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# Report on the individual review of the annual submission of Hungary 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 Hungary, 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 2 to 7 September 2019 in Bonn.

* 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* |
| 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" |
| CER | certified emission reduction |
| $C_f$ | combustion factor |
| $CH_4$ | methane |
| CM | cropland management |
| $CO_2$ | carbon dioxide |
| $CO_2$ eq | carbon dioxide equivalent |
| 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" |
| CPR | commitment period reserve |
| CP | commitment period of the Kyoto Protocol |
| CRF | common reporting format |
| DOM | dead organic matter |
| EF | emission factor |
| ERT | expert review team |
| ERU | emission reduction unit |
| EU | European Union |
| EU ETS | European Union Emissions Trading System |
| F-gas | fluorinated gas |
| FM | forest management |
| FMRL | forest management reference level |
| $Frac_{GasMS}$ | percentage of managed manure nitrogen for livestock category that volatilizes as ammonia and nitrogen oxides in the manure management system |
| $Frac_{Remove}$ | fraction of above-ground residues of crop removed |
| GE | gross energy intake |
| $G_{ef}$ | greenhouse gas-specific emission factor |
| GHG | greenhouse gas |
| GM | grazing land management |
| HFC | hydrofluorocarbon |
| HWP | harvested wood products |
| IE | included elsewhere |
| IEF | implied emission factor |
| IPCC | Intergovernmental Panel on Climate Change |
| IPPU | industrial processes and product use |
| KP-LULUCF activities | activities under Article 3, paragraphs 3–4, of the Kyoto Protocol |
| LULUCF | land use, land-use change and forestry |
| $M_B$ | mass of fuel available for combustion |
| N | nitrogen |
| $N_2O$ | nitrous oxide |
| NA | not applicable |
| NE | not estimated |

| | |
|---|---|
| $NF_3$ | nitrogen trifluoride |
| $NH_3$ | ammonia |
| NIR | national inventory report |
| NO | not occurring |
| $NO_X$ | nitrogen oxides |
| PFC | perfluorocarbon |
| QA/QC | quality assurance/quality control |
| RMU | removal unit |
| RV | revegetation |
| SEF | standard electronic format |
| $SF_6$ | sulfur hexafluoride |
| SOM | soil organic matter |
| SWDS | solid waste disposal site(s) |
| 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 Hungary 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 2 to 7 September 2019 in Bonn and was coordinated by Pedro Torres, Davor Vesligaj and Simon Wear (secretariat). Table 1 provides information on the composition of the ERT that conducted the review of Hungary.

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

| *Area of expertise* | *Name* | *Party* |
|---|---|---|
| Generalist | Mausami Desai | United States of America |
| | Hongwei Yang | China |
| Energy | Branca Americano | Brazil |
| | Kendal Blanco-Salas | Costa Rica |
| | Veronika Ginzburg | Russian Federation |
| IPPU | Ann Marie Ryan | Ireland |
| | Takuji Terakawa | Japan |
| | Qing Tong | China |
| Agriculture | Jorge Alvarez | Peru |
| | Jacques Kouazounde | Benin |
| LULUCF and KP-LULUCF activities | Thiago de Araújo Mendes | Brazil |
| | Atsuko Hayashi | Japan |
| | Igor Onopchuk | Ukraine |
| Waste | Takefumi Oda | Japan |
| | Gao Qingxian | China |
| Lead reviewers | Mausami Desai | |
| | Hongwei Yang | |

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 Hungary'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 Hungary resolve the findings related to issues,[2] including issues designated as problems.[3] Other findings, and, if applicable, the encouragements of the ERT to Hungary to resolve them, are also included.

[1] At the time of publication of this report, Hungary 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.

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

5. Annex I shows annual GHG emissions for Hungary, 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 Hungary, by gas, sector and activity.

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

# 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 Hungary**

| *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, 15 April 2019 (SEF-CP1-2018), 2 May 2019 (SEF-CP2-2018) | | |
| Review format | Centralized | | |
| 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 | I.7, A.13, L.7, L.18 |
| | (c) Development and selection of EFs? | Yes | E.6 |
| | (d) Collection and selection of AD? | Yes | I.5, I.10, I.12, L.12, L.16, L.18 |
| | (e) Reporting of recalculations? | No | |
| | (f) Reporting of a consistent time series? | Yes | E.2, E.7, E.8, I.12, I.12, W.7 |
| | (g) Reporting of uncertainties, including methodologies? | Yes | A.7 |
| | (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.11, A.9 |
| | (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? | Yes | |
| Description of trends | Did the ERT conclude that the description in the NIR of the trends for the different gases and sectors is reasonable? | Yes | |
| Supplementary information under | Have any issues been identified related to the following aspects of the national system: | | |

| *Assessment* | | | *Issue or problem ID#(s) in table 3 and/or 5[a]* |
|---|---|---|---|
| the Kyoto Protocol | (a) Overall organization of the national system, including the effectiveness and reliability of the institutional, procedural and legal arrangements? | No | |
| | (b) Performance of the national system functions? | No | |
| | Have any issues been identified related to the national registry: | | |
| | (a) Overall functioning of the national registry? | No | |
| | (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.1 |
| | (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? | No | |
| | (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? | Yes | |
| 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 | Hungary 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 | |

| *Assessment* | | | *Issue or problem ID#(s) in table 3 and/or 5[a]* |
|---|---|---|---|
| Questions of implementation | Did the ERT list any questions of implementation? | No | |

[a] The ERT identified additional issues and/or problems in the energy, IPPU, agriculture, LULUCF and waste 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 12 February 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 Hungary**

| *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, 2016) (G.1, 2015) (table 3, 2014) Completeness | Estimate and report the carbon stock changes and emissions/removals from all mandatory categories in the LULUCF sector. | Resolved. Hungary provided estimates of stock changes and emissions/removals from all mandatory categories in the LULUCF sector, including carbon stock changes as well as GHG emissions and removals from forest land (CRF table 4.A), cropland (CRF table 4.B), grassland (CRF table 4.C), wetlands (CRF table 4.D) and settlements (CRF table 4.E) that were previously reported as "NE". |
| G.2 | QA/QC and verification (G.2, 2017) (G.2, 2016) (G.2, 2015) (12, 2014) (16, 2013) Transparency | Include in the NIR all relevant information on QA activities carried out for the annual submission. | Resolved. As explained in section 1.7 of the NIR, Hungary provided information on existing QA activities such as the EU effort-sharing decision and Monitoring Mechanism Regulation reviews (not covering all emissions), International Organization for Standardization QA/QC procedures implemented by the Hungarian Meteorological Service and QA/QC cooperation with Czechia, Poland and Slovakia. |
| G.3 | QA/QC and verification (G.3, 2017) (G.3, 2016) (G.3, 2015) (12, 2014) Transparency | Include in the NIR a summary of the results of the QA activities carried out each year. | Resolved. Hungary provided information on the results of the QA activities and reviews of national emission inventories under the EU Monitoring Mechanism Regulation in annex 7 to the NIR. |
| G.4 | QA/QC and verification (G.4, 2017) (G.4, 2016) (G.4, 2015) (13, | Revise the QA/QC plan to clearly distinguish between QC checks (e.g. LULUCF sector checks, EU | Resolved. Hungary included a revised QA/QC plan in annex 5 to the NIR that differentiated between QC checks and QA procedures. |

[4] FCCC/ARR/2017/HUN. The ERT notes that the report on the individual inventory review of Hungary'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* |
|---|---|---|---|
| | 2014) Transparency | completeness checks) and QA procedures. | |
| G.5 | QA/QC and verification (G.6, 2017) Transparency | Improve the transparency of the NIR by including information on: how external QA results are taken into consideration in the national inventory development plan, for example, what measures are included in the EU review and how its results relating to Hungary are used to improve the inventory; and current as well as planned regional QA activities (expert peer review). | Resolved. Hungary provided additional information in section 1.7 of and annex 5 to the NIR on the QA/QC plan and application of external QA results (such as the EU review) in the preparation of the national GHG inventories. |
| Energy | | | |
| E.1 | 1.A Fuel combustion – sectoral approach – liquid fuels – $CO_2$, $CH_4$ and $N_2O$ (E.2, 2017) (E.16, 2016) (E.16, 2015) Accuracy | Correctly estimate all emissions from all fuels used for off-road vehicles and other machinery and allocate them to the relevant categories, and use the notation key "IE" for all such categories and fuels whose emissions are included elsewhere; as a first step, apply the IPCC tier 1 methodology for gasoline, diesel and biofuels for subcategories 1.A.2.g.vii, 1.A.3.e.ii, 1.A.4.b.ii and 1.A.4.c.ii for all years, treating emissions from agriculture and forestry separately because different default EFs apply for machines using gasoline. If, because of the correct allocation of emissions as outlined above, non-$CO_2$ emissions from off-road vehicles becomes a key category, estimate and report these emissions by developing and implementing a higher-tier methodology, transparently describing the methodology used and any recalculations in the NIR. | Resolved. The Party calculated and allocated emissions from liquid fuels used in off-road vehicles to appropriate categories (1.A.2.g.vii and 1.A.4.b.ii) (see ID# E.11 in table 5) and reported the notation key "NO" for category 1.A.3.e.ii. |
| E.2 | 1.A.1 Energy industries – gaseous fuels – $CO_2$ (E.7, 2017) Consistency | Provide in future NIRs the country-specific $CO_2$ EFs used to calculate emissions from natural gas consumption for the entire time series with a description of how time-series consistency is ensured. | Addressing. The Party explained that it has started cooperating with the authority in charge of EU ETS data, to enable the Party to access the EU ETS database with information regarding EFs at the plant level. This information will help Hungary to develop country-specific $CO_2$ EFs for natural gas, as well as to analyse time-series consistency. |
| E.3 | 1.A.2.g Other (manufacturing industries and construction) – all fuels – $CO_2$, $CH_4$ and $N_2O$ (E.8, 2017) Comparability | Use the results of the information gathered from 'auto producers', including the information on the proportion of fuel consumed by 'auto producers', and allocate the emissions from 'auto producers' under the sector where they were generated, in accordance with the methods in the 2006 IPCC Guidelines. | Addressing. Hungary has allocated part of its emissions from auto producers, for iron and steel, to the corresponding sector. However, some of the emissions from auto producers are still allocated outside the sector in which they were generated, namely in other stationary combustion (1.A.2.g), which is not the allocation recommended in the 2006 IPCC Guidelines. |

