

## ANNEXES TO THE NATIONAL INVENTORY REPORT

**2022**

**TABLE OF CONTENT**

|  |            |
|--|------------|
| <b>ANNEX 1 KEY CATEGORIES.....</b>   | <b>3</b>   |
| <b>ANNEX 2 ASSESSMENT OF UNCERTAINTY.....</b>  | <b>35</b>  |
| <b>ANNEX 3 DETAILED METHODOLOGICAL DESCRIPTIONS FOR INDIVIDUAL SOURCE OR SINK<br/>CATEGORIES .....</b> | <b>52</b>  |
| <b>ANNEX 4 THE NATIONAL ENERGY BALANCE FOR THE MOST RECENT INVENTORY YEAR .....</b>                    | <b>60</b>  |
| <b>ANNEX 5 ADDITIONAL INFORMATION.....</b>   | <b>62</b>  |
| <b>ANNEX 6 RESPONSES TO THE REVIEW OF THE 2021 INVENTORY SUBMISSION.....</b>                           | <b>102</b> |
| <b>ANNEX 7 SUMMARY OF THE RESULTS OF THE QA ACTIVITIES CARRIED OUT BY THE EU .....</b>                 | <b>116</b> |
| <b>ANNEX 8 LIST OF ABBREVIATIONS AND UNITS.....</b>  | <b>120</b> |

## ANNEX 1 Key Categories

### A1.1 Description of methodology used for identifying key sources and reference to the key source tables in the CRF

This annex describes the key category analysis conducted for the 2020 Hungarian inventory.

Generally, inventory uncertainty is lower when emissions are estimated using the available most rigorous methods, but due to finite resources this may not be feasible for every category. Therefore, it is good practice to identify those categories (key categories) that have the greatest contribution to overall inventory uncertainty in order to make the most efficient use of available resources. In that context, a "key category" is one that is prioritized within the national inventory system because its estimate has a significant influence on a country's total inventory of direct greenhouse gases in terms of the absolute level of emissions (level assessment) or/and to the trend of emissions (trend assessment).

The 2006 IPCC Guidelines describes two Tier level for identification of key categories. The difference is that in Tier 2 approach assessments are weighted with the uncertainty values of each source category.

Both in Tier 1 and Tier 2 approaches key categories are identified from two perspectives.

The first analyzes the emission contribution that each category makes to the national total (with LULUCF). The second perspective analyzes the trend of emission contributions from each category to identify where the greatest absolute changes (either increases or reductions) have taken place over a given time (with LULUCF categories). The percent contributions to both levels and trends in emissions are calculated and sorted from greatest to least. A cumulative total is calculated for both approaches. IPCC has determined that a cumulative contribution threshold of 95% for both level and trend assessments. The 95% cumulative contribution threshold has been used in this analysis to define an upper boundary for key category identification. Therefore, when source and/or sink contributions are sorted in decreasing order of importance, those that integrate the group of categories that accumulate the upper 95% of national GHG emissions are considered quantitatively to be key. Results for these analyses are shown in *Table A1-2* and *Table A1-3*. Key categories are highlighted with bold characters.

The Equation 4.1 from 2006 IPCC Guidelines Vol.1 was used for level assessment and equation 4.2 from 2006 IPCC Guidelines Vol.1 was used for trend assessment.

Good practice first requires that source categories should be disaggregated into categories from which key sources and sinks may be identified. Several recommendations exist for the list of categories (aggregation/disaggregation level):

- 2006 IPCC Guidelines Table 4.1;
- EU list
- country specific list

In Hungary Tier 1 level and trend assessment was conducted on a list of categories that follow Table 4.1 from 2006 IPCC Guidelines in order to be consistent with CRF Table 7 Key categories. This list of Tier 1 analysis is shown in Table A1-1 below.

**Table A1-1** Category list used in Tier 1 analysis

| CRF code and category name                        | GHG              |
|---|------------------|
| 1A1 Energy Industries - Biomass                   | CH <sub>4</sub>  |
| 1A1 Energy Industries - Biomass                   | N <sub>2</sub> O |
| 1A1 Energy Industries - Gaseous fuels             | CH <sub>4</sub>  |
| 1A1 Energy Industries - Gaseous fuels             | CO <sub>2</sub>  |
| 1A1 Energy Industries - Gaseous fuels             | N <sub>2</sub> O |
| 1A1 Energy Industries - Liquid fuels              | CH <sub>4</sub>  |
| 1A1 Energy Industries - Liquid fuels              | CO <sub>2</sub>  |
| 1A1 Energy Industries - Liquid fuels              | N <sub>2</sub> O |
| 1A1 Energy Industries - Other fossil fuels        | CH <sub>4</sub>  |
| 1A1 Energy Industries - Other fossil fuels        | CO <sub>2</sub>  |
| 1A1 Energy Industries - Other fossil fuels        | N <sub>2</sub> O |
| 1A1 Energy Industries - Peat                      | CH <sub>4</sub>  |
| 1A1 Energy Industries - Peat                      | N <sub>2</sub> O |
| 1A1 Energy Industries - Solid fuels               | CH <sub>4</sub>  |
| 1A1 Energy Industries - Solid fuels               | CO <sub>2</sub>  |
| 1A1 Energy Industries - Solid fuels               | N <sub>2</sub> O |
| 1A2 Manufacturing industries - Biomass            | CH <sub>4</sub>  |
| 1A2 Manufacturing industries - Biomass            | N <sub>2</sub> O |
| 1A2 Manufacturing industries - Gaseous fuels      | CH <sub>4</sub>  |
| 1A2 Manufacturing industries - Gaseous fuels      | CO <sub>2</sub>  |
| 1A2 Manufacturing industries - Gaseous fuels      | N <sub>2</sub> O |
| 1A2 Manufacturing industries - Liquid fuels       | CH <sub>4</sub>  |
| 1A2 Manufacturing industries - Liquid fuels       | CO <sub>2</sub>  |
| 1A2 Manufacturing industries - Liquid fuels       | N <sub>2</sub> O |
| 1A2 Manufacturing industries - Other fossil fuels | CH <sub>4</sub>  |
| 1A2 Manufacturing industries - Other fossil fuels | CO <sub>2</sub>  |
| 1A2 Manufacturing industries - Other fossil fuels | N <sub>2</sub> O |
| 1A2 Manufacturing industries - Peat               | CH <sub>4</sub>  |
| 1A2 Manufacturing industries - Peat               | N <sub>2</sub> O |
| 1A2 Manufacturing industries - Solid fuels        | CH <sub>4</sub>  |
| 1A2 Manufacturing industries - Solid fuels        | CO <sub>2</sub>  |
| 1A2 Manufacturing industries - Solid fuels        | N <sub>2</sub> O |
| 1A3a Domestic aviation - All fuels                | CH <sub>4</sub>  |
| 1A3a Domestic aviation - All fuels                | CO <sub>2</sub>  |
| 1A3a Domestic aviation - All fuels                | N <sub>2</sub> O |
| 1A3b Road transport - All Fuels                   | CH <sub>4</sub>  |
| 1A3b Road transport - All Fuels                   | CO <sub>2</sub>  |
| 1A3b Road transport - All Fuels                   | N <sub>2</sub> O |
| 1A3c Railways - All Fuels                         | CH <sub>4</sub>  |

| CRF code and category name   | GHG              |
|--|------------------|
| 1A3c Railways - All Fuels  | CO <sub>2</sub>  |
| 1A3c Railways - All Fuels  | N <sub>2</sub> O |
| 1A3d Domestic navigation - Gaseous fuels   | CH <sub>4</sub>  |
| 1A3d Domestic navigation - Gaseous fuels   | CO <sub>2</sub>  |
| 1A3d Domestic navigation - Gaseous fuels   | N <sub>2</sub> O |
| 1A3d Domestic navigation - All Liquid fuels  | CH <sub>4</sub>  |
| 1A3d Domestic navigation - All Liquid fuels  | CO <sub>2</sub>  |
| 1A3d Domestic navigation - All Liquid fuels  | N <sub>2</sub> O |
| 1A3e Other Transportation (as specified in table 1A(a) sheet 3) - Pipeline, only gaseous | CH <sub>4</sub>  |
| 1A3e Other Transportation (as specified in table 1A(a) sheet 3) - Pipeline, only gaseous | CO <sub>2</sub>  |
| 1A3e Other Transportation (as specified in table 1A(a) sheet 3) - Pipeline, only gaseous | N <sub>2</sub> O |
| 1A4 Other sectors - Biomass  | CH <sub>4</sub>  |
| 1A4 Other sectors - Biomass  | N <sub>2</sub> O |
| 1A4 Other sectors - Gaseous fuels  | CH <sub>4</sub>  |
| 1A4 Other sectors - Gaseous fuels  | CO <sub>2</sub>  |
| 1A4 Other sectors - Gaseous fuels  | N <sub>2</sub> O |
| 1A4 Other sectors - Liquid fuels   | CH <sub>4</sub>  |
| 1A4 Other sectors - Liquid fuels   | CO <sub>2</sub>  |
| 1A4 Other sectors - Liquid fuels   | N <sub>2</sub> O |
| 1A4 Other sectors - Other Fossil Fuels   | CH <sub>4</sub>  |
| 1A4 Other sectors - Other Fossil Fuels   | CO <sub>2</sub>  |
| 1A4 Other sectors - Other Fossil Fuels   | N <sub>2</sub> O |
| 1A4 Other sectors - Solid fuels  | CH <sub>4</sub>  |
| 1A4 Other sectors - Solid fuels  | CO <sub>2</sub>  |
| 1A4 Other sectors - Solid fuels  | N <sub>2</sub> O |
| 1A5a Stationary  | CH <sub>4</sub>  |
| 1A5a Stationary  | CO <sub>2</sub>  |
| 1A5a Stationary  | N <sub>2</sub> O |
| 1A5b Mobile  | CH <sub>4</sub>  |
| 1A5b Mobile  | CO <sub>2</sub>  |
| 1A5b Mobile  | N <sub>2</sub> O |
| 1B1 Solid fuels  | CH <sub>4</sub>  |
| 1B1 Solid fuels  | CO <sub>2</sub>  |
| 1B2a Oil   | CH <sub>4</sub>  |
| 1B2a Oil   | CO <sub>2</sub>  |
| 1B2b Natural Gas   | CH <sub>4</sub>  |
| 1B2b Natural Gas   | CO <sub>2</sub>  |
| 1B2b Natural Gas   | N <sub>2</sub> O |
| 1B2c Venting and flaring   | CH <sub>4</sub>  |
| 1B2c Venting and flaring   | CO <sub>2</sub>  |

| CRF code and category name                                  | GHG              |
|---|------------------|
| 1B2c Venting and flaring                                    | N <sub>2</sub> O |
| 1B2d Other (Thermal water extraction + natural gas storage) | CH <sub>4</sub>  |
| 1B2d Other (Thermal water extraction + natural gas storage) | CO <sub>2</sub>  |
| 1B2d Other (Thermal water extraction + natural gas storage) | N <sub>2</sub> O |
| 2A1 Cement Production                                       | CO <sub>2</sub>  |
| 2A2 Lime Production   | CO <sub>2</sub>  |
| 2A3 Glass production  | CO <sub>2</sub>  |
| 2A4 Other Process Uses of Carbonates                        | CO <sub>2</sub>  |
| 2B1 Ammonia Production                                      | CH <sub>4</sub>  |
| 2B1 Ammonia Production                                      | CO <sub>2</sub>  |
| 2B1 Ammonia Production                                      | N <sub>2</sub> O |
| 2B2 Nitric Acid Production                                  | N <sub>2</sub> O |
| 2B8 Petrochemical and carbon black production               | CH <sub>4</sub>  |
| 2B8 Petrochemical and carbon black production               | CO <sub>2</sub>  |
| 2B8 Petrochemical and carbon black production               | N <sub>2</sub> O |
| 2C1 Iron and Steel Production                               | CH <sub>4</sub>  |
| 2C1 Iron and Steel Production                               | CO <sub>2</sub>  |
| 2C1 Iron and Steel Production                               | N <sub>2</sub> O |
| 2C2 Ferroalloys Production                                  | CH <sub>4</sub>  |
| 2C2 Ferroalloys Production                                  | CO <sub>2</sub>  |
| 2C2 Ferroalloys Production                                  | N <sub>2</sub> O |
| 2C3 Aluminium Production                                    | CH <sub>4</sub>  |
| 2C3 Aluminium Production                                    | CO <sub>2</sub>  |
| 2C3 Aluminium Production                                    | N <sub>2</sub> O |
| 2C3 Aluminium Production                                    | PFC              |
| 2D Non-energy products from fuels and solvent use           | CH <sub>4</sub>  |
| 2D Non-energy products from fuels and solvent use           | CO <sub>2</sub>  |
| 2E Electronics industry                                     | SF <sub>6</sub>  |
| 2F1 Refrigeration and Air Conditioning Equipment - HFC+PFC  | Aggr. F-gases    |
| 2F2 Foam Blowing - HFC                                      | Aggr. F-gases    |
| 2F3 Fire extinguishers - HFC                                | Aggr. F-gases    |
| 2F4 Aerosol + MDI - HFC                                     | Aggr. F-gases    |
| 2F5 Solvent - HFC+PFC                                       | Aggr. F-gases    |
| 2G Other Product Manufacture and Use - SF <sub>6</sub>      | Aggr. F-gases    |
| 2G Other Product Manufacture and Use                        | N <sub>2</sub> O |
| 3A Enteric Fermentation                                     | CH <sub>4</sub>  |
| 3B Manure Management  | CH <sub>4</sub>  |
| 3B Manure Management  | N <sub>2</sub> O |
| 3C Rice Cultivation   | CH <sub>4</sub>  |
| 3D Agricultural Soils                                       | CH <sub>4</sub>  |

| CRF code and category name   | GHG              |
|--|------------------|
| 3D1 Direct N <sub>2</sub> O Emissions from Managed Soils   | N <sub>2</sub> O |
| 3D2 Indirect N <sub>2</sub> O Emissions from Managed Soils   | N <sub>2</sub> O |
| 3F Field Burning of Agricultural Residues  | CH <sub>4</sub>  |
| 3F Field Burning of Agricultural Residues  | N <sub>2</sub> O |
| 3G Liming  | CO <sub>2</sub>  |
| 3H Urea application  | CO <sub>2</sub>  |
| 3I Other carboncontaining fertilizers  | CO <sub>2</sub>  |
| 3J Other   | CH <sub>4</sub>  |
| 3J Other   | CO <sub>2</sub>  |
| 3J Other   | N <sub>2</sub> O |
| 4(I) Direct N <sub>2</sub> O emissions from N inputs to managed soils                                      | N <sub>2</sub> O |
| 4(II) Emissions and removals from drainage and rewetting and other management of organic and mineral soils | CH <sub>4</sub>  |
| 4(II) Emissions and removals from drainage and rewetting and other management of organic and mineral soils | CO <sub>2</sub>  |
| 4(II) Emissions and removals from drainage and rewetting and other management of organic and mineral soils | N <sub>2</sub> O |
| 4(III) Direct N <sub>2</sub> O emissions from N mineralization/immobilization                              | N <sub>2</sub> O |
| 4(IV) Indirect N <sub>2</sub> O Emissions from Managed Soils   | N <sub>2</sub> O |
| 4(V) Biomass Burning   | CH <sub>4</sub>  |
| 4(V) Biomass Burning   | CO <sub>2</sub>  |
| 4(V) Biomass Burning   | N <sub>2</sub> O |
| 4A1 Forest Land Remaining Forest Land  | CO <sub>2</sub>  |
| 4A2 Land Converted to Forest Land  | CO <sub>2</sub>  |
| 4B1 Cropland Remaining Cropland  | CO <sub>2</sub>  |
| 4B2 Land Converted to Cropland   | CO <sub>2</sub>  |
| 4C1 Grassland Remaining Grassland  | CO <sub>2</sub>  |
| 4C2 Land Converted to Grassland  | CO <sub>2</sub>  |
| 4D11 Peat Extraction Remaining Peat Extraction   | CO <sub>2</sub>  |
| 4D12 Flooded Land Remaining Flooded Land   | CO <sub>2</sub>  |
| 4D13 Other Wetlands Remaining Other Wetlands   | CO <sub>2</sub>  |
| 4D2 Land Converted to Wetlands   | CO <sub>2</sub>  |
| 4E1 Settlements Remaining Settlements  | CO <sub>2</sub>  |
| 4E2 Land Converted to Settlements  | CO <sub>2</sub>  |
| 4F1 Other Land Remaining Other Land  | CO <sub>2</sub>  |
| 4F2 Land Converted to Other Land   | CO <sub>2</sub>  |
| 4G Harvested Wood Products   | CO <sub>2</sub>  |
| 4H Other   | CH <sub>4</sub>  |
| 4H Other   | CO <sub>2</sub>  |
| 4H Other   | N <sub>2</sub> O |
| 5A Solid waste disposal  | CH <sub>4</sub>  |
| 5A Solid waste disposal  | CO <sub>2</sub>  |

| CRF code and category name                | GHG              |
|---|------------------|
| 5A Solid waste disposal                   | N <sub>2</sub> O |
| 5B Biological Treatment of Soild Waste    | CH <sub>4</sub>  |
| 5B Biological Treatment of Soild Waste    | CO <sub>2</sub>  |
| 5B Biological Treatment of Soild Waste    | N <sub>2</sub> O |
| 5C Incineration and open burning of waste | CH <sub>4</sub>  |
| 5C Incineration and open burning of waste | CO <sub>2</sub>  |
| 5C Incineration and open burning of waste | N <sub>2</sub> O |
| 5D Wastewater Treatment and Discharge     | CH <sub>4</sub>  |
| 5D Wastewater Treatment and Discharge     | CO <sub>2</sub>  |
| 5D Wastewater Treatment and Discharge     | N <sub>2</sub> O |
| 5E Other                                  | CH <sub>4</sub>  |
| 5E Other                                  | CO <sub>2</sub>  |
| 5E Other                                  | N <sub>2</sub> O |

## A1.2 Results of the key category analysis

**Table A1-2** Tier 1 level assessment including LULUCF (2020)

| CRF code + note  | Direct Greenhouse Gas | Latest Year Emission [Gg CO <sub>2</sub> -eq] | Emission in absolute value [Gg CO <sub>2</sub> -eq] | Level Assessment | Cumulative Total% |
|--|-----------------------|---|---|------------------|-------------------|
| 1A3b Road trasport - All Fuels                             | CO <sub>2</sub>       | 12,181.35                                     | 12,181.35   | 17.22%           | 17.22%            |
| 1A4 Other sectors - Gaseous fuels                          | CO <sub>2</sub>       | 10,034.35                                     | 10,034.35   | 14.18%           | 31.40%            |
| 1A1 Energy Industries - Gaseous fuels                      | CO <sub>2</sub>       | 5,786.16                                      | 5,786.16  | 8.18%            | 39.58%            |
| 4A1 Forest Land Remaining Forest Land                      | CO <sub>2</sub>       | -5,470.51                                     | 5,470.51  | 7.73%            | 47.31%            |
| 1A1 Energy Industries - Solid fuels                        | CO <sub>2</sub>       | 5,274.94                                      | 5,274.94  | 7.46%            | 54.77%            |
| 3.D.1 Direct N <sub>2</sub> O Emissions From Managed Soils | N <sub>2</sub> O      | 3,596.24                                      | 3,596.24  | 5.08%            | 59.85%            |
| 1A2 Manufacturing industries - Gaseous fuels               | CO <sub>2</sub>       | 3,072.77                                      | 3,072.77  | 4.34%            | 64.19%            |
| 5A Solid waste disposal                                    | CH <sub>4</sub>       | 2,906.76                                      | 2,906.76  | 4.11%            | 68.30%            |
| 3A Enteric Fermentation                                    | CH <sub>4</sub>       | 2,095.03                                      | 2,095.03  | 2.96%            | 71.26%            |
| 2F1 Refrigeration and Air Conditioning Equipment - HFC+PFC | Aggregate F-gases     | 2,000.73                                      | 2,000.73  | 2.83%            | 74.09%            |
| 1A4 Other sectors - Liquid fuels                           | CO <sub>2</sub>       | 1,615.69                                      | 1,615.69  | 2.28%            | 76.38%            |
| 2B8 Petrochemical and carbon black production              | CO <sub>2</sub>       | 1,339.80                                      | 1,339.80  | 1.89%            | 78.27%            |
| 1B2b Natural Gas   | CH <sub>4</sub>       | 1,322.15                                      | 1,322.15  | 1.87%            | 80.14%            |
| 2B1 Ammonia Production                                     | CO <sub>2</sub>       | 1,239.10                                      | 1,239.10  | 1.75%            | 81.89%            |
| 1A2 Manufacturing industries - Liquid fuels                | CO <sub>2</sub>       | 1,153.93                                      | 1,153.93  | 1.63%            | 83.52%            |
| 4A2 Land Converted to Forest Land                          | CO <sub>2</sub>       | -1,143.20                                     | 1,143.20  | 1.62%            | 85.14%            |
| 2C1 Iron and Steel Production                              | CO <sub>2</sub>       | 1,109.59                                      | 1,109.59  | 1.57%            | 86.71%            |
| 1A1 Energy Industries - Liquid fuels                       | CO <sub>2</sub>       | 988.89  | 988.89  | 1.40%            | 88.10%            |
| 2A1 Cement Production                                      | CO <sub>2</sub>       | 928.79  | 928.79  | 1.31%            | 89.42%            |
| 3B Manure Management                                       | CH <sub>4</sub>       | 639.06  | 639.06  | 0.90%            | 90.32%            |

|  |                          |                |               |              |               |
|--|--------------------------|----------------|---------------|--------------|---------------|
| <b>3B Manure Management</b>  | <b>N2O</b>               | <b>435.23</b>  | <b>435.23</b> | <b>0.62%</b> | <b>90.93%</b> |
| <b>1A4 Other sectors - Biomass</b>   | <b>CH4</b>               | <b>409.15</b>  | <b>409.15</b> | <b>0.58%</b> | <b>91.51%</b> |
| <b>1A2 Manufacturing industries - Solid fuels</b>  | <b>CO2</b>               | <b>359.57</b>  | <b>359.57</b> | <b>0.51%</b> | <b>92.02%</b> |
| <b>1A2 Manufacturing industries - Other fossil fuels</b>   | <b>CO2</b>               | <b>340.97</b>  | <b>340.97</b> | <b>0.48%</b> | <b>92.50%</b> |
| <b>4G Harvested Wood Products</b>  | <b>CO2</b>               | <b>-336.91</b> | <b>336.91</b> | <b>0.48%</b> | <b>92.98%</b> |
| <b>4B1 Cropland Remaining Cropland</b>   | <b>CO2</b>               | <b>-316.09</b> | <b>316.09</b> | <b>0.45%</b> | <b>93.43%</b> |
| <b>3.D.2 Indirect N2O Emissions From Managed Soils</b>   | <b>N2O</b>               | <b>271.64</b>  | <b>271.64</b> | <b>0.38%</b> | <b>93.81%</b> |
| <b>1A4 Other sectors - Solid fuels</b>   | <b>CO2</b>               | <b>249.75</b>  | <b>249.75</b> | <b>0.35%</b> | <b>94.16%</b> |
| <b>4B2 Land Converted to Cropland</b>  | <b>CO2</b>               | <b>239.01</b>  | <b>239.01</b> | <b>0.34%</b> | <b>94.50%</b> |
| <b>5D Wastewater Treatment and Discharge</b>   | <b>CH4</b>               | <b>235.36</b>  | <b>235.36</b> | <b>0.33%</b> | <b>94.83%</b> |
| <b>2G Other Product Manufacture and Use - N2O</b>  | <b>N2O</b>               | <b>230.69</b>  | <b>230.69</b> | <b>0.33%</b> | <b>95.16%</b> |
| 4E2 Land Converted to Settlements  | <b>CO2</b>               | 212.67         | 212.67        | 0.30%        | 95.46%        |
| 1A1 Energy Industries - Other fossil fuels   | <b>CO2</b>               | 211.05         | 211.05        | 0.30%        | 95.76%        |
| 2A4 Other Process Uses of Carbonates   | <b>CO2</b>               | 195.14         | 195.14        | 0.28%        | 96.03%        |
| 1B2c Venting and flaring   | <b>CH4</b>               | 186.46         | 186.46        | 0.26%        | 96.30%        |
| 1A4 Other sectors - Other Fossil Fuels   | <b>CO2</b>               | 156.98         | 156.98        | 0.22%        | 96.52%        |
| 2F2 Foam Blowing - HFC   | <b>Aggregate F-gases</b> | 149.40         | 149.40        | 0.21%        | 96.73%        |
| 2A2 Lime Production  | <b>CO2</b>               | 143.52         | 143.52        | 0.20%        | 96.93%        |
| 3H Urea application  | <b>CO2</b>               | 136.37         | 136.37        | 0.19%        | 97.13%        |
| 1B2c Venting and flaring   | <b>CO2</b>               | 132.17         | 132.17        | 0.19%        | 97.31%        |
| 1A3b Road transport - All Fuels  | <b>N2O</b>               | 127.61         | 127.61        | 0.18%        | 97.49%        |
| 1A3e Other Transportation - Pipelines  | <b>CO2</b>               | 125.10         | 125.10        | 0.18%        | 97.67%        |
| 2D Non-energy products from fuels and solvent use  | <b>CO2</b>               | 120.52         | 120.52        | 0.17%        | 97.84%        |
| 2G Other Product Manufacture and Use - SF6   | <b>Aggregate F-gases</b> | 109.43         | 109.43        | 0.15%        | 98.00%        |
| 1A3c Railways - All Fuels  | <b>CO2</b>               | 104.59         | 104.59        | 0.15%        | 98.14%        |
| 5B Biological Treatment of Soild Waste   | <b>CH4</b>               | 102.76         | 102.76        | 0.15%        | 98.29%        |
| 4C2 Land Converted to Grassland  | <b>CO2</b>               | -101.81        | 101.81        | 0.14%        | 98.43%        |
| 3I Other carboncontaining fertilizers  | <b>CO2</b>               | 97.50          | 97.50         | 0.14%        | 98.57%        |
| 5D Wastewater Treatment and Discharge  | <b>N2O</b>               | 86.92          | 86.92         | 0.12%        | 98.69%        |
| 1B2d Other (Thermal water extraction + NatGas storage)   | <b>CH4</b>               | 70.24          | 70.24         | 0.10%        | 98.79%        |
| 1A4 Other sectors - Biomass  | <b>N2O</b>               | 65.04          | 65.04         | 0.09%        | 98.88%        |
| 4(II) Emissions and removals from drainage and rewetting and other management of organic and mineral soils | <b>CO2</b>               | 51.70          | 51.70         | 0.07%        | 98.96%        |
| 1B2a Oil   | <b>CH4</b>               | 49.58          | 49.58         | 0.07%        | 99.03%        |
| 2B8 Petrochemical and carbon black production  | <b>CH4</b>               | 44.35          | 44.35         | 0.06%        | 99.09%        |
| 5B Biological Treatment of Soild Waste   | <b>N2O</b>               | 43.98          | 43.98         | 0.06%        | 99.15%        |
| 2A3 Glass production   | <b>CO2</b>               | 43.20          | 43.20         | 0.06%        | 99.21%        |
| 1A5a Stationary  | <b>CO2</b>               | 36.86          | 36.86         | 0.05%        | 99.27%        |
| 2F4 Aerosol + MDI - HFC  | <b>Aggregate F-gases</b> | 34.97          | 34.97         | 0.05%        | 99.32%        |
| 2B2 Nitric Acid Production   | <b>N2O</b>               | 32.97          | 32.97         | 0.05%        | 99.36%        |
| 1B1 Solid fuels  | <b>CH4</b>               | 31.65          | 31.65         | 0.04%        | 99.41%        |
| 1A5b Mobile  | <b>CO2</b>               | 31.50          | 31.50         | 0.04%        | 99.45%        |
| 1A1 Energy Industries - Biomass  | <b>N2O</b>               | 28.76          | 28.76         | 0.04%        | 99.49%        |
| 1B1 Solid fuels  | <b>CO2</b>               | 28.67          | 28.67         | 0.04%        | 99.53%        |

