO |
| 2017 | 86.85 | 86.85 | NA | NA | | NO | NO | NO |

*Note*: Emissions/removals reported in the sector other (sector 6) are not included in the total GHG emissions.

[a] "Base year" refers to the base year under the Kyoto Protocol, which is 1990 for $CO_2$, $CH_4$, $N_2O$ and $NF_3$, and 1995 for HFCs, PFCs and $SF_6$. Monaco has not elected any activities under Article 3, para. 4, of the Kyoto Protocol. For activities under Article 3, para. 3, of the Kyoto Protocol and FM under Article 3, para. 4, only the inventory years of the commitment period must be reported.

[b] The Party did not report indirect $CO_2$ emissions in CRF table 6.

[c] The value reported in this column refers to 1990.

[d] Activities under Article 3, para. 3, of the Kyoto Protocol, namely AR and deforestation.

Table 2
**Greenhouse gas emissions by gas for Monaco, excluding land use, land-use change and forestry, 1990–2017**
(kt $CO_2$ eq)

| | $CO_2$[a] | $CH_4$ | $N_2O$ | HFCs | PFCs | Unspecified mix of HFCs and PFCs | $SF_6$ | $NF_3$ |
|---|---|---|---|---|---|---|---|---|
| 1990 | 96.99 | 2.15 | 2.23 | NO, IE | NO, IE | NO | 0.22 | NO |
| 1995 | 99.83 | 1.61 | 2.82 | 0.29 | NO, IE | NO | 0.09 | NO |
| 2000 | 98.94 | 2.53 | 3.17 | 4.04 | NO, IE | NO | 0.09 | NO |
| 2010 | 76.26 | 2.59 | 4.14 | 4.60 | NO, IE | NO | 0.09 | NO |
| 2011 | 73.82 | 2.33 | 4.11 | 5.41 | NO, IE | NO | 0.09 | NO |
| 2012 | 76.96 | 2.95 | 3.95 | 4.60 | NO, IE | NO | 0.09 | NO |
| 2013 | 77.81 | 2.71 | 4.09 | 5.62 | NO, IE | NO | 0.08 | NO |
| 2014 | 72.99 | 2.54 | 3.73 | 4.79 | NO, IE | NO | 0.08 | NO |
| 2015 | 75.83 | 3.01 | 3.69 | 6.45 | NO, IE | NO | 0.08 | NO |
| 2016 | 74.57 | 2.76 | 3.44 | 7.01 | NO, IE | NO | 0.11 | NO |
| 2017 | 73.27 | 2.44 | 2.91 | 8.13 | NO, IE | NO | 0.11 | NO |
| **Per cent change 1990–2017** | **–24.5** | **13.5** | **30.1** | **NA** | **NA** | **NA** | **–50.7** | **NA** |

*Note*: Emissions/removals reported in the sector other (sector 6) are not included in the total GHG emissions.
[a] Monaco did not report indirect $CO_2$ emissions in CRF table 6.

Table 3
**Greenhouse gas emissions by sector for Monaco, 1990–2017**
(kt $CO_2$ eq)

| | Energy | IPPU | Agriculture | LULUCF | Waste | Other |
|---|---|---|---|---|---|---|
| 1990 | 100.50 | 0.44 | NO, NA | 0.00 | 0.65 | NO |
| 1995 | 102.94 | 0.63 | NO, NA | –0.02 | 1.08 | NO |
| 2000 | 102.06 | 4.57 | NO, NA | –0.04 | 2.15 | NO |
| 2010 | 78.67 | 6.67 | NO, NA | –0.05 | 2.35 | NO |
| 2011 | 76.12 | 7.47 | NO, NA | –0.04 | 2.17 | NO |
| 2012 | 79.28 | 6.61 | NO, NA | –0.04 | 2.67 | NO |
| 2013 | 80.31 | 7.51 | NO, NA | –0.03 | 2.49 | NO |
| 2014 | 75.42 | 6.33 | NO, NA | –0.03 | 2.39 | NO |
| 2015 | 78.52 | 7.75 | NO, NA | 0.07 | 2.79 | NO |
| 2016 | 77.23 | 8.13 | NO, NA | –0.01 | 2.54 | NO |

| | *Energy* | *IPPU* | *Agriculture* | *LULUCF* | *Waste* | *Other* |
|---|---|---|---|---|---|---|
| 2017 | 75.74 | 8.89 | NO, NA | 0.00 | 2.21 | NO |
| **Per cent change 1990–2017** | **–24.6** | **1 914.0** | **NA** | **–346.0** | **242.0** | **NA** |