| *ID#* | *Issue and/or problem classification*[a, b] | *Recommendation made in previous review report* | *ERT assessment and rationale* |
|---|---|---|---|
| E.4 | 1.A.3.b Road transportation – all fuels – $CH_4$ and $N_2O$ (E.4, 2017) (E.14, 2016) (E.14, 2015) Consistency | Recalculate the non-$CO_2$ emissions from road transport using the same version of the COPERT model for the entire time series, while also resolving the remaining inconsistencies in the underlying databases. | Resolved. Hungary recalculated the non-$CO_2$ emissions and explained in the NIR (section 3.2.7.2) that it is using the COPERT 5 model for the entire time series. |
| E.5 | 1.A.3.c Railways – solid and liquid fuels – $CO_2$, $CH_4$ and $N_2O$ (E.9, 2017) Transparency | Report in the NIR the EFs used to estimate the emissions from railways. | Addressing. The Party reported only $CO_2$ EFs in the NIR (section 3.2.7.2) and did not report non-$CO_2$ EFs ($CH_4$ and $N_2O$). During the review, Hungary explained that it had only added information on $CO_2$ emissions since the last annual submission. |
| E.6 | 1.A.3.c Railways – solid and liquid fuels – $CO_2$ (E.10, 2017) Accuracy | Develop country-specific EFs for all fuels to estimate $CO_2$ emissions from this category. | Not resolved. The Party explained that it had not yet developed country-specific EFs for $CO_2$ emissions from railways but was planning to do so for future annual submissions. |
| IPPU | | | |
| I.1 | 2.A.1 Cement production – $CO_2$ (I.3, 2017) (I.9, 2016) (I.9, 2015) Transparency | Use the good practice data splicing technique given in the 2006 IPCC Guidelines (e.g. the overlap technique or surrogate data), as appropriate for Hungary's national circumstances, to fill data gaps in the time series of the $CO_2$ IEF for the period before 2005; recalculate $CO_2$ emissions based on the revised $CO_2$ IEF for that period; and include transparent information in the NIR on the estimation methodology. | Addressing. The ERT considers that the data gaps in the time series have been resolved based on the clear information provided by the Party to explain why the average IEF was not used. However, the ERT notes that the description of the methodology for estimating emissions for 1985–2004 is not sufficiently transparent and this is not yet resolved. The current description in the NIR (p.109) refers to tier 2 for 1985–2001 and tier 3 for 2002–2016, but it states in section 4.3.1.2 of the NIR that tier 3 has been applied to 2005–2017 and tier 2 has been applied to 1985–2004. During the review, Hungary explained that it considered the methodology applied to 1985–2004 to be tier 3. The ERT considers that the previous recommendation could be resolved by outlining, in a structured way, the key elements of the methodology used, and the assumptions made for the period before 2005, as outlined during the review. |
| I.2 | 2.A.3 Glass production – $CO_2$ (I.10, 2017) Accuracy | Complete the research and obtain correct AD for the latest years to calculate the estimates of $CO_2$ emissions from glass production, if appropriate. | Resolved. Research was completed, and the results are described in section 4.3.3 of the NIR. Estimates of $CO_2$ emissions from glass production were recalculated using the amount of glass manufactured as AD. |
| I.3 | 2.A.4 Other process uses of carbonates – $CO_2$ (I.4, 2017) (I.7, 2016) (I.7, 2015) (41, 2014) Accuracy | Carry out the planned investigation regarding the assumption underpinning the addition of 10 per cent to the data reported under the EU ETS for 2005 and onwards, as well as the use of the 10 per cent higher EF for 1985–2004 to account for bricks and ceramics manufacturers not included in the EU ETS and improve the estimates accordingly to ensure time-series consistency. | Resolved. The Party has investigated the assumption regarding the addition of 10 per cent to the data reported under the EU ETS and its findings are described in section 4.3.4 and chapter 10 of the NIR. The investigation concluded that the method used was not appropriate and the 10 per cent higher IEF was replaced by an IEF derived from the EU ETS reports for each type of glass product. The non-EU ETS part of glass production was recalculated for the 2005–2016 period. However, a time-series consistency issue was identified as part of the investigation and this in included in table 5 (see ID# I.12). |

| *ID#* | *Issue and/or problem classification*[a, b] | *Recommendation made in previous review report* | *ERT assessment and rationale* |
|---|---|---|---|
| I.4 | 2.B.1 $NH_3$ production – $CO_2$ (I.11, 2017) Transparency | Explain transparently in the NIR why the emissions from hydrogen production are reported under the category $NH_3$ production. | Resolved. An explanation is provided in section 4.4.1.1 of the NIR. |
| I.5 | 2.F.1 Refrigeration and air conditioning – HFCs and PFCs (I.7, 2017) (I.8, 2016) (I.8, 2015) (42, 2014) (62, 2013) Accuracy | Make efforts to collect relevant data from companies and develop a country-specific value for recovery efficiency for refrigeration and air-conditioning equipment and include all the information related to the estimation of disposal emissions in the NIR. | Addressing. During the review, Hungary explained that there is a national project in progress at the National Climate Protection Authority to improve the F-gases inventory, but that the project, commissioned by the Ministry for Innovation and Technology as the ministry responsible for climate policy in Hungary, had not been successful in 2018. The project had been relaunched in 2019 and was expected to complete successfully by the end of the year. More detailed data from the Hungarian F-gases database, which is managed by the National Climate Protection Authority, will be available for the 2020 annual submission, so that a country-specific value for recovery efficiency for refrigeration and air-conditioning equipment can be included. |
| I.6 | 2.F.1 Refrigeration and air conditioning – HFCs and PFCs (I.8, 2017) (I.12, 2016) (I.11, 2015) Accuracy | Recalculate the F-gas emissions from refrigeration and air conditioning by replacing the extrapolated HFC and PFC AD for 2014 with actual data. | Resolved. Annual sales data were obtained and used to replace the extrapolated AD for 2014. It is explained in section 4.9.1.5 of the 2018 NIR on recalculations that the sales data became available in time for the 2018 annual submission. |
| I.7 | 2.F.1 Refrigeration and air conditioning – HFCs and PFCs (I.12, 2017) Accuracy | Implement a tier 2 method to estimate the emissions of F-gases from refrigeration and air conditioning. | Addressing. Hungary has implemented a bottom-up tier 2 method for categories 2.F.1.b and 2.F.1.e and described this in sections 4.9.1.2.2 and 4.9.1.2.3 of the NIR. However, the other sub-applications are calculated using a tier 1 method. During the review, Hungary explained that a tier 2 method would be used for the other four sub-applications for the next annual submission. The Party explained that the tier 2 method would be a top-down method based on chemical sales for industrial, commercial and transport refrigeration. Equipment market data would be used to calculate emissions from the use of stationary air conditioners. |
| I.8 | 2.F.1 Refrigeration and air conditioning – HFCs and PFCs (I.13, 2017) Accuracy | Include emissions from F-gases imported and exported in bulk, and imported and exported contained in equipment, for the subcategories commercial refrigeration, domestic refrigeration, industrial refrigeration, transport refrigeration, mobile air conditioning and stationary air conditioning, providing all necessary explanations of the methodologies EFs and assumptions used. | Resolved. Hungary has included emissions from F-gases imported in bulk and imported, and exported contained in equipment for commercial refrigeration, domestic refrigeration, industrial refrigeration, transport refrigeration, mobile air conditioning and stationary air conditioning. Hungary has included a description of the methodologies and assumptions used in section 4.9.1.2.1 of the NIR. |
| I.9 | 2.G.1 Electrical equipment – $SF_6$ | Obtain annual sales data for 2014 to replace the interpolated data for 2014 if the data of that year are | Resolved. Annual sales data were obtained and used to replace the 2014 data and the recalculation was explained in section 4.10.1.4 of the 2018 NIR. |

| ID# | Issue and/or problem classification[a, b] | Recommendation made in previous review report | ERT assessment and rationale |
|---|---|---|---|
| | (I.14, 2017) Accuracy | still not available for the next submission. | |
| I.10 | 2.G.2 $SF_6$ and PFCs from other product use – $SF_6$ (I.15, 2017) Accuracy | Obtain data on existing stocks of soundproof windows and estimate and report the $SF_6$ emissions from soundproof windows separately under this category. | Addressing. In response to a question raised by the ERT during the review, requesting a proposed time frame and method for including an estimate for this category, Hungary has given an outline of the planned methodology and stated that it will attempt to include an estimate in the next annual submission. If this is not possible, the Party plans to provide an update on progress in the 2020 NIR and to include an estimate of the emissions in the 2021 annual submission. The ERT believes that future ERTs should consider this issue further to ensure that there is not an underestimate of emissions from this category. |
| Agriculture | | | |
| A.1 | 3.B.5 Indirect $N_2O$ emissions – $N_2O$ (A.13, 2017) Transparency | Include more detailed information in the NIR on how the value for $Frac_{GasMS}$ was developed. | Resolved. Hungary reported in section 5.3.2.5 of the NIR that the country-specific values of $Frac_{GasMS}$ were calculated as a fraction of the total N volatilized and the managed manure N. In the NIR, Hungary provided a new table (table 5.3.17) containing volatilized N as $NH_3$ and $NO_X$ from manure management systems for 1990–2017 reported to the United Nations Economic Commission for Europe under the Convention on Long-range Transboundary Air Pollution and the estimated country-specific values of $Frac_{GasMS}$. Hungary also added table 5.3.16 to demonstrate how the total N volatilized as $NH_3$ and $NO_X$ from manure management systems was calculated for 2017 based on the N volatilized as $NH_3$ and $NO_X$ from manure management for each type of livestock. |
| A.2 | 3.D.a.4 Crop residues – $N_2O$ (A.14, 2017) Transparency | Justify the application of $Frac_{Remove}$ by documenting the data source and explaining how the data were obtained for the estimates of $Frac_{Remove}$ and provide a time series of $Frac_{Remove}$ values in the NIR. | Resolved. Hungary provided information in section 5.5.2.1.4 of the 2019 NIR on the derivation of the value of $Frac_{Remove}$. Hungary explained that the value of $Frac_{Remove}$ was calculated from the N content of straw used for bedding divided by the sum of the N content of the above-ground biomass of grain crops for which straw is used for bedding (wheat, barley, rye and oats). In the NIR, the Party provided data, indicating their source, used for the calculations to estimate N in bedding materials in table 5.5.3. The Party also provided N input from bedding materials and N content of above-ground biomass of grain crops used as bedding material in table 5.5.4, which also contains a summary of the time series of $Frac_{Remove}$ values for the base year and 1990–2017. |
| A.3 | 3.D.a.5 Mineralization/ immobilization associated with loss/gain of SOM – $N_2O$ (A.15, 2017) Transparency | Provide the source of the AD for N mineralization associated with loss of SOM and the tier of the methodology used in the NIR. | Addressing. Hungary explained in section 5.5.2.1.5 of the NIR that carbon losses calculated in the LULUCF sector based on the detailed land-use matrices were used as AD to calculate the N losses owing to mineralization and referred to section 6.6.2 of the NIR and CRF table 4.B.1. The ERT noted that the source of the AD for N mineralization associated with |

| *ID#* | *Issue and/or problem classification*[a, b] | *Recommendation made in previous review report* | *ERT assessment and rationale* |
|---|---|---|---|
| | | | loss of SOM is provided under the LULUCF sector in the NIR. In response to a question from the ERT regarding where the tier of the method used was reported in the NIR, the Party indicated that the use of disaggregated land-use categories under category 4.B.1 (cropland remaining cropland) in the calculation meets the requirement of a tier 2 methodology, which is not reported in the NIR by Hungary. |
| A.4 | 3.D.b.2 N leaching and run-off – $N_2O$ (A.10, 2017) (A.14, 2016) (A.14, 2015) Transparency | Include the QA/QC process and verification information for the model used to classify areas into leaching and non-leaching areas (e.g. scientific papers or measurement data, comparison with other countries, comparison with other estimates such as those based on soil type and/or crop type) in the NIR. | Resolved. The previous ERT acknowledged that Hungary provided QA/QC information in the 2017 NIR but did not consider the fraction of N in crop residues in the equation in the QA/QC section of the NIR which covers $N_2O$ emissions from leaching and run-off from soil. In the 2019 NIR (section 5.5.2.1.5), Hungary included the fraction of N in crop residues in the calculations of indirect $N_2O$ emissions from leaching and run-off. |
| LULUCF | | | |
| L.1 | 4. General (LULUCF) $CO_2$, $CH_4$ and $N_2O$ (L.5, 2017) Transparency | Include the following improvements in the NIR: correct the incorrect values for the non-set-aside grassland area in the land-use matrix table (table 6.3.6 in the 2017 NIR); and correct the description of how the biomass before conversion value used for the biomass carbon stock change estimate for land converted to settlements was derived. | Addressing. The Party has corrected the values for the non-set-aside grassland area in the land-use matrix table (table 6.3.6). The ERT noted that the description of the biomass before conversion value had not been revised (NIR, section 6.9.3.2.1). During the review, the Party explained that the methodology used, with reference to section 6.9.3.2 of the NIR, under which both cropland and grassland converted to settlements were included under cropland converted to settlements, needs to be revised. |
| L.2 | 4. General (LULUCF) $CO_2$, $CH_4$ and $N_2O$ (L.6, 2017) Transparency | Justify in the NIR, both qualitatively and quantitatively (for example in the form of a table), that the total national aggregate of estimated emissions for all gases and categories considered insignificant shall remain below 0.1 per cent of the national total GHG emissions, in accordance with paragraph 37(b) of the UNFCCC Annex I inventory reporting guidelines. | Resolved. The Party has estimated the emissions and removals previously reported as "NE" (see ID#s L.3 and L.8 below). |
| L.3 | 4.A.2 Land converted to forest land – $CO_2$ (L.7, 2017) Transparency | Either include the estimate of the carbon stock changes in litter and deadwood in wetlands converted to forest land and deadwood in settlements converted to forest land or provide information, in the NIR, confirming that these removals meet the threshold of insignificant in line with the procedure set out in paragraph 37(b) of the UNFCCC Annex I inventory reporting guidelines. | Resolved. The Party has estimated the carbon stock changes both in litter and deadwood in wetlands converted to forest land, and deadwood in settlements converted to forest land since the 2018 annual submission. The Party also provided the estimation methods in the NIR (section 6.5.5.2.2). |
| L.4 | 4.C.1 Grassland remaining grassland – $CO_2$ (L.8, 2017) | Modify the notation key of living biomass pool to "NA". | Not resolved. Although the Party was recommended to change the notation key from "NO" to "NA" for the carbon stock change in biomass in grassland remaining grassland, the |