|  |                          |       |       |       |         |
|--|--------------------------|-------|-------|-------|---------|
| 4(III)Direct N2O emissions from N mineralization/immobilization  | <b>N2O</b>               | 27.59 | 27.59 | 0.04% | 99.57%  |
| 5C Incineration and open burning of waste  | <b>CO2</b>               | 25.31 | 25.31 | 0.04% | 99.61%  |
| 1A4 Other sectors - Gaseous fuels  | <b>CH4</b>               | 22.48 | 22.48 | 0.03% | 99.64%  |
| 3C Rice Cultivation  | <b>CH4</b>               | 20.16 | 20.16 | 0.03% | 99.67%  |
| 1A3b Road transport - All Fuels  | <b>CH4</b>               | 20.05 | 20.05 | 0.03% | 99.70%  |
| 1A4 Other sectors - Solid fuels  | <b>CH4</b>               | 18.17 | 18.17 | 0.03% | 99.72%  |
| 1A1 Energy Industries - Biomass  | <b>CH4</b>               | 18.10 | 18.10 | 0.03% | 99.75%  |
| 1A1 Energy Industries - Solid fuels  | <b>N2O</b>               | 17.43 | 17.43 | 0.02% | 99.77%  |
| 1A4 Other sectors - Liquid fuels   | <b>N2O</b>               | 16.01 | 16.01 | 0.02% | 99.79%  |
| 1A2 Manufacturing industries - Biomass   | <b>N2O</b>               | 12.08 | 12.08 | 0.02% | 99.81%  |
| 1A3c Railways - All Fuels  | <b>N2O</b>               | 12.03 | 12.03 | 0.02% | 99.83%  |
| 4(V) Biomass Burning   | <b>CH4</b>               | 10.80 | 10.80 | 0.02% | 99.84%  |
| 1A2 Manufacturing industries - Liquid fuels  | <b>N2O</b>               | 10.36 | 10.36 | 0.01% | 99.86%  |
| 1A3d Domestic navigation - All Liquid fuels  | <b>CO2</b>               | 9.50  | 9.50  | 0.01% | 99.87%  |
| 1A2 Manufacturing industries - Biomass   | <b>CH4</b>               | 7.49  | 7.49  | 0.01% | 99.88%  |
| 4(V) Biomass Burning   | <b>N2O</b>               | 7.39  | 7.39  | 0.01% | 99.89%  |
| 2F3 Fire extinguishers - HFC   | <b>Aggregate F-gases</b> | 6.91  | 6.91  | 0.01% | 99.90%  |
| 1A2 Manufacturing industries - Other fossil fuels  | <b>N2O</b>               | 6.10  | 6.10  | 0.01% | 99.91%  |
| 3G Liming  | <b>CO2</b>               | 5.46  | 5.46  | 0.01% | 99.92%  |
| 1A4 Other sectors - Gaseous fuels  | <b>N2O</b>               | 5.36  | 5.36  | 0.01% | 99.93%  |
| 4D2 Land Converted to Wetlands   | <b>CO2</b>               | -4.35 | 4.35  | 0.01% | 99.93%  |
| 4(IV) Indirect N2O Emissions from Managed Soils  | <b>N2O</b>               | 4.28  | 4.28  | 0.01% | 99.94%  |
| 2C1 Iron and Steel Production  | <b>CH4</b>               | 4.27  | 4.27  | 0.01% | 99.94%  |
| 1A3a Domestic aviation - All fuels   | <b>CO2</b>               | 4.18  | 4.18  | 0.01% | 99.95%  |
| 1A2 Manufacturing industries - Other fossil fuels  | <b>CH4</b>               | 3.84  | 3.84  | 0.01% | 99.96%  |
| 1A1 Energy Industries - Gaseous fuels  | <b>N2O</b>               | 3.09  | 3.09  | 0.00% | 99.96%  |
| 1A1 Energy Industries - Other fossil fuels   | <b>N2O</b>               | 2.91  | 2.91  | 0.00% | 99.96%  |
| 1A1 Energy Industries - Gaseous fuels  | <b>CH4</b>               | 2.59  | 2.59  | 0.00% | 99.97%  |
| 1A4 Other sectors - Liquid fuels   | <b>CH4</b>               | 2.56  | 2.56  | 0.00% | 99.97%  |
| 1A4 Other sectors - Other Fossil Fuels   | <b>N2O</b>               | 1.93  | 1.93  | 0.00% | 99.97%  |
| 4C1 Grassland Remaining Grassland  | <b>CO2</b>               | -1.90 | 1.90  | 0.00% | 99.98%  |
| 1A1 Energy Industries - Other fossil fuels   | <b>CH4</b>               | 1.68  | 1.68  | 0.00% | 99.98%  |
| 1A2 Manufacturing industries - Gaseous fuels   | <b>N2O</b>               | 1.64  | 1.64  | 0.00% | 99.98%  |
| 1A2 Manufacturing industries - Solid fuels   | <b>N2O</b>               | 1.55  | 1.55  | 0.00% | 99.98%  |
| 1A2 Manufacturing industries - Gaseous fuels   | <b>CH4</b>               | 1.38  | 1.38  | 0.00% | 99.99%  |
| 1A4 Other sectors - Other Fossil Fuels   | <b>CH4</b>               | 1.21  | 1.21  | 0.00% | 99.99%  |
| 1A1 Energy Industries - Solid fuels  | <b>CH4</b>               | 1.17  | 1.17  | 0.00% | 99.99%  |
| 1A4 Other sectors - Solid fuels  | <b>N2O</b>               | 1.10  | 1.10  | 0.00% | 99.99%  |
| 1A1 Energy Industries - Liquid fuels   | <b>N2O</b>               | 0.88  | 0.88  | 0.00% | 99.99%  |
| 1B2b Natural Gas   | <b>CO2</b>               | 0.70  | 0.70  | 0.00% | 99.99%  |
| 1A1 Energy Industries - Liquid fuels   | <b>CH4</b>               | 0.53  | 0.53  | 0.00% | 99.99%  |
| 1B2a Oil   | <b>CO2</b>               | 0.53  | 0.53  | 0.00% | 99.99%  |
| 4(II) Emissions and removals from drainage and rewetting and other management of organic and mineral soils | <b>N2O</b>               | 0.48  | 0.48  | 0.00% | 100.00% |
| 4D13 Other Wetlands Remaining Other Wetlands   | <b>CO2</b>               | -0.43 | 0.43  | 0.00% | 100.00% |

|  |                          |      |      |       |         |
|--|--------------------------|------|------|-------|---------|
| 1A2 Manufacturing industries - Liquid fuels            | <b>CH4</b>               | 0.43 | 0.43 | 0.00% | 100.00% |
| 1A2 Manufacturing industries - Solid fuels             | <b>CH4</b>               | 0.41 | 0.41 | 0.00% | 100.00% |
| 5C Incineration and open burning of waste              | <b>N2O</b>               | 0.37 | 0.37 | 0.00% | 100.00% |
| 1B2c Venting and flaring                               | <b>N2O</b>               | 0.28 | 0.28 | 0.00% | 100.00% |
| 1A5b Mobile  | <b>N2O</b>               | 0.26 | 0.26 | 0.00% | 100.00% |
| 3F Field Burning of Agricultural Residues              | <b>CH4</b>               | 0.25 | 0.25 | 0.00% | 100.00% |
| 1A3c Railways - All Fuels                              | <b>CH4</b>               | 0.15 | 0.15 | 0.00% | 100.00% |
| 4D11 Peat Extraction Remaining Peat Extraction         | <b>CO2</b>               | 0.12 | 0.12 | 0.00% | 100.00% |
| 5C Incineration and open burning of waste              | <b>CH4</b>               | 0.09 | 0.09 | 0.00% | 100.00% |
| 1A5a Stationary  | <b>CH4</b>               | 0.08 | 0.08 | 0.00% | 100.00% |
| 3F Field Burning of Agricultural Residues              | <b>N2O</b>               | 0.08 | 0.08 | 0.00% | 100.00% |
| 1A3d Domestic navigation - All Liquid fuels            | <b>N2O</b>               | 0.08 | 0.08 | 0.00% | 100.00% |
| 1A3e Other Transportation - Pipelines                  | <b>N2O</b>               | 0.07 | 0.07 | 0.00% | 100.00% |
| 1A3e Other Transportation - Pipelines                  | <b>CH4</b>               | 0.06 | 0.06 | 0.00% | 100.00% |
| 1A3a Domestic aviation - All fuels                     | <b>N2O</b>               | 0.04 | 0.04 | 0.00% | 100.00% |
| 1A3d Domestic navigation - All Liquid fuels            | <b>CH4</b>               | 0.02 | 0.02 | 0.00% | 100.00% |
| 1A5a Stationary  | <b>N2O</b>               | 0.02 | 0.02 | 0.00% | 100.00% |
| 1B2d Other (Thermal water extraction + NatGas storage) | <b>CO2</b>               | 0.01 | 0.01 | 0.00% | 100.00% |
| 1A5b Mobile  | <b>CH4</b>               | 0.01 | 0.01 | 0.00% | 100.00% |
| 1A3a Domestic aviation - All fuels                     | <b>CH4</b>               | 0.00 | 0.00 | 0.00% | 100.00% |
| 4F2 Land Converted to Other Land                       | <b>CO2</b>               | 0.00 | 0.00 | 0.00% | 100.00% |
| 1A1 Energy Industries - Peat                           | <b>CH4</b>               | 0.00 | 0.00 | 0.00% | 100.00% |
| 1A1 Energy Industries - Peat                           | <b>N2O</b>               | 0.00 | 0.00 | 0.00% | 100.00% |
| 1A2 Manufacturing industries - Peat                    | <b>CH4</b>               | 0.00 | 0.00 | 0.00% | 100.00% |
| 1A2 Manufacturing industries - Peat                    | <b>N2O</b>               | 0.00 | 0.00 | 0.00% | 100.00% |
| 1A3d Domestic navigation - Gaseous fuels               | <b>CH4</b>               | 0.00 | 0.00 | 0.00% | 100.00% |
| 1A3d Domestic navigation - Gaseous fuels               | <b>CO2</b>               | 0.00 | 0.00 | 0.00% | 100.00% |
| 1A3d Domestic navigation - Gaseous fuels               | <b>N2O</b>               | 0.00 | 0.00 | 0.00% | 100.00% |
| 1B2b Natural Gas                                       | <b>N2O</b>               | 0.00 | 0.00 | 0.00% | 100.00% |
| 1B2d Other (Thermal water extraction + NatGas storage) | <b>N2O</b>               | 0.00 | 0.00 | 0.00% | 100.00% |
| 2B1 Ammonia Production                                 | <b>CH4</b>               | 0.00 | 0.00 | 0.00% | 100.00% |
| 2B1 Ammonia Production                                 | <b>N2O</b>               | 0.00 | 0.00 | 0.00% | 100.00% |
| 2B8 Petrochemical and carbon black production          | <b>N2O</b>               | 0.00 | 0.00 | 0.00% | 100.00% |
| 2C1 Iron and Steel Production                          | <b>N2O</b>               | 0.00 | 0.00 | 0.00% | 100.00% |
| 2C2 Ferroalloys Production                             | <b>CH4</b>               | 0.00 | 0.00 | 0.00% | 100.00% |
| 2C2 Ferroalloys Production                             | <b>CO2</b>               | 0.00 | 0.00 | 0.00% | 100.00% |
| 2C2 Ferroalloys Production                             | <b>N2O</b>               | 0.00 | 0.00 | 0.00% | 100.00% |
| 2C3 Aluminium Production                               | <b>CH4</b>               | 0.00 | 0.00 | 0.00% | 100.00% |
| 2C3 Aluminium Production                               | <b>CO2</b>               | 0.00 | 0.00 | 0.00% | 100.00% |
| 2C3 Aluminium Production                               | <b>N2O</b>               | 0.00 | 0.00 | 0.00% | 100.00% |
| 2C3 Aluminium Production                               | <b>PFC</b>               | 0.00 | 0.00 | 0.00% | 100.00% |
| 2D Non-energy products from fuels and solvent use      | <b>CH4</b>               | 0.00 | 0.00 | 0.00% | 100.00% |
| 2E Electronics industry                                | <b>SF6</b>               | 0.00 | 0.00 | 0.00% | 100.00% |
| 2F5 Solvent - HFC+PFC                                  | <b>Aggregate F-gases</b> | 0.00 | 0.00 | 0.00% | 100.00% |
| 3D Agricultural Soils                                  | <b>CH4</b>               | 0.00 | 0.00 | 0.00% | 100.00% |

|  |            |      |      |       |         |
|--|------------|------|------|-------|---------|
| 3J Other   | <b>CH4</b> | 0.00 | 0.00 | 0.00% | 100.00% |
| 3J Other   | <b>CO2</b> | 0.00 | 0.00 | 0.00% | 100.00% |
| 3J Other   | <b>N2O</b> | 0.00 | 0.00 | 0.00% | 100.00% |
| 4(I) Direct N2O emissions from N inputs to managed soils   | <b>N2O</b> | 0.00 | 0.00 | 0.00% | 100.00% |
| 4(II) Emissions and removals from drainage and rewetting and other management of organic and mineral soils | <b>CH4</b> | 0.00 | 0.00 | 0.00% | 100.00% |
| 4(V) Biomass Burning   | <b>CO2</b> | 0.00 | 0.00 | 0.00% | 100.00% |
| 4D12 Flooded Land Remaining Flooded Land   | <b>CO2</b> | 0.00 | 0.00 | 0.00% | 100.00% |
| 4E1 Settlements Remaining Settlements  | <b>CO2</b> | 0.00 | 0.00 | 0.00% | 100.00% |
| 4F1 Other Land Remaining Other Land  | <b>CO2</b> | 0.00 | 0.00 | 0.00% | 100.00% |
| 4H Other   | <b>CH4</b> | 0.00 | 0.00 | 0.00% | 100.00% |
| 4H Other   | <b>CO2</b> | 0.00 | 0.00 | 0.00% | 100.00% |
| 4H Other   | <b>N2O</b> | 0.00 | 0.00 | 0.00% | 100.00% |
| 5A Solid waste disposal  | <b>CO2</b> | 0.00 | 0.00 | 0.00% | 100.00% |
| 5A Solid waste disposal  | <b>N2O</b> | 0.00 | 0.00 | 0.00% | 100.00% |
| 5B Biological Treatment of Solid Waste   | <b>CO2</b> | 0.00 | 0.00 | 0.00% | 100.00% |
| 5D Wastewater Treatment and Discharge  | <b>CO2</b> | 0.00 | 0.00 | 0.00% | 100.00% |
| 5E Other   | <b>CH4</b> | 0.00 | 0.00 | 0.00% | 100.00% |
| 5E Other   | <b>CO2</b> | 0.00 | 0.00 | 0.00% | 100.00% |
| 5E Other   | <b>N2O</b> | 0.00 | 0.00 | 0.00% | 100.00% |

**Table A1-3** Tier1 trend assessment including LULUCF

| CRF code + note  | Direct Greenhouse Gas | Base Year Emission<br>[Gg CO2-eq] | Current Year Emission<br>[Gg CO2-eq] | Trend Assessment | % Contribution to Trend | Cumulative Total % |
|--|-----------------------|-----------------------------------|--------------------------------------|------------------|-------------------------|--------------------|
| 1A3b Road transport - All Fuels                            | CO2                   | 7,153.76                          | 12,181.35                            | 0.074            | 15.24%                  | 15.24%             |
| 1A4 Other sectors - Gaseous fuels                          | CO2                   | 3,988.18                          | 10,034.35                            | 0.070            | 14.33%                  | 29.57%             |
| 1A4 Other sectors - Solid fuels                            | CO2                   | 12,499.72                         | 249.75                               | 0.055            | 11.19%                  | 40.76%             |
| 1A1 Energy Industries - Gaseous fuels                      | CO2                   | 5,731.21                          | 5,786.16                             | 0.025            | 5.07%                   | 45.83%             |
| 2B2 Nitric Acid Production                                 | N2O                   | 4,365.71                          | 32.97                                | 0.020            | 4.00%                   | 49.83%             |
| 1A1 Energy Industries - Solid fuels                        | CO2                   | 14,335.74                         | 5,274.94                             | 0.019            | 3.86%                   | 53.69%             |
| 1A1 Energy Industries - Liquid fuels                       | CO2                   | 5,880.18                          | 988.89                               | 0.018            | 3.70%                   | 57.39%             |
| 2F1 Refrigeration and Air Conditioning Equipment - HFC+PFC | Aggregate F-gases     | 0.00                              | 2,000.73                             | 0.018            | 3.60%                   | 60.98%             |
| 1A4 Other sectors - Liquid fuels                           | CO2                   | 6,947.45                          | 1,615.69                             | 0.017            | 3.56%                   | 64.55%             |
| 4A1 Forest Land Remaining Forest Land                      | CO2                   | -2,368.01                         | -5,470.51                            | 0.017            | 3.52%                   | 68.07%             |
| 5A Solid waste disposal                                    | CH4                   | 2,094.36                          | 2,906.76                             | 0.016            | 3.28%                   | 71.35%             |
| 1A2 Manufacturing industries - Gaseous fuels               | CO2                   | 8,774.22                          | 3,072.77                             | 0.013            | 2.64%                   | 73.99%             |
| 1A2 Manufacturing industries - Solid fuels                 | CO2                   | 3,318.74                          | 359.57                               | 0.012            | 2.44%                   | 76.43%             |
| 2C1 Iron and Steel Production                              | CO2                   | 4,578.59                          | 1,109.59                             | 0.011            | 2.27%                   | 78.70%             |
| 3.D.1 Direct N2O Emissions From Managed Soils              | N2O                   | 4,693.23                          | 3,596.24                             | 0.010            | 2.10%                   | 80.80%             |
| 4A2 Land Converted to Forest Land                          | CO2                   | -41.77                            | -1,143.20                            | 0.009            | 1.94%                   | 82.74%             |
| 2B8 Petrochemical and carbon black production              | CO2                   | 571.26                            | 1,339.80                             | 0.009            | 1.88%                   | 84.62%             |
| 1A2 Manufacturing industries - Liquid fuels                | CO2                   | 4,241.62                          | 1,153.93                             | 0.009            | 1.87%                   | 86.49%             |
| 1B1 Solid fuels  | CH4                   | 1,598.88                          | 31.65                                | 0.007            | 1.43%                   | 87.92%             |
| 1B2b Natural Gas   | CH4                   | 1,400.61                          | 1,322.15                             | 0.005            | 1.07%                   | 89.00%             |
| 1A4 Other sectors - Solid fuels                            | CH4                   | 870.79                            | 18.17                                | 0.004            | 0.78%                   | 89.78%             |
| 4B1 Cropland Remaining Cropland                            | CO2                   | 157.96                            | -316.09                              | 0.003            | 0.72%                   | 90.49%             |
| 2B1 Ammonia Production                                     | CO2                   | 1,714.65                          | 1,239.10                             | 0.003            | 0.63%                   | 91.12%             |
| 1A2 Manufacturing industries - Other fossil fuels          | CO2                   | 0.00                              | 340.97                               | 0.003            | 0.61%                   | 91.74%             |
| 1A4 Other sectors - Biomass                                | CH4                   | 153.20                            | 409.15                               | 0.003            | 0.59%                   | 92.33%             |
| 1A3c Railways - All Fuels                                  | CO2                   | 753.73                            | 104.59                               | 0.003            | 0.51%                   | 92.84%             |
| 4G Harvested Wood Products                                 | CO2                   | -406.40                           | -336.91                              | 0.002            | 0.48%                   | 93.32%             |
| 4B2 Land Converted to Cropland                             | CO2                   | 16.00                             | 239.01                               | 0.002            | 0.41%                   | 93.74%             |
| 2G Other Product Manufacture and Use - N2O                 | N2O                   | 7.29                              | 230.69                               | 0.002            | 0.41%                   | 94.14%             |
| 5D Wastewater Treatment and Discharge                      | CH4                   | 868.47                            | 235.36                               | 0.002            | 0.39%                   | 94.53%             |
| 2C3 Aluminium Production                                   | PFC                   | 371.08                            | 0.00                                 | 0.002            | 0.35%                   | 94.87%             |
| 1A1 Energy Industries - Other fossil fuels                 | CO2                   | 49.45                             | 211.05                               | 0.002            | 0.33%                   | 95.21%             |
| 4E2 Land Converted to Settlements                          | CO2                   | 62.26                             | 212.67                               | 0.002            | 0.32%                   | 95.53%             |
| 2A2 Lime Production  | CO2                   | 606.79                            | 143.52                               | 0.001            | 0.31%                   | 95.84%             |
| 1A3d Domestic navigation - All Liquid fuels                | CO2                   | 340.57                            | 9.50                                 | 0.001            | 0.30%                   | 96.14%             |