*Notes*: (1) Emissions/removals reported in the sector other (sector 6) are not included in the total GHG emissions; (2) Monaco did not report indirect $CO_2$ emissions in CRF table 6.

Table 4

**Greenhouse gas emissions/removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol by activity, base year[a]–2017, for Monaco**

($kt\ CO_2\ eq$)

| | *Article 3.7 bis as contained in the Doha Amendment*[b] | *Activities under Article 3, paragraph 3, of the Kyoto Protocol* | | *FM and elected activities under Article 3, paragraph 4, of the Kyoto Protocol* | | | | |
|---|---|---|---|---|---|---|---|---|
| | *Land-use change* | *AR* | *Deforestation* | *FM* | *CM* | *GM* | *RV* | *WDR* |
| FMRL | | | | NA | | | | |
| Technical correction | | | | NA | | | | |
| Base year | NA | | | | NO | NO | NO | NO |
| 2013 | | NO | NO | NO | NO | NO | NO | NO |
| 2014 | | NO | NO | NO | NO | NO | NO | NO |
| 2015 | | NO | NO | NO | NO | NO | NO | NO |
| 2016 | | NO | NO | NO | NO | NO | NO | NO |
| 2017 | | NO | NO | NO | NO | NO | NO | NO |
| **Per cent change base year–2017** | | | | | **NA** | **NA** | **NA** | **NA** |

*Notes*: (1) Monaco did not report information in the CRF tables on accounting and the base year for emissions and removals from KP-LULUCF activities. (2) Values in this table include emissions from land subject to natural disturbances, if applicable.

[a] Monaco has not elected to report on any activities under Article 3, para. 4, of the Kyoto Protocol. For activities under Article 3, para. 3, of the Kyoto Protocol and FM under Article 3, para. 4, only the inventory years of the commitment period must be reported.

[b] The value reported in this column refers to 1990.

2. Table 5 provides an overview of key relevant data from Monaco's reporting under Article 3, paragraphs 3 and 4, of the Kyoto Protocol.

Table 5
**Key relevant data for Monaco under Article 3, paragraphs 3 and 4, of the Kyoto Protocol in the 2019 annual submission**

| *Key parameters* | *Values* |
|---|---|
| Periodicity of accounting | (a) AR: commitment period accounting<br>(b) Deforestation: commitment period accounting<br>(c) FM: commitment period accounting<br>(d) CM: not elected<br>(e) GM: not elected<br>(f) RV: not elected<br>(g) WDR: not elected |
| Election of activities under Article 3, paragraph 4 | None |
| Election of application of provisions for natural disturbances | No |
| 3.5% of total base-year GHG emissions, excluding LULUCF | 3.476 kt $CO_2$ eq (27.809 kt $CO_2$ eq for the duration of the commitment period) |
| Cancellation of AAUs, CERs and ERUs and/or issuance of RMUs in the national registry for: | |
| 1. AR | NA |
| 2. Deforestation | NA |
| 3. FM | NA |
| 4. CM | NA |
| 5. GM | NA |
| 6. RV | NA |
| 7. WDR | NA |

# Annex II

## Information to be included in the compilation and accounting database

Tables 1–5 include the information to be included in the compilation and accounting database for Monaco. Data shown are from the original annual submission of the Party, including the latest revised estimates submitted, adjustments (if applicable) and the final data to be included in the compilation and accounting database.