| ID# | Issue and/or problem classification[a, b] | Recommendation made in previous review report | ERT assessment and rationale |
|---|---|---|---|
| | Convention reporting adherence | | Party has still used the notation key "NO" for its reporting of this category, both in table 6.7.1 of the NIR and in CRF table 4.C. |
| L.5 | 4.D.1 Wetlands remaining wetlands – $CO_2$ (L.9, 2017) Transparency | If Hungary estimates the country-specific carbon stock changes for its lands for which the standard land-use categories based on the 2006 IPCC Guidelines (e.g. peat extraction and flooded land remaining flooded land) are not applicable, for instance the mineral soil carbon stock changes under wetlands remaining wetlands with grass vegetation, the Party to examine the ways to report the carbon stock changes in such lands under "other wetlands" with a notification in the documentation box or in the comment box in the CRF tables, together with a clear explanation in the relevant section of the NIR of where in the CRF tables the emissions from those lands are reported. | Addressing. The ERT noted that the Party changed its reporting for the subcategory mineral soil carbon stock change with wet grassland conditions under wetlands remaining wetlands. However, the same figures were also reported under net carbon stock change in mineral soils under flooded land remaining flooded land and net carbon stock change in mineral soils under other wetlands remaining other wetlands. Further, there was no notification in the documentation box or any explanation in the NIR regarding this change. |
| L.6 | 4.D.1.1 Peat extraction remaining peat extraction – $CO_2$, $CH_4$ and $N_2O$ (L.11, 2017) Transparency | Provide information on the method used, along with the AD and EFs applied, to estimate nutrient-rich and nutrient-poor organic soils under peat extraction. | Resolved. The Party provided a methodology in the NIR (section 6.8.2.1) to differentiate between nutrient-rich and nutrient-poor organic soils by using a database that classifies the type of organic material in soil. |
| L.7 | 4(II) Emissions and removals from drainage and rewetting and other management of organic/mineral soils – $CO_2$ (L.13, 2017) Accuracy | Correct the reporting of $CO_2$ emissions from peat extraction in CRF table 4(II) and provide the correct value or a notation key. | Addressing. Hungary has not explained why the values of $CO_2$ emissions from peat extraction are disproportionally high in CRF table 4(II), although the Party corrected errors in values in the 2018 annual submission (this issue is discussed under ID# L.18 in table 5). |
| L.8 | 4(IV) Indirect $N_2O$ emissions from managed soils – $N_2O$ (L.14, 2017) Completeness | Include the estimate of indirect $N_2O$ emissions from leaching and run-off relating to N mineralization associated with loss of SOM resulting from land converted to forest land, land converted to cropland and land converted to settlements. | Resolved. The Party has included these indirect $N_2O$ emissions in CRF table 4(IV) and provided the related explanation in the NIR (section 6.4.2). |
| L.9 | 4(V) Biomass burning – $CH_4$ and $N_2O$ (L.15, 2017) Transparency | Provide category-specific information on the following parameters used for the estimates of biomass burning in cropland ($C_f$ and $G_{ef}$) and grassland ($M_B$, $C_f$ and $G_{ef}$), as appropriate based on the information provided by the Party during the review. | Resolved. Hungary provided additional information on the parameters used for the estimates of biomass burning in cropland ($C_f$ and $G_{ef}$) in section 6.6.2.4 and in grassland ($M_B$, $C_f$ and $G_{ef}$) in section 6.7.2.4 of the NIR. |
| Waste | | | |
| W.1 | 5.A Solid waste disposal on land – | Include information on the amount of sludge disposed in the landfill | Resolved. The amounts of disposed sludge are shown in figure 7.2.4 of the NIR, together with |

| ID# | Issue and/or problem classification[a, b] | Recommendation made in previous review report | ERT assessment and rationale |
|---|---|---|---|
| | $CH_4$<br>(W.8, 2017)<br>Transparency | sites in the NIR in order to ensure the consistency between the data provided in the NIR and the emissions reported in CRF table 5.A. | those of other waste types (e.g. food, paper and wood). The total amounts of disposed waste in figure 7.2.4 are consistent with those in CRF table 5.A. |
| W.2 | 5.A.1 Managed waste disposal sites – $CH_4$<br>(W.9, 2017)<br>Transparency | Provide, in the NIR, information on how Hungary uses information contained in the Waste Management Information System to determine the amount of waste by type and by treatment for purposes of the GHG inventory calculations and the assumptions used in the procedure. | Resolved. Chapter 7.2.2 of the NIR provides detailed information on how the amounts of waste are determined and used in the GHG inventory calculations. |
| W.3 | 5.A.2 Unmanaged waste disposal sites – $CH_4$<br>(W.10, 2017)<br>Transparency | Clarify in the NIR both the reason for choosing the notation key "IE" to report unmanaged waste disposal sites and where the emissions are reported, for the whole time series. | Resolved. The explanation related to the notation key "IE" for unmanaged waste disposal sites is provided in section 7.2.2 (p.428) of the NIR and CRF table 9. |
| W.4 | 5.C.1 Waste incineration – $CO_2$<br>(W.11, 2017)<br>Transparency | Include in the NIR an explanation of how the Party determined the amount of non-biogenic waste incinerated, to make the information in the NIR and the CRF tables consistent. | Resolved. Hungary reported the emissions from four waste types (liquid, clinical, hazardous and industrial solid waste) separately in CRF table 5.C to ensure that the information in section 7.4.2 of the NIR and in the CRF tables is consistent. The Party also explained in the NIR (section 7.4.2) the data sources used and assumptions made to derive the carbon content and fossil fraction of the incinerated waste. |
| W.5 | 5.D Wastewater treatment and discharge – $CH_4$<br>(W.3, 2017) (W.7, 2016) (W.7, 2015)<br>Transparency | Improve the transparency of the description of the calculation for $CH_4$ recovery in the NIR by including an explanation on the amount of $CH_4$ flared and by adding a new column for $CH_4$ recovery from biogas production. | Not resolved. During the review, Hungary explained that this issue has not yet been resolved. |
| W.6 | 5.D Wastewater treatment and discharge – $CH_4$ and $N_2O$<br>(W.6, 2017)<br>Transparency | Provide detailed information in the NIR on any recalculations performed since the previous submission, including all reasons and justification(s) for the recalculations and the effect of the changes. | Resolved. In the 2018 annual submission, Hungary provided detailed information on recalculations for changes that occurred in relation to AD (e.g. shares of the different treatments), an update of AD for 2014 and 2015, and the effects of those changes. There were no recalculations for this category in the 2019 annual submission. |
| W.7 | 5.D Wastewater treatment and discharge – $CH_4$ and $N_2O$<br>(W.7, 2017)<br>Consistency | Demonstrate in the NIR that the application of two different methods for the share of the volume of water treated in different ways results in a consistent time series and, if this is not possible, update the method to ensure a consistent time series, considering the methods contained in the 2006 IPCC Guidelines (vol. 1, chap. 5). | Not resolved. The demonstration was not included in the NIR, and the methodology also remained unchanged. During the review, Hungary explained that this issue has been addressed by using the same data source for the share of the volume of wastewater treated in different ways. However, the meaning of the "same data source" remains unclear; it is not clear whether the coverage of the data for the two time periods (1990–2011 and 2012 onward) is consistent. |
| W.8 | 5.D.1 Domestic wastewater – $CH_4$<br>(W.5, 2017) (W.9, | Include the share (per cent) of untreated wastewater in table 7.5.3 of the NIR. | Resolved. The share of untreated wastewater is included in figure 7.5.1 of the NIR and presented as a percentage. |

| ID# | Issue and/or problem classification[a, b] | Recommendation made in previous review report | ERT assessment and rationale |
|---|---|---|---|
| | 2016) (W.9, 2015) Transparency | | |
| KP-LULUCF activities | | | |
| KL.1 | HWP – $CO_2$ (KL.5, 2017) Yes. Transparency | Improve the explanation of the methods for estimating and accounting HWP, considering the following points:<br>(a) Provide accurate information on the treatment of emissions from HWP originating from forests prior to the start of the second commitment period and describe how these emissions are included in the accounting (see decision 2/CMP.8, annex II, para. 2(g)(iii));<br>(b) Provide further methodological information on how the emissions from HWP already accounted for during the first commitment period based on instantaneous oxidation were excluded. The emissions estimated based on the first-order decay method occurred from wood harvested in previous years and so explaining that emissions occurred only in the second commitment period does not prove the exclusion of emissions that are already accounted as instantaneous oxidation during the first commitment period (see decision 2/CMP.8, annex II, para. 2(g)(iv)). | (a) Addressing. Hungary included descriptions to explain how it treated the emissions/stocks from HWP removed from forests prior to the start of the second commitment period (NIR, section 11.5.2.5). The Party explained that estimates of the emissions/stocks from the HWP pool from harvests before the start of the second commitment period were included in both the FMRL and the annual estimates, so the values were offset in the accounting quantities for KP-LULUCF activities. The Party's explanation implies that this treatment of estimation should be considered as a situation where "the Party is choosing not to account for the emissions from HWP originating from forests prior to the start of the second commitment period". The ERT considers that Hungary's situation is not consistent with decision 2/CMP.7, annex, paragraph 16, as excluding a result because it is offset is not the same situation as not being included in the calculation from the beginning.<br>Optionally, the ERT notes that if the FMRL is based on a projection, then, under decision 2/CMP.7, annex, paragraph 16, a Party could choose not to account for the emissions from HWP originating from forests prior to the start of the second commitment period;<br>(b) Not resolved. The estimation of emissions from HWP already accounted for during the first commitment period based on instantaneous oxidation was excluded by the offset, as the estimation was assumed to be included in the FMRL and the annual estimates. |
| KL.2 | $N_2O$ emissions from N mineralization/ immobilization due to carbon loss/gain associated with land-use conversions and management change in mineral soils – $N_2O$ (KL.6, 2017) Yes. Completeness | Include the estimates of indirect $N_2O$ emissions from leaching and run-off relating to N mineralization associated with loss of SOM resulting from activities under Article 3, paragraph 3, of the Kyoto Protocol. | Resolved. The Party has included its estimates in CRF table 4(KP-II)3 and provided a description of the methodology used in section 6.4.2 of its NIR. |

[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 Hungary 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 Hungary, and have not been addressed by the Party.