|  |                   |          |          |       |       |        |
|--|-------------------|----------|----------|-------|-------|--------|
| 1B2c Venting and flaring   | CO2               | 571.06   | 132.17   | 0.001 | 0.29% | 96.43% |
| 1A4 Other sectors - Other Fossil Fuels   | CO2               | 0.00     | 156.98   | 0.001 | 0.28% | 96.71% |
| 2F2 Foam Blowing - HFC   | Aggregate F-gases | 0.00     | 149.40   | 0.001 | 0.27% | 96.98% |
| 1B2c Venting and flaring   | CH4               | 590.61   | 186.46   | 0.001 | 0.21% | 97.20% |
| 1A3b Road transport - All Fuels  | N2O               | 52.86    | 127.61   | 0.001 | 0.18% | 97.38% |
| 5B Biological Treatment of Solid Waste   | CH4               | 5.00     | 102.76   | 0.001 | 0.18% | 97.56% |
| 4C2 Land Converted to Grassland  | CO2               | -14.39   | -101.81  | 0.001 | 0.14% | 97.70% |
| 3I Other carboncontaining fertilizers  | CO2               | 48.11    | 97.50    | 0.001 | 0.13% | 97.83% |
| 2C3 Aluminium Production   | CO2               | 125.37   | 0.00     | 0.001 | 0.12% | 97.95% |
| 3G Liming  | CO2               | 130.21   | 5.46     | 0.001 | 0.11% | 98.06% |
| 3A Enteric Fermentation  | CH4               | 4,151.36 | 2,095.03 | 0.000 | 0.10% | 98.16% |
| 1A4 Other sectors - Biomass  | N2O               | 24.35    | 65.04    | 0.000 | 0.09% | 98.25% |
| 4(II) Emissions and removals from drainage and rewetting and other management of organic and mineral soils | CO2               | 200.59   | 51.70    | 0.000 | 0.09% | 98.35% |
| 1B2a Oil   | CH4               | 194.56   | 49.58    | 0.000 | 0.09% | 98.44% |
| 1A3e Other Transportation - Pipelines  | CO2               | 154.38   | 125.10   | 0.000 | 0.08% | 98.52% |
| 3B Manure Management   | N2O               | 926.70   | 435.23   | 0.000 | 0.08% | 98.60% |
| 5B Biological Treatment of Solid Waste   | N2O               | 3.58     | 43.98    | 0.000 | 0.08% | 98.68% |
| 2A4 Other Process Uses of Carbonates   | CO2               | 453.29   | 195.14   | 0.000 | 0.07% | 98.75% |
| 3.D.2 Indirect N2O Emissions From Managed Soils  | N2O               | 450.85   | 271.64   | 0.000 | 0.07% | 98.82% |
| 1A5a Stationary  | CO2               | 0.00     | 36.86    | 0.000 | 0.07% | 98.88% |
| 2F4 Aerosol + MDI - HFC  | Aggregate F-gases | 0.00     | 34.97    | 0.000 | 0.06% | 98.95% |
| 2B8 Petrochemical and carbon black production  | CH4               | 20.40    | 44.35    | 0.000 | 0.06% | 99.01% |
| 1A3c Railways - All Fuels  | N2O               | 84.02    | 12.03    | 0.000 | 0.06% | 99.06% |
| 1A4 Other sectors - Solid fuels  | N2O               | 57.48    | 1.10     | 0.000 | 0.05% | 99.11% |
| 2G Other Product Manufacture and Use - SF6   | Aggregate F-gases | 156.32   | 109.43   | 0.000 | 0.05% | 99.17% |
| 1A1 Energy Industries - Biomass  | N2O               | 0.94     | 28.76    | 0.000 | 0.05% | 99.22% |
| 1B1 Solid fuels  | CO2               | 3.60     | 28.67    | 0.000 | 0.05% | 99.26% |
| 2A1 Cement Production  | CO2               | 1,744.64 | 928.79   | 0.000 | 0.05% | 99.31% |
| 4(III)Direct N2O emissions from N mineralization/immobilization  | N2O               | 4.52     | 27.59    | 0.000 | 0.05% | 99.36% |
| 5C Incineration and open burning of waste  | CO2               | 96.88    | 25.31    | 0.000 | 0.04% | 99.40% |
| 1A5b Mobile  | CO2               | 14.50    | 31.50    | 0.000 | 0.04% | 99.44% |
| 3F Field Burning of Agricultural Residues  | CH4               | 46.39    | 0.25     | 0.000 | 0.04% | 99.49% |
| 3C Rice Cultivation  | CH4               | 81.23    | 20.16    | 0.000 | 0.04% | 99.53% |
| 4C1 Grassland Remaining Grassland  | CO2               | -15.46   | -1.90    | 0.000 | 0.04% | 99.56% |
| 2C2 Ferroalloys Production   | CO2               | 40.24    | 0.00     | 0.000 | 0.04% | 99.60% |
| 1A4 Other sectors - Gaseous fuels  | CH4               | 8.97     | 22.48    | 0.000 | 0.03% | 99.63% |
| 1A1 Energy Industries - Biomass  | CH4               | 0.59     | 18.10    | 0.000 | 0.03% | 99.66% |
| 3H Urea application  | CO2               | 229.03   | 136.37   | 0.000 | 0.03% | 99.70% |
| 1A1 Energy Industries - Solid fuels  | N2O               | 63.36    | 17.43    | 0.000 | 0.03% | 99.72% |

|   |                   |          |        |       |       |        |
|---|-------------------|----------|--------|-------|-------|--------|
| <b>3B Manure Management</b>                                   | CH4               | 1,258.92 | 639.06 | 0.000 | 0.02% | 99.75% |
| <b>1A2 Manufacturing industries - Biomass</b>                 | N2O               | 0.90     | 12.08  | 0.000 | 0.02% | 99.77% |
| <b>1A4 Other sectors - Liquid fuels</b>                       | CH4               | 20.38    | 2.56   | 0.000 | 0.01% | 99.78% |
| <b>1A3b Road transport - All Fuels</b>                        | CH4               | 54.06    | 20.05  | 0.000 | 0.01% | 99.80% |
| <b>3F Field Burning of Agricultural Residues</b>              | N2O               | 14.34    | 0.08   | 0.000 | 0.01% | 99.81% |
| <b>1A2 Manufacturing industries - Biomass</b>                 | CH4               | 0.57     | 7.49   | 0.000 | 0.01% | 99.82% |
| <b>2F3 Fire extinguishers - HFC</b>                           | Aggregate F-gases | 0.00     | 6.91   | 0.000 | 0.01% | 99.84% |
| <b>5D Wastewater Treatment and Discharge</b>                  | N2O               | 154.87   | 86.92  | 0.000 | 0.01% | 99.85% |
| <b>1A2 Manufacturing industries - Other fossil fuels</b>      | N2O               | 0.00     | 6.10   | 0.000 | 0.01% | 99.86% |
| <b>4D2 Land Converted to Wetlands</b>                         | CO2               | 3.09     | -4.35  | 0.000 | 0.01% | 99.87% |
| <b>2D Non-energy products from fuels and solvent use</b>      | CO2               | 221.82   | 120.52 | 0.000 | 0.01% | 99.88% |
| <b>1A1 Energy Industries - Liquid fuels</b>                   | N2O               | 12.53    | 0.88   | 0.000 | 0.01% | 99.89% |
| <b>1A2 Manufacturing industries - Solid fuels</b>             | N2O               | 12.70    | 1.55   | 0.000 | 0.01% | 99.90% |
| <b>1A4 Other sectors - Gaseous fuels</b>                      | N2O               | 2.14     | 5.36   | 0.000 | 0.01% | 99.91% |
| <b>1A2 Manufacturing industries - Other fossil fuels</b>      | CH4               | 0.00     | 3.84   | 0.000 | 0.01% | 99.91% |
| <b>4(IV) Indirect N2O Emissions from Managed Soils</b>        | N2O               | 0.91     | 4.28   | 0.000 | 0.01% | 99.92% |
| <b>1B2d Other (Thermal water extraction + NatGas storage)</b> | CH4               | 129.25   | 70.24  | 0.000 | 0.01% | 99.93% |
| <b>1A2 Manufacturing industries - Solid fuels</b>             | CH4               | 7.16     | 0.41   | 0.000 | 0.01% | 99.93% |
| <b>1A2 Manufacturing industries - Liquid fuels</b>            | N2O               | 13.98    | 10.36  | 0.000 | 0.01% | 99.94% |
| <b>4D13 Other Wetlands Remaining Other Wetlands</b>           | CO2               | -2.05    | -0.43  | 0.000 | 0.00% | 99.94% |
| <b>1A1 Energy Industries - Other fossil fuels</b>             | N2O               | 0.94     | 2.91   | 0.000 | 0.00% | 99.95% |
| <b>1B2a Oil</b>   | CO2               | 5.57     | 0.53   | 0.000 | 0.00% | 99.95% |
| <b>1A3a Domestic aviation - All fuels</b>                     | CO2               | 3.63     | 4.18   | 0.000 | 0.00% | 99.95% |
| <b>1A1 Energy Industries - Liquid fuels</b>                   | CH4               | 5.39     | 0.53   | 0.000 | 0.00% | 99.96% |
| <b>2A3 Glass production</b>                                   | CO2               | 87.63    | 43.20  | 0.000 | 0.00% | 99.96% |
| <b>4(V) Biomass Burning</b>                                   | CH4               | 24.72    | 10.80  | 0.000 | 0.00% | 99.97% |
| <b>1A4 Other sectors - Other Fossil Fuels</b>                 | N2O               | 0.00     | 1.93   | 0.000 | 0.00% | 99.97% |
| <b>1A2 Manufacturing industries - Liquid fuels</b>            | CH4               | 4.34     | 0.43   | 0.000 | 0.00% | 99.97% |
| <b>1A1 Energy Industries - Gaseous fuels</b>                  | N2O               | 3.07     | 3.09   | 0.000 | 0.00% | 99.98% |
| <b>1A3d Domestic navigation - All Liquid fuels</b>            | N2O               | 2.87     | 0.08   | 0.000 | 0.00% | 99.98% |
| <b>1A1 Energy Industries - Other fossil fuels</b>             | CH4               | 0.59     | 1.68   | 0.000 | 0.00% | 99.98% |
| <b>2C1 Iron and Steel Production</b>                          | CH4               | 10.89    | 4.27   | 0.000 | 0.00% | 99.98% |
| <b>1A1 Energy Industries - Gaseous fuels</b>                  | CH4               | 2.57     | 2.59   | 0.000 | 0.00% | 99.99% |
| <b>1A4 Other sectors - Other Fossil Fuels</b>                 | CH4               | 0.00     | 1.21   | 0.000 | 0.00% | 99.99% |
| <b>1A4 Other sectors - Liquid fuels</b>                       | N2O               | 29.31    | 16.01  | 0.000 | 0.00% | 99.99% |
| <b>1A2 Manufacturing industries - Gaseous fuels</b>           | N2O               | 4.70     | 1.64   | 0.000 | 0.00% | 99.99% |
| <b>4(V) Biomass Burning</b>                                   | N2O               | 15.74    | 7.39   | 0.000 | 0.00% | 99.99% |

|   |     |      |      |       |       |         |
|---|-----|------|------|-------|-------|---------|
| <b>1A1 Energy Industries - Solid fuels</b>  | CH4 | 3.59 | 1.17 | 0.000 | 0.00% | 99.99%  |
| <b>1A2 Manufacturing industries - Gaseous fuels</b>   | CH4 | 3.95 | 1.38 | 0.000 | 0.00% | 99.99%  |
| <b>1B2b Natural Gas</b>   | CO2 | 2.28 | 0.70 | 0.000 | 0.00% | 100.00% |
| <b>5C Incineration and open burning of waste</b>  | N2O | 1.64 | 0.37 | 0.000 | 0.00% | 100.00% |
| <b>1A3d Domestic navigation - All Liquid fuels</b>  | CH4 | 0.84 | 0.02 | 0.000 | 0.00% | 100.00% |
| <b>4(II) Emissions and removals from drainage and rewetting and other management of organic and mineral soils</b> | N2O | 0.14 | 0.48 | 0.000 | 0.00% | 100.00% |
| <b>1A3c Railways - All Fuels</b>  | CH4 | 1.04 | 0.15 | 0.000 | 0.00% | 100.00% |
| <b>1A5b Mobile</b>  | N2O | 0.12 | 0.26 | 0.000 | 0.00% | 100.00% |
| <b>1B2c Venting and flaring</b>   | N2O | 0.89 | 0.28 | 0.000 | 0.00% | 100.00% |
| <b>2C2 Ferroalloys Production</b>   | CH4 | 0.25 | 0.00 | 0.000 | 0.00% | 100.00% |
| <b>4D11 Peat Extraction Remaining Peat Extraction</b>   | CO2 | 1.32 | 0.12 | 0.000 | 0.00% | 100.00% |
| <b>5C Incineration and open burning of waste</b>  | CH4 | 0.40 | 0.09 | 0.000 | 0.00% | 100.00% |
| <b>1A5a Stationary</b>  | CH4 | 0.00 | 0.08 | 0.000 | 0.00% | 100.00% |
| <b>1A3e Other Transportation - Pipelines</b>  | N2O | 0.08 | 0.07 | 0.000 | 0.00% | 100.00% |
| <b>1A3e Other Transportation - Pipelines</b>  | CH4 | 0.07 | 0.06 | 0.000 | 0.00% | 100.00% |
| <b>1A5a Stationary</b>  | N2O | 0.00 | 0.02 | 0.000 | 0.00% | 100.00% |
| <b>1A3a Domestic aviation - All fuels</b>   | N2O | 0.03 | 0.04 | 0.000 | 0.00% | 100.00% |
| <b>1B2d Other (Thermal water extraction + NatGas storage)</b>   | CO2 | 0.04 | 0.01 | 0.000 | 0.00% | 100.00% |
| <b>1A5b Mobile</b>  | CH4 | 0.00 | 0.01 | 0.000 | 0.00% | 100.00% |
| <b>1A3a Domestic aviation - All fuels</b>   | CH4 | 0.00 | 0.00 | 0.000 | 0.00% | 100.00% |
| <b>5E Other</b>   | N2O | 0.00 | 0.00 | 0.000 | 0.00% | 100.00% |
| <b>5E Other</b>   | CO2 | 0.00 | 0.00 | 0.000 | 0.00% | 100.00% |
| <b>5E Other</b>   | CH4 | 0.00 | 0.00 | 0.000 | 0.00% | 100.00% |
| <b>5D Wastewater Treatment and Discharge</b>  | CO2 | 0.00 | 0.00 | 0.000 | 0.00% | 100.00% |
| <b>5B Biological Treatment of Solid Waste</b>   | CO2 | 0.00 | 0.00 | 0.000 | 0.00% | 100.00% |
| <b>5A Solid waste disposal</b>  | N2O | 0.00 | 0.00 | 0.000 | 0.00% | 100.00% |
| <b>5A Solid waste disposal</b>  | CO2 | 0.00 | 0.00 | 0.000 | 0.00% | 100.00% |
| <b>4H Other</b>   | N2O | 0.00 | 0.00 | 0.000 | 0.00% | 100.00% |
| <b>4H Other</b>   | CO2 | 0.00 | 0.00 | 0.000 | 0.00% | 100.00% |
| <b>4H Other</b>   | CH4 | 0.00 | 0.00 | 0.000 | 0.00% | 100.00% |
| <b>4F2 Land Converted to Other Land</b>   | CO2 | 0.00 | 0.00 | 0.000 | 0.00% | 100.00% |
| <b>4F1 Other Land Remaining Other Land</b>  | CO2 | 0.00 | 0.00 | 0.000 | 0.00% | 100.00% |
| <b>4E1 Settlements Remaining Settlements</b>  | CO2 | 0.00 | 0.00 | 0.000 | 0.00% | 100.00% |
| <b>4D12 Flooded Land Remaining Flooded Land</b>   | CO2 | 0.00 | 0.00 | 0.000 | 0.00% | 100.00% |
| <b>4(V) Biomass Burning</b>   | CO2 | 0.00 | 0.00 | 0.000 | 0.00% | 100.00% |
| <b>4(II) Emissions and removals from drainage and rewetting and other management of organic and mineral soils</b> | CH4 | 0.00 | 0.00 | 0.000 | 0.00% | 100.00% |

|   |                   |      |      |       |       |         |
|---|-------------------|------|------|-------|-------|---------|
| <b>4(I) Direct N2O emissions from N inputs to managed soils</b> | N2O               | 0.00 | 0.00 | 0.000 | 0.00% | 100.00% |
| <b>3J Other</b>   | N2O               | 0.00 | 0.00 | 0.000 | 0.00% | 100.00% |
| <b>3J Other</b>   | CO2               | 0.00 | 0.00 | 0.000 | 0.00% | 100.00% |
| <b>3J Other</b>   | CH4               | 0.00 | 0.00 | 0.000 | 0.00% | 100.00% |
| <b>3D Agricultural Soils</b>                                    | CH4               | 0.00 | 0.00 | 0.000 | 0.00% | 100.00% |
| <b>2F5 Solvent - HFC+PFC</b>                                    | Aggregate F-gases | 0.00 | 0.00 | 0.000 | 0.00% | 100.00% |
| <b>2E Electronics industry</b>                                  | SF6               | 0.00 | 0.00 | 0.000 | 0.00% | 100.00% |
| <b>2D Non-energy products from fuels and solvent use</b>        | CH4               | 0.00 | 0.00 | 0.000 | 0.00% | 100.00% |
| <b>2C3 Aluminium Production</b>                                 | N2O               | 0.00 | 0.00 | 0.000 | 0.00% | 100.00% |
| <b>2C3 Aluminium Production</b>                                 | CH4               | 0.00 | 0.00 | 0.000 | 0.00% | 100.00% |
| <b>2C2 Ferroalloys Production</b>                               | N2O               | 0.00 | 0.00 | 0.000 | 0.00% | 100.00% |
| <b>2C1 Iron and Steel Production</b>                            | N2O               | 0.00 | 0.00 | 0.000 | 0.00% | 100.00% |
| <b>2B8 Petrochemical and carbon black production</b>            | N2O               | 0.00 | 0.00 | 0.000 | 0.00% | 100.00% |
| <b>2B1 Ammonia Production</b>                                   | N2O               | 0.00 | 0.00 | 0.000 | 0.00% | 100.00% |
| <b>2B1 Ammonia Production</b>                                   | CH4               | 0.00 | 0.00 | 0.000 | 0.00% | 100.00% |
| <b>1B2d Other (Thermal water extraction + NatGas storage)</b>   | N2O               | 0.00 | 0.00 | 0.000 | 0.00% | 100.00% |
| <b>1B2b Natural Gas</b>   | N2O               | 0.00 | 0.00 | 0.000 | 0.00% | 100.00% |
| <b>1A3d Domestic navigation - Gaseous fuels</b>                 | N2O               | 0.00 | 0.00 | 0.000 | 0.00% | 100.00% |
| <b>1A3d Domestic navigation - Gaseous fuels</b>                 | CO2               | 0.00 | 0.00 | 0.000 | 0.00% | 100.00% |
| <b>1A3d Domestic navigation - Gaseous fuels</b>                 | CH4               | 0.00 | 0.00 | 0.000 | 0.00% | 100.00% |
| <b>1A2 Manufacturing industries - Peat</b>                      | N2O               | 0.00 | 0.00 | 0.000 | 0.00% | 100.00% |
| <b>1A2 Manufacturing industries - Peat</b>                      | CH4               | 0.00 | 0.00 | 0.000 | 0.00% | 100.00% |
| <b>1A1 Energy Industries - Peat</b>                             | N2O               | 0.00 | 0.00 | 0.000 | 0.00% | 100.00% |
| <b>1A1 Energy Industries - Peat</b>                             | CH4               | 0.00 | 0.00 | 0.000 | 0.00% | 100.00% |

**Table A1-4** Tier 1 level assessment excluding LULUCF (2020)

| Category   | Direct Greenhouse Gas | Latest Year Emission excluding LULUCF [Gg CO <sub>2</sub> -eq] | Emission in absolute value [Gg CO <sub>2</sub> -eq] | Level Assessment | Cumulative Total% |
|--|-----------------------|--|---|------------------|-------------------|
| 1A3b Road transport - All Fuels                              | CO <sub>2</sub>       | 12,181.35  | 12,181.35   | 19.39%           | 19.39%            |
| 1A4 Other sectors - Gaseous fuels                            | CO <sub>2</sub>       | 10,034.35  | 10,034.35   | 15.97%           | 35.36%            |
| 1A1 Energy Industries - Gaseous fuels                        | CO <sub>2</sub>       | 5,786.16   | 5,786.16  | 9.21%            | 44.58%            |
| 1A1 Energy Industries - Solid fuels                          | CO <sub>2</sub>       | 5,274.94   | 5,274.94  | 8.40%            | 52.97%            |
| 3.D.1 Direct N <sub>2</sub> O Emissions From Managed Soils   | N <sub>2</sub> O      | 3,596.24   | 3,596.24  | 5.72%            | 58.70%            |
| 1A2 Manufacturing industries - Gaseous fuels                 | CO <sub>2</sub>       | 3,072.77   | 3,072.77  | 4.89%            | 63.59%            |
| 5A Solid waste disposal                                      | CH <sub>4</sub>       | 2,906.76   | 2,906.76  | 4.63%            | 68.22%            |
| 3A Enteric Fermentation                                      | CH <sub>4</sub>       | 2,095.03   | 2,095.03  | 3.34%            | 71.55%            |
| 2F1 Refrigeration and Air Conditioning Equipment - HFC+PFC   | Aggregate F-gases     | 2,000.73   | 2,000.73  | 3.18%            | 74.74%            |
| 1A4 Other sectors - Liquid fuels                             | CO <sub>2</sub>       | 1,615.69   | 1,615.69  | 2.57%            | 77.31%            |
| 2B8 Petrochemical and carbon black production                | CO <sub>2</sub>       | 1,339.80   | 1,339.80  | 2.13%            | 79.44%            |
| 1B2b Natural Gas   | CH <sub>4</sub>       | 1,322.15   | 1,322.15  | 2.10%            | 81.55%            |
| 2B1 Ammonia Production                                       | CO <sub>2</sub>       | 1,239.10   | 1,239.10  | 1.97%            | 83.52%            |
| 1A2 Manufacturing industries - Liquid fuels                  | CO <sub>2</sub>       | 1,153.93   | 1,153.93  | 1.84%            | 85.36%            |
| 2C1 Iron and Steel Production                                | CO <sub>2</sub>       | 1,109.59   | 1,109.59  | 1.77%            | 87.12%            |
| 1A1 Energy Industries - Liquid fuels                         | CO <sub>2</sub>       | 988.89   | 988.89  | 1.57%            | 88.70%            |
| 2A1 Cement Production  | CO <sub>2</sub>       | 928.79   | 928.79  | 1.48%            | 90.17%            |
| 3B Manure Management   | CH <sub>4</sub>       | 639.06   | 639.06  | 1.02%            | 91.19%            |
| 3B Manure Management   | N <sub>2</sub> O      | 435.23   | 435.23  | 0.69%            | 91.88%            |
| 1A4 Other sectors - Biomass                                  | CH <sub>4</sub>       | 409.15   | 409.15  | 0.65%            | 92.54%            |
| 1A2 Manufacturing industries - Solid fuels                   | CO <sub>2</sub>       | 359.57   | 359.57  | 0.57%            | 93.11%            |
| 1A2 Manufacturing industries - Other fossil fuels            | CO <sub>2</sub>       | 340.97   | 340.97  | 0.54%            | 93.65%            |
| 3.D.2 Indirect N <sub>2</sub> O Emissions From Managed Soils | N <sub>2</sub> O      | 271.64   | 271.64  | 0.43%            | 94.08%            |
| 1A4 Other sectors - Solid fuels                              | CO <sub>2</sub>       | 249.75   | 249.75  | 0.40%            | 94.48%            |
| 5D Wastewater Treatment and Discharge                        | CH <sub>4</sub>       | 235.36   | 235.36  | 0.37%            | 94.86%            |
| 2G Other Product Manufacture and Use - N <sub>2</sub> O      | N <sub>2</sub> O      | 230.69   | 230.69  | 0.37%            | 95.22%            |
| 1A1 Energy Industries - Other fossil fuels                   | CO <sub>2</sub>       | 211.05   | 211.05  | 0.34%            | 95.56%            |
| 2A4 Other Process Uses of Carbonates                         | CO <sub>2</sub>       | 195.14   | 195.14  | 0.31%            | 95.87%            |
| 1B2c Venting and flaring                                     | CH <sub>4</sub>       | 186.46   | 186.46  | 0.30%            | 96.17%            |
| 1A4 Other sectors - Other Fossil Fuels                       | CO <sub>2</sub>       | 156.98   | 156.98  | 0.25%            | 96.42%            |
| 2F2 Foam Blowing - HFC                                       | Aggregate F-gases     | 149.40   | 149.40  | 0.24%            | 96.65%            |
| 2A2 Lime Production  | CO <sub>2</sub>       | 143.52   | 143.52  | 0.23%            | 96.88%            |
| 3H Urea application  | CO <sub>2</sub>       | 136.37   | 136.37  | 0.22%            | 97.10%            |
| 1B2c Venting and flaring                                     | CO <sub>2</sub>       | 132.17   | 132.17  | 0.21%            | 97.31%            |
| 1A3b Road transport - All Fuels                              | N <sub>2</sub> O      | 127.61   | 127.61  | 0.20%            | 97.51%            |
| 1A3e Other Transportation - Pipelines                        | CO <sub>2</sub>       | 125.10   | 125.10  | 0.20%            | 97.71%            |