Table 1
**Information to be included in the compilation and accounting database for 2017, including on the commitment period reserve, for Monaco**
(t $CO_2$ eq)

| | *Original submission* | *Revised estimate* | *Adjustment* | *Final* |
|---|---|---|---|---|
| **CPR** | 557 736 | 557 777 | – | 557 777 |
| **Annex A emissions for 2017** | – | – | – | – |
| $CO_2$[a] | 73 056 | 73 266 | – | 73 266 |
| $CH_4$ | 2 438 | 2 442 | – | 2 442 |
| $N_2O$ | 2 854 | 2 905 | – | 2 905 |
| HFCs | 8 131 | – | – | 8 131 |
| PFCs | NO, IE | – | – | NO, IE |
| Unspecified mix of HFCs and PFCs | NO | – | – | NO |
| $SF_6$ | 107 | – | – | 107 |
| $NF_3$ | NO | – | – | NO |
| **Total Annex A sources** | **86 586** | – | – | **86 851** |
| **Activities under Article 3, paragraph 3, of the Kyoto Protocol for 2017** | – | – | – | – |
| AR | NO | – | – | NO |
| Deforestation | NO | – | – | NO |
| **FM and elected activities under Article 3, paragraph 4, of the Kyoto Protocol for 2017** | – | – | – | – |
| FM | NO | – | – | NO |

[a] The Party did not report indirect $CO_2$ emissions in CRF table 6.

Table 2
**Information to be included in the compilation and accounting database for 2016 for Monaco**
(t $CO_2$ eq)

| | *Original submission* | *Revised estimate* | *Adjustment* | *Final* |
|---|---|---|---|---|
| **Annex A emissions for 2016** | – | – | – | – |
| $CO_2$[a] | 74 345 | 74 573 | – | 74 573 |
| $CH_4$ | 2 758 | 2 762 | – | 2 762 |
| $N_2O$ | 3 395 | 3 444 | – | 3 444 |
| HFCs | 7 008 | – | – | 7 008 |
| PFCs | NO, IE | – | – | NO, IE |
| Unspecified mix of HFCs and PFCs | NO | – | – | NO |
| $SF_6$ | 107 | – | – | 107 |
| $NF_3$ | NO | – | – | NO |
| **Total Annex A sources** | **87 612** | – | – | **87 894** |
| **Activities under Article 3, paragraph 3, of the Kyoto Protocol for 2016** | – | – | – | – |

| | *Original submission* | *Revised estimate* | *Adjustment* | *Final* |
|---|---|---|---|---|
| AR | NO | – | – | NO |
| Deforestation | NO | – | – | NO |
| **FM and elected activities under Article 3, paragraph 4, of the Kyoto Protocol for 2016** | – | – | – | – |
| FM | NO | – | – | NO |

[a] The Party did not report indirect $CO_2$ emissions in CRF table 6.

Table 3
**Information to be included in the compilation and accounting database for 2015 for Monaco**
(t $CO_2$ eq)

| | *Original submission* | *Revised estimate* | *Adjustment* | *Final* |
|---|---|---|---|---|
| **Annex A emissions for 2015** | – | – | – | – |
| $CO_2$[a] | 75 599 | 75 831 | – | 75 831 |
| $CH_4$ | 3 003 | 3 008 | – | 3 008 |
| $N_2O$ | 3 640 | 3 691 | – | 3 691 |
| HFCs | 6 451 | – | – | 6 451 |
| PFCs | NO, IE | – | – | NO, IE |
| Unspecified mix of HFCs and PFCs | NO | – | – | NO |
| $SF_6$ | 82 | – | – | 82 |
| $NF_3$ | NO | – | – | NO |
| **Total Annex A sources** | **88 775** | – | – | **89 061** |
| **Activities under Article 3, paragraph 3, of the Kyoto Protocol for 2015** | – | – | – | – |
| AR | NO | – | – | NO |
| Deforestation | NO | – | – | NO |
| **FM and elected activities under Article 3, paragraph 4, of the Kyoto Protocol for 2015** | – | – | – | – |
| FM | NO | – | – | NO |

[a] The Party did not report indirect $CO_2$ emissions in CRF table 6.