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

| *ID#* | *Previous recommendation for the issue identified* | *Number of successive reviews issue not addressed*[a] |
|---|---|---|
| General | No issues identified | |
| Energy | No issues identified | |
| IPPU | | |
| I.1 | Use the good practice data splicing technique given in the 2006 IPCC Guidelines (e.g. the overlap technique or surrogate data), as appropriate for Hungary's national circumstances, to fill data gaps in the time series of the $CO_2$ IEF for the period before 2005; recalculate $CO_2$ emissions based on the revised $CO_2$ IEF for that period; and include transparent information in the NIR on the estimation methodology | 3 (2015/2016–2019) |
| I.5 | Make efforts to collect relevant data from companies and develop a country-specific value for recovery efficiency for refrigeration and air-conditioning equipment and include all the information related to the estimation of disposal emissions in the NIR | 5 (2013–2019) |
| Agriculture | No issues identified | |
| Waste | | |
| W.5 | Improve the transparency of the description of the calculation for $CH_4$ recovery in the NIR by including an explanation on the amount of $CH_4$ flared and by adding a new column for $CH_4$ recovery from biogas production | 3 (2015/2016–2019) |
| KP-LULUCF activities | No issues identified | |

[a] The report on the review of the 2018 annual submission of Hungary has not yet been published. Therefore, 2018 was not included when counting the number of successive years in table 4. As the reviews of the Party's 2015 and 2016 annual submissions were conducted together, they are not considered successive and 2015/2016 is considered as one year.

# 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 Hungary that are additional to those identified in table 3.

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

| *ID#* | *Finding classification* | *Description of the finding with recommendation or encouragement* | *Is finding an issue and/or a problem?*[a] |
|---|---|---|---|
| General | | | |
| G.6 | NIR | The ERT noted that the NIR could be improved by organizing the text in a more reader-friendly format to avoid fragmentation of information across different parts and sections and presenting various pieces of information together but without a summative sentence. The ERT further noted that headings for Part I and the annexes were missing from the table of contents. During the review, in response to questions raised by the ERT, Hungary confirmed that it will manually add the annexes to the table of contents and then submit a report where all necessary information can easily be found.<br>The ERT encourages Hungary to improve the NIR text further, for example by using more structured text that highlights the key elements of the UNFCCC Annex I inventory reporting guidelines and including headings for Part I and the annexes in the table of contents. | Not an issue/problem |
| G.7 | Kyoto Protocol units | Hungary provided information on the calculation of the CPR using Mg $CO_2$ eq as the unit in the NIR (section 12.1).<br>Noting that Mg $CO_2$ eq is equal to t $CO_2$ eq, the ERT encourages Hungary to use t $CO_2$ eq as the unit for CPR in the NIR (section 12.1), which is consistent with the unit used in the initial review report contained in document FCCC/IRR/2016/HUN. | Not an issue/problem |
| Energy | | | |
| E.7 | 1.A.3.b.ii Light-duty trucks – gasoline – $N_2O$ | The ERT identified that significant inter-annual changes occurred in the $N_2O$ IEF for gasoline used in light-duty trucks (1.A.3.b.ii) during the period 1997–1999 but were not explained in the NIR.<br>The variations were 181.5 per cent from 1996 to 1997, 29.1 per cent from 1997 to 1998 and –60.6 per cent from 1998 to 1999, with figures showing a stable trend after 2000. The ERT further noted that the fluctuation of the IEF in 1997–1999 appeared after the emissions were recalculated for the 2019 annual submission, while the trend in the previous submission was more stable for these years.<br>During the review, the Party explained that technological changes in the fleet and the fuels were responsible for the variations in $N_2O$ emissions. The Party also explained that the emissions are calculated using the COPERT 5 model, a complex model that uses a large database. A worksheet with outputs from the COPERT 5 model containing many EFs for different vehicle models for different years was provided to the ERT. However, the ERT considers that technological changes cannot explain the peak that occurred in 1997–1999.<br>The ERT recommends that Hungary review the reasons for the inter-annual changes in the IEF for 1997–1999 and revise its estimates, if appropriate, or provide a justification for the trend in the IEF in its NIR. | Yes. Consistency |
| E.8 | 1.A.3.b.iii Heavy-duty trucks and buses – diesel – $N_2O$ | The ERT identified that the $N_2O$ IEFs for diesel used in heavy-duty trucks and buses (1.A.3.b.iii were relatively stable from 1990 to 1999 (2.72 t $N_2O$/TJ). However, from 2000 to 2009 the IEF dropped by 51 per cent to 1.4 t $N_2O$/TJ, followed by a reverse in the trend (i.e. the IEF increased by 119 per cent from 2010 to 2016 (3.06 t $N_2O$/TJ)). | Yes. Consistency |

| *ID#* | *Finding classification* | *Description of the finding with recommendation or encouragement* | *Is finding an issue and/or a problem?*[a] |
|---|---|---|---|
| | | During the review, the Party provided the explanation in ID# E.7 above. However, the ERT considers that technological changes cannot explain the drop and the subsequent increase in the IEF that occurred in 2000–2016.<br>The ERT recommends that Hungary explain the inter-annual changes in the IEF for 2000–2017 or revise its estimates, if appropriate, or provide a justification for the trend in the IEF in its NIR. | |
| E.9 | 1.A.4.b Residential – biomass – $CO_2$, $CH_4$ and $N_2O$ | The ERT noted that in CRF table 1.A(a), biomass consumption for category 1.A.4.b.ii (off-road vehicles and other machinery) and the related emissions were reported as "IE". However, there is no explanation in CRF table 9 or in the NIR as to where these emissions were allocated.<br>The ERT recommends that the Party include an explanation in CRF table 9 and in the NIR of where emissions from off-road vehicles and other machinery (1.A.4.b.ii) are included. | Yes. Transparency |
| E.10 | 1.A.4.b Residential – natural gas and biomass – $CO_2$, $CH_4$ and $N_2O$ | The ERT noted that the gaseous fuel consumption trend variation in the residential sector (figure 3.2.23 in the NIR) seemed to be much more closely correlated to heating degree days than to the behaviour change among consumers as stated in the NIR (section 3.2.8.2). During the review, the Party provided the ERT with additional explanations regarding the many reasons for gaseous fuel consumption variation in the residential sector. The Party also explained how natural gas and biomass are complementary, and how relative prices are correlated to respective consumption.<br>The ERT recommends that Hungary provide further information on the reasons for the trends in natural gas and biomass used in the NIR, including regarding the impacts of the relative prices of these fuels on their consumption. | Yes. Transparency |
| E.11 | 1.A.4.b.ii Residential – liquid fuels – $CO_2$, $CH_4$ and $N_2O$ | The ERT noted that $CO_2$ emissions from the category off-road vehicles and other machinery (1.A.4.b.ii ) were constant (see ID# E.1 in table 3). During the review, the Party explained that off-road emissions from the residential sector are constant because the method applied assumed that the number of households remained constant in Hungary for the entire time series.<br>The ERT believes that future ERTs should consider this issue further to ensure that there is not an underestimate of emissions from this category.<br>The ERT recommends that Hungary review its assumption that the number of households in Hungary is constant across the time series. If this assumption cannot be justified, the ERT recommends that the Party either revise its estimates or the assumption based on which the emissions are estimated to be constant. The ERT further recommends that the Party provide the result of the key category analysis for this subcategory that can justify the proposed approach. | Yes. Accuracy |
| IPPU | | | |
| I.11 | 2. General (IPPU) | Hungary reported the methods used under the category descriptions in the relevant category-specific sections of the NIR. Some examples of incorrect information on methods being used were identified during the review. For example, for cement production (2.A.1), tier 3 is given as the method in CRF Reporter for all years but the methodological description was not updated in the NIR. In section 4.3.1.1 of the NIR the Party states that tier 2 was used for the period 1985–2001 and tier 3 for the period 2002–2016. This issue was raised with the Party during the review. The Party responded that the correct method was reported in the CRF tables while the methodological description was not corrected in the 2019 NIR. | Yes. Convention reporting adherence |