| Category   | Direct Greenhouse Gas | Latest Year Emission excluding LULUCF [Gg CO2-eq] | Emission in absolute value [Gg CO2-eq] | Level Assessment | Cumulative Total% |
|--|-----------------------|---|--|------------------|-------------------|
| 2D Non-energy products from fuels and solvent use      | CO2                   | 120.52  | 120.52                                 | 0.19%            | 97.90%            |
| 2G Other Product Manufacture and Use - SF6             | Aggregate F-gases     | 109.43  | 109.43                                 | 0.17%            | 98.08%            |
| 1A3c Railways - All Fuels                              | CO2                   | 104.59  | 104.59                                 | 0.17%            | 98.25%            |
| 5B Biological Treatment of Soild Waste                 | CH4                   | 102.76  | 102.76                                 | 0.16%            | 98.41%            |
| 3I Other carboncontaining fertilizers                  | CO2                   | 97.50   | 97.50                                  | 0.16%            | 98.56%            |
| 5D Wastewater Treatment and Discharge                  | N2O                   | 86.92   | 86.92                                  | 0.14%            | 98.70%            |
| 1B2d Other (Thermal water extraction + NatGas storage) | CH4                   | 70.24   | 70.24                                  | 0.11%            | 98.81%            |
| 1A4 Other sectors - Biomass                            | N2O                   | 65.04   | 65.04                                  | 0.10%            | 98.92%            |
| 1B2a Oil   | CH4                   | 49.58   | 49.58                                  | 0.08%            | 99.00%            |
| 2B8 Petrochemical and carbon black production          | CH4                   | 44.35   | 44.35                                  | 0.07%            | 99.07%            |
| 5B Biological Treatment of Soild Waste                 | N2O                   | 43.98   | 43.98                                  | 0.07%            | 99.14%            |
| 2A3 Glass production                                   | CO2                   | 43.20   | 43.20                                  | 0.07%            | 99.21%            |
| 1A5a Stationary  | CO2                   | 36.86   | 36.86                                  | 0.06%            | 99.26%            |
| 2F4 Aerosol + MDI - HFC                                | Aggregate F-gases     | 34.97   | 34.97                                  | 0.06%            | 99.32%            |
| 2B2 Nitric Acid Production                             | N2O                   | 32.97   | 32.97                                  | 0.05%            | 99.37%            |
| 1B1 Solid fuels  | CH4                   | 31.65   | 31.65                                  | 0.05%            | 99.42%            |
| 1A5b Mobile  | CO2                   | 31.50   | 31.50                                  | 0.05%            | 99.47%            |
| 1A1 Energy Industries - Biomass                        | N2O                   | 28.76   | 28.76                                  | 0.05%            | 99.52%            |
| 1B1 Solid fuels  | CO2                   | 28.67   | 28.67                                  | 0.05%            | 99.56%            |
| 5C Incineration and open burning of waste              | CO2                   | 25.31   | 25.31                                  | 0.04%            | 99.61%            |
| 1A4 Other sectors - Gaseous fuels                      | CH4                   | 22.48   | 22.48                                  | 0.04%            | 99.64%            |
| 3C Rice Cultivation                                    | CH4                   | 20.16   | 20.16                                  | 0.03%            | 99.67%            |
| 1A3b Road trasport - All Fuels                         | CH4                   | 20.05   | 20.05                                  | 0.03%            | 99.70%            |
| 1A4 Other sectors - Solid fuels                        | CH4                   | 18.17   | 18.17                                  | 0.03%            | 99.73%            |
| 1A1 Energy Industries - Biomass                        | CH4                   | 18.10   | 18.10                                  | 0.03%            | 99.76%            |
| 1A1 Energy Industries - Solid fuels                    | N2O                   | 17.43   | 17.43                                  | 0.03%            | 99.79%            |
| 1A4 Other sectors - Liquid fuels                       | N2O                   | 16.01   | 16.01                                  | 0.03%            | 99.82%            |
| 1A2 Manufacturing industries - Biomass                 | N2O                   | 12.08   | 12.08                                  | 0.02%            | 99.84%            |
| 1A3c Railways - All Fuels                              | N2O                   | 12.03   | 12.03                                  | 0.02%            | 99.85%            |
| 1A2 Manufacturing industries - Liquid fuels            | N2O                   | 10.36   | 10.36                                  | 0.02%            | 99.87%            |
| 1A3d Domestic navigation - All Liquid fuels            | CO2                   | 9.50  | 9.50                                   | 0.02%            | 99.89%            |
| 1A2 Manufacturing industries - Biomass                 | CH4                   | 7.49  | 7.49                                   | 0.01%            | 99.90%            |
| 2F3 Fire extinguishers - HFC                           | Aggregate F-gases     | 6.91  | 6.91                                   | 0.01%            | 99.91%            |
| 1A2 Manufacturing industries - Other fossil fuels      | N2O                   | 6.10  | 6.10                                   | 0.01%            | 99.92%            |
| 3G Liming  | CO2                   | 5.46  | 5.46                                   | 0.01%            | 99.93%            |
| 1A4 Other sectors - Gaseous fuels                      | N2O                   | 5.36  | 5.36                                   | 0.01%            | 99.94%            |
| 2C1 Iron and Steel Production                          | CH4                   | 4.27  | 4.27                                   | 0.01%            | 99.94%            |
| 1A3a Domestic aviation - All fuels                     | CO2                   | 4.18  | 4.18                                   | 0.01%            | 99.95%            |
| 1A2 Manufacturing industries - Other fossil fuels      | CH4                   | 3.84  | 3.84                                   | 0.01%            | 99.96%            |

| Category   | Direct Greenhouse Gas | Latest Year                           | Emission in                |       | Level Assessment | Cumulative Total% |
|--|-----------------------|---------------------------------------|----------------------------|-------|------------------|-------------------|
|  |                       | Emission excluding LULUCF [Gg CO2-eq] | absolute value [Gg CO2-eq] |       |                  |                   |
| 1A1 Energy Industries - Gaseous fuels                  | N2O                   | 3.09                                  | 3.09                       | 0.00% | 99.96%           |                   |
| 1A1 Energy Industries - Other fossil fuels             | N2O                   | 2.91                                  | 2.91                       | 0.00% | 99.96%           |                   |
| 1A1 Energy Industries - Gaseous fuels                  | CH4                   | 2.59                                  | 2.59                       | 0.00% | 99.97%           |                   |
| 1A4 Other sectors - Liquid fuels                       | CH4                   | 2.56                                  | 2.56                       | 0.00% | 99.97%           |                   |
| 1A4 Other sectors - Other Fossil Fuels                 | N2O                   | 1.93                                  | 1.93                       | 0.00% | 99.98%           |                   |
| 1A1 Energy Industries - Other fossil fuels             | CH4                   | 1.68                                  | 1.68                       | 0.00% | 99.98%           |                   |
| 1A2 Manufacturing industries - Gaseous fuels           | N2O                   | 1.64                                  | 1.64                       | 0.00% | 99.98%           |                   |
| 1A2 Manufacturing industries - Solid fuels             | N2O                   | 1.55                                  | 1.55                       | 0.00% | 99.98%           |                   |
| 1A2 Manufacturing industries - Gaseous fuels           | CH4                   | 1.38                                  | 1.38                       | 0.00% | 99.99%           |                   |
| 1A4 Other sectors - Other Fossil Fuels                 | CH4                   | 1.21                                  | 1.21                       | 0.00% | 99.99%           |                   |
| 1A1 Energy Industries - Solid fuels                    | CH4                   | 1.17                                  | 1.17                       | 0.00% | 99.99%           |                   |
| 1A4 Other sectors - Solid fuels                        | N2O                   | 1.10                                  | 1.10                       | 0.00% | 99.99%           |                   |
| 1A1 Energy Industries - Liquid fuels                   | N2O                   | 0.88                                  | 0.88                       | 0.00% | 99.99%           |                   |
| 1B2b Natural Gas                                       | CO2                   | 0.70                                  | 0.70                       | 0.00% | 99.99%           |                   |
| 1A1 Energy Industries - Liquid fuels                   | CH4                   | 0.53                                  | 0.53                       | 0.00% | 99.99%           |                   |
| 1B2a Oil   | CO2                   | 0.53                                  | 0.53                       | 0.00% | 100.00%          |                   |
| 1A2 Manufacturing industries - Liquid fuels            | CH4                   | 0.43                                  | 0.43                       | 0.00% | 100.00%          |                   |
| 1A2 Manufacturing industries - Solid fuels             | CH4                   | 0.41                                  | 0.41                       | 0.00% | 100.00%          |                   |
| 5C Incineration and open burning of waste              | N2O                   | 0.37                                  | 0.37                       | 0.00% | 100.00%          |                   |
| 1B2c Venting and flaring                               | N2O                   | 0.28                                  | 0.28                       | 0.00% | 100.00%          |                   |
| 1A5b Mobile  | N2O                   | 0.26                                  | 0.26                       | 0.00% | 100.00%          |                   |
| 3F Field Burning of Agricultural Residues              | CH4                   | 0.25                                  | 0.25                       | 0.00% | 100.00%          |                   |
| 1A3c Railways - All Fuels                              | CH4                   | 0.15                                  | 0.15                       | 0.00% | 100.00%          |                   |
| 5C Incineration and open burning of waste              | CH4                   | 0.09                                  | 0.09                       | 0.00% | 100.00%          |                   |
| 1A5a Stationary  | CH4                   | 0.08                                  | 0.08                       | 0.00% | 100.00%          |                   |
| 3F Field Burning of Agricultural Residues              | N2O                   | 0.08                                  | 0.08                       | 0.00% | 100.00%          |                   |
| 1A3d Domestic navigation - All Liquid fuels            | N2O                   | 0.08                                  | 0.08                       | 0.00% | 100.00%          |                   |
| 1A3e Other Transportation - Pipelines                  | N2O                   | 0.07                                  | 0.07                       | 0.00% | 100.00%          |                   |
| 1A3e Other Transportation - Pipelines                  | CH4                   | 0.06                                  | 0.06                       | 0.00% | 100.00%          |                   |
| 1A3a Domestic aviation - All fuels                     | N2O                   | 0.04                                  | 0.04                       | 0.00% | 100.00%          |                   |
| 1A3d Domestic navigation - All Liquid fuels            | CH4                   | 0.02                                  | 0.02                       | 0.00% | 100.00%          |                   |
| 1A5a Stationary  | N2O                   | 0.02                                  | 0.02                       | 0.00% | 100.00%          |                   |
| 1B2d Other (Thermal water extraction + NatGas storage) | CO2                   | 0.01                                  | 0.01                       | 0.00% | 100.00%          |                   |
| 1A5b Mobile  | CH4                   | 0.01                                  | 0.01                       | 0.00% | 100.00%          |                   |
| 1A3a Domestic aviation - All fuels                     | CH4                   | 0.00                                  | 0.00                       | 0.00% | 100.00%          |                   |
| 1A1 Energy Industries - Peat                           | CH4                   | 0.00                                  | 0.00                       | 0.00% | 100.00%          |                   |
| 1A1 Energy Industries - Peat                           | N2O                   | 0.00                                  | 0.00                       | 0.00% | 100.00%          |                   |
| 1A2 Manufacturing industries - Peat                    | CH4                   | 0.00                                  | 0.00                       | 0.00% | 100.00%          |                   |
| 1A2 Manufacturing industries - Peat                    | N2O                   | 0.00                                  | 0.00                       | 0.00% | 100.00%          |                   |
| 1A3d Domestic navigation - Gaseous fuels               | CH4                   | 0.00                                  | 0.00                       | 0.00% | 100.00%          |                   |
| 1A3d Domestic navigation - Gaseous fuels               | CO2                   | 0.00                                  | 0.00                       | 0.00% | 100.00%          |                   |
| 1A3d Domestic navigation - Gaseous fuels               | N2O                   | 0.00                                  | 0.00                       | 0.00% | 100.00%          |                   |

| Category   | Direct Greenhouse Gas | Latest Year Emission excluding LULUCF [Gg CO2-eq] | Emission in absolute value [Gg CO2-eq] | Level Assessment | Cumulative Total% |
|--|-----------------------|---|--|------------------|-------------------|
| 1B2b Natural Gas                                       | N2O                   | 0.00  | 0.00                                   | 0.00%            | 100.00%           |
| 1B2d Other (Thermal water extraction + NatGas storage) | N2O                   | 0.00  | 0.00                                   | 0.00%            | 100.00%           |
| 2B1 Ammonia Production                                 | CH4                   | 0.00  | 0.00                                   | 0.00%            | 100.00%           |
| 2B1 Ammonia Production                                 | N2O                   | 0.00  | 0.00                                   | 0.00%            | 100.00%           |
| 2B8 Petrochemical and carbon black production          | N2O                   | 0.00  | 0.00                                   | 0.00%            | 100.00%           |
| 2C1 Iron and Steel Production                          | N2O                   | 0.00  | 0.00                                   | 0.00%            | 100.00%           |
| 2C2 Ferroalloys Production                             | CH4                   | 0.00  | 0.00                                   | 0.00%            | 100.00%           |
| 2C2 Ferroalloys Production                             | CO2                   | 0.00  | 0.00                                   | 0.00%            | 100.00%           |
| 2C2 Ferroalloys Production                             | N2O                   | 0.00  | 0.00                                   | 0.00%            | 100.00%           |
| 2C3 Aluminium Production                               | CH4                   | 0.00  | 0.00                                   | 0.00%            | 100.00%           |
| 2C3 Aluminium Production                               | CO2                   | 0.00  | 0.00                                   | 0.00%            | 100.00%           |
| 2C3 Aluminium Production                               | N2O                   | 0.00  | 0.00                                   | 0.00%            | 100.00%           |
| 2C3 Aluminium Production                               | PFC                   | 0.00  | 0.00                                   | 0.00%            | 100.00%           |
| 2D Non-energy products from fuels and solvent use      | CH4                   | 0.00  | 0.00                                   | 0.00%            | 100.00%           |
| 2E Electronics industry                                | SF6                   | 0.00  | 0.00                                   | 0.00%            | 100.00%           |
| 2F5 Solvent - HFC+PFC                                  | Aggregate F-gases     | 0.00  | 0.00                                   | 0.00%            | 100.00%           |
| 3D Agricultural Soils                                  | CH4                   | 0.00  | 0.00                                   | 0.00%            | 100.00%           |
| 3J Other   | CH4                   | 0.00  | 0.00                                   | 0.00%            | 100.00%           |
| 3J Other   | CO2                   | 0.00  | 0.00                                   | 0.00%            | 100.00%           |
| 3J Other   | N2O                   | 0.00  | 0.00                                   | 0.00%            | 100.00%           |
| 5A Solid waste disposal                                | CO2                   | 0.00  | 0.00                                   | 0.00%            | 100.00%           |
| 5A Solid waste disposal                                | N2O                   | 0.00  | 0.00                                   | 0.00%            | 100.00%           |
| 5B Biological Treatment of Soild Waste                 | CO2                   | 0.00  | 0.00                                   | 0.00%            | 100.00%           |
| 5D Wastewater Treatment and Discharge                  | CO2                   | 0.00  | 0.00                                   | 0.00%            | 100.00%           |
| 5E Other   | CH4                   | 0.00  | 0.00                                   | 0.00%            | 100.00%           |
| 5E Other   | CO2                   | 0.00  | 0.00                                   | 0.00%            | 100.00%           |
| 5E Other   | N2O                   | 0.00  | 0.00                                   | 0.00%            | 100.00%           |

**Table A1-5** Tier1 trend assessment excluding LULUCF

| CRF code + note  | Direct Greenhouse Gas | Base Years Emission [Gg CO <sub>2</sub> -eq] | Current Year Emission [Gg CO <sub>2</sub> -eq] | Trend Assesment | % Contribution to Trend | Cumulative Total % |
|--|-----------------------|--|--|-----------------|-------------------------|--------------------|
| 1A3b Road trasport - All Fuels                             | CO2                   | 7,153.76                                     | 12,181.35                                      | 0.073           | 15.05%                  | 15.05%             |
| 1A4 Other sectors - Gaseous fuels                          | CO2                   | 3,988.18                                     | 10,034.35                                      | 0.070           | 14.41%                  | 29.46%             |
| 1A4 Other sectors - Solid fuels                            | CO2                   | 12,499.72                                    | 249.75   | 0.062           | 12.72%                  | 42.18%             |
| 1A1 Energy Industries - Solid fuels                        | CO2                   | 14,335.74                                    | 5,274.94                                       | 0.026           | 5.33%                   | 47.51%             |
| 1A1 Energy Industries - Gaseous fuels                      | CO2                   | 5,731.21                                     | 5,786.16                                       | 0.023           | 4.69%                   | 52.20%             |
| 2B2 Nitric Acid Production                                 | N2O                   | 4,365.71                                     | 32.97  | 0.022           | 4.54%                   | 56.74%             |
| 1A1 Energy Industries - Liquid fuels                       | CO2                   | 5,880.18                                     | 988.89   | 0.021           | 4.37%                   | 61.11%             |
| 1A4 Other sectors - Liquid fuels                           | CO2                   | 6,947.45                                     | 1,615.69                                       | 0.021           | 4.33%                   | 65.44%             |
| 2F1 Refrigeration and Air Conditioning Equipment - HFC+PFC | Aggregate F-gases     | 0.00   | 2,000.73                                       | 0.018           | 3.71%                   | 69.15%             |
| 1A2 Manufacturing industries - Gaseous fuels               | CO2                   | 8,774.22                                     | 3,072.77                                       | 0.017           | 3.55%                   | 72.70%             |
| 5A Solid waste disposal                                    | CH4                   | 2,094.36                                     | 2,906.76                                       | 0.016           | 3.18%                   | 75.88%             |
| 1A2 Manufacturing industries - Solid fuels                 | CO2                   | 3,318.74                                     | 359.57   | 0.014           | 2.83%                   | 78.71%             |
| 2C1 Iron and Steel Production                              | CO2                   | 4,578.59                                     | 1,109.59                                       | 0.014           | 2.77%                   | 81.48%             |
| 1A2 Manufacturing industries - Liquid fuels                | CO2                   | 4,241.62                                     | 1,153.93                                       | 0.011           | 2.33%                   | 83.81%             |
| 2B8 Petrochemical and carbon black production              | CO2                   | 571.26                                       | 1,339.80                                       | 0.009           | 1.88%                   | 85.70%             |
| 3.D.1 Direct N2O Emissions From Managed Soils              | N2O                   | 4,693.23                                     | 3,596.24                                       | 0.008           | 1.72%                   | 87.42%             |
| 1B1 Solid fuels  | CH4                   | 1,598.88                                     | 31.65  | 0.008           | 1.63%                   | 89.05%             |
| 1B2b Natural Gas   | CH4                   | 1,400.61                                     | 1,322.15                                       | 0.005           | 0.98%                   | 90.02%             |
| 1A4 Other sectors - Solid fuels                            | CH4                   | 870.79                                       | 18.17  | 0.004           | 0.88%                   | 90.91%             |
| 1A2 Manufacturing industries - Other fossil fuels          | CO2                   | 0.00   | 340.97   | 0.003           | 0.63%                   | 91.54%             |
| 1A3c Railways - All Fuels                                  | CO2                   | 753.73                                       | 104.59   | 0.003           | 0.60%                   | 92.14%             |
| 1A4 Other sectors - Biomass                                | CH4                   | 153.20                                       | 409.15   | 0.003           | 0.60%                   | 92.74%             |
| 3A Enteric Fermentation                                    | CH4                   | 4,151.36                                     | 2,095.03                                       | 0.002           | 0.49%                   | 93.23%             |
| 2B1 Ammonia Production                                     | CO2                   | 1,714.65                                     | 1,239.10                                       | 0.002           | 0.49%                   | 93.72%             |
| 5D Wastewater Treatment and Discharge                      | CH4                   | 868.47                                       | 235.36   | 0.002           | 0.48%                   | 94.20%             |
| 2G Other Product Manufacture and Use - N2O                 | N2O                   | 7.29   | 230.69   | 0.002           | 0.42%                   | 94.62%             |
| 2C3 Aluminium Production                                   | PFC                   | 371.08                                       | 0.00   | 0.002           | 0.39%                   | 95.01%             |
| 2A2 Lime Production  | CO2                   | 606.79                                       | 143.52   | 0.002           | 0.37%                   | 95.38%             |
| 1B2c Venting and flaring                                   | CO2                   | 571.06                                       | 132.17   | 0.002           | 0.36%                   | 95.74%             |
| 1A3d Domestic navigation - All Liquid fuels                | CO2                   | 340.57                                       | 9.50   | 0.002           | 0.34%                   | 96.08%             |
| 1A1 Energy Industries - Other fossil fuels                 | CO2                   | 49.45  | 211.05   | 0.002           | 0.34%                   | 96.42%             |
| 1A4 Other sectors - Other Fossil Fuels                     | CO2                   | 0.00   | 156.98   | 0.001           | 0.29%                   | 96.71%             |
| 2F2 Foam Blowing - HFC                                     | Aggregate F-gases     | 0.00   | 149.40   | 0.001           | 0.28%                   | 96.99%             |
| 1B2c Venting and flaring                                   | CH4                   | 590.61                                       | 186.46   | 0.001           | 0.28%                   | 97.27%             |
| 5B Biological Treatment of Soil Waste                      | CH4                   | 5.00   | 102.76   | 0.001           | 0.19%                   | 97.45%             |
| 1A3b Road trasport - All Fuels                             | N2O                   | 52.86  | 127.61   | 0.001           | 0.18%                   | 97.63%             |

| CRF code + note  | Direct Greenhouse Gas | Base Years Emission [Gg CO <sub>2</sub> -eq] | Current Year Emission [Gg CO <sub>2</sub> -eq] | Trend Assessment | % Contribution to Trend | Cumulative Total % |
|--|-----------------------|--|--|------------------|-------------------------|--------------------|
| 3B Manure Management   | N <sub>2</sub> O      | 926.70                                       | 435.23   | 0.001            | 0.17%                   | 97.80%             |
| 3B Manure Management   | CH <sub>4</sub>       | 1,258.92                                     | 639.06   | 0.001            | 0.14%                   | 97.94%             |
| 2C3 Aluminium Production                                     | CO <sub>2</sub>       | 125.37                                       | 0.00   | 0.001            | 0.13%                   | 98.08%             |
| 3I Other carboncontaining fertilizers                        | CO <sub>2</sub>       | 48.11  | 97.50  | 0.001            | 0.13%                   | 98.21%             |
| 3G Liming  | CO <sub>2</sub>       | 130.21                                       | 5.46   | 0.001            | 0.13%                   | 98.33%             |
| 2A1 Cement Production  | CO <sub>2</sub>       | 1,744.64                                     | 928.79   | 0.001            | 0.12%                   | 98.45%             |
| 2A4 Other Process Uses of Carbonates                         | CO <sub>2</sub>       | 453.29                                       | 195.14   | 0.001            | 0.12%                   | 98.57%             |
| 1B2a Oil   | CH <sub>4</sub>       | 194.56                                       | 49.58  | 0.001            | 0.11%                   | 98.68%             |
| 1A4 Other sectors - Biomass                                  | N <sub>2</sub> O      | 24.35  | 65.04  | 0.000            | 0.09%                   | 98.77%             |
| 5B Biological Treatment of Soild Waste                       | N <sub>2</sub> O      | 3.58   | 43.98  | 0.000            | 0.08%                   | 98.85%             |
| 1A3e Other Transportation - Pipelines                        | CO <sub>2</sub>       | 154.38                                       | 125.10   | 0.000            | 0.07%                   | 98.92%             |
| 1A5a Stationary  | CO <sub>2</sub>       | 0.00   | 36.86  | 0.000            | 0.07%                   | 98.99%             |
| 1A3c Railways - All Fuels                                    | N <sub>2</sub> O      | 84.02  | 12.03  | 0.000            | 0.07%                   | 99.06%             |
| 2F4 Aerosol + MDI - HFC                                      | Aggregate F-gases     | 0.00   | 34.97  | 0.000            | 0.06%                   | 99.12%             |
| 2B8 Petrochemical and carbon black production                | CH <sub>4</sub>       | 20.40  | 44.35  | 0.000            | 0.06%                   | 99.18%             |
| 1A4 Other sectors - Solid fuels                              | N <sub>2</sub> O      | 57.48  | 1.10   | 0.000            | 0.06%                   | 99.24%             |
| 5C Incineration and open burning of waste                    | CO <sub>2</sub>       | 96.88  | 25.31  | 0.000            | 0.06%                   | 99.30%             |
| 1A1 Energy Industries - Biomass                              | N <sub>2</sub> O      | 0.94   | 28.76  | 0.000            | 0.05%                   | 99.35%             |
| 1B1 Solid fuels  | CO <sub>2</sub>       | 3.60   | 28.67  | 0.000            | 0.05%                   | 99.40%             |
| 3F Field Burning of Agricultural Residues                    | CH <sub>4</sub>       | 46.39  | 0.25   | 0.000            | 0.05%                   | 99.45%             |
| 3C Rice Cultivation  | CH <sub>4</sub>       | 81.23  | 20.16  | 0.000            | 0.05%                   | 99.49%             |
| 1A5b Mobile  | CO <sub>2</sub>       | 14.50  | 31.50  | 0.000            | 0.04%                   | 99.54%             |
| 2C2 Ferroalloys Production                                   | CO <sub>2</sub>       | 40.24  | 0.00   | 0.000            | 0.04%                   | 99.58%             |
| 2G Other Product Manufacture and Use - SF <sub>6</sub>       | Aggregate F-gases     | 156.32                                       | 109.43   | 0.000            | 0.04%                   | 99.62%             |
| 1A1 Energy Industries - Solid fuels                          | N <sub>2</sub> O      | 63.36  | 17.43  | 0.000            | 0.03%                   | 99.65%             |
| 1A1 Energy Industries - Biomass                              | CH <sub>4</sub>       | 0.59   | 18.10  | 0.000            | 0.03%                   | 99.69%             |
| 1A4 Other sectors - Gaseous fuels                            | CH <sub>4</sub>       | 8.97   | 22.48  | 0.000            | 0.03%                   | 99.72%             |
| 3.D.2 Indirect N <sub>2</sub> O Emissions From Managed Soils | N <sub>2</sub> O      | 450.85                                       | 271.64   | 0.000            | 0.03%                   | 99.75%             |
| 1A2 Manufacturing industries - Biomass                       | N <sub>2</sub> O      | 0.90   | 12.08  | 0.000            | 0.02%                   | 99.77%             |
| 1A3b Road trasport - All Fuels                               | CH <sub>4</sub>       | 54.06  | 20.05  | 0.000            | 0.02%                   | 99.79%             |
| 1A4 Other sectors - Liquid fuels                             | CH <sub>4</sub>       | 20.38  | 2.56   | 0.000            | 0.02%                   | 99.80%             |
| 3F Field Burning of Agricultural Residues                    | N <sub>2</sub> O      | 14.34  | 0.08   | 0.000            | 0.01%                   | 99.82%             |
| 1A2 Manufacturing industries - Biomass                       | CH <sub>4</sub>       | 0.57   | 7.49   | 0.000            | 0.01%                   | 99.83%             |
| 2F3 Fire extinguishers - HFC                                 | Aggregate F-gases     | 0.00   | 6.91   | 0.000            | 0.01%                   | 99.85%             |
| 2A3 Glass production   | CO <sub>2</sub>       | 87.63  | 43.20  | 0.000            | 0.01%                   | 99.86%             |
| 1A1 Energy Industries - Liquid fuels                         | N <sub>2</sub> O      | 12.53  | 0.88   | 0.000            | 0.01%                   | 99.87%             |
| 3H Urea application  | CO <sub>2</sub>       | 229.03                                       | 136.37   | 0.000            | 0.01%                   | 99.88%             |
| 1A2 Manufacturing industries - Other fossil fuels            | N <sub>2</sub> O      | 0.00   | 6.10   | 0.000            | 0.01%                   | 99.89%             |