Table 4
**Information to be included in the compilation and accounting database for 2014 for Monaco**
(t $CO_2$ eq)

| | *Original submission* | *Revised estimate* | *Adjustment* | *Final* |
|---|---|---|---|---|
| **Annex A emissions for 2014** | – | – | – | – |
| $CO_2$[a] | 72 744 | 72 988 | – | 72 988 |
| $CH_4$ | 2 537 | 2 541 | – | 2 541 |
| $N_2O$ | 3 681 | 3 731 | – | 3 731 |
| HFCs | 4 785 | – | – | 4 785 |
| PFCs | NO, IE | – | – | NO, IE |
| Unspecified mix of HFCs and PFCs | NO | – | – | NO |
| $SF_6$ | 82 | – | – | 82 |
| $NF_3$ | NO | – | – | NO |
| **Total Annex A sources** | **83 829** | – | – | **84 127** |
| **Activities under Article 3, paragraph 3, of the Kyoto Protocol for 2014** | – | – | – | – |
| AR | NO | – | – | NO |
| Deforestation | NO | – | – | NO |
| **FM and elected activities under Article 3, paragraph 4, of the Kyoto Protocol for 2014** | – | – | – | – |

| | *Original submission* | *Revised estimate* | *Adjustment* | *Final* |
|---|---|---|---|---|
| FM | NO | – | – | NO |

[a] The Party did not report indirect $CO_2$ emissions in CRF table 6.

Table 5
**Information to be included in the compilation and accounting database for 2013 for Monaco**
($t\ CO_2\ eq$)

| | *Original submission* | *Revised estimate* | *Adjustment* | *Final* |
|---|---|---|---|---|
| **Annex A emissions for 2013** | – | – | – | – |
| $CO_2$[a] | 77 548 | 77 809 | – | 77 809 |
| $CH_4$ | 2 703 | 2 708 | – | 2 708 |
| $N_2O$ | 4 038 | 4 092 | – | 4 092 |
| HFCs | 5 617 | – | – | 5 617 |
| PFCs | NO, IE | – | – | NO, IE |
| Unspecified mix of HFCs and PFCs | NO | – | – | NO |
| $SF_6$ | 81 | – | – | 81 |
| $NF_3$ | NO | – | – | NO |
| **Total Annex A sources** | **89 988** | – | – | **90 307** |
| **Activities under Article 3, paragraph 3, of the Kyoto Protocol for 2013** | – | – | – | – |
| AR | NO | – | – | NO |
| Deforestation | NO | – | – | NO |
| **FM and elected activities under Article 3, paragraph 4, of the Kyoto Protocol for 2013** | – | – | – | – |
| FM | NO | – | – | NO |

[a] The Party did not report indirect $CO_2$ emissions in CRF table 6.

# Annex III

## Additional information to support findings in table 2 in this report

### Missing categories that may affect completeness

The categories for which methods are included in the 2006 IPCC Guidelines that were reported as "NE" or for which the ERT otherwise determined that there may be an issue with the completeness of reporting in the Party's inventory are the following:

(a) 1.A.3.b.iii heavy-duty trucks and buses ($CO_2$, $CH_4$ and $N_2O$) (see ID# E.21 in table 5 in this report);

(b) 1.A.4.a commercial/institutional ($CO_2$, $CH_4$ and $N_2O$) (see ID# E.22 in table 5 in this report).

# Annex IV

## Reference documents

### A. Reports of the Intergovernmental Panel on Climate Change

IPCC. 2000. *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories*. J Penman, D Kruger, I Galbally, et al. (eds.). Hayama, Japan: IPCC/Organisation for Economic Co-operation and Development/International Energy Agency/Institute for Global Environmental Strategies. Available at http://www.ipcc-nggip.iges.or.jp/public/gp/english/.

IPCC. 2006. *2006 IPCC Guidelines for National Greenhouse Gas Inventories*. S Eggleston, L Buendia, K Miwa, et al. (eds.). Hayama, Japan: Institute for Global Environmental Strategies. Available at http://www.ipcc-nggip.iges.or.jp/public/2006gl.