| *ID#* | *Finding classification* | *Description of the finding with recommendation or encouragement* | *Is finding an issue and/or a problem?*[a] |
|---|---|---|---|
| | | The ERT recommends that Hungary ensure consistency between the methods reported in CRF table Summary 3 and in the NIR and encourages the Party to provide a disaggregated summary table of tier methods used in the NIR. | |
| I.12 | 2.A.4 Other process use of carbonates – $CO_2$ | Hungary explained in the NIR (section 4.3.4.2) that in its investigations to address ID# I.3 (see table 3) a time-series inconsistency was identified. In response to a question raised by the ERT during the review, Hungary stated that the inconsistency appears before 2003 and is due to AD units. The Party stated that no alternative data source is available and that the time-series inconsistency will be resolved using a mathematical method. This will ensure the accuracy of the estimates and time-series consistency.<br>The ERT recommends that Hungary resolve the time-series inconsistency related to AD for manufacturers of bricks and ceramics not included in the EU ETS using appropriate methods as described in the 2006 IPCC Guidelines. | Yes. Accuracy |
| I.13 | 2.E.1 Electronics industry – HFCs, PFCs, $SF_6$ and $NF_3$ | Hungary reported in the NIR (p.163) that emission sources of F-gases from the electronics industry were not identified, except for $SF_6$ emissions, which were reported only for 2001–2005. During the review, the ERT requested an explanation of how it had been determined that there were no other companies with emissions relevant to this category. Hungary explained that a survey of companies in this sector was conducted in 2014, through which it was determined that a single semiconductor manufacturing company was the only user of $SF_6$ in this sector, and only between 2001 and 2005. The Party also explained that the Hungarian Photovoltaic and Solar Collector Association had responded that no manufacturing of photovoltaic panels took place in Hungary and that although there was a company using technology for experimental solar cell slicing, F-gases were not used during the process.<br>The ERT recommends that Hungary include an explanation as to how it had determined that there were no other companies in this category with relevant F-gas emissions in the NIR, referring, for example, to the 2006 IPCC Guidelines (vol. 3, sections 6.2.3 and 6.2.4), to justify that completeness had been ensured. | Yes. Transparency |
| I.14 | 2.F.1 Refrigeration and air conditioning – HFCs | In CRF table 2(II).B-Hs2, Hungary reported a disposal loss factor of 100 per cent for domestic refrigeration (2.F.1.b). Section 4.9.1.2.2 of the NIR did not refer to, or explain, this factor. During the review, the ERT requested justification of this loss factor and evidence that there was no recovery or intentional disposal of HFCs from domestic refrigeration by hazardous waste incineration facilities in Hungary. The Party responded that a disposal loss factor of 100 per cent was used for domestic refrigeration to provide a conservative emission estimate from this category but that an effort would be made to estimate the value of this factor for the next annual submission based on a study on the success of an exchange programme for domestic refrigerators.<br>The ERT recommends that Hungary report in the NIR the outcome of the planned study on the success of an exchange programme for domestic refrigerators and implement a country-specific disposal factor in its inventory, if appropriate. | Yes. Transparency |
| I.15 | 2.F.1 Refrigeration and air conditioning – HFCs | Hungary reported in section 4.9.1.2.3 of the NIR regarding mobile air conditioning that emissions from buses and trains had been considered in the current annual submission for the first time. However, the methodology, assumptions and AD used for including these emissions were not described. During the review, the Party provided a description of the calculation methodology for buses and trains, and stated that this would be included in the next NIR. | 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 the Party include information on the methodology, AD sources and assumptions for calculating mobile air-conditioning emissions from buses and trains in the NIR. | |
| I.16 | 2.F.4 Aerosols – HFCs | The Party reported "NE" in CRF table 2(II).B-Hs2 for 2000–2017 for the amount filled into new manufactured products for other aerosols of HFC-134a and HFC-152a (2.F.4.b). Hungary also reported "NE" for 1992–2017 for the amount filled into new manufactured products for metered dose inhalers of HFC-134a (2.F.4.a). During the review, the Party explained that the use of the notation key "NE" had been incorrect, the correct notation key in all cases was "NO", and confirmed that this would be changed for the next annual submission. | Yes. Comparability |
| | | The ERT recommends that the Party review the use of the notation key "NE" for the amount filled into new manufactured products for the category other, HFC-134a and HFC-152a (2.F.4.b) and for metered dose inhalers of HFC-134a (2.F.4.a) for 1992–2017 and update the notation keys to "NO". | |
| Agriculture | | | |
| A.5 | 3.A Enteric fermentation – $CH_4$ | The ERT noted that the same values are reported for livestock population for 2016 as for 2017 in the NIR (table 5.2.1). It was also noted that the livestock population reported for 2017 in the NIR (table 5.2.1) differs from that reported in CRF table 3.As1. During the review, Hungary explained that the animal numbers reported in CRF table 3.As1 for 2016 and 2017 were correct, as shown by the data provided during the review. The Party also explained that the inconsistency between the NIR and the CRF tables regarding animal population reported for 2017 was due to an editorial error and had no effect on the reported emissions. | Yes. Accuracy |
| | | The ERT recommends that Hungary ensure consistency between table 5.2.1 in the NIR and CRF table 3.As1 when reporting livestock populations. | |
| A.6 | 3.A.1 Cattle – $CH_4$ | Hungary reported in table 5.2.4 of the NIR that equation 10.5 from the 2006 IPCC Guidelines was used to estimate the net energy for activity when estimating the GE for dairy cattle, but the ERT noted that equation 10.5 is in fact the equation for the net energy for activity for sheep. During the review, the Party indicated that this had been a typographical error. Hungary explained and demonstrated that the net energy for activity for cattle was calculated using equation 10.4, as provided for cattle in the 2006 IPCC Guidelines. | Yes. Convention reporting adherence |
| | | The ERT recommends that the Party correct the error identified in the NIR regarding the number of equations used to estimate the net energy for activity when estimating the GE for dairy cattle. | |
| A.7 | 3.A.1 Cattle – $CH_4$ | Hungary assumed the uncertainty of the country-specific $CH_4$ EF for dairy cattle at ±20 per cent in the NIR (p.234) but did not provide a rationale for this assumption. The ERT noted that, according to the 2006 IPCC Guidelines (vol. 4, section 10.3.4), in the absence of analysis of the uncertainty under the tier 2 method, the uncertainty under the tier 1 method should be used, which ranged from to ±30 to ±50 per cent. During the review, Hungary explained that section 10.3.4 of volume 4 of the 2006 IPCC Guidelines states that uncertainties of EFs estimated using the tier 2 method were likely to be in the order of ±20 per cent. The Party also added that the $CH_4$ EF for dairy cattle was estimated based on data for milk production and GE, for which uncertainties could be assumed to be less than ±3 per cent and ±10 per cent, respectively. Hungary explained that milk production data were readily available, and that the GE estimate was checked against cattle feeding requirements arising from the biology of ruminants (e.g. ratio of crude protein, dry matter intake and proportion of silage in the diet). | 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 Hungary provide in the NIR the assumptions underlying the uncertainty value of ±20 per cent associated with the country-specific $CH_4$ EF for dairy cattle. | |
| A.8 | 3.B Manure management – $N_2O$ | Hungary reported the EFs used in the inventory to estimate direct $N_2O$ emissions from manure management in table 5.3.15 of the NIR and stated in the NIR (p.243) that it had used default EFs from the 2006 IPCC Guidelines. However, the ERT noted that the values of $N_2O$ EFs used by Hungary in table 5.3.15 for a liquid system for cattle and swine differed from those provided in table 10.21 of volume 4 of the 2006 IPCC Guidelines. During the review, Hungary explained that the IPCC default $N_2O$ EFs for liquid manure "with natural crust cover" and liquid manure "without natural crust cover" provided in table 10.21 of the 2006 IPCC Guidelines were used to estimate $N_2O$ emissions for manure from cattle and swine managed in a liquid system and indicated that table 5.3.15 referred to the values of the $N_2O$ IEF. | Yes. Transparency |
| | | The ERT recommends that Hungary improve the transparency of the NIR by referencing the $N_2O$ EFs reported in table 5.3.15 accurately and by explaining any differences between those figures and the $N_2O$ EF for manure management from the 2006 IPCC Guidelines, for example by explaining that the values in NIR table 5.3.15 are IEFs based on the weighted averages of IPCC default EFs (table 10.21 of the 2006 IPCC Guidelines) for liquid manure "with natural crust cover" and liquid manure "without natural crust cover". | |
| A.9 | 3.B Manure management – $CH_4$ | The ERT noted that Hungary used the notation key "IE" in table 5.3.4 of the NIR to report cattle, poultry and swine manure allocated to anaerobic digesters for 2017. In CRF table 3.B(a), manure allocated to anaerobic digesters was reported as "IE" for cattle for the time series 2004–2017; "IE" for poultry for 2004 and 2005 and the period 2010–2017; and "IE" for swine for the period 2006–2017. The ERT could not find where in the NIR or CRF tables Hungary had reported emissions from manure allocated to anaerobic digesters, for which it had used the notation key "IE" in the tables mentioned above. During the review, Hungary explained that statistics on animal manure used in anaerobic digesters were available, but the resulting $CH_4$ emissions were reported based on the on-farm storage system. The Party explained (referencing a personal communication from the Department of Environmental Science, Aarhus University, Denmark) that using the methodology provided in the 2006 IPCC Guidelines (vol. 4, chap. 10, p.52) to calculate $CH_4$ emissions from aerobically digested manure could result in significantly conservative estimates. The ERT believes that future ERTs should consider this issue further to ensure that there is not an underestimate of emissions from this category. | Yes. Transparency |
| | | The ERT recommends that Hungary provide clear information in the NIR and in CRF table 9 on where the emissions from manure treated in anaerobic digesters are included and justify in the NIR why they are reported according to the on-farm storage system. | |
| A.10 | 3.B Manure management – $CH_4$ and $N_2O$ | The ERT noted that, in table 5.3.4 of the NIR, Hungary used the notation key "IE" to report cattle, poultry and swine manure allocated to anaerobic digesters for 2017. In CRF table 3.B(a), manure allocated to anaerobic digesters was reported as "IE" for years and species referred to in ID# A.9 above, and as "NO" for the remaining years for the three categories of animal. The Party did not document in the NIR the reason for the change in the use of notation key in reporting manure allocated to anaerobic digesters over the time series. During the review, Hungary explained that the notation key "NO" was reported for the years before 2004 because the first biogas plant was installed in the country in 2004. The Party also explained that the notation key "NO" was reported for certain years when the manure of certain animal categories was not managed under the anaerobic digesters system. | 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 Hungary explain in the NIR the reason for reporting "NO" for some years of the time series for cattle, poultry and swine manure allocated to anaerobic digesters. | |
| A.11 | 3.B Manure management – $CH_4$ | The ERT noted that Hungary reported that it used the tier 2 method to estimate the $CH_4$ EF for manure management for all livestock except for rabbits in the 2019 NIR (p.239). According to the 2006 IPCC Guidelines (vol. 4, chap. 10, p.41), the tier 2 method relies on two primary types of input that affect the calculation of $CH_4$ EFs from manure: (1) manure characteristics (amount of volatile solids excreted and maximum $CH_4$-producing capacity of manure); and (2) manure management system characteristics (types of systems used to manage manure and a system-specific $CH_4$ conversion factor that reflects the portion of the maximum $CH_4$-producing capacity of manure that is achieved). Except for cattle, for which country-specific information on volatile solids is available, the only country-specific data for other animals is the distribution of manure management systems. During the review, Hungary explained that tier 2 was reported as the method used to estimate the $CH_4$ EF for manure management for livestock other than cattle and rabbits according to the 2006 IPCC Guidelines (vol. 4, chap. 10, p.42), which encourages countries to calculate country-specific EFs using the data in tables 10A-4 to 10A-9 to fill gaps if country-specific data are available for only a portion of these variables. | Not an issue/problem |
| | | The ERT encourages the Party to improve the tier 2 method used to estimate the $CH_4$ EF for manure management for livestock other than cattle and rabbits by also using other available country-specific data as required in the 2006 IPCC Guidelines in addition to country-specific data on the manure management systems. | |
| A.12 | 3.D.a.2 Organic N fertilizers – $N_2O$ | Hungary reported in the NIR (p.260) that the N content of the composted municipal waste and composted sewage sludge was calculated using the IPCC default parameters in table 4.1 of the 2006 IPCC Guidelines. The ERT noted that the reference for the table was not sufficiently detailed to enable the ERT to locate the table in the 2006 IPCC Guidelines. During the review, Hungary indicated that the table in question is in volume 5 (waste) of the 2006 IPCC Guidelines. | Yes. Transparency |
| | | The ERT recommends that Hungary reference accurately the IPCC default parameters used to calculate the N content of the composted municipal waste and composted sewage sludge in the NIR by indicating that these data are taken from table 4.1, volume 5 (waste), in the 2006 IPCC Guidelines. | |
| A.13 | 3.D.a.2.b Sewage sludge applied to soils – $N_2O$ | Hungary reported in the NIR (p.260) that the N content of sewage sludge was assumed to be 4 per cent in the calculation of the amount of N from sewage applied to soils, but the ERT could not find the justification for this in the NIR. During the review, Hungary explained that the value was based on a short literature review, consisting of a report on sewage sludge management in Germany and a peer-reviewed paper on soil microbial problems in sewage sludge disposal. In the report on sewage sludge management, the ERT noted that the N content of sewage sludge is in the range of 2–6 per cent, according to the German Association for Water, Wastewater and Waste. The peer-reviewed paper had been published in Hungary in 1985 and reported the N content of sewage sludge in the range of 2.5–5 per cent, with its source for this figure being a non-Hungarian peer-reviewed paper published in 1963. The ERT considered that the applicability of the German data to Hungary's national circumstance, as well as the applicability of the data in the peer-reviewed publication based on research carried out in 1963, had not been justified. | Yes. Accuracy |

| *ID#* | *Finding classification* | *Description of the finding with recommendation or encouragement* | *Is finding an issue and/or a problem?*[a] |
|---|---|---|---|
| | | The ERT recommends that Hungary use an appropriate N content for sewage sludge that reflects its national circumstances when estimating $N_2O$ emissions from sewage sludge applied to soils and provide a justification for its choice in the NIR. | |
| LULUCF | | | |
| L.10 | 4. General (LULUCF) – $CO_2$ | Hungary reported emissions from organic soils under forest land converted to other land uses as "IE" in tables 6.5.12 and 11.4 of the NIR. However, the Party used the notation key "NO" for all reported emissions in CRF tables 4.B, 4.C, 4.D, 4.E and 4.F. During the review, the Party explained that the notation key in NIR tables 6.5.12 and 11.4 should be "NO". | Yes. Comparability |
| | | The ERT recommends that the Party correct the notation key used to report emissions from organic soils under forest land converted to other land uses in NIR tables 6.5.12 and 11.4 to "NO". | |
| L.11 | 4. General (LULUCF) – $CO_2$ | The ERT noted that the Party reported carbon stock changes in mineral soils in grassland remaining grassland and flooded land remaining flooded land as zero in 2017. During the review, the Party explained that it plans to use a notation key instead of zero in the next annual submission. | Yes. Accuracy |
| | | The ERT recommends that the Party review the calculation which results in zero emissions/removals for carbon stock changes in mineral soils for grassland remaining grassland and flooded land remaining flooded land in 2017, and, if appropriate, revise and report a proper value or notation key in CRF tables 4.C and 4.D. | |
| L.12 | 4.A Forest land – $CO_2$ | Hungary reported data for areas of forest land (pp.341–344) and provided explanations for each figure in table 6.5.1 of the NIR. During the review, the Party noted some errors in the figures: namely, the total area of all forest sub-compartments in the text on page 342, the area covered by trees in the text on page 343 and the total area of forest sub-compartments under FM reported in table 6.5.1. | Yes. Convention reporting adherence |
| | | The ERT recommends that the Party correct the erroneous figures for the area of forest sub-compartments and calculated area covered by trees in 2017. | |
| L.13 | 4.A Forest land – $CO_2$ | Hungary described in the NIR (p.344) the trends in afforestation and deforestation for recent decades and explained that deforested areas had usually been offset by afforestation elsewhere, and that the area of deforestation had been kept below 500 ha/year. However, the ERT noted that table 6.5.1 showed that figures were higher (over 1,000 ha) for deforested areas and lower for areas of new land converted to forest land in the last three years (245 ha in 2015 and 160 ha in 2016). During the review, the Party explained that the trends in deforestation and afforestation have been changing in recent years and the system of data collection has been improved. | Yes. Transparency |
| | | The ERT recommends that the Party update the description of trends in deforestation and afforestation to include the current situation and include the information on the change in data collection for these areas. | |
| L.14 | 4.A Forest land – $CO_2$ | The ERT noted that the Party reported what it describes as "found forest" (NIR, p.342) under forest land remaining forest land (4.A.1) in its estimate of emissions and removals but treated the area of "found forest" as land converted to forest land (4.A.2) in the land-use change matrix. | Yes. Accuracy |
| | | During the review, the Party explained that there had been inconsistency in the treatment of "found forest" between the land-use change matrix and the estimation of emissions and removals. The Party further explained that the | |