| CRF code + note  | Direct Greenhouse Gas | Base Years Emission [Gg CO <sub>2</sub> -eq] | Current Year Emission [Gg CO <sub>2</sub> -eq] | Trend Assessment | % Contribution to Trend | Cumulative Total % |
|--|-----------------------|--|--|------------------|-------------------------|--------------------|
| 1A2 Manufacturing industries - Solid fuels             | N <sub>2</sub> O      | 12.70  | 1.55   | 0.000            | 0.01%                   | 99.90%             |
| 2D Non-energy products from fuels and solvent use      | CO <sub>2</sub>       | 221.82                                       | 120.52   | 0.000            | 0.01%                   | 99.91%             |
| 1A4 Other sectors - Gaseous fuels                      | N <sub>2</sub> O      | 2.14   | 5.36   | 0.000            | 0.01%                   | 99.92%             |
| 1A2 Manufacturing industries - Other fossil fuels      | CH <sub>4</sub>       | 0.00   | 3.84   | 0.000            | 0.01%                   | 99.93%             |
| 1A2 Manufacturing industries - Solid fuels             | CH <sub>4</sub>       | 7.16   | 0.41   | 0.000            | 0.01%                   | 99.93%             |
| 1B2d Other (Thermal water extraction + NatGas storage) | CH <sub>4</sub>       | 129.25                                       | 70.24  | 0.000            | 0.01%                   | 99.94%             |
| 1B2a Oil   | CO <sub>2</sub>       | 5.57   | 0.53   | 0.000            | 0.00%                   | 99.95%             |
| 1A1 Energy Industries - Liquid fuels                   | CH <sub>4</sub>       | 5.39   | 0.53   | 0.000            | 0.00%                   | 99.95%             |
| 1A2 Manufacturing industries - Liquid fuels            | N <sub>2</sub> O      | 13.98  | 10.36  | 0.000            | 0.00%                   | 99.95%             |
| 1A1 Energy Industries - Other fossil fuels             | N <sub>2</sub> O      | 0.94   | 2.91   | 0.000            | 0.00%                   | 99.96%             |
| 1A3a Domestic aviation - All fuels                     | CO <sub>2</sub>       | 3.63   | 4.18   | 0.000            | 0.00%                   | 99.96%             |
| 1A2 Manufacturing industries - Liquid fuels            | CH <sub>4</sub>       | 4.34   | 0.43   | 0.000            | 0.00%                   | 99.97%             |
| 1A4 Other sectors - Other Fossil Fuels                 | N <sub>2</sub> O      | 0.00   | 1.93   | 0.000            | 0.00%                   | 99.97%             |
| 2C1 Iron and Steel Production                          | CH <sub>4</sub>       | 10.89  | 4.27   | 0.000            | 0.00%                   | 99.97%             |
| 1A3d Domestic navigation - All Liquid fuels            | N <sub>2</sub> O      | 2.87   | 0.08   | 0.000            | 0.00%                   | 99.98%             |
| 1A1 Energy Industries - Gaseous fuels                  | N <sub>2</sub> O      | 3.07   | 3.09   | 0.000            | 0.00%                   | 99.98%             |
| 1A1 Energy Industries - Other fossil fuels             | CH <sub>4</sub>       | 0.59   | 1.68   | 0.000            | 0.00%                   | 99.98%             |
| 1A4 Other sectors - Other Fossil Fuels                 | CH <sub>4</sub>       | 0.00   | 1.21   | 0.000            | 0.00%                   | 99.98%             |
| 1A1 Energy Industries - Gaseous fuels                  | CH <sub>4</sub>       | 2.57   | 2.59   | 0.000            | 0.00%                   | 99.99%             |
| 5D Wastewater Treatment and Discharge                  | N <sub>2</sub> O      | 154.87                                       | 86.92  | 0.000            | 0.00%                   | 99.99%             |
| 1A2 Manufacturing industries - Gaseous fuels           | N <sub>2</sub> O      | 4.70   | 1.64   | 0.000            | 0.00%                   | 99.99%             |
| 1A1 Energy Industries - Solid fuels                    | CH <sub>4</sub>       | 3.59   | 1.17   | 0.000            | 0.00%                   | 99.99%             |
| 1A2 Manufacturing industries - Gaseous fuels           | CH <sub>4</sub>       | 3.95   | 1.38   | 0.000            | 0.00%                   | 99.99%             |
| 1A4 Other sectors - Liquid fuels                       | N <sub>2</sub> O      | 29.31  | 16.01  | 0.000            | 0.00%                   | 99.99%             |
| 1B2b Natural Gas                                       | CO <sub>2</sub>       | 2.28   | 0.70   | 0.000            | 0.00%                   | 100.00%            |
| 5C Incineration and open burning of waste              | N <sub>2</sub> O      | 1.64   | 0.37   | 0.000            | 0.00%                   | 100.00%            |
| 1A3d Domestic navigation - All Liquid fuels            | CH <sub>4</sub>       | 0.84   | 0.02   | 0.000            | 0.00%                   | 100.00%            |
| 1A3c Railways - All Fuels                              | CH <sub>4</sub>       | 1.04   | 0.15   | 0.000            | 0.00%                   | 100.00%            |
| 1B2c Venting and flaring                               | N <sub>2</sub> O      | 0.89   | 0.28   | 0.000            | 0.00%                   | 100.00%            |
| 1A5b Mobile  | N <sub>2</sub> O      | 0.12   | 0.26   | 0.000            | 0.00%                   | 100.00%            |
| 2C2 Ferroalloys Production                             | CH <sub>4</sub>       | 0.25   | 0.00   | 0.000            | 0.00%                   | 100.00%            |
| 5C Incineration and open burning of waste              | CH <sub>4</sub>       | 0.40   | 0.09   | 0.000            | 0.00%                   | 100.00%            |
| 1A5a Stationary  | CH <sub>4</sub>       | 0.00   | 0.08   | 0.000            | 0.00%                   | 100.00%            |
| 1A3e Other Transportation - Pipelines                  | N <sub>2</sub> O      | 0.08   | 0.07   | 0.000            | 0.00%                   | 100.00%            |
| 1A5a Stationary  | N <sub>2</sub> O      | 0.00   | 0.02   | 0.000            | 0.00%                   | 100.00%            |
| 1A3a Domestic aviation - All fuels                     | N <sub>2</sub> O      | 0.03   | 0.04   | 0.000            | 0.00%                   | 100.00%            |
| 1A3e Other Transportation - Pipelines                  | CH <sub>4</sub>       | 0.07   | 0.06   | 0.000            | 0.00%                   | 100.00%            |
| 1B2d Other (Thermal water extraction + NatGas storage) | CO <sub>2</sub>       | 0.04   | 0.01   | 0.000            | 0.00%                   | 100.00%            |

| CRF code + note  | Direct Greenhouse Gas | Base Years Emission [Gg CO <sub>2</sub> -eq] | Current Year Emission [Gg CO <sub>2</sub> -eq] | Trend Assesment | % Contribution to Trend | Cumulative Total % |
|--|-----------------------|--|--|-----------------|-------------------------|--------------------|
| 1A5b Mobile  | CH4                   | 0.00   | 0.01   | 0.000           | 0.00%                   | 100.00%            |
| 1A3a Domestic aviation - All fuels                     | CH4                   | 0.00   | 0.00   | 0.000           | 0.00%                   | 100.00%            |
| 1A1 Energy Industries - Peat                           | CH4                   | 0.00   | 0.00   | 0.000           | 0.00%                   | 100.00%            |
| 1A1 Energy Industries - Peat                           | N2O                   | 0.00   | 0.00   | 0.000           | 0.00%                   | 100.00%            |
| 1A2 Manufacturing industries - Peat                    | CH4                   | 0.00   | 0.00   | 0.000           | 0.00%                   | 100.00%            |
| 1A2 Manufacturing industries - Peat                    | N2O                   | 0.00   | 0.00   | 0.000           | 0.00%                   | 100.00%            |
| 1A3d Domestic navigation - Gaseous fuels               | CH4                   | 0.00   | 0.00   | 0.000           | 0.00%                   | 100.00%            |
| 1A3d Domestic navigation - Gaseous fuels               | CO2                   | 0.00   | 0.00   | 0.000           | 0.00%                   | 100.00%            |
| 1A3d Domestic navigation - Gaseous fuels               | N2O                   | 0.00   | 0.00   | 0.000           | 0.00%                   | 100.00%            |
| 1B2b Natural Gas                                       | N2O                   | 0.00   | 0.00   | 0.000           | 0.00%                   | 100.00%            |
| 1B2d Other (Thermal water extraction + NatGas storage) | N2O                   | 0.00   | 0.00   | 0.000           | 0.00%                   | 100.00%            |
| 2B1 Ammonia Production                                 | CH4                   | 0.00   | 0.00   | 0.000           | 0.00%                   | 100.00%            |
| 2B1 Ammonia Production                                 | N2O                   | 0.00   | 0.00   | 0.000           | 0.00%                   | 100.00%            |
| 2B8 Petrochemical and carbon black production          | N2O                   | 0.00   | 0.00   | 0.000           | 0.00%                   | 100.00%            |
| 2C1 Iron and Steel Production                          | N2O                   | 0.00   | 0.00   | 0.000           | 0.00%                   | 100.00%            |
| 2C2 Ferroalloys Production                             | N2O                   | 0.00   | 0.00   | 0.000           | 0.00%                   | 100.00%            |
| 2C3 Aluminium Production                               | CH4                   | 0.00   | 0.00   | 0.000           | 0.00%                   | 100.00%            |
| 2C3 Aluminium Production                               | N2O                   | 0.00   | 0.00   | 0.000           | 0.00%                   | 100.00%            |
| 2D Non-energy products from fuels and solvent use      | CH4                   | 0.00   | 0.00   | 0.000           | 0.00%                   | 100.00%            |
| 2E Electronics industry                                | SF6                   | 0.00   | 0.00   | 0.000           | 0.00%                   | 100.00%            |
| 2F5 Solvent - HFC+PFC                                  | Aggregate F-gases     | 0.00   | 0.00   | 0.000           | 0.00%                   | 100.00%            |
| 3D Agricultural Soils                                  | CH4                   | 0.00   | 0.00   | 0.000           | 0.00%                   | 100.00%            |
| 3J Other   | CH4                   | 0.00   | 0.00   | 0.000           | 0.00%                   | 100.00%            |
| 3J Other   | CO2                   | 0.00   | 0.00   | 0.000           | 0.00%                   | 100.00%            |
| 3J Other   | N2O                   | 0.00   | 0.00   | 0.000           | 0.00%                   | 100.00%            |
| 5A Solid waste disposal                                | CO2                   | 0.00   | 0.00   | 0.000           | 0.00%                   | 100.00%            |
| 5A Solid waste disposal                                | N2O                   | 0.00   | 0.00   | 0.000           | 0.00%                   | 100.00%            |
| 5B Biological Treatment of Soild Waste                 | CO2                   | 0.00   | 0.00   | 0.000           | 0.00%                   | 100.00%            |
| 5D Wastewater Treatment and Discharge                  | CO2                   | 0.00   | 0.00   | 0.000           | 0.00%                   | 100.00%            |
| 5E Other   | CH4                   | 0.00   | 0.00   | 0.000           | 0.00%                   | 100.00%            |
| 5E Other   | CO2                   | 0.00   | 0.00   | 0.000           | 0.00%                   | 100.00%            |
| 5E Other   | N2O                   | 0.00   | 0.00   | 0.000           | 0.00%                   | 100.00%            |

**Table A1-6** Tier 1 level assessment including LULUCF (Base year)

| Category   | Direct Greenhouse Gas | Base Year Emission [Gg CO <sub>2</sub> -eq] | Emission in absolute value [Gg CO <sub>2</sub> -eq] | Level Assessment | Cumulative Total% |
|--|-----------------------|---|---|------------------|-------------------|
| 1A1 Energy Industries - Solid fuels  | CO <sub>2</sub>       | 14,335.74                                   | 14,335.74   | 12.59%           | 12.59%            |
| 1A4 Other sectors - Solid fuels  | CO <sub>2</sub>       | 12,499.72                                   | 12,499.72   | 10.98%           | 23.57%            |
| 1A2 Manufacturing industries - Gaseous fuels   | CO <sub>2</sub>       | 8,774.22                                    | 8,774.22  | 7.71%            | 31.28%            |
| 1A3b Road transport - All Fuels  | CO <sub>2</sub>       | 7,153.76                                    | 7,153.76  | 6.28%            | 37.56%            |
| 1A4 Other sectors - Liquid fuels   | CO <sub>2</sub>       | 6,947.45                                    | 6,947.45  | 6.10%            | 43.66%            |
| 1A1 Energy Industries - Liquid fuels   | CO <sub>2</sub>       | 5,880.18                                    | 5,880.18  | 5.16%            | 48.83%            |
| 1A1 Energy Industries - Gaseous fuels  | CO <sub>2</sub>       | 5,731.21                                    | 5,731.21  | 5.03%            | 53.86%            |
| 3.D.1 Direct N <sub>2</sub> O Emissions From Managed Soils   | N <sub>2</sub> O      | 4,693.23                                    | 4,693.23  | 4.12%            | 57.98%            |
| 2C1 Iron and Steel Production  | CO <sub>2</sub>       | 4,578.59                                    | 4,578.59  | 4.02%            | 62.00%            |
| 2B2 Nitric Acid Production   | N <sub>2</sub> O      | 4,365.71                                    | 4,365.71  | 3.83%            | 65.84%            |
| 1A2 Manufacturing industries - Liquid fuels  | CO <sub>2</sub>       | 4,241.62                                    | 4,241.62  | 3.73%            | 69.56%            |
| 3A Enteric Fermentation  | CH <sub>4</sub>       | 4,151.36                                    | 4,151.36  | 3.65%            | 73.21%            |
| 1A4 Other sectors - Gaseous fuels  | CO <sub>2</sub>       | 3,988.18                                    | 3,988.18  | 3.50%            | 76.71%            |
| 1A2 Manufacturing industries - Solid fuels   | CO <sub>2</sub>       | 3,318.74                                    | 3,318.74  | 2.91%            | 79.63%            |
| 4A1 Forest Land Remaining Forest Land  | CO <sub>2</sub>       | -2,368.01                                   | 2,368.01  | 2.08%            | 81.71%            |
| 5A Solid waste disposal  | CH <sub>4</sub>       | 2,094.36                                    | 2,094.36  | 1.84%            | 83.55%            |
| 2A1 Cement Production  | CO <sub>2</sub>       | 1,744.64                                    | 1,744.64  | 1.53%            | 85.08%            |
| 2B1 Ammonia Production   | CO <sub>2</sub>       | 1,714.65                                    | 1,714.65  | 1.51%            | 86.58%            |
| 1B1 Solid fuels  | CH <sub>4</sub>       | 1,598.88                                    | 1,598.88  | 1.40%            | 87.99%            |
| 1B2b Natural Gas   | CH <sub>4</sub>       | 1,400.61                                    | 1,400.61  | 1.23%            | 89.22%            |
| 3B Manure Management   | CH <sub>4</sub>       | 1,258.92                                    | 1,258.92  | 1.11%            | 90.32%            |
| 3B Manure Management   | N <sub>2</sub> O      | 926.70                                      | 926.70  | 0.81%            | 91.14%            |
| 1A4 Other sectors - Solid fuels  | CH <sub>4</sub>       | 870.79                                      | 870.79  | 0.76%            | 91.90%            |
| 5D Wastewater Treatment and Discharge  | CH <sub>4</sub>       | 868.47                                      | 868.47  | 0.76%            | 92.67%            |
| 1A3c Railways - All Fuels  | CO <sub>2</sub>       | 753.73                                      | 753.73  | 0.66%            | 93.33%            |
| 2A2 Lime Production  | CO <sub>2</sub>       | 606.79                                      | 606.79  | 0.53%            | 93.86%            |
| 1B2c Venting and flaring   | CH <sub>4</sub>       | 590.61                                      | 590.61  | 0.52%            | 94.38%            |
| 2B8 Petrochemical and carbon black production  | CO <sub>2</sub>       | 571.26                                      | 571.26  | 0.50%            | 94.88%            |
| 1B2c Venting and flaring   | CO <sub>2</sub>       | 571.06                                      | 571.06  | 0.50%            | 95.38%            |
| 2A4 Other Process Uses of Carbonates   | CO <sub>2</sub>       | 453.29                                      | 453.29  | 0.40%            | 95.78%            |
| 3.D.2 Indirect N <sub>2</sub> O Emissions From Managed Soils   | N <sub>2</sub> O      | 450.85                                      | 450.85  | 0.40%            | 96.18%            |
| 4G Harvested Wood Products   | CO <sub>2</sub>       | -406.40                                     | 406.40  | 0.36%            | 96.53%            |
| 2C3 Aluminium Production   | PFC                   | 371.08                                      | 371.08  | 0.33%            | 96.86%            |
| 1A3d Domestic navigation - All Liquid fuels  | CO <sub>2</sub>       | 340.57                                      | 340.57  | 0.30%            | 97.16%            |
| 3H Urea application  | CO <sub>2</sub>       | 229.03                                      | 229.03  | 0.20%            | 97.36%            |
| 2D Non-energy products from fuels and solvent use  | CO <sub>2</sub>       | 221.82                                      | 221.82  | 0.19%            | 97.55%            |
| 4(II) Emissions and removals from drainage and rewetting and other management of organic and mineral soils | CO <sub>2</sub>       | 200.59                                      | 200.59  | 0.18%            | 97.73%            |
| 1B2a Oil   | CH <sub>4</sub>       | 194.56                                      | 194.56  | 0.17%            | 97.90%            |
| 4B1 Cropland Remaining Cropland  | CO <sub>2</sub>       | 157.96                                      | 157.96  | 0.14%            | 98.04%            |

| Category  | Direct Greenhouse Gas | Base Year Emission [Gg CO <sub>2</sub> -eq] | Emission in absolute value [Gg CO <sub>2</sub> -eq] | Level Assessment | Cumulative Total% |
|---|-----------------------|---|---|------------------|-------------------|
| 2G Other Product Manufacture and Use - N <sub>2</sub> O | N <sub>2</sub> O      | 156.32                                      | 156.32  | 0.14%            | 98.18%            |
| 5D Wastewater Treatment and Discharge                   | N <sub>2</sub> O      | 154.87                                      | 154.87  | 0.14%            | 98.31%            |
| 1A3e Other Transportation - Pipelines                   | CO <sub>2</sub>       | 154.38                                      | 154.38  | 0.14%            | 98.45%            |
| 1A4 Other sectors - Biomass                             | CH <sub>4</sub>       | 153.20                                      | 153.20  | 0.13%            | 98.58%            |
| 3G Liming   | CO <sub>2</sub>       | 130.21                                      | 130.21  | 0.11%            | 98.70%            |
| 1B2d Other (Thermal water extraction + NatGas storage)  | CH <sub>4</sub>       | 129.25                                      | 129.25  | 0.11%            | 98.81%            |
| 2C3 Aluminium Production                                | CO <sub>2</sub>       | 125.37                                      | 125.37  | 0.11%            | 98.92%            |
| 5C Incineration and open burning of waste               | CO <sub>2</sub>       | 96.88                                       | 96.88   | 0.09%            | 99.01%            |
| 2A3 Glass production                                    | CO <sub>2</sub>       | 87.63                                       | 87.63   | 0.08%            | 99.08%            |
| 1A3c Railways - All Fuels                               | N <sub>2</sub> O      | 84.02                                       | 84.02   | 0.07%            | 99.16%            |
| 3C Rice Cultivation                                     | CH <sub>4</sub>       | 81.23                                       | 81.23   | 0.07%            | 99.23%            |
| 1A1 Energy Industries - Solid fuels                     | N <sub>2</sub> O      | 63.36                                       | 63.36   | 0.06%            | 99.29%            |
| 4E2 Land Converted to Settlements                       | CO <sub>2</sub>       | 62.26                                       | 62.26   | 0.05%            | 99.34%            |
| 1A4 Other sectors - Solid fuels                         | N <sub>2</sub> O      | 57.48                                       | 57.48   | 0.05%            | 99.39%            |
| 1A3b Road transport - All Fuels                         | CH <sub>4</sub>       | 54.06                                       | 54.06   | 0.05%            | 99.44%            |
| 1A3b Road transport - All Fuels                         | N <sub>2</sub> O      | 52.86                                       | 52.86   | 0.05%            | 99.48%            |
| 1A1 Energy Industries - Other fossil fuels              | CO <sub>2</sub>       | 49.45                                       | 49.45   | 0.04%            | 99.53%            |
| 3I Other carboncontaining fertilizers                   | CO <sub>2</sub>       | 48.11                                       | 48.11   | 0.04%            | 99.57%            |
| 3F Field Burning of Agricultural Residues               | CH <sub>4</sub>       | 46.39                                       | 46.39   | 0.04%            | 99.61%            |
| 4A2 Land Converted to Forest Land                       | CO <sub>2</sub>       | -41.77                                      | 41.77   | 0.04%            | 99.65%            |
| 2C2 Ferroalloys Production                              | CO <sub>2</sub>       | 40.24                                       | 40.24   | 0.04%            | 99.68%            |
| 1A4 Other sectors - Liquid fuels                        | N <sub>2</sub> O      | 29.31                                       | 29.31   | 0.03%            | 99.71%            |
| 4(V) Biomass Burning                                    | CH <sub>4</sub>       | 24.72                                       | 24.72   | 0.02%            | 99.73%            |
| 1A4 Other sectors - Biomass                             | N <sub>2</sub> O      | 24.35                                       | 24.35   | 0.02%            | 99.75%            |
| 2B8 Petrochemical and carbon black production           | CH <sub>4</sub>       | 20.40                                       | 20.40   | 0.02%            | 99.77%            |
| 1A4 Other sectors - Liquid fuels                        | CH <sub>4</sub>       | 20.38                                       | 20.38   | 0.02%            | 99.79%            |
| 4B2 Land Converted to Cropland                          | CO <sub>2</sub>       | 16.00                                       | 16.00   | 0.01%            | 99.80%            |
| 4(V) Biomass Burning                                    | N <sub>2</sub> O      | 15.74                                       | 15.74   | 0.01%            | 99.82%            |
| 4C1 Grassland Remaining Grassland                       | CO <sub>2</sub>       | -15.46                                      | 15.46   | 0.01%            | 99.83%            |
| 1A5b Mobile   | CO <sub>2</sub>       | 14.50                                       | 14.50   | 0.01%            | 99.84%            |
| 4C2 Land Converted to Grassland                         | CO <sub>2</sub>       | -14.39                                      | 14.39   | 0.01%            | 99.85%            |
| 3F Field Burning of Agricultural Residues               | N <sub>2</sub> O      | 14.34                                       | 14.34   | 0.01%            | 99.87%            |
| 1A2 Manufacturing industries - Liquid fuels             | N <sub>2</sub> O      | 13.98                                       | 13.98   | 0.01%            | 99.88%            |
| 1A2 Manufacturing industries - Solid fuels              | N <sub>2</sub> O      | 12.70                                       | 12.70   | 0.01%            | 99.89%            |
| 1A1 Energy Industries - Liquid fuels                    | N <sub>2</sub> O      | 12.53                                       | 12.53   | 0.01%            | 99.90%            |
| 2C1 Iron and Steel Production                           | CH <sub>4</sub>       | 10.89                                       | 10.89   | 0.01%            | 99.91%            |
| 1A4 Other sectors - Gaseous fuels                       | CH <sub>4</sub>       | 8.97  | 8.97  | 0.01%            | 99.92%            |
| 2G Other Product Manufacture and Use - SF <sub>6</sub>  | Aggregate F-gases     | 7.29  | 7.29  | 0.01%            | 99.93%            |
| 1A2 Manufacturing industries - Solid fuels              | CH <sub>4</sub>       | 7.16  | 7.16  | 0.01%            | 99.93%            |
| 1B2a Oil  | CO <sub>2</sub>       | 5.57  | 5.57  | 0.00%            | 99.94%            |
| 1A1 Energy Industries - Liquid fuels                    | CH <sub>4</sub>       | 5.39  | 5.39  | 0.00%            | 99.94%            |
| 5B Biological Treatment of Soild Waste                  | CH <sub>4</sub>       | 5.00  | 5.00  | 0.00%            | 99.95%            |