IPCC. 2019. *2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories*. E Calvo, K Tanabe, A Kranjc, J Baasansuren, M Fukuda, S Ngarize, A Osako, Y Pyrozhenko, P Shermanau, S Federici (eds). Hayama, Japan: Institute for Global Environmental Strategies. Available at https://www.ipcc-nggip.iges.or.jp/public/2019rf/index.html.

IPCC. 2014. *2013 Revised Supplementary Methods and Good Practice Guidance Arising from the Kyoto Protocol*. T Hiraishi, T Krug, K Tanabe, et al. (eds.). Hayama, Japan: Institute for Global Environmental Strategies. Available at http://www.ipcc-nggip.iges.or.jp/public/kpsg.

IPCC. 2014. *2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands*. T Hiraishi, T Krug, K Tanabe, et al. (eds.). Geneva: IPCC. Available at http://www.ipcc-nggip.iges.or.jp/public/wetlands/.

### B. UNFCCC documents

**Annual review reports**

Reports on the individual reviews of the 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015 and 2017 annual submissions of Monaco, contained in documents FCCC/ARR/2008/MCO, FCCC/ARR/2009/MCO, FCCC/ARR/2010/MCO, FCCC/ARR/2011/MCO, FCCC/ARR/2012/MCO, FCCC/ARR/2013/MCO, FCCC/ARR/2014/MCO, FCCC/ARR/2015/MCO and FCCC/ARR/2017/MCO, respectively.

**Other**

Aggregate information on greenhouse gas emissions by sources and removals by sinks for Parties included in Annex I to the Convention. Note by the secretariat. Available at https://unfccc.int/sites/default/files/resource/AGI%202019.pdf.

Annual status report for Monaco for 2019. Available at https://unfccc.int/documents/196293.

Compliance Committee document CC-2018-1-2/Monaco/EB. Available at https://unfccc.int/process-and-meetings/the-kyoto-protocol/compliance-under-the-kyoto-protocol/questions-of-implementation-monaco.

Compliance Committee document CC-2018-1-3/Monaco/EB. Available at https://unfccc.int/process-and-meetings/the-kyoto-protocol/compliance-under-the-kyoto-protocol/questions-of-implementation-monaco.

Compliance Committee document CC-2018-1-4/Monaco/EB. Available at https://unfccc.int/process-and-meetings/the-kyoto-protocol/compliance-under-the-kyoto-protocol/questions-of-implementation-monaco.

Compliance Committee document CC-2018-1-5/Monaco/EB. Available at https://unfccc.int/process-and-meetings/the-kyoto-protocol/compliance-under-the-kyoto-protocol/questions-of-implementation-monaco.

## C. Other documents used during the review

Responses to questions during the review were received from Jérémie Carles (Department of the Environment of Monaco), including additional material on the methodology and assumptions used. The following references are reproduced as received:

Customs and Indirect Taxes. 2016. Trouble-free Travel - What you need to know about French Customs, Directorate-General of Customs and Indirect Taxes, p.21. Available at https://franceintheus.org/IMG/pdf/trouble_free_travel_with_french_customs-2.pdf.

Reddy B, Ramesh S, Kumar Are A, Wani S, Ortiz R, Ceballos H, Sreedevi T. 2008. *Bio-fuel crops research for energy security and rural development in developing countries.* BioEnergy Research 1(3):248–258. Available at https://www.researchgate.net/publication/227089916_Bio-Fuel_Crops_Research_for_Energy_Security_and_Rural_Development_in_Developing_Countries.

SMEG. 2016. *Rapport dÁctivité 2015*. Available at https://en.calameo.com/read/004859724d300c42b411c.

SMEG. 2017. *Rapport dÁctivité 2016*. Available at https://en.calameo.com/read/004859724664ec92caded?authid=6QfBNSiwaGMs.

SMEG. 2018. *Rapport dÁctivité 2017*. Available at https://en.calameo.com/read/00485972452321cf78272.