| ID# | Finding classification | Description of the finding with recommendation or encouragement | Is finding an issue and/or a problem?[a] |
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| | | conversion was based on cropland converted to forest land and a different treatment of "found forest" in the land-use change matrix would not change the estimation procedure.<br>The Party further described the reason for "found forest" in the NIR (p.348). The Party explained that 60 per cent of the cases had occurred owing to the reclassification of land. In this case of occurrence of forest, the ERT considered that the Party should treat it as conversion from an estimated point of time of conversion. The remaining increase in forest has been caused either by natural expansion or by geodesic remeasurements. In such cases, the ERT considered that the area should be treated as forest land remaining forest land for the complete time series without changing its land category.<br>The ERT recommends that the Party recalculate the area of forest land for the entire time series for the portion of "found forest" established by conversion, and for the portion of "found forest" established by natural expansion or by geodesic remeasurements, separately. The ERT further recommends that the Party recalculate, for the entire time series, carbon stock changes in all pools under forest land remaining forest land (4.A.1) and land converted to forest land (4.A.2). | |
| L.15 | 4.A.1 Forest land remaining forest land – $CO_2$ | The ERT noted that Hungary has included in the NIR (section 6.5.5.2.2) new information to demonstrate that the DOM and mineral soil pools are not a source. The ERT further noted that these pools were already reported as "NE" in CRF tables 4(KP-I)A.1 and 4(KP-I)B. However, the Party is still reporting these pools in CRF table 4.A as "NO" for forest land remaining forest land. During the review, the Party explained the inconsistencies in reporting.<br>The ERT recommends that the Party change the notation key from "NO" to "NE" for the DOM and mineral soil pools for forest land remaining forest land in CRF table 4.A. | Yes. Convention reporting adherence |
| L.16 | 4(II) Emissions and removals from drainage and rewetting and other management of organic/mineral soils – $CO_2$ | The ERT noted that the density value of 0.8 t/$m^3$ that the Party used in the NIR (p.404) for conversion from wet peat in $m^3$ to air-dry peat in tonnes was high. The 2006 IPCC Guidelines (vol. 4, chap. 7, pp.7–14) explain that air-dry peat contains between 35 and 55 per cent moisture, so wet peat should contain more moisture than air-dry peat and should have a correspondingly lower density value. During the review, the Party commented that it did not understand why the high value was being questioned.<br>The ERT recommends that the Party provide a justification for the high value used to convert from wet peat to air-dry peat (0.8 t/$m^3$). If the value cannot be justified, the ERT recommends that the Party try to obtain a more accurate value and recalculate the emissions from off-site emissions from managed peatlands accordingly. | Yes. Accuracy |
| L.17 | 4.A.2 Land converted to forest land – $CO_2$ | Hungary provided detailed information for the calculation of land converted to forest land area in tables 6.5.3 and 6.5.11 of the NIR. However, the ERT noted that there were errors in these tables. During the review, the Party provided some clarification regarding these figures. The figures for new land converted to forest land (table 6.5.3) should be the same as those in the first column of table 6.5.11, the figures for forest land remaining forest land in table 6.5.3 should be the same figures as those in table 6.5.11, and the total areas of land converted to forest land in tables 6.5.3 (t2, L-FL) and 6.5.11 should be the same figures as those reported in CRF table 4.A for category 4.A.2.<br>The ERT further noted that some of the figures in the 2017 row are showing a slight increase from the figures in the previous year in table 6.5.11, which could not have logically occurred. During the review, the Party explained that the errors were generated in the underlying database that the Party needs to analyse for the next annual submission. | Yes. Convention reporting adherence |

| *ID#* | *Finding classification* | *Description of the finding with recommendation or encouragement* | *Is finding an issue and/or a problem?*[a] |
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| | | The ERT recommends that the Party correct the figures for land converted to forest land in tables 6.5.3 and 6.5.11 so that the figures pointed out by the ERT above are consistent in tables 6.5.3 and 6.5.11 and CRF table 4.A for category 4.A.2. The ERT also recommends that the Party address the problem that occurred in the underlying database for inventory year 2017 (table 6.5.11). | |
| L.18 | 4.C.2.1 Forest land converted to grassland – $CO_2$ | The ERT reproduced the figures reported in table 6.5.12 (NIR, p.374) by using data from CRF tables 4.B, 4.C and 4.E from 2008 to 2017, and the figures reported in table 11.4(b) (NIR, p.470) by using data from CRF table 4(KP-I)A.2 from 2013 to 2017, as both of these NIR tables contained identical information. When the ERT compared the two NIR tables with the area data extracted from the CRF tables, the ERT noted that the aggregated area from CRF tables 4.B, 4.C and 4.E under forest land converted to other land uses was almost double that in CRF table 4(KP-I)A.2, and that there were discrepancies in the figures between the tables for carbon stock changes in biomass and DOM. During the review, the Party explained that the forest land converted to other land uses reported in the CRF tables contained the aggregated area of forest and other sub-compartments from 1985 onward, whereas CRF table 4(KP-I)A.2 contained the area of the forest sub-compartment aggregated from 1990 onward. The Party explained that the other discrepancies had occurred owing to data entry errors in CRF table 4.C. | Yes. Accuracy |
| | | The ERT recommends that the Party recalculate the figures for the area of forest land converted to other lands by using transition periods of 20 years, rather than the area accumulated since 1985, in CRF tables 4.B, 4.C and 4.E and then recalculate all the related emissions and removals accordingly. The ERT also recommends that the Party correct the data entry errors in the reported carbon stock changes in biomass and DOM in CRF table 4.C. The ERT encourages the Party to provide the subcategories forest and other under each land-converted category in CRF tables 4.B, 4.C and 4.E, so that the information can be seen transparently and cross-checked against CRF table 4(KP-I)A.2 (area of forest land converted to other land uses). | |
| Waste | | | |
| W.9 | 5.A Solid waste disposal on land – $CH_4$ | According to table 7.2.2 of the NIR, Hungary chose to use the default $CH_4$ generation rate constants for dry rather than wet temperate climates from the 2006 IPCC Guidelines (vol. 5, table 3.3) but did not provide an explanation for that choice. During the review, Hungary provided a set of graphical data, including a histogram of precipitation and potential evapotranspiration values and a distribution map, and explained that the ratio of mean annual precipitation and potential evapotranspiration in Hungary is between 0.48 and 1.11, with a mean of 0.60, and so Hungary's climate can be defined as dry temperate in accordance with table 3.4 in the 2006 IPCC Guidelines (vol. 5, chap. 3). | Yes. Transparency |
| | | The ERT recommends that Hungary include in the NIR the information to justify the appropriateness of the chosen default $CH_4$ generation rate constants for Hungary's specific national circumstances. | |
| W.10 | 5.A Solid waste disposal on land – $CH_4$ | Hungary stated in the NIR (p.423) that it used AD for SWDS from several data sources and that the waste types in its national waste management information system were defined based on both the six-digit European Waste Catalogue codes and the European Waste Classification for Statistics. A comparison of waste types with those used for the Eurostat data was provided in the NIR (p.426) for all waste types except for sludge. However, it is not clear that the data on disposal amount are the same as the data from Eurostat. During the review, Hungary explained that the AD for this category from 2005 onward were the same as those reported to Eurostat, except in the case of | Yes. Transparency |

| ID# | Finding classification | Description of the finding with recommendation or encouragement | Is finding an issue and/or a problem?[a] |
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| | | sludge. For sludge, Hungary used data from the General Directorate of Water Management, which collected detailed information on wastewater management, including sludge treatment.<br><br>In comparison with the sewage sludge production and disposal data for urban wastewater treatment plants from Eurostat, disposal amounts from domestic data had much higher values. Hungary therefore applied the higher value of the domestic data for the $CH_4$ emission estimates for this category. During the review, Hungary pointed out additional problems regarding sludge: the Eurostat data category "sewage sludge production and disposal" contained the subcategory "other wastewater treatment plants", and the category "treatment of waste by waste category, hazardousness and waste management operations" contained the subcategories "common sludges" and "industrial effluent sludges", which are reported in wet weight, and converting them to a dry substance weight might not be straightforward.<br><br>The ERT recommends that Hungary include further detailed information regarding waste criteria and data sources, especially for sludge, in its NIR. The ERT also encourages Hungary to investigate the discrepancy in sludge criteria with the Eurostat data, and provide the results of the investigation in future NIR submissions. | |
| W.11 | 5.A.2 Unmanaged waste disposal sites – $CH_4$ | Hungary reported emissions from unmanaged waste disposal sites as "IE". Hungary explained in its NIR (p.428) that the 2006 IPCC Guidelines waste model that it used in its calculation did not produce emissions separately for different types of disposal. During the review, Hungary suggested modifying the calculation system based on the 2006 IPCC Guidelines model to disaggregate $CH_4$ emissions from unmanaged sites from those from managed sites. The ERT notes that paragraph 36 of the UNFCCC Annex I inventory reporting guidelines states that emissions should be reported at the most disaggregated level of each source/sink category. Therefore, $CH_4$ emissions should be given by waste management type consistent with 2006 IPCC Guidelines methodologies.<br><br>The ERT recommends that Hungary disaggregate the estimates and report $CH_4$ emissions from managed and unmanaged disposal sites separately and explain this recalculation in the NIR. | Yes. Comparability |
| W.12 | 5.B.1 Composting – $CH_4$ and $N_2O$ | The ERT noted that Hungary stated in the NIR (section 7.3.1) that it applied the default EFs for composting from the 2006 IPCC Guidelines, but did not specify the values of those default EFs. The moisture content of municipal solid waste composted was given in the NIR as being 60 per cent but no explanation on reference was provided. During the review, Hungary explained that dry-based EFs of 10 (g $CH_4$/kg waste) and 0.6 (g $N_2O$/kg waste) were taken from the 2006 IPCC Guidelines (vol. 5, table 4.1), and that the figure of 60 per cent as the moisture content of municipal solid waste was taken from the "remarks" column of the same table.<br><br>The ERT recommends that Hungary include specific values for EFs and an explanation for the moisture content that it has applied to composting in the NIR. | Yes. Transparency |
| W.13 | 5.C.1 Waste incineration – $CO_2$ | Hungary reported in its NIR (p.437) dry matter content as 35 per cent and fossil carbon fraction as 24 per cent for industrial sludge without any further explanation and used these parameters to estimate 8.4 per cent of its fossil carbon content on a wet weight basis. During the review, Hungary explained that these assumptions were based on information from the 2006 IPCC Guidelines (vol. 5, chap. 2.3.2), which identified a default value of 9 per cent degradable organic carbon, assuming the dry matter content to be 35 per cent for industrial sludge. That could then be converted to 26 per cent on a dry basis (based on the calculation of 9 divided by 35). Table 5.2 in volume 5 of the 2006 IPCC Guidelines gave the total carbon content as 50 per cent for industrial waste and between 40 and 50 | Yes. Transparency |