| Category   | Direct Greenhouse Gas | Base Year Emission [Gg CO <sub>2</sub> -eq] | Emission in absolute value [Gg CO <sub>2</sub> -eq] | Level Assessment | Cumulative Total% |
|--|-----------------------|---|---|------------------|-------------------|
| 1A2 Manufacturing industries - Gaseous fuels   | N <sub>2</sub> O      | 4.70  | 4.70  | 0.00%            | 99.95%            |
| 4(III)Direct N <sub>2</sub> O emissions from N mineralization/immobilization                               | N <sub>2</sub> O      | 4.52  | 4.52  | 0.00%            | 99.95%            |
| 1A2 Manufacturing industries - Liquid fuels  | CH <sub>4</sub>       | 4.34  | 4.34  | 0.00%            | 99.96%            |
| 1A2 Manufacturing industries - Gaseous fuels   | CH <sub>4</sub>       | 3.95  | 3.95  | 0.00%            | 99.96%            |
| 1A3a Domestic aviation - All fuels   | CO <sub>2</sub>       | 3.63  | 3.63  | 0.00%            | 99.96%            |
| 1B1 Solid fuels  | CO <sub>2</sub>       | 3.60  | 3.60  | 0.00%            | 99.97%            |
| 1A1 Energy Industries - Solid fuels  | CH <sub>4</sub>       | 3.59  | 3.59  | 0.00%            | 99.97%            |
| 5B Biological Treatment of Soild Waste   | N <sub>2</sub> O      | 3.58  | 3.58  | 0.00%            | 99.97%            |
| 4D2 Land Converted to Wetlands   | CO <sub>2</sub>       | 3.09  | 3.09  | 0.00%            | 99.98%            |
| 1A1 Energy Industries - Gaseous fuels  | N <sub>2</sub> O      | 3.07  | 3.07  | 0.00%            | 99.98%            |
| 1A3d Domestic navigation - All Liquid fuels  | N <sub>2</sub> O      | 2.87  | 2.87  | 0.00%            | 99.98%            |
| 1A1 Energy Industries - Gaseous fuels  | CH <sub>4</sub>       | 2.57  | 2.57  | 0.00%            | 99.98%            |
| 1B2b Natural Gas   | CO <sub>2</sub>       | 2.28  | 2.28  | 0.00%            | 99.99%            |
| 1A4 Other sectors - Gaseous fuels  | N <sub>2</sub> O      | 2.14  | 2.14  | 0.00%            | 99.99%            |
| 4D13 Other Wetlands Remaining Other Wetlands   | CO <sub>2</sub>       | -2.05                                       | 2.05  | 0.00%            | 99.99%            |
| 5C Incineration and open burning of waste  | N <sub>2</sub> O      | 1.64  | 1.64  | 0.00%            | 99.99%            |
| 4D11 Peat Extraction Remaining Peat Extraction   | CO <sub>2</sub>       | 1.32  | 1.32  | 0.00%            | 99.99%            |
| 1A3c Railways - All Fuels  | CH <sub>4</sub>       | 1.04  | 1.04  | 0.00%            | 99.99%            |
| 1A1 Energy Industries - Biomass  | N <sub>2</sub> O      | 0.94  | 0.94  | 0.00%            | 99.99%            |
| 1A1 Energy Industries - Other fossil fuels   | N <sub>2</sub> O      | 0.94  | 0.94  | 0.00%            | 99.99%            |
| 4(IV) Indirect N <sub>2</sub> O Emissions from Managed Soils   | N <sub>2</sub> O      | 0.91  | 0.91  | 0.00%            | 100.00%           |
| 1A2 Manufacturing industries - Biomass   | N <sub>2</sub> O      | 0.90  | 0.90  | 0.00%            | 100.00%           |
| 1B2c Venting and flaring   | N <sub>2</sub> O      | 0.89  | 0.89  | 0.00%            | 100.00%           |
| 1A3d Domestic navigation - All Liquid fuels  | CH <sub>4</sub>       | 0.84  | 0.84  | 0.00%            | 100.00%           |
| 1A1 Energy Industries - Biomass  | CH <sub>4</sub>       | 0.59  | 0.59  | 0.00%            | 100.00%           |
| 1A1 Energy Industries - Other fossil fuels   | CH <sub>4</sub>       | 0.59  | 0.59  | 0.00%            | 100.00%           |
| 1A2 Manufacturing industries - Biomass   | CH <sub>4</sub>       | 0.57  | 0.57  | 0.00%            | 100.00%           |
| 5C Incineration and open burning of waste  | CH <sub>4</sub>       | 0.40  | 0.40  | 0.00%            | 100.00%           |
| 2C2 Ferroalloys Production   | CH <sub>4</sub>       | 0.25  | 0.25  | 0.00%            | 100.00%           |
| 4(II) Emissions and removals from drainage and rewetting and other management of organic and mineral soils | N <sub>2</sub> O      | 0.14  | 0.14  | 0.00%            | 100.00%           |
| 1A5b Mobile  | N <sub>2</sub> O      | 0.12  | 0.12  | 0.00%            | 100.00%           |
| 1A3e Other Transportation - Pipelines  | N <sub>2</sub> O      | 0.08  | 0.08  | 0.00%            | 100.00%           |
| 1A3e Other Transportation - Pipelines  | CH <sub>4</sub>       | 0.07  | 0.07  | 0.00%            | 100.00%           |
| 1B2d Other (Thermal water extraction + NatGas storage)   | CO <sub>2</sub>       | 0.04  | 0.04  | 0.00%            | 100.00%           |
| 1A3a Domestic aviation - All fuels   | N <sub>2</sub> O      | 0.03  | 0.03  | 0.00%            | 100.00%           |
| 1A5b Mobile  | CH <sub>4</sub>       | 0.00  | 0.00  | 0.00%            | 100.00%           |
| 1A3a Domestic aviation - All fuels   | CH <sub>4</sub>       | 0.00  | 0.00  | 0.00%            | 100.00%           |
| 1A1 Energy Industries - Peat   | CH <sub>4</sub>       | 0.00  | 0.00  | 0.00%            | 100.00%           |
| 1A1 Energy Industries - Peat   | N <sub>2</sub> O      | 0.00  | 0.00  | 0.00%            | 100.00%           |
| 1A2 Manufacturing industries - Other fossil fuels  | CH <sub>4</sub>       | 0.00  | 0.00  | 0.00%            | 100.00%           |

| Category   | Direct Greenhouse Gas | Base Year Emission [Gg CO2-eq] | Emission in absolute value [Gg CO2-eq] | Level Assessment | Cumulative Total% |
|--|-----------------------|--------------------------------|--|------------------|-------------------|
| 1A2 Manufacturing industries - Other fossil fuels  | CO2                   | 0.00                           | 0.00                                   | 0.00%            | 100.00%           |
| 1A2 Manufacturing industries - Other fossil fuels  | N2O                   | 0.00                           | 0.00                                   | 0.00%            | 100.00%           |
| 1A2 Manufacturing industries - Peat  | CH4                   | 0.00                           | 0.00                                   | 0.00%            | 100.00%           |
| 1A2 Manufacturing industries - Peat  | N2O                   | 0.00                           | 0.00                                   | 0.00%            | 100.00%           |
| 1A3d Domestic navigation - Gaseous fuels   | CH4                   | 0.00                           | 0.00                                   | 0.00%            | 100.00%           |
| 1A3d Domestic navigation - Gaseous fuels   | CO2                   | 0.00                           | 0.00                                   | 0.00%            | 100.00%           |
| 1A3d Domestic navigation - Gaseous fuels   | N2O                   | 0.00                           | 0.00                                   | 0.00%            | 100.00%           |
| 1A4 Other sectors - Other Fossil Fuels   | CH4                   | 0.00                           | 0.00                                   | 0.00%            | 100.00%           |
| 1A4 Other sectors - Other Fossil Fuels   | CO2                   | 0.00                           | 0.00                                   | 0.00%            | 100.00%           |
| 1A4 Other sectors - Other Fossil Fuels   | N2O                   | 0.00                           | 0.00                                   | 0.00%            | 100.00%           |
| 1A5a Stationary  | CH4                   | 0.00                           | 0.00                                   | 0.00%            | 100.00%           |
| 1A5a Stationary  | CO2                   | 0.00                           | 0.00                                   | 0.00%            | 100.00%           |
| 1A5a Stationary  | N2O                   | 0.00                           | 0.00                                   | 0.00%            | 100.00%           |
| 1B2b Natural Gas   | N2O                   | 0.00                           | 0.00                                   | 0.00%            | 100.00%           |
| 1B2d Other (Thermal water extraction + NatGas storage)   | N2O                   | 0.00                           | 0.00                                   | 0.00%            | 100.00%           |
| 2B1 Ammonia Production   | CH4                   | 0.00                           | 0.00                                   | 0.00%            | 100.00%           |
| 2B1 Ammonia Production   | N2O                   | 0.00                           | 0.00                                   | 0.00%            | 100.00%           |
| 2B8 Petrochemical and carbon black production  | N2O                   | 0.00                           | 0.00                                   | 0.00%            | 100.00%           |
| 2C1 Iron and Steel Production  | N2O                   | 0.00                           | 0.00                                   | 0.00%            | 100.00%           |
| 2C2 Ferroalloys Production   | N2O                   | 0.00                           | 0.00                                   | 0.00%            | 100.00%           |
| 2C3 Aluminium Production   | CH4                   | 0.00                           | 0.00                                   | 0.00%            | 100.00%           |
| 2C3 Aluminium Production   | N2O                   | 0.00                           | 0.00                                   | 0.00%            | 100.00%           |
| 2D Non-energy products from fuels and solvent use  | CH4                   | 0.00                           | 0.00                                   | 0.00%            | 100.00%           |
| 2E Electronics industry  | SF6                   | 0.00                           | 0.00                                   | 0.00%            | 100.00%           |
| 2F1 Refrigeration and Air Conditioning Equipment - HFC+PFC   | Aggregate F-gases     | 0.00                           | 0.00                                   | 0.00%            | 100.00%           |
| 2F2 Foam Blowing - HFC   | Aggregate F-gases     | 0.00                           | 0.00                                   | 0.00%            | 100.00%           |
| 2F3 Fire extinguishers - HFC   | Aggregate F-gases     | 0.00                           | 0.00                                   | 0.00%            | 100.00%           |
| 2F4 Aerosol + MDI - HFC  | Aggregate F-gases     | 0.00                           | 0.00                                   | 0.00%            | 100.00%           |
| 2F5 Solvent - HFC+PFC  | Aggregate F-gases     | 0.00                           | 0.00                                   | 0.00%            | 100.00%           |
| 3D Agricultural Soils  | CH4                   | 0.00                           | 0.00                                   | 0.00%            | 100.00%           |
| 3J Other   | CH4                   | 0.00                           | 0.00                                   | 0.00%            | 100.00%           |
| 3J Other   | CO2                   | 0.00                           | 0.00                                   | 0.00%            | 100.00%           |
| 3J Other   | N2O                   | 0.00                           | 0.00                                   | 0.00%            | 100.00%           |
| 4(I) Direct N2O emissions from N inputs to managed soils   | N2O                   | 0.00                           | 0.00                                   | 0.00%            | 100.00%           |
| 4(II) Emissions and removals from drainage and rewetting and other management of organic and mineral soils | CH4                   | 0.00                           | 0.00                                   | 0.00%            | 100.00%           |
| 4(V) Biomass Burning   | CO2                   | 0.00                           | 0.00                                   | 0.00%            | 100.00%           |
| 4D12 Flooded Land Remaining Flooded Land   | CO2                   | 0.00                           | 0.00                                   | 0.00%            | 100.00%           |

| Category                               | Direct Greenhouse Gas | Base Year Emission [Gg CO2-eq] | Emission in absolute value [Gg CO2-eq] | Level Assessment | Cumulative Total% |
|--|-----------------------|--------------------------------|--|------------------|-------------------|
| 4E1 Settlements Remaining Settlements  | CO2                   | 0.00                           | 0.00                                   | 0.00%            | 100.00%           |
| 4F1 Other Land Remaining Other Land    | CO2                   | 0.00                           | 0.00                                   | 0.00%            | 100.00%           |
| 4F2 Land Converted to Other Land       | CO2                   | 0.00                           | 0.00                                   | 0.00%            | 100.00%           |
| 4H Other                               | CH4                   | 0.00                           | 0.00                                   | 0.00%            | 100.00%           |
| 4H Other                               | CO2                   | 0.00                           | 0.00                                   | 0.00%            | 100.00%           |
| 4H Other                               | N2O                   | 0.00                           | 0.00                                   | 0.00%            | 100.00%           |
| 5A Solid waste disposal                | CO2                   | 0.00                           | 0.00                                   | 0.00%            | 100.00%           |
| 5A Solid waste disposal                | N2O                   | 0.00                           | 0.00                                   | 0.00%            | 100.00%           |
| 5B Biological Treatment of Solid Waste | CO2                   | 0.00                           | 0.00                                   | 0.00%            | 100.00%           |
| 5D Wastewater Treatment and Discharge  | CO2                   | 0.00                           | 0.00                                   | 0.00%            | 100.00%           |
| 5E Other                               | CH4                   | 0.00                           | 0.00                                   | 0.00%            | 100.00%           |
| 5E Other                               | CO2                   | 0.00                           | 0.00                                   | 0.00%            | 100.00%           |
| 5E Other                               | N2O                   | 0.00                           | 0.00                                   | 0.00%            | 100.00%           |

**Table A1-7** Tier 1 level assessment excluding LULUCF (Base year)

| Category                                      | Direct Greenhouse Gas | Base Year Emission exluding LULUCF [Gg CO2-eq] | Emission in absolute value [Gg CO2-eq] | Level Assessment | Cumulative Total% |
|---|-----------------------|--|--|------------------|-------------------|
| 1A1 Energy Industries - Solid fuels           | CO2                   | 14,335.74                                      | 14,335.74                              | 12.97%           | 12.97%            |
| 1A4 Other sectors - Solid fuels               | CO2                   | 12,499.72                                      | 12,499.72                              | 11.31%           | 24.28%            |
| 1A2 Manufacturing industries - Gaseous fuels  | CO2                   | 8,774.22                                       | 8,774.22                               | 7.94%            | 32.22%            |
| 1A3b Road transport - All Fuels               | CO2                   | 7,153.76                                       | 7,153.76                               | 6.47%            | 38.69%            |
| 1A4 Other sectors - Liquid fuels              | CO2                   | 6,947.45                                       | 6,947.45                               | 6.29%            | 44.98%            |
| 1A1 Energy Industries - Liquid fuels          | CO2                   | 5,880.18                                       | 5,880.18                               | 5.32%            | 50.30%            |
| 1A1 Energy Industries - Gaseous fuels         | CO2                   | 5,731.21                                       | 5,731.21                               | 5.19%            | 55.48%            |
| 3.D.1 Direct N2O Emissions From Managed Soils | N2O                   | 4,693.23                                       | 4,693.23                               | 4.25%            | 59.73%            |
| 2C1 Iron and Steel Production                 | CO2                   | 4,578.59                                       | 4,578.59                               | 4.14%            | 63.87%            |
| 2B2 Nitric Acid Production                    | N2O                   | 4,365.71                                       | 4,365.71                               | 3.95%            | 67.82%            |
| 1A2 Manufacturing industries - Liquid fuels   | CO2                   | 4,241.62                                       | 4,241.62                               | 3.84%            | 71.66%            |
| 3A Enteric Fermentation                       | CH4                   | 4,151.36                                       | 4,151.36                               | 3.76%            | 75.42%            |
| 1A4 Other sectors - Gaseous fuels             | CO2                   | 3,988.18                                       | 3,988.18                               | 3.61%            | 79.03%            |
| 1A2 Manufacturing industries - Solid fuels    | CO2                   | 3,318.74                                       | 3,318.74                               | 3.00%            | 82.03%            |
| 5A Solid waste disposal                       | CH4                   | 2,094.36                                       | 2,094.36                               | 1.89%            | 83.92%            |
| 2A1 Cement Production                         | CO2                   | 1,744.64                                       | 1,744.64                               | 1.58%            | 85.50%            |
| 2B1 Ammonia Production                        | CO2                   | 1,714.65                                       | 1,714.65                               | 1.55%            | 87.05%            |
| 1B1 Solid fuels                               | CH4                   | 1,598.88                                       | 1,598.88                               | 1.45%            | 88.50%            |
| 1B2b Natural Gas                              | CH4                   | 1,400.61                                       | 1,400.61                               | 1.27%            | 89.77%            |
| 3B Manure Management                          | CH4                   | 1,258.92                                       | 1,258.92                               | 1.14%            | 90.91%            |
| 3B Manure Management                          | N2O                   | 926.70   | 926.70                                 | 0.84%            | 91.75%            |
| 1A4 Other sectors - Solid fuels               | CH4                   | 870.79   | 870.79                                 | 0.79%            | 92.53%            |

| Category   | Direct Greenhouse Gas | Base Year Emission excluding LULUCF [Gg CO2-eq] | Emission in absolute value [Gg CO2-eq] | Level Assessment | Cumulative Total% |
|--|-----------------------|---|--|------------------|-------------------|
| 5D Wastewater Treatment and Discharge                  | CH4                   | 868.47  | 868.47                                 | 0.79%            | 93.32%            |
| 1A3c Railways - All Fuels                              | CO2                   | 753.73  | 753.73                                 | 0.68%            | 94.00%            |
| 2A2 Lime Production                                    | CO2                   | 606.79  | 606.79                                 | 0.55%            | 94.55%            |
| 1B2c Venting and flaring                               | CH4                   | 590.61  | 590.61                                 | 0.53%            | 95.09%            |
| 2B8 Petrochemical and carbon black production          | CO2                   | 571.26  | 571.26                                 | 0.52%            | 95.60%            |
| 1B2c Venting and flaring                               | CO2                   | 571.06  | 571.06                                 | 0.52%            | 96.12%            |
| 2A4 Other Process Uses of Carbonates                   | CO2                   | 453.29  | 453.29                                 | 0.41%            | 96.53%            |
| 3.D.2 Indirect N2O Emissions From Managed Soils        | N2O                   | 450.85  | 450.85                                 | 0.41%            | 96.94%            |
| 2C3 Aluminium Production                               | PFC                   | 371.08  | 371.08                                 | 0.34%            | 97.27%            |
| 1A3d Domestic navigation - All Liquid fuels            | CO2                   | 340.57  | 340.57                                 | 0.31%            | 97.58%            |
| 3H Urea application                                    | CO2                   | 229.03  | 229.03                                 | 0.21%            | 97.79%            |
| 2D Non-energy products from fuels and solvent use      | CO2                   | 221.82  | 221.82                                 | 0.20%            | 97.99%            |
| 1B2a Oil   | CH4                   | 194.56  | 194.56                                 | 0.18%            | 98.16%            |
| 2G Other Product Manufacture and Use - N2O             | N2O                   | 156.32  | 156.32                                 | 0.14%            | 98.31%            |
| 5D Wastewater Treatment and Discharge                  | N2O                   | 154.87  | 154.87                                 | 0.14%            | 98.45%            |
| 1A3e Other Transportation - Pipelines                  | CO2                   | 154.38  | 154.38                                 | 0.14%            | 98.59%            |
| 1A4 Other sectors - Biomass                            | CH4                   | 153.20  | 153.20                                 | 0.14%            | 98.72%            |
| 3G Liming  | CO2                   | 130.21  | 130.21                                 | 0.12%            | 98.84%            |
| 1B2d Other (Thermal water extraction + NatGas storage) | CH4                   | 129.25  | 129.25                                 | 0.12%            | 98.96%            |
| 2C3 Aluminium Production                               | CO2                   | 125.37  | 125.37                                 | 0.11%            | 99.07%            |
| 5C Incineration and open burning of waste              | CO2                   | 96.88   | 96.88                                  | 0.09%            | 99.16%            |
| 2A3 Glass production                                   | CO2                   | 87.63   | 87.63                                  | 0.08%            | 99.24%            |
| 1A3c Railways - All Fuels                              | N2O                   | 84.02   | 84.02                                  | 0.08%            | 99.32%            |
| 3C Rice Cultivation                                    | CH4                   | 81.23   | 81.23                                  | 0.07%            | 99.39%            |
| 1A1 Energy Industries - Solid fuels                    | N2O                   | 63.36   | 63.36                                  | 0.06%            | 99.45%            |
| 1A4 Other sectors - Solid fuels                        | N2O                   | 57.48   | 57.48                                  | 0.05%            | 99.50%            |
| 1A3b Road transport - All Fuels                        | CH4                   | 54.06   | 54.06                                  | 0.05%            | 99.55%            |
| 1A3b Road transport - All Fuels                        | N2O                   | 52.86   | 52.86                                  | 0.05%            | 99.60%            |
| 1A1 Energy Industries - Other fossil fuels             | CO2                   | 49.45   | 49.45                                  | 0.04%            | 99.64%            |
| 3I Other carboncontaining fertilizers                  | CO2                   | 48.11   | 48.11                                  | 0.04%            | 99.68%            |
| 3F Field Burning of Agricultural Residues              | CH4                   | 46.39   | 46.39                                  | 0.04%            | 99.73%            |
| 2C2 Ferroalloys Production                             | CO2                   | 40.24   | 40.24                                  | 0.04%            | 99.76%            |
| 1A4 Other sectors - Liquid fuels                       | N2O                   | 29.31   | 29.31                                  | 0.03%            | 99.79%            |
| 1A4 Other sectors - Biomass                            | N2O                   | 24.35   | 24.35                                  | 0.02%            | 99.81%            |
| 2B8 Petrochemical and carbon black production          | CH4                   | 20.40   | 20.40                                  | 0.02%            | 99.83%            |
| 1A4 Other sectors - Liquid fuels                       | CH4                   | 20.38   | 20.38                                  | 0.02%            | 99.85%            |
| 1A5b Mobile  | CO2                   | 14.50   | 14.50                                  | 0.01%            | 99.86%            |
| 3F Field Burning of Agricultural Residues              | N2O                   | 14.34   | 14.34                                  | 0.01%            | 99.87%            |
| 1A2 Manufacturing industries - Liquid fuels            | N2O                   | 13.98   | 13.98                                  | 0.01%            | 99.89%            |
| 1A2 Manufacturing industries - Solid fuels             | N2O                   | 12.70   | 12.70                                  | 0.01%            | 99.90%            |

| Category   | Direct Greenhouse Gas | Base Year Emission excluding LULUCF [Gg CO2-eq] | Emission in absolute value [Gg CO2-eq] | Level Assessment | Cumulative Total% |
|--|-----------------------|---|--|------------------|-------------------|
| 1A1 Energy Industries - Liquid fuels                   | N2O                   | 12.53   | 12.53                                  | 0.01%            | 99.91%            |
| 2C1 Iron and Steel Production                          | CH4                   | 10.89   | 10.89                                  | 0.01%            | 99.92%            |
| 1A4 Other sectors - Gaseous fuels                      | CH4                   | 8.97  | 8.97                                   | 0.01%            | 99.93%            |
| 2G Other Product Manufacture and Use - SF6             | Aggregate F-gases     | 7.29  | 7.29                                   | 0.01%            | 99.93%            |
| 1A2 Manufacturing industries - Solid fuels             | CH4                   | 7.16  | 7.16                                   | 0.01%            | 99.94%            |
| 1B2a Oil   | CO2                   | 5.57  | 5.57                                   | 0.01%            | 99.95%            |
| 1A1 Energy Industries - Liquid fuels                   | CH4                   | 5.39  | 5.39                                   | 0.00%            | 99.95%            |
| 5B Biological Treatment of Soild Waste                 | CH4                   | 5.00  | 5.00                                   | 0.00%            | 99.95%            |
| 1A2 Manufacturing industries - Gaseous fuels           | N2O                   | 4.70  | 4.70                                   | 0.00%            | 99.96%            |
| 1A2 Manufacturing industries - Liquid fuels            | CH4                   | 4.34  | 4.34                                   | 0.00%            | 99.96%            |
| 1A2 Manufacturing industries - Gaseous fuels           | CH4                   | 3.95  | 3.95                                   | 0.00%            | 99.97%            |
| 1A3a Domestic aviation - All fuels                     | CO2                   | 3.63  | 3.63                                   | 0.00%            | 99.97%            |
| 1B1 Solid fuels  | CO2                   | 3.60  | 3.60                                   | 0.00%            | 99.97%            |
| 1A1 Energy Industries - Solid fuels                    | CH4                   | 3.59  | 3.59                                   | 0.00%            | 99.98%            |
| 5B Biological Treatment of Soild Waste                 | N2O                   | 3.58  | 3.58                                   | 0.00%            | 99.98%            |
| 1A1 Energy Industries - Gaseous fuels                  | N2O                   | 3.07  | 3.07                                   | 0.00%            | 99.98%            |
| 1A3d Domestic navigation - All Liquid fuels            | N2O                   | 2.87  | 2.87                                   | 0.00%            | 99.98%            |
| 1A1 Energy Industries - Gaseous fuels                  | CH4                   | 2.57  | 2.57                                   | 0.00%            | 99.99%            |
| 1B2b Natural Gas                                       | CO2                   | 2.28  | 2.28                                   | 0.00%            | 99.99%            |
| 1A4 Other sectors - Gaseous fuels                      | N2O                   | 2.14  | 2.14                                   | 0.00%            | 99.99%            |
| 5C Incineration and open burning of waste              | N2O                   | 1.64  | 1.64                                   | 0.00%            | 99.99%            |
| 1A3c Railways - All Fuels                              | CH4                   | 1.04  | 1.04                                   | 0.00%            | 99.99%            |
| 1A1 Energy Industries - Biomass                        | N2O                   | 0.94  | 0.94                                   | 0.00%            | 99.99%            |
| 1A1 Energy Industries - Other fossil fuels             | N2O                   | 0.94  | 0.94                                   | 0.00%            | 100.00%           |
| 1A2 Manufacturing industries - Biomass                 | N2O                   | 0.90  | 0.90                                   | 0.00%            | 100.00%           |
| 1B2c Venting and flaring                               | N2O                   | 0.89  | 0.89                                   | 0.00%            | 100.00%           |
| 1A3d Domestic navigation - All Liquid fuels            | CH4                   | 0.84  | 0.84                                   | 0.00%            | 100.00%           |
| 1A1 Energy Industries - Biomass                        | CH4                   | 0.59  | 0.59                                   | 0.00%            | 100.00%           |
| 1A1 Energy Industries - Other fossil fuels             | CH4                   | 0.59  | 0.59                                   | 0.00%            | 100.00%           |
| 1A2 Manufacturing industries - Biomass                 | CH4                   | 0.57  | 0.57                                   | 0.00%            | 100.00%           |
| 5C Incineration and open burning of waste              | CH4                   | 0.40  | 0.40                                   | 0.00%            | 100.00%           |
| 2C2 Ferroalloys Production                             | CH4                   | 0.25  | 0.25                                   | 0.00%            | 100.00%           |
| 1A5b Mobile  | N2O                   | 0.12  | 0.12                                   | 0.00%            | 100.00%           |
| 1A3e Other Transportation - Pipelines                  | N2O                   | 0.08  | 0.08                                   | 0.00%            | 100.00%           |
| 1A3e Other Transportation - Pipelines                  | CH4                   | 0.07  | 0.07                                   | 0.00%            | 100.00%           |
| 1B2d Other (Thermal water extraction + NatGas storage) | CO2                   | 0.04  | 0.04                                   | 0.00%            | 100.00%           |
| 1A3a Domestic aviation - All fuels                     | N2O                   | 0.03  | 0.03                                   | 0.00%            | 100.00%           |
| 1A5b Mobile  | CH4                   | 0.00  | 0.00                                   | 0.00%            | 100.00%           |
| 1A3a Domestic aviation - All fuels                     | CH4                   | 0.00  | 0.00                                   | 0.00%            | 100.00%           |
| 1A1 Energy Industries - Peat                           | CH4                   | 0.00  | 0.00                                   | 0.00%            | 100.00%           |
| 1A1 Energy Industries - Peat                           | N2O                   | 0.00  | 0.00                                   | 0.00%            | 100.00%           |

| Category   | Direct Greenhouse Gas | Base Year Emission excluding LULUCF [Gg CO <sub>2</sub> -eq] | Emission in absolute value [Gg CO <sub>2</sub> -eq] | Level Assessment | Cumulative Total% |
|--|-----------------------|--|---|------------------|-------------------|
| 1A2 Manufacturing industries - Other fossil fuels          | CH4                   | 0.00   | 0.00  | 0.00%            | 100.00%           |
| 1A2 Manufacturing industries - Other fossil fuels          | CO2                   | 0.00   | 0.00  | 0.00%            | 100.00%           |
| 1A2 Manufacturing industries - Other fossil fuels          | N2O                   | 0.00   | 0.00  | 0.00%            | 100.00%           |
| 1A2 Manufacturing industries - Peat                        | CH4                   | 0.00   | 0.00  | 0.00%            | 100.00%           |
| 1A2 Manufacturing industries - Peat                        | N2O                   | 0.00   | 0.00  | 0.00%            | 100.00%           |
| 1A3d Domestic navigation - Gaseous fuels                   | CH4                   | 0.00   | 0.00  | 0.00%            | 100.00%           |
| 1A3d Domestic navigation - Gaseous fuels                   | CO2                   | 0.00   | 0.00  | 0.00%            | 100.00%           |
| 1A3d Domestic navigation - Gaseous fuels                   | N2O                   | 0.00   | 0.00  | 0.00%            | 100.00%           |
| 1A4 Other sectors - Other Fossil Fuels                     | CH4                   | 0.00   | 0.00  | 0.00%            | 100.00%           |
| 1A4 Other sectors - Other Fossil Fuels                     | CO2                   | 0.00   | 0.00  | 0.00%            | 100.00%           |
| 1A4 Other sectors - Other Fossil Fuels                     | N2O                   | 0.00   | 0.00  | 0.00%            | 100.00%           |
| 1A5a Stationary  | CH4                   | 0.00   | 0.00  | 0.00%            | 100.00%           |
| 1A5a Stationary  | CO2                   | 0.00   | 0.00  | 0.00%            | 100.00%           |
| 1A5a Stationary  | N2O                   | 0.00   | 0.00  | 0.00%            | 100.00%           |
| 1B2b Natural Gas   | N2O                   | 0.00   | 0.00  | 0.00%            | 100.00%           |
| 1B2d Other (Thermal water extraction + NatGas storage)     | N2O                   | 0.00   | 0.00  | 0.00%            | 100.00%           |
| 2B1 Ammonia Production                                     | CH4                   | 0.00   | 0.00  | 0.00%            | 100.00%           |
| 2B1 Ammonia Production                                     | N2O                   | 0.00   | 0.00  | 0.00%            | 100.00%           |
| 2B8 Petrochemical and carbon black production              | N2O                   | 0.00   | 0.00  | 0.00%            | 100.00%           |
| 2C1 Iron and Steel Production                              | N2O                   | 0.00   | 0.00  | 0.00%            | 100.00%           |
| 2C2 Ferroalloys Production                                 | N2O                   | 0.00   | 0.00  | 0.00%            | 100.00%           |
| 2C3 Aluminium Production                                   | CH4                   | 0.00   | 0.00  | 0.00%            | 100.00%           |
| 2C3 Aluminium Production                                   | N2O                   | 0.00   | 0.00  | 0.00%            | 100.00%           |
| 2D Non-energy products from fuels and solvent use          | CH4                   | 0.00   | 0.00  | 0.00%            | 100.00%           |
| 2E Electronics industry                                    | SF6                   | 0.00   | 0.00  | 0.00%            | 100.00%           |
| 2F1 Refrigeration and Air Conditioning Equipment - HFC+PFC | Aggregate F-gases     | 0.00   | 0.00  | 0.00%            | 100.00%           |
| 2F2 Foam Blowing - HFC                                     | Aggregate F-gases     | 0.00   | 0.00  | 0.00%            | 100.00%           |
| 2F3 Fire extinguishers - HFC                               | Aggregate F-gases     | 0.00   | 0.00  | 0.00%            | 100.00%           |
| 2F4 Aerosol + MDI - HFC                                    | Aggregate F-gases     | 0.00   | 0.00  | 0.00%            | 100.00%           |
| 2F5 Solvent - HFC+PFC                                      | Aggregate F-gases     | 0.00   | 0.00  | 0.00%            | 100.00%           |
| 3D Agricultural Soils                                      | CH4                   | 0.00   | 0.00  | 0.00%            | 100.00%           |
| 3J Other   | CH4                   | 0.00   | 0.00  | 0.00%            | 100.00%           |
| 3J Other   | CO2                   | 0.00   | 0.00  | 0.00%            | 100.00%           |
| 3J Other   | N2O                   | 0.00   | 0.00  | 0.00%            | 100.00%           |
| 5A Solid waste disposal                                    | CO2                   | 0.00   | 0.00  | 0.00%            | 100.00%           |
| 5A Solid waste disposal                                    | N2O                   | 0.00   | 0.00  | 0.00%            | 100.00%           |
| 5B Biological Treatment of Solid Waste                     | CO2                   | 0.00   | 0.00  | 0.00%            | 100.00%           |
| 5D Wastewater Treatment and Discharge                      | CO2                   | 0.00   | 0.00  | 0.00%            | 100.00%           |

| Category | Direct Greenhouse Gas | Base Year Emission excluding LULUCF [Gg CO2-eq] | Emission in absolute value [Gg CO2-eq] | Level Assessment | Cumulative Total% |
|----------|-----------------------|---|--|------------------|-------------------|
| 5E Other | CH4                   | 0.00  | 0.00                                   | 0.00%            | 100.00%           |
| 5E Other | CO2                   | 0.00  | 0.00                                   | 0.00%            | 100.00%           |
| 5E Other | N2O                   | 0.00  | 0.00                                   | 0.00%            | 100.00%           |

## ANNEX 2 Assessment of uncertainty

### A2.1 Description of methodology used for uncertainty calculation

The first uncertainty calculation for the Hungarian greenhouse gas inventory was reported in 2006 for the year 2004 to fulfill the IPCC requirements for a complete emission inventory. For the 2012 submission the full coverage of the emission sources and sinks has been achieved both in key category analysis and in uncertainty estimation. The disaggregation of the categories used in uncertainty analysis is the same as listed in Table A1-1 (currently without LULUCF).

“Uncertainty estimates are an essential element of a complete emissions inventory. Uncertainty information is not intended to dispute the validity of the inventory estimates but to help prioritize efforts to improve the accuracy of inventories in the future and guide decisions on methodological choice.” (IPCC, 2000) There are two methods for the uncertainty estimation suggested by the 2006 IPCC Guidelines, a basic method (Tier 1) which is mandatory and an analytic one (Tier 2). The combination of uncertainties of the sectors “in order to arrive at the overall uncertainty in the national emissions and the trend” in the Hungarian inventory is carried out on the basis of Tier 1 method (error propagation rule). The uncertainty calculation was performed using the relevant Table of the 2006 IPCC Guidelines.

The calculations of the emissions estimates uncertainty are presented without LULUCF sectors, in the Table A2-1 below. Uncertainty calculation for each GHG (without LULUCF sector) is presented in Table A2-2. Calculation of the uncertainty with LULUCF is a planned improvement.

**Table A2-1** Uncertainty calculation without LULUCF, Tier 1 method

| CRF  | Pollutant | Base year emissions | Year t emissions | Activity data uncertainty | Emission factor uncertainty | Combined uncertainty | Combined uncertainty as % of total national emissions in the year t | Type A sensitivity | Type B sensitivity | Uncertainty introduced in trend in national emissions introduced by emission factor uncertainty | Uncertainty introduced in trend in national emissions introduced by activity data uncertainty | Uncertainty introduced in trend in national emissions |
|--|-----------|---------------------|------------------|---------------------------|-----------------------------|----------------------|---|--------------------|--------------------|---|---|---|
|  |           | Gg CO2 eq           | Gg CO2 eq        |                           |                             |                      |   |                    |                    |   |   |   |
| 1A1 Energy Industries - Biomass            | CH4       | 0.59                | 18.10            | 5                         | 100                         | 100.12               | 0.029   | 0.000              | 0.000              | 0.016   | 0.001   | 0.016   |
| 1A1 Energy Industries - Biomass            | N2O       | 0.94                | 29.53            | 5                         | 200                         | 200.06               | 0.092   | 0.000              | 0.000              | 0.052   | 0.002   | 0.052   |
| 1A1 Energy Industries - Gaseous fuels      | CH4       | 2.57                | 2.44             | 1                         | 100                         | 100.00               | 0.004   | 0.000              | 0.000              | 0.001   | 0.000   | 0.001   |
| 1A1 Energy Industries - Gaseous fuels      | CO2       | 5731.21             | 5435.09          | 1                         | 3                           | 3.16                 | 0.267   | 0.019              | 0.049              | 0.057   | 0.070   | 0.090   |
| 1A1 Energy Industries - Gaseous fuels      | N2O       | 3.07                | 2.90             | 1                         | 200                         | 200.00               | 0.009   | 0.000              | 0.000              | 0.002   | 0.000   | 0.002   |
| 1A1 Energy Industries - Liquid fuels       | CH4       | 5.39                | 0.55             | 1                         | 100                         | 100.00               | 0.001   | 0.000              | 0.000              | -0.002  | 0.000   | 0.002   |
| 1A1 Energy Industries - Liquid fuels       | CO2       | 5880.18             | 972.36           | 1                         | 2                           | 2.24                 | 0.034   | -0.022             | 0.009              | -0.044  | 0.012   | 0.046   |
| 1A1 Energy Industries - Liquid fuels       | N2O       | 12.53               | 0.94             | 1                         | 200                         | 200.00               | 0.003   | 0.000              | 0.000              | -0.012  | 0.000   | 0.012   |
| 1A1 Energy Industries - Other fossil fuels | CH4       | 0.59                | 1.76             | 1                         | 100                         | 100.00               | 0.003   | 0.000              | 0.000              | 0.001   | 0.000   | 0.001   |
| 1A1 Energy Industries - Other fossil fuels | CO2       | 49.45               | 218.12           | 1                         | 5                           | 5.10                 | 0.017   | 0.002              | 0.002              | 0.009   | 0.003   | 0.009   |
| 1A1 Energy Industries - Other fossil fuels | N2O       | 0.94                | 3.09             | 1                         | 200                         | 200.00               | 0.010   | 0.000              | 0.000              | 0.005   | 0.000   | 0.005   |
| 1A1 Energy Industries - Solid fuels        | CH4       | 3.59                | 1.24             | 1                         | 100                         | 100.00               | 0.002   | 0.000              | 0.000              | -0.001  | 0.000   | 0.001   |
| 1A1 Energy Industries - Solid fuels        | CO2       | 14335.74            | 5760.11          | 1                         | 2                           | 2.24                 | 0.200   | -0.024             | 0.052              | -0.047  | 0.074   | 0.087   |

| CRF   | Pollutant | Base year emissions | Year t emissions | Activity data uncertainty | Emission factor uncertainty | Combined uncertainty | Combined uncertainty as % of total national emissions in the year t | Type A sensitivity | Type B sensitivity | Uncertainty introduced in trend in national emissions introduced by emission factor uncertainty | Uncertainty introduced in trend in national emissions introduced by activity data uncertainty | Uncertainty introduced in trend in national emissions |
|---|-----------|---------------------|------------------|---------------------------|-----------------------------|----------------------|---|--------------------|--------------------|---|---|---|
| 1A1 Energy Industries - Solid fuels               | N2O       | 63.36               | 18.40            | 1                         | 200                         | 200.00               | 0.057   | 0.000              | 0.000              | -0.034  | 0.000   | 0.034   |
| 1A2 Manufacturing industries - Biomass            | CH4       | 0.57                | 7.51             | 5                         | 100                         | 100.12               | 0.012   | 0.000              | 0.000              | 0.006   | 0.000   | 0.007   |
| 1A2 Manufacturing industries - Biomass            | N2O       | 0.90                | 12.10            | 5                         | 200                         | 200.06               | 0.038   | 0.000              | 0.000              | 0.021   | 0.001   | 0.021   |
| 1A2 Manufacturing industries - Gaseous fuels      | CH4       | 3.95                | 1.39             | 5                         | 100                         | 100.12               | 0.002   | 0.000              | 0.000              | -0.001  | 0.000   | 0.001   |
| 1A2 Manufacturing industries - Gaseous fuels      | CO2       | 8774.22             | 3108.80          | 5                         | 5                           | 7.07                 | 0.341   | -0.018             | 0.028              | -0.091  | 0.199   | 0.219   |
| 1A2 Manufacturing industries - Gaseous fuels      | N2O       | 4.70                | 1.66             | 5                         | 200                         | 200.06               | 0.005   | 0.000              | 0.000              | -0.002  | 0.000   | 0.002   |
| 1A2 Manufacturing industries - Liquid fuels       | CH4       | 4.34                | 0.50             | 5                         | 100                         | 100.12               | 0.001   | 0.000              | 0.000              | -0.002  | 0.000   | 0.002   |
| 1A2 Manufacturing industries - Liquid fuels       | CO2       | 4241.62             | 1187.51          | 5                         | 2                           | 5.39                 | 0.099   | -0.012             | 0.011              | -0.023  | 0.076   | 0.079   |
| 1A2 Manufacturing industries - Liquid fuels       | N2O       | 13.98               | 9.93             | 5                         | 200                         | 200.06               | 0.031   | 0.000              | 0.000              | 0.003   | 0.001   | 0.003   |
| 1A2 Manufacturing industries - Other fossil fuels | CH4       | 0.00                | 3.82             | 5                         | 100                         | 100.12               | 0.006   | 0.000              | 0.000              | 0.003   | 0.000   | 0.003   |
| 1A2 Manufacturing industries - Other fossil fuels | CO2       | 0.00                | 366.46           | 5                         | 5                           | 7.07                 | 0.040   | 0.003              | 0.003              | 0.017   | 0.023   | 0.029   |
| 1A2 Manufacturing industries - Other fossil fuels | N2O       | 0.00                | 6.07             | 5                         | 200                         | 200.06               | 0.019   | 0.000              | 0.000              | 0.011   | 0.000   | 0.011   |

| CRF   | Pollutant | Base year emissions | Year t emissions | Activity data uncertainty | Emission factor uncertainty | Combined uncertainty | Combined uncertainty as % of total national emissions in the year t | Type A sensitivity | Type B sensitivity | Uncertainty introduced in trend in national emissions introduced by emission factor uncertainty | Uncertainty introduced in trend in national emissions introduced by activity data uncertainty | Uncertainty introduced in trend in national emissions |
|---|-----------|---------------------|------------------|---------------------------|-----------------------------|----------------------|---|--------------------|--------------------|---|---|---|
| 1A2 Manufacturing industries - Solid fuels  | CH4       | 7.16                | 0.43             | 5                         | 100                         | 100.12               | 0.001   | 0.000              | 0.000              | -0.003  | 0.000   | 0.003   |
| 1A2 Manufacturing industries - Solid fuels  | CO2       | 3318.74             | 452.97           | 5                         | 5                           | 7.07                 | 0.050   | -0.013             | 0.004              | -0.067  | 0.029   | 0.073   |
| 1A2 Manufacturing industries - Solid fuels  | N2O       | 12.70               | 1.88             | 5                         | 200                         | 200.06               | 0.006   | 0.000              | 0.000              | -0.010  | 0.000   | 0.010   |
| 1A3a Domestic aviation - All fuels          | CH4       | 0.00                | 0.00             | 5                         | 100                         | 100.12               | 0.000   | 0.000              | 0.000              | 0.000   | 0.000   | 0.000   |
| 1A3a Domestic aviation - All fuels          | CO2       | 3.59                | 7.72             | 5                         | 5                           | 7.07                 | 0.001   | 0.000              | 0.000              | 0.000   | 0.000   | 0.001   |
| 1A3a Domestic aviation - All fuels          | N2O       | 0.03                | 0.07             | 5                         | 150                         | 150.08               | 0.000   | 0.000              | 0.000              | 0.000   | 0.000   | 0.000   |
| 1A3b Road transport - All Fuels             | CH4       | 54.06               | 23.66            | 5                         | 100                         | 100.12               | 0.037   | 0.000              | 0.000              | -0.007  | 0.002   | 0.007   |
| 1A3b Road transport - All Fuels             | CO2       | 7153.76             | 14197.14         | 5                         | 2                           | 5.22                 | 1.150   | 0.091              | 0.129              | 0.136   | 0.909   | 0.919   |
| 1A3b Road transport - All Fuels             | N2O       | 56.29               | 150.50           | 5                         | 200                         | 200.06               | 0.467   | 0.001              | 0.001              | 0.213   | 0.010   | 0.213   |
| 1A3c Railways - All Fuels                   | CH4       | 1.04                | 0.17             | 5                         | 250                         | 250.05               | 0.001   | 0.000              | 0.000              | -0.001  | 0.000   | 0.001   |
| 1A3c Railways - All Fuels                   | CO2       | 753.73              | 120.57           | 5                         | 1                           | 5.10                 | 0.010   | -0.003             | 0.001              | -0.003  | 0.008   | 0.008   |
| 1A3c Railways - All Fuels                   | N2O       | 84.02               | 13.84            | 5                         | 300                         | 300.04               | 0.064   | 0.000              | 0.000              | -0.095  | 0.001   | 0.095   |
| 1A3d Domestic navigation - All Liquid fuels | CH4       | 0.84                | 0.04             | 5                         | 50                          | 50.25                | 0.000   | 0.000              | 0.000              | 0.000   | 0.000   | 0.000   |
| 1A3d Domestic navigation - All Liquid fuels | CO2       | 340.57              | 15.86            | 5                         | 2                           | 5.22                 | 0.001   | -0.002             | 0.000              | -0.002  | 0.001   | 0.003   |
| 1A3d Domestic navigation - All Liquid fuels | N2O       | 2.87                | 0.13             | 5                         | 140                         | 140.09               | 0.000   | 0.000              | 0.000              | -0.002  | 0.000   | 0.002   |

| CRF  | Pollutant | Base year emissions | Year t emissions | Activity data uncertainty | Emission factor uncertainty | Combined uncertainty | Combined uncertainty as % of total national emissions in the year t | Type A sensitivity | Type B sensitivity | Uncertainty introduced in trend in national emissions introduced by emission factor uncertainty | Uncertainty introduced in trend in national emissions introduced by activity data uncertainty | Uncertainty introduced in trend in national emissions |
|--|-----------|---------------------|------------------|---------------------------|-----------------------------|----------------------|---|--------------------|--------------------|---|---|---|
| 1A3e Other Transportation (as specified in table 1A(a) sheet 3) - Pipeline, only gaseous | CH4       | 0.07                | 0.08             | 5                         | 100                         | 100.12               | 0.000   | 0.000              | 0.000              | 0.000   | 0.000   | 0.000   |
| 1A3e Other Transportation (as specified in table 1A(a) sheet 3) - Pipeline, only gaseous | CO2       | 154.38              | 172.15           | 5                         | 5                           | 7.07                 | 0.019   | 0.001              | 0.002              | 0.004   | 0.011   | 0.012   |
| 1A3e Other Transportation (as specified in table 1A(a) sheet 3) - Pipeline, only gaseous | N2O       | 0.08                | 0.09             | 5                         | 200                         | 200.06               | 0.000   | 0.000              | 0.000              | 0.000   | 0.000   | 0.000   |
| 1A4 Other sectors - Biomass  | CH4       | 153.20              | 409.73           | 20                        | 100                         | 101.98               | 0.648   | 0.003              | 0.004              | 0.290   | 0.105   | 0.308   |
| 1A4 Other sectors - Biomass  | N2O       | 24.35               | 65.13            | 20                        | 200                         | 201.00               | 0.203   | 0.000              | 0.001              | 0.092   | 0.017   | 0.094   |
| 1A4 Other sectors - Gaseous fuels  | CH4       | 8.97                | 21.18            | 5                         | 100                         | 100.12               | 0.033   | 0.000              | 0.000              | 0.014   | 0.001   | 0.014   |
| 1A4 Other sectors - Gaseous fuels  | CO2       | 3988.18             | 9415.31          | 5                         | 5                           | 7.07                 | 1.033   | 0.064              | 0.085              | 0.321   | 0.603   | 0.683   |
| 1A4 Other sectors - Gaseous fuels  | N2O       | 2.14                | 5.05             | 5                         | 200                         | 200.06               | 0.016   | 0.000              | 0.000              | 0.007   | 0.000   | 0.007   |
| 1A4 Other sectors - Liquid fuels   | CH4       | 20.38               | 2.54             | 5                         | 100                         | 100.12               | 0.004   | 0.000              | 0.000              | -0.008  | 0.000   | 0.008   |
| 1A4 Other sectors - Liquid fuels   | CO2       | 6947.45             | 1560.84          | 5                         | 2                           | 5.39                 | 0.130   | -0.023             | 0.014              | -0.045  | 0.100   | 0.110   |
| 1A4 Other sectors - Liquid fuels   | N2O       | 29.31               | 15.67            | 5                         | 200                         | 200.06               | 0.049   | 0.000              | 0.000              | -0.003  | 0.001   | 0.003   |

| CRF  | Pollutant | Base year emissions | Year t emissions | Activity data uncertainty | Emission factor uncertainty | Combined uncertainty | Combined uncertainty as % of total national emissions in the year t | Type A sensitivity | Type B sensitivity | Uncertainty introduced in trend in national emissions introduced by emission factor uncertainty | Uncertainty introduced in trend in national emissions introduced by activity data uncertainty | Uncertainty introduced in trend in national emissions |
|--|-----------|---------------------|------------------|---------------------------|-----------------------------|----------------------|---|--------------------|--------------------|---|---|---|
| 1A4 Other sectors - Other Fossil Fuels                 | CH4       | 0.00                | 1.29             | 5                         | 100                         | 100.12               | 0.002   | 0.000              | 0.000              | 0.001   | 0.000   | 0.001   |
| 1A4 Other sectors - Other Fossil Fuels                 | CO2       | 0.00                | 157.24           | 5                         | 7                           | 8.60                 | 0.021   | 0.001              | 0.001              | 0.010   | 0.010   | 0.014   |
| 1A4 Other sectors - Other Fossil Fuels                 | N2O       | 0.00                | 2.05             | 5                         | 200                         | 200.06               | 0.006   | 0.000              | 0.000              | 0.004   | 0.000   | 0.004   |
| 1A4 Other sectors - Solid fuels                        | CH4       | 870.79              | 22.63            | 5                         | 100                         | 100.12               | 0.035   | -0.004             | 0.000              | -0.439  | 0.001   | 0.439   |
| 1A4 Other sectors - Solid fuels                        | CO2       | 12499.72            | 313.91           | 5                         | 7                           | 8.60                 | 0.042   | -0.063             | 0.003              | -0.442  | 0.020   | 0.442   |
| 1A4 Other sectors - Solid fuels                        | N2O       | 57.48               | 1.38             | 5                         | 200                         | 200.06               | 0.004   | 0.000              | 0.000              | -0.058  | 0.000   | 0.058   |
| 1A5b Other   | CH4       | 0.00                | 0.09             | 10                        | 100                         | 100.50               | 0.000   | 0.000              | 0.000              | 0.000   | 0.000   | 0.000   |
| 1A5b Other   | CO2       | 14.50               | 64.62            | 10                        | 5                           | 11.18                | 0.011   | 0.001              | 0.001              | 0.003   | 0.008   | 0.009   |
| 1A5b Other   | N2O       | 0.12                | 0.23             | 10                        | 200                         | 200.25               | 0.001   | 0.000              | 0.000              | 0.000   | 0.000   | 0.000   |
| 1B1 Solid fuels  | CH4       | 1598.88             | 31.74            | 5                         | 200                         | 200.06               | 0.099   | -0.008             | 0.000              | -1.630  | 0.002   | 1.630   |
| 1B1 Solid fuels  | CO2       | 3.60                | 9.02             | 5                         | 200                         | 200.06               | 0.028   | 0.000              | 0.000              | 0.013   | 0.001   | 0.013   |
| 1B2a Oil   | CH4       | 194.56              | 54.43            | 0                         | 89                          | 88.75                | 0.075   | -0.001             | 0.000              | -0.047  | 0.000   | 0.047   |
| 1B2a Oil   | CO2       | 5.57                | 0.56             | 0                         | 45                          | 44.70                | 0.000   | 0.000              | 0.000              | -0.001  | 0.000   | 0.001   |
| 1B2b Natural Gas                                       | CH4       | 1825.32             | 1495.89          | 0                         | 379                         | 379.38               | 8.808   | 0.004              | 0.014              | 1.481   | 0.000   | 1.481   |
| 1B2b Natural Gas                                       | CO2       | 2.28                | 0.68             | 0                         | 266                         | 266.30               | 0.003   | 0.000              | 0.000              | -0.002  | 0.000   | 0.002   |
| 1B2c Venting and flaring                               | CH4       | 165.91              | 25.20            | 0                         | 39                          | 39.08                | 0.015   | -0.001             | 0.000              | -0.025  | 0.000   | 0.025   |
| 1B2c Venting and flaring                               | CO2       | 571.06              | 124.01           | 0                         | 465                         | 465.27               | 0.896   | -0.002             | 0.001              | -0.880  | 0.000   | 0.880   |
| 1B2c Venting and flaring                               | N2O       | 0.89                | 0.26             | 0                         | 573                         | 573.28               | 0.002   | 0.000              | 0.000              | -0.001  | 0.000   | 0.001   |
| 1B2d Other (Thermal water extraction + NatGas storage) | CH4       | 94.91               | 69.08            | 5                         | 200                         | 200.06               | 0.215   | 0.000              | 0.001              | 0.025   | 0.004   | 0.025   |