| *ID#* | *Finding classification* | *Description of the finding with recommendation or encouragement* | *Is finding an issue and/or a problem?*[a] |
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| | | per cent for sewage sludge, so the fossil carbon fraction would therefore be 24 per cent, based on a calculation of 50 per cent minus 26 per cent.<br>The ERT recommends that Hungary include an explanation of its assumption for dry matter content and fossil carbon fraction for industrial sludge in the NIR. | |
| W.14 | 5.C.1 Waste incineration – $CO_2$ | In the NIR (p.437), Hungary reported carbon contents of liquid waste and industrial sludge (80 per cent and 8.4 per cent on a wet basis, respectively) in the estimates. However, specific values were not given in the NIR for carbon content or fossil carbon fraction for clinical, hazardous (non-liquid) or industrial solid waste, which were taken from default values from the 2006 IPCC Guidelines. During the review, Hungary explained that for its calculation of carbon content, it applied the default fossil carbon content (25 per cent) for clinical waste from table 2.6 in the 2006 IPCC Guidelines (vol. 5), and in the case of hazardous (non-liquid) waste, it used a combination of two EFs, assuming 50 per cent fossil carbon fraction for solid hazardous waste and the mean value of the range 5–50 per cent (being 27.5 per cent) from table 2.6 for other hazardous waste. For industrial solid waste, 45 per cent was used, as the 50 per cent of total carbon content of dry weight was multiplied by the 90 per cent of fossil carbon fraction of total carbon content in table 5.2 of the 2006 IPCC Guidelines.<br>The ERT recommends that Hungary include in the NIR all specific values and relevant information regarding the fossil carbon content that it uses in the $CO_2$ emission estimates for clinical, hazardous (non-liquid) and industrial solid waste. | Yes. Transparency |
| W.15 | 5.C.2 Open burning of waste – $CO_2$, $CH_4$ and $N_2O$ | The ERT noted that emissions from open burning were reported as "NO" in CRF table 5.C but did not find any information in the NIR that stated that no open burning activities were taking place in Hungary. During the review, Hungary explained that the assumption had been made, as a Government decree on air protection prohibited the open burning of waste.<br>The ERT recommends that Hungary include additional information to justify the reporting of emissions from open burning using the notation key "NO" in the NIR. | Yes. Transparency |
| W.16 | 5.D Wastewater treatment and discharge – $CH_4$ | Hungary described in the NIR (pp.439–443) the method used to estimate $CH_4$ emissions from both domestic and industrial wastewater. However, the description lacks enough information regarding the main AD and parameters used in the methods to enable the ERT to reproduce the estimates. During the review, Hungary provided tables with enough information regarding the main AD and parameters used in the calculations for $CH_4$ emissions from wastewater treatment.<br>The ERT recommends that Hungary include in the NIR the tables that indicate the main AD and parameters used in the calculations for $CH_4$ emissions from both domestic and industrial wastewater treatment. | Yes. Transparency |
| W.17 | 5.D.1 Domestic wastewater – $N_2O$ | The methodology used by Hungary for estimating $N_2O$ emissions was considered sophisticated, as it employed actual measurements to obtain removed N in advanced wastewater treatment plants. However, no description was provided in the NIR as to how total N was calculated in table 7.5.3, nor was there an explanation of the EF for $N_2O$ emissions from effluent. During the review, Hungary explained that total N was estimated from statistics on per capita protein consumption using the parameter of the fraction of N in protein having a default value of 0.16 kg N/kg protein (2006 IPCC Guidelines, vol. 5, table 6.11). Hungary used the default EF for $N_2O$ emissions from effluent of 0.005 (kg $N_2O$-N/kg N) from table 6.11 of volume 5 of the 2006 IPCC Guidelines. Emissions from | Yes. Transparency |

| *ID#* | *Finding classification* | *Description of the finding with recommendation or encouragement* | *Is finding an issue and/or a problem?*[a] |
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| | | advanced treatment plants were included in the reported $N_2O$ emissions in CRF table 5.D, which were calculated by applying equation 6.9 from volume 5 of the 2006 IPCC Guidelines with country-specific and yearly changing parameters.<br><br>The ERT recommends that Hungary include in the NIR a description of how it obtained total N included in table 7.5.3, an explanation of the EF for $N_2O$ emissions from effluent and the methodology used to estimate $N_2O$ emissions from advanced treatment plants. | |
| W.18 | 5.D.2 Industrial wastewater – $CH_4$ | Hungary provided an explanation in the NIR (pp.441–442) for adopting $CH_4$ correction factors in the estimation of EFs for domestic wastewater treatment but not for industrial wastewater treatment. During the review, Hungary provided the following explanation of the EFs for industrial wastewater treatment: the $CH_4$ correction factor of 0.05 (the middle of the range for well managed aerobic treatment plants taken from table 6.8 of the 2006 IPCC Guidelines) was applied for 2000 onwards, and the highest value of the range ($CH_4$ correction factor of 0.1) was applied for 1985–1995. Although the approach was sufficiently conservative, the explanation for the adoption of that approach remained unclear.<br><br>The ERT recommends that Hungary provide an explanation of the EFs for industrial wastewater treatment, including a reason for adopting these $CH_4$ correction factors, in the NIR. | Yes. Transparency |
| KP-LULUCF activities | | | |
| KP.3 | General (KP-LULUCF activities) | No additional findings beyond those contained in table 3 above were made by the ERT during the 2019 individual review for the KP-LULUCF activities. | Not a problem |

[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 Hungary.

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

12. Annex I show the accounting quantities for KP-LULUCF activities as reported by Hungary and the final values after the review. The final quantities of units to be issued and cancelled are presented in the same annex.

# 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 Hungary for submission year 2019 and data and information on activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, as submitted by Hungary in its 2019 annual submission

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

Table 1
**Total greenhouse gas emissions for Hungary, 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]* | | | | *KP-LULUCF activities (Article 3.4 of the Kyoto Protocol)* | |
|---|---|---|---|---|---|---|---|---|
| | *Total including LULUCF* | *Total excluding LULUCF* | *Total including LULUCF* | *Total excluding LULUCF* | *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]* | *CM, GM, RV, WDR* | *FM* |
| FMRL | | | | | | | | –1 000.35 |
| Base year | 107 492.08 | 109 248.68 | NA | NA | NA | | NA | |
| 1990 | 91 137.17 | 91 137.17 | NA | NA | NA | | NA | |
| 1995 | 69 848.15 | 75 319.56 | NA | NA | | | | |
| 2000 | 72 801.17 | 73 207.97 | NA | NA | | | | |
| 2010 | 60 936.95 | 64 949.13 | NA | NA | | | | |
| 2011 | 59 720.28 | 63 351.01 | NA | NA | | | | |
| 2012 | 55 268.82 | 59 647.18 | NA | NA | | | | |
| 2013 | 53 420.65 | 56 795.77 | NA | NA | | –1 125.82 | NA | –2 260.91 |
| 2014 | 52 551.96 | 57 415.82 | NA | NA | | –936.44 | NA | –3 384.99 |
| 2015 | 55 409.31 | 60 767.14 | NA | NA | | –1 022.84 | NA | –4 347.19 |
| 2016 | 56 837.27 | 61 139.78 | NA | NA | | –900.77 | NA | –3 070.24 |
| 2017 | 58 348.61 | 63 787.58 | NA | NA | | –986.88 | NA | –4 320.84 |

*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 the average of the period 1985–1987 for $CO_2$, $CH_4$ and $N_2O$, and 1995 for HFCs, PFCs, $SF_6$ and $NF_3$. Hungary 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 Hungary, excluding land use, land-use change and forestry, average of 1985–1987 to 2017**
(kt $CO_2$ eq)

| | *$CO_2$*[a] | *$CH_4$* | *$N_2O$* | *HFCs* | *PFCs* | *Unspecified mix of HFCs and PFCs* | *$SF_6$* | *$NF_3$* |
|---|---|---|---|---|---|---|---|---|
| Average of 1985–1987 | 85 569.80 | 12 446.64 | 10 920.33 | NO | 371.08 | NO | 6.15 | NO |
| 1990 | 73 444.74 | 11 632.54 | 8 192.04 | NO | 375.72 | NO | 10.89 | NO |
| 1995 | 61 626.80 | 8 686.96 | 4 693.90 | 37.15 | 222.72 | NO | 52.04 | NO |
| 2000 | 58 559.92 | 8 777.71 | 5 292.07 | 211.12 | 283.11 | NO | 84.04 | NO |
| 2010 | 52 138.09 | 7 876.63 | 3 642.35 | 1 203.20 | 1.52 | NO | 87.34 | NO |
| 2011 | 50 375.54 | 7 752.35 | 3 838.34 | 1 308.43 | 2.16 | NO | 74.18 | NO |
| 2012 | 46 829.67 | 7 758.97 | 3 780.03 | 1 203.12 | 1.72 | NO | 73.68 | NO |
| 2013 | 43 779.70 | 7 541.21 | 4 126.51 | 1 252.76 | 1.69 | NO | 93.90 | NO |
| 2014 | 43 925.19 | 7 427.89 | 4 287.21 | 1 694.26 | 1.30 | NO | 79.98 | NO |
| 2015 | 46 677.05 | 7 407.09 | 4 365.65 | 2 202.19 | 1.05 | NO | 114.11 | NO |
| 2016 | 47 430.30 | 7 388.77 | 4 546.09 | 1 648.00 | 0.66 | NO | 125.96 | NO |
| 2017 | 49 645.98 | 7 538.67 | 4 686.89 | 1 801.17 | 1.06 | NO | 113.80 | NO |
| **Per cent change average of 1985–1987 to 2017** | **–42.0** | **–39.4** | **–57.1** | **NA** | **–99.7** | **NA** | **1 751.5** | **NA** |

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

Table 3
**Greenhouse gas emissions by sector for Hungary, average of 1985–1987 to 2017**
(kt $CO_2$ eq)

| | *Energy* | *IPPU* | *Agriculture* | *LULUCF* | *Waste* | *Other* |
|---|---|---|---|---|---|---|
| Average of 1985–1987 | 78 983.75 | 15 175.44 | 11 868.98 | –1 756.60 | 3 285.82 | NO |
| 1990 | 68 182.36 | 11 809.58 | 9 879.93 | –2 518.76 | 3 784.06 | NO |
| 1995 | 57 137.21 | 8 274.80 | 5 891.59 | –5 471.41 | 4 015.96 | NO |
| 2000 | 54 665.14 | 8 239.95 | 6 067.47 | –406.80 | 4 235.41 | NO |
| 2010 | 48 770.19 | 6 431.12 | 5 636.62 | –4 012.19 | 4 111.21 | NO |
| 2011 | 47 019.11 | 6 507.61 | 5 863.57 | –3 630.73 | 3 960.72 | NO |
| 2012 | 43 767.96 | 6 053.87 | 5 903.39 | –4 378.36 | 3 921.97 | NO |
| 2013 | 41 313.09 | 5 468.13 | 6 307.65 | –3 375.12 | 3 706.90 | NO |

| | *Energy* | *IPPU* | *Agriculture* | *LULUCF* | *Waste* | *Other* |
|---|---|---|---|---|---|---|
| 2014 | 40 875.77 | 6 459.28 | 6 472.29 | –4 863.86 | 3 608.47 | NO |
| 2015 | 43 338.44 | 7 286.58 | 6 671.67 | –5 357.83 | 3 470.44 | NO |
| 2016 | 44 451.96 | 6 446.46 | 6 881.43 | –4 302.51 | 3 359.93 | NO |
| 2017 | 46 150.07 | 7 204.25 | 7 056.40 | –5 438.97 | 3 376.86 | NO |
| **Per cent change average of 1985–1987 to 2017** | **–41.6** | **–52.5** | **–40.5** | **209.6** | **2.8** | **NA** |

*Notes*: (1) Emissions/removals reported in the sector other (sector 6) are not included in the total GHG emissions; (2) Hungary 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 Hungary**
(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 | | | | –1 000.35 | | | | |
| Technical correction | | | | –40.37 | | | | |
| Base year | NA | | | | NA | NA | NA | NA |
| 2013 | | –1 248.27 | 122.45 | –2 260.91 | NA | NA | NA | NA |
| 2014 | | –1 087.11 | 150.67 | –3 384.99 | NA | NA | NA | NA |
| 2015 | | –1 241.08 | 218.24 | –4 347.19 | NA | NA | NA | NA |
| 2016 | | –1 189.01 | 288.24 | –3 070.24 | NA | NA | NA | NA |
| 2017 | | –1 281.56 | 294.68 | –4 320.84 | NA | NA | NA | NA |
| **Per cent change base year–2017** | | | | | **NA** | **NA** | **NA** | **NA** |

*Note*: Values in this table include emissions from land subject to natural disturbances, if applicable.
[a] Hungary 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 information on the accounting quantities for reporting under Article 3, paragraphs 3–4, of the Kyoto Protocol.