| CRF  | Pollutant | Base year emissions | Year t emissions | Activity data uncertainty | Emission factor uncertainty | Combined uncertainty | Combined uncertainty as % of total national emissions in the year t | Type A sensitivity | Type B sensitivity | Uncertainty introduced in trend in national emissions introduced by emission factor uncertainty | Uncertainty introduced in trend in national emissions introduced by activity data uncertainty | Uncertainty introduced in trend in national emissions |
|--|-----------|---------------------|------------------|---------------------------|-----------------------------|----------------------|---|--------------------|--------------------|---|---|---|
| 1B2d Other (Thermal water extraction + NatGas storage) | CO2       | 0.04                | 0.01             | 5                         | 200                         | 200.06               | 0.000   | 0.000              | 0.000              | 0.000   | 0.000   | 0.000   |
| 2A1 Cement Production                                  | CO2       | 1744.64             | 1022.86          | 3                         | 3                           | 3.54                 | 0.056   | 0.000              | 0.009              | 0.000   | 0.033   | 0.033   |
| 2A2 Lime Production                                    | CO2       | 606.79              | 144.62           | 3                         | 3                           | 3.54                 | 0.008   | -0.002             | 0.001              | -0.005  | 0.005   | 0.007   |
| 2A3 Glass production                                   | CO2       | 87.63               | 49.34            | 3                         | 3                           | 3.54                 | 0.003   | 0.000              | 0.000              | 0.000   | 0.002   | 0.002   |
| 2A4 Other Process Uses of Carbonates                   | CO2       | 453.29              | 248.79           | 3                         | 3                           | 3.54                 | 0.014   | 0.000              | 0.002              | 0.000   | 0.008   | 0.008   |
| 2B1 Ammonia Production                                 | CO2       | 1714.65             | 1081.22          | 5                         | 5                           | 7.07                 | 0.119   | 0.001              | 0.010              | 0.004   | 0.069   | 0.069   |
| 2B2 Nitric Acid Production                             | N2O       | 4365.71             | 32.11            | 8                         | 8                           | 10.61                | 0.005   | -0.023             | 0.000              | -0.171  | 0.003   | 0.171   |
| 2B8 Petrochemical and carbon black production          | CH4       | 20.40               | 42.71            | 3                         | 10                          | 10.44                | 0.007   | 0.000              | 0.000              | 0.003   | 0.002   | 0.003   |
| 2B8 Petrochemical and carbon black production          | CO2       | 571.26              | 1306.63          | 8                         | 8                           | 10.61                | 0.215   | 0.009              | 0.012              | 0.066   | 0.125   | 0.142   |
| 2C1 Iron and Steel Production                          | CH4       | 10.89               | 4.71             | 10                        | 10                          | 14.14                | 0.001   | 0.000              | 0.000              | 0.000   | 0.001   | 0.001   |
| 2C1 Iron and Steel Production                          | CO2       | 4578.59             | 1218.10          | 8                         | 5                           | 9.01                 | 0.170   | -0.013             | 0.011              | -0.066  | 0.117   | 0.134   |
| 2C2 Ferroalloys Production                             | CH4       | 0.25                | 0.00             | 5                         | 38                          | 37.83                | 0.000   | 0.000              | 0.000              | 0.000   | 0.000   | 0.000   |
| 2C2 Ferroalloys Production                             | CO2       | 40.24               | 0.00             | 5                         | 38                          | 37.83                | 0.000   | 0.000              | 0.000              | -0.008  | 0.000   | 0.008   |
| 2C3 Aluminium Production                               | CO2       | 125.37              | 0.00             | 2                         | 10                          | 10.20                | 0.000   | -0.001             | 0.000              | -0.007  | 0.000   | 0.007   |
| 2C3 Aluminium Production                               | PFC       | 371.08              | 0.00             | 2                         | 99                          | 99.02                | 0.000   | -0.002             | 0.000              | -0.194  | 0.000   | 0.194   |

| CRF  | Pollutant         | Base year emissions | Year t emissions | Activity data uncertainty | Emission factor uncertainty | Combined uncertainty | Combined uncertainty as % of total national emissions in the year t | Type A sensitivity | Type B sensitivity | Uncertainty introduced in trend in national emissions introduced by emission factor uncertainty | Uncertainty introduced in trend in national emissions introduced by activity data uncertainty | Uncertainty introduced in trend in national emissions |
|--|-------------------|---------------------|------------------|---------------------------|-----------------------------|----------------------|---|--------------------|--------------------|---|---|---|
| 2D Non-energy products from fuels and solvent use          | CO2               | 221.82              | 99.53            | 5                         | 50                          | 50.25                | 0.078   | 0.000              | 0.001              | -0.014  | 0.006   | 0.015   |
| 2F1 Refrigeration and Air Conditioning Equipment - HFC+PFC | Aggregate F-gases | 0.00                | 1965.57          | 10                        | 10                          | 14.14                | 0.431   | 0.018              | 0.018              | 0.178   | 0.252   | 0.308   |
| 2F2 Foam Blowing - HFC                                     | Aggregate F-gases | 0.00                | 128.79           | 50                        | 21                          | 54.23                | 0.108   | 0.001              | 0.001              | 0.024   | 0.082   | 0.086   |
| 2F3 Fire extinguishers - HFC                               | Aggregate F-gases | 0.00                | 7.20             | 15                        | 2                           | 15.13                | 0.002   | 0.000              | 0.000              | 0.000   | 0.001   | 0.001   |
| 2F4 Aerosol + MDI - HFC                                    | Aggregate F-gases | 0.00                | 35.02            | 10                        | 50                          | 50.99                | 0.028   | 0.000              | 0.000              | 0.016   | 0.004   | 0.016   |
| 2G Other Product Manufacture and Use - SF6                 | Aggregate F-gases | 7.29                | 101.14           | 3                         | 40                          | 40.11                | 0.063   | 0.001              | 0.001              | 0.035   | 0.004   | 0.035   |
| 2G Other Product Manufacture and Use                       | N2O               | 156.32              | 177.45           | 3                         | 3                           | 4.24                 | 0.012   | 0.001              | 0.002              | 0.002   | 0.007   | 0.007   |
| 3A Enteric Fermentation                                    | CH4               | 4151.36             | 2048.34          | 0                         | 13                          | 12.64                | 0.402   | -0.003             | 0.019              | -0.043  | 0.000   | 0.043   |
| 3B Manure Management                                       | CH4               | 1243.25             | 649.89           | 0                         | 14                          | 14.21                | 0.143   | -0.001             | 0.006              | -0.010  | 0.000   | 0.010   |
| 3B Manure Management                                       | N2O               | 929.09              | 462.95           | 0                         | 130                         | 130.46               | 0.937   | -0.001             | 0.004              | -0.093  | 0.000   | 0.093   |
| 3C Rice Cultivation  | CH4               | 81.23               | 17.87            | 5                         | 75                          | 75.61                | 0.021   | 0.000              | 0.000              | -0.020  | 0.001   | 0.020   |
| 3D Agricultural Soils                                      | N2O               | 5145.00             | 3736.54          | 0                         | 187                         | 186.57               | 10.819  | 0.007              | 0.034              | 1.242   | 0.000   | 1.242   |
| 3F Field Burning of Agricultural Residues                  | CH4               | 46.39               | 0.23             | 40                        | 50                          | 64.03                | 0.000   | 0.000              | 0.000              | -0.012  | 0.000   | 0.012   |
| 3F Field Burning of Agricultural Residues                  | N2O               | 14.34               | 0.07             | 40                        | 50                          | 64.03                | 0.000   | 0.000              | 0.000              | -0.004  | 0.000   | 0.004   |
| 3G Liming  | CO2               | 130.21              | 8.26             | 10                        | 20                          | 22.36                | 0.003   | -0.001             | 0.000              | -0.012  | 0.001   | 0.012   |
| 3H Urea application  | CO2               | 229.03              | 115.94           | 5                         | 20                          | 20.62                | 0.037   | 0.000              | 0.001              | -0.003  | 0.007   | 0.008   |

| CRF                                       | Pollutant  | Base year emissions | Year t emissions | Activity data uncertainty | Emission factor uncertainty | Combined uncertainty | Combined uncertainty as % of total national emissions in the year t | Type A sensitivity | Type B sensitivity | Uncertainty introduced in trend in national emissions introduced by emission factor uncertainty | Uncertainty introduced in trend in national emissions introduced by activity data uncertainty | Uncertainty introduced in trend in national emissions |
|---|------------|---------------------|------------------|---------------------------|-----------------------------|----------------------|---|--------------------|--------------------|---|---|---|
| 3I Other carboncontaining fertilizers     | CO2        | 48.11               | 92.63            | 5                         | 20                          | 20.62                | 0.030   | 0.001              | 0.001              | 0.012   | 0.006   | 0.013   |
| 5A Solid waste disposal                   | CH4        | 2094.36             | 2926.56          | 10                        | 33                          | 34.48                | 1.566   | 0.015              | 0.026              | 0.509   | 0.375   | 0.632   |
| 5B Biological Treatment of Soil Waste     | CH4        | 5.00                | 113.67           | 10                        | 140                         | 140.36               | 0.248   | 0.001              | 0.001              | 0.140   | 0.015   | 0.141   |
| 5B Biological Treatment of Soil Waste     | N2O        | 3.58                | 41.60            | 10                        | 130                         | 130.38               | 0.084   | 0.000              | 0.000              | 0.047   | 0.005   | 0.047   |
| 5C Incineration and open burning of waste | CH4        | 0.40                | 0.11             | 10                        | 100                         | 100.50               | 0.000   | 0.000              | 0.000              | 0.000   | 0.000   | 0.000   |
| 5C Incineration and open burning of waste | CO2        | 96.88               | 30.70            | 10                        | 25                          | 26.93                | 0.013   | 0.000              | 0.000              | -0.006  | 0.004   | 0.007   |
| 5C Incineration and open burning of waste | N2O        | 1.64                | 0.46             | 10                        | 100                         | 100.50               | 0.001   | 0.000              | 0.000              | 0.000   | 0.000   | 0.000   |
| 5D Wastewater Treatment and Discharge     | CH4        | 868.47              | 238.00           | 30                        | 40                          | 50.00                | 0.185   | -0.002             | 0.002              | -0.097  | 0.091   | 0.133   |
| 5D Wastewater Treatment and Discharge     | N2O        | 154.87              | 85.57            | 15                        | 200                         | 200.56               | 0.266   | 0.000              | 0.001              | -0.009  | 0.016   | 0.019   |
|   | $\Sigma C$ |                     | $\Sigma D$       |                           |                             |                      | $(\Sigma H^2)^{1/2}$  |                    |                    |   |   | $(\Sigma M^2)^{1/2}$                                  |
| <b>TOTAL excluding LULUCF</b>             |            | <b>110,520.70</b>   | <b>62,818.39</b> |                           |                             |                      | <b>13.34</b>  |                    |                    |   |   | <b>3.18</b>   |

**Table A2-2** Uncertainty calculation for CO<sub>2</sub> without LULUCF, Tier 1 method

| CRF   | Pollutant       | Base year emissions   | Year t emissions      | Activity data uncertainty | Emission factor uncertainty | Combined uncertainty | Combined uncertainty as % of total national emissions in the year t | Type A sensitivity | Type B sensitivity | Uncertainty introduced in trend in national emissions introduced by activity data | Uncertainty introduced in trend in national emissions introduced by emission factor | Uncertainty introduced in trend in national emissions |
|---|-----------------|-----------------------|-----------------------|---------------------------|-----------------------------|----------------------|---|--------------------|--------------------|---|---|---|
|   |                 | Gg CO <sub>2</sub> eq | Gg CO <sub>2</sub> eq |                           |                             |                      |   | %                  |                    |   |   |   |
| 1A1 Energy Industries - Gaseous fuels             | CO <sub>2</sub> | 5,731.21              | 5,786.16              | 1                         | 3                           | 3.16                 | 0.387   | 0.031              | 0.068              | 0.092   | 0.096   | 0.133   |
| 1A1 Energy Industries - Liquid fuels              | CO <sub>2</sub> | 5,880.18              | 988.89                | 1                         | 2                           | 2.24                 | 0.047   | -0.027             | 0.012              | -0.053  | 0.016   | 0.055   |
| 1A1 Energy Industries - Other fossil fuels        | CO <sub>2</sub> | 49.45                 | 211.05                | 1                         | 5                           | 5.10                 | 0.023   | 0.002              | 0.002              | 0.011   | 0.003   | 0.011   |
| 1A1 Energy Industries - Solid fuels               | CO <sub>2</sub> | 14,335.74             | 5,274.94              | 1                         | 2                           | 2.24                 | 0.249   | -0.031             | 0.062              | -0.062  | 0.087   | 0.107   |
| 1A2 Manufacturing industries - Gaseous fuels      | CO <sub>2</sub> | 8,774.22              | 3,072.77              | 5                         | 5                           | 7.07                 | 0.460   | -0.021             | 0.036              | -0.104  | 0.254   | 0.275   |
| 1A2 Manufacturing industries - Liquid fuels       | CO <sub>2</sub> | 4,241.62              | 1,153.93              | 5                         | 2                           | 5.39                 | 0.131   | -0.014             | 0.014              | -0.028  | 0.096   | 0.100   |
| 1A2 Manufacturing industries - Other fossil fuels | CO <sub>2</sub> | 0.00                  | 340.97                | 5                         | 5                           | 7.07                 | 0.051   | 0.004              | 0.004              | 0.020   | 0.028   | 0.035   |
| 1A2 Manufacturing industries - Solid fuels        | CO <sub>2</sub> | 3,318.74              | 359.57                | 5                         | 5                           | 7.07                 | 0.054   | -0.017             | 0.004              | -0.086  | 0.030   | 0.091   |
| 1A3a Domestic aviation - All fuels                | CO <sub>2</sub> | 3.63                  | 4.18                  | 5                         | 5                           | 7.07                 | 0.001   | 0.000              | 0.000              | 0.000   | 0.000   | 0.000   |
| 1A3b Road transport - All Fuels                   | CO <sub>2</sub> | 7,153.76              | 12,181.35             | 5                         | 2                           | 5.22                 | 1.345   | 0.096              | 0.143              | 0.144   | 1.008   | 1.019   |
| 1A3c Railways - All Fuels                         | CO <sub>2</sub> | 753.73                | 104.59                | 5                         | 1                           | 5.10                 | 0.011   | -0.004             | 0.001              | -0.004  | 0.009   | 0.009   |
| 1A3d Domestic navigation - All Liquid fuels       | CO <sub>2</sub> | 340.57                | 9.50                  | 5                         | 2                           | 5.22                 | 0.001   | -0.002             | 0.000              | -0.003  | 0.001   | 0.003   |
| 1A3e Other Transportation (as                     | CO <sub>2</sub> | 154.38                | 125.10                | 5                         | 5                           | 7.07                 | 0.019   | 0.000              | 0.001              | 0.002   | 0.010   | 0.011   |

| CRF  | Pollutant | Base year emissions | Year t emissions | Activity data uncertainty | Emission factor uncertainty | Combined uncertainty | Combined national uncertainty as % of total national emissions in the year t | Type A sensitivity | Type B sensitivity | Uncertainty introduced in trend in national emissions introduced by activity data | Uncertainty introduced in trend in national emissions introduced by emission factor | Uncertainty introduced in trend in national emissions |
|--|-----------|---------------------|------------------|---------------------------|-----------------------------|----------------------|--|--------------------|--------------------|---|---|---|
| specified in table 1A(a) sheet 3) - Pipeline, only gaseous |           |                     |                  |                           |                             |                      |  |                    |                    |   |   |   |
| 1A4 Other sectors - Gaseous fuels                          | CO2       | 3,988.18            | 10,034.35        | 5                         | 5                           | 7.07                 | 1.501  | 0.092              | 0.117              | 0.458   | 0.831   | 0.949   |
| 1A4 Other sectors - Liquid fuels                           | CO2       | 6,947.45            | 1,615.69         | 5                         | 2                           | 5.39                 | 0.184  | -0.026             | 0.019              | -0.052  | 0.134   | 0.144   |
| 1A4 Other sectors - Other Fossil Fuels                     | CO2       | 0.00                | 156.98           | 5                         | 7                           | 8.60                 | 0.029  | 0.002              | 0.002              | 0.013   | 0.013   | 0.018   |
| 1A4 Other sectors - Solid fuels                            | CO2       | 12,499.72           | 249.75           | 5                         | 7                           | 8.60                 | 0.045  | -0.078             | 0.003              | -0.546  | 0.021   | 0.546   |
| 1A5b Other - Mobile  | CO2       | 14.50               | 68.36            | 10                        | 5                           | 11.18                | 0.016  | 0.001              | 0.001              | 0.004   | 0.011   | 0.012   |
| 1B1 Solid fuels  | CO2       | 3.60                | 28.67            | 5                         | 200                         | 200.06               | 0.121  | 0.000              | 0.000              | 0.062   | 0.002   | 0.063   |
| 1B2a Oil   | CO2       | 5.57                | 0.53             | 0                         | 45                          | 44.61                | 0.000  | 0.000              | 0.000              | -0.001  | 0.000   | 0.001   |
| 1B2b Natural Gas   | CO2       | 2.28                | 0.70             | 0                         | 266                         | 265.68               | 0.004  | 0.000              | 0.000              | -0.002  | 0.000   | 0.002   |
| 1B2c Venting and flaring                                   | CO2       | 571.06              | 132.17           | 0                         | 479                         | 479.38               | 1.340  | -0.002             | 0.002              | -1.032  | 0.000   | 1.032   |
| 1B2d Other (Thermal water extraction + NatGas storage)     | CO2       | 0.04                | 0.01             | 5                         | 200                         | 200.06               | 0.000  | 0.000              | 0.000              | 0.000   | 0.000   | 0.000   |
| 2A1 Cement Production                                      | CO2       | 1,744.64            | 928.79           | 3                         | 3                           | 3.54                 | 0.069  | 0.000              | 0.011              | -0.001  | 0.038   | 0.038   |
| 2A2 Lime Production  | CO2       | 606.79              | 143.52           | 3                         | 3                           | 3.54                 | 0.011  | -0.002             | 0.002              | -0.006  | 0.006   | 0.008   |
| 2A3 Glass production                                       | CO2       | 87.63               | 43.20            | 3                         | 3                           | 3.54                 | 0.003  | 0.000              | 0.001              | 0.000   | 0.002   | 0.002   |
| 2A4 Other Process Uses of Carbonates                       | CO2       | 453.29              | 195.14           | 3                         | 3                           | 3.54                 | 0.015  | -0.001             | 0.002              | -0.002  | 0.008   | 0.008   |
| 2B1 Ammonia Production                                     | CO2       | 1,714.65            | 1,239.10         | 5                         | 5                           | 7.07                 | 0.185  | 0.003              | 0.015              | 0.017   | 0.103   | 0.104   |
| 2B8 Petrochemical and carbon black production              | CO2       | 571.26              | 1,339.80         | 8                         | 8                           | 10.61                | 0.301  | 0.012              | 0.016              | 0.090   | 0.166   | 0.189   |
| 2C1 Iron and Steel Production                              | CO2       | 4,578.59            | 1,109.59         | 8                         | 5                           | 9.01                 | 0.212  | -0.017             | 0.013              | -0.083  | 0.138   | 0.161   |

| CRF   | Pollutant | Base year emissions | Year t emissions | Activity data uncertainty | Emission factor uncertainty | Combined uncertainty | Combined uncertainty as % of total national emissions in the year t | Type A sensitivity | Type B sensitivity | Uncertainty introduced in trend in national emissions introduced by activity data | Uncertainty introduced in trend in national emissions introduced by emission factor | Uncertainty introduced in trend in national emissions |
|---|-----------|---------------------|------------------|---------------------------|-----------------------------|----------------------|---|--------------------|--------------------|---|---|---|
| 2C2 Ferroalloys Production                        | CO2       | 40.24               | 0.00             | 5                         | 38                          | 37.83                | 0.000   | 0.000              | 0.000              | -0.010  | 0.000   | 0.010   |
| 2C3 Aluminium Production                          | CO2       | 125.37              | 0.00             | 2                         | 10                          | 10.20                | 0.000   | -0.001             | 0.000              | -0.008  | 0.000   | 0.008   |
| 2D Non-energy products from fuels and solvent use | CO2       | 221.82              | 120.52           | 5                         | 50                          | 50.25                | 0.128   | 0.000              | 0.001              | -0.001  | 0.010   | 0.010   |
| 3G Liming   | CO2       | 130.21              | 5.46             | 10                        | 20                          | 22.36                | 0.003   | -0.001             | 0.000              | -0.016  | 0.001   | 0.016   |
| 3H Urea application                               | CO2       | 229.03              | 136.37           | 5                         | 20                          | 20.62                | 0.059   | 0.000              | 0.002              | 0.002   | 0.011   | 0.012   |
| 3I Other carboncontaining fertilizers             | CO2       | 48.11               | 97.50            | 5                         | 20                          | 20.62                | 0.043   | 0.001              | 0.001              | 0.017   | 0.008   | 0.018   |
| 5C Incineration and open burning of waste         | CO2       | 96.88               | 25.31            | 10                        | 25                          | 26.93                | 0.014   | 0.000              | 0.000              | -0.008  | 0.004   | 0.009   |
|   |           | <b>Σ C</b>          | <b>Σ D</b>       |                           |                             |                      | <b>(ΣH<sup>2</sup>)<sup>1/2</sup></b>                               |                    |                    |   |   | <b>(ΣM<sup>2</sup>)<sup>1/2</sup></b>                 |
| TOTAL excluding LULUCF                            |           | <b>85,418.15</b>    | <b>47,284.50</b> |                           |                             |                      | <b>2.56</b>   |                    |                    |   |   | <b>1.88</b>   |

**Table A2-3** Uncertainty calculation for CH<sub>4</sub> without LULUCF, Tier 1 method

| CRF   | Pollutant | Base year emissions | Year t emissions | Activity data uncertainty | Emission factor uncertainty | Combined uncertainty | Combined uncertainty as % of total national emissions in the year t | Type A sensitivity | Type B sensitivity | Uncertainty introduced in trend in national emissions introduced by emission factor uncertainty | Uncertainty introduced in trend in national emissions introduced by activity data uncertainty | Uncertainty introduced in trend in national emissions |
|---|-----------|---------------------|------------------|---------------------------|-----------------------------|----------------------|---|--------------------|--------------------|---|---|---|
|   |           | Gg CO2 eq           | Gg CO2 eq        |                           |                             |                      |   | %                  |                    |   |   |   |
| 1A1 Energy Industries - Biomass                   | CH4       | 0.59                | 18.10            | 5                         | 100                         | 100.12               | 0.221   | 0.001              | 0.001              | 0.131   | 0.009   | 0.131   |
| 1A1 Energy Industries - Gaseous fuels             | CH4       | 2.57                | 2.59             | 1                         | 100                         | 100.00               | 0.032   | 0.000              | 0.000              | 0.008   | 0.000   | 0.008   |
| 1A1 Energy Industries - Liquid fuels              | CH4       | 5.39                | 0.53             | 1                         | 100                         | 100.00               | 0.007   | 0.000              | 0.000              | -0.020  | 0.000   | 0.020   |
| 1A1 Energy Industries - Other fossil fuels        | CH4       | 0.59                | 1.68             | 1                         | 100                         | 100.00               | 0.020   | 0.000              | 0.000              | 0.010   | 0.000   | 0.010   |
| 1A1 Energy Industries - Solid fuels               | CH4       | 3.59                | 1.17             | 1                         | 100                         | 100.00               | 0.014   | 0.000              | 0.000              | -0.007  | 0.000   | 0.007   |
| 1A2 Manufacturing industries - Biomass            | CH4       | 0.57                | 7.49             | 5                         | 100                         | 100.12               | 0.091   | 0.001              | 0.001              | 0.053   | 0.004   | 0.053   |
| 1A2 Manufacturing industries - Gaseous fuels      | CH4       | 3