Table 5

**Accounting quantities for activities under Article 3, paragraph 3, and forest management and any elected activities under Article 3, paragraph 4, of the Kyoto Protocol for Hungary**

(kt $CO_2$ eq)

| | | Net emissions/removals | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| *GHG source and sink activities* | *Base year*[a] | *2013* | *2014* | *2015* | *2016* | *2017* | *Total*[b] | *Accounting parameters* | *Accounting quantity*[c] |
| A.1. AR | | –1 248.269 | –1 087.109 | –1 241.080 | –1 189.008 | –1 281.556 | –6 047.023 | | –6 047.023 |
| Excluded emissions from natural disturbances[d] | | NA | NA | NA | NA | NA | NA | | NA |
| Excluded subsequent removals from land subject to natural disturbances | | NA | NA | NA | NA | NA | NA | | NA |
| A.2. Deforestation | | 122.451 | 150.669 | 218.237 | 288.238 | 294.679 | 1 074.273 | | 1 074.273 |
| B.1. FM | | | | | | | –17 384.171 | | –12 180.559 |
| Net emissions/removals | | –2 260.910 | –3 384.990 | –4 347.190 | –3 070.241 | –4 320.840 | –17 384.171 | | |
| Excluded emissions from natural disturbances[d] | | NA | NA | NA | NA | NA | NA | | NA |
| Excluded subsequent removals from land subject to natural disturbances | | NA | NA | NA | NA | NA | NA | | NA |
| Any debits from newly established forests | | NO | NO | NO | NO | NO | NO | | NO |
| FMRL[e] | | | | | | | | –1 000.349 | |
| Technical corrections to FMRL | | | | | | | | –40.373 | |
| FM cap | | | | | | | | 30 680.949 | –12 180.559 |
| B.2. CM (if elected) | | NA | NA | NA | NA | NA | NA | | NA |
| B.3. GM (if elected) | | NA | NA | NA | NA | NA | NA | | NA |
| B.4. RV (if elected) | | NA | NA | NA | NA | NA | NA | | NA |
| B.5. WDR (if elected) | | NA | NA | NA | NA | NA | NA | | NA |

[a] Net emissions and removals from CM, GM, RV and/or WDR, if elected, in the Party's base year, as established in decision 9/CP.2.
[b] Cumulative net emissions and removals for all years of the commitment period reported in the current submission.
[c] The accounting quantity is the total quantity of units to be issued or cancelled for a particular activity.
[d] The Party indicated that it does not intend to exclude emissions from natural disturbances.
[e] FMRL as inscribed in the appendix of the annex to decision 2/CMP.7 in kt $CO_2$ eq per year.

1.

3. Table 6 provides an overview of key relevant data from Hungary's reporting under Article 3, paragraphs 3–4, of the Kyoto Protocol.

Table 6
**Key relevant data for Hungary under Article 3, paragraphs 3 and 4, of the Kyoto Protocol in the 2019 annual submission**

| *Key parameters* | *Values* |
|---|---|
| Periodicity of accounting | (a) AR: annual accounting<br>(b) Deforestation: annual accounting<br>(c) FM: annual 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-period GHG emissions, excluding LULUCF | 3 835.119 kt $CO_2$ eq (30 680.949 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 | Issue 2 524 301 RMUs |
| 2. Deforestation | Cancel 584 065 units |
| 3. FM | Issue 6 240 427 RMUs |
| 4. CM | NA |
| 5. GM | NA |
| 6. RV | NA |
| 7. WDR | NA |

*Note*: The values in this table reflect the difference in the accounting quantities for activities under Article 3, para. 3, and FM and any elected activities under Article 3, para. 4, of the Kyoto Protocol, as reported in table 5 in this annex, between this report and the Party's previously published review report.

# 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 Hungary. 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 Hungary**
(t $CO_2$ eq)

| | *Original submission* | *Revised estimate* | *Adjustment* | *Final* |
|---|---|---|---|---|
| **CPR** | 391 037 652 | – | – | 391 037 652 |
| **Annex A emissions for 2017** | – | – | – | – |
| $CO_2$[a] | 49 645 984 | – | – | 49 645 984 |
| $CH_4$ | 7 538 675 | – | – | 7 538 675 |
| $N_2O$ | 4 686 889 | – | – | 4 686 889 |
| HFCs | 1 801 171 | – | – | 1 801 171 |
| PFCs | 1 057 | – | – | 1 057 |
| Unspecified mix of HFCs and PFCs | NO | – | – | NO |
| $SF_6$ | 113 804 | – | – | 113 804 |
| $NF_3$ | NO | – | – | NO |
| **Total Annex A sources** | **63 787 580** | **–** | **–** | **63 787 580** |
| **Activities under Article 3, paragraph 3, of the Kyoto Protocol for 2017** | – | – | – | – |
| AR | –1 281 556 | – | – | –1 281 556 |
| Deforestation | 294 679 | – | – | 294 679 |
| **FM and elected activities under Article 3, paragraph 4, of the Kyoto Protocol for 2017** | **–** | **–** | **–** | **–** |
| FM | –4 320 840 | – | – | –4 320 840 |

[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 Hungary**
(t $CO_2$ eq)

| | *Original submission* | *Revised estimate* | *Adjustment* | *Final* |
|---|---|---|---|---|
| **Annex A emissions for 2016** | – | – | – | – |
| $CO_2$[a] | 47 430 303 | – | – | 47 430 303 |
| $CH_4$ | 7 388 771 | – | – | 7 388 771 |
| $N_2O$ | 4 546 091 | – | – | 4 546 091 |
| HFCs | 1 648 001 | – | – | 1 648 001 |
| PFCs | 656 | – | – | 656 |
| Unspecified mix of HFCs and PFCs | NO | – | – | NO |
| $SF_6$ | 125 958 | – | – | 125 958 |
| $NF_3$ | NO | – | – | NO |
| **Total Annex A sources** | **61 139 780** | **–** | **–** | **61 139 780** |

| | *Original submission* | *Revised estimate* | *Adjustment* | *Final* |
|---|---|---|---|---|
| **Activities under Article 3, paragraph 3, of the Kyoto Protocol for 2016** | – | – | – | – |
| AR | –1 189 008 | – | – | –1 189 008 |
| Deforestation | 288 238 | – | – | 288 238 |
| **FM and elected activities under Article 3, paragraph 4, of the Kyoto Protocol for 2016** | **–** | **–** | **–** | **–** |
| FM | –3 070 241 | – | – | –3 070 241 |

[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 Hungary**
(t $CO_2$ eq)

| | *Original submission* | *Revised estimate* | *Adjustment* | *Final* |
|---|---|---|---|---|
| **Annex A emissions for 2015** | – | – | – | – |
| $CO_2$[a] | 46 677 049 | – | – | 46 677 049 |
| $CH_4$ | 7 407 091 | – | – | 7 407 091 |
| $N_2O$ | 4 365 650 | – | – | 4 365 650 |
| HFCs | 2 202 192 | – | – | 2 202 192 |
| PFCs | 1 047 | – | – | 1 047 |
| Unspecified mix of HFCs and PFCs | NO | – | – | NO |
| $SF_6$ | 114 114 | – | – | 114 114 |
| $NF_3$ | NO | – | – | NO |
| **Total Annex A sources** | **60 767 143** | – | – | **60 767 143** |
| **Activities under Article 3, paragraph 3, of the Kyoto Protocol for 2015** | – | – | – | – |
| AR | –1 241 080 | – | – | –1 241 080 |
| Deforestation | 218 237 | – | – | 218 237 |
| **FM and elected activities under Article 3, paragraph 4, of the Kyoto Protocol for 2015** | **–** | **–** | **–** | **–** |
| FM | –4 347 190 | – | – | –4 347 190 |

[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 Hungary**
(t $CO_2$ eq)

| | *Original submission* | *Revised estimate* | *Adjustment* | | *Final* |
|---|---|---|---|---|---|
| **Annex A emissions for 2014** | – | – | – | – | – |
| $CO_2$[a] | 43 925 189 | – | – | – | 43 925 189 |
| $CH_4$ | 7 427 892 | – | – | – | 7 427 892 |
| $N_2O$ | 4 287 209 | – | – | – | 4 287 209 |
| HFCs | 1 694 258 | – | – | – | 1 694 258 |
| PFCs | 1 296 | – | – | – | 1 296 |
| Unspecified mix of HFCs and PFCs | NO | – | – | – | NO |
| $SF_6$ | 79 975 | – | – | – | 79 975 |
| $NF_3$ | NO | – | – | – | NO |
| **Total Annex A sources** | **57 415 820** | – | – | – | **57 415 820** |
| **Activities under Article 3, paragraph 3, of the Kyoto Protocol for 2014** | – | – | – | – | – |
| AR | –1 087 109 | – | – | – | –1 087 109 |

| | *Original submission* | *Revised estimate* | *Adjustment* | | *Final* |
|---|---|---|---|---|---|
| Deforestation | 150 669 | – | – | – | 150 669 |
| **FM and elected activities under Article 3, paragraph 4, of the Kyoto Protocol for 2014** | **–** | **–** | **–** | – | **–** |
| FM | –3 384 990 | – | – | – | –3 384 990 |

[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 Hungary**
(t $CO_2$ eq)

| | *Original submission* | *Revised estimate* | *Adjustment* | *Final* |
|---|---|---|---|---|
| **Annex A emissions for 2013** | – | – | – | – |
| $CO_2$[a] | 43 779 698 | – | – | 43 779 698 |
| $CH_4$ | 7 541 213 | – | – | 7 541 213 |
| $N_2O$ | 4 126 507 | – | – | 4 126 507 |
| HFCs | 1 252 764 | – | – | 1 252 764 |
| PFCs | 1 691 | – | – | 1 691 |
| Unspecified mix of HFCs and PFCs | NO | – | – | NO |
| $SF_6$ | 93 896 | – | – | 93 896 |
| $NF_3$ | NO | – | – | NO |
| **Total Annex A sources** | **56 795 769** | **–** | **–** | **56 795 769** |
| **Activities under Article 3, paragraph 3, of the Kyoto Protocol for 2013** | – | – | – | – |
| AR | –1 248 269 | – | – | –1 248 269 |
| Deforestation | 122 451 | – | – | 122 451 |
| **FM and elected activities under Article 3, paragraph 4, of the Kyoto Protocol for 2013** | **–** | **–** | **–** | **–** |
| FM | –2 260 910 | – | – | –2 260 910 |

[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.4.b residential – liquid fuels – $CO_2$, $CH_4$ and $N_2O$ (see ID# E.11 in table 5 in this report) and (b) 3.B manure management – $CH_4$ (see ID# A.9 in table 5 in this report).

# Annex IV

## Reference documents

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

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. 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 2013, 2014, 2015, 2016 and 2017 annual submissions of Hungary, contained in documents FCCC/ARR/2013/HUN, FCCC/ARR/2014/HUN, FCCC/ARR/2015/HUN, FCCC/ARR/2016/HUN and FCCC/ARR/2017/HUN, 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 Hungary for 2019. Available at https://unfccc.int/sites/default/files/resource/hun.pdf.

### C. Other documents used during the review

Responses to questions during the review were received from Gábor Kis-Kovács (Hungarian Meteorological Service), including additional material on the methodology and assumptions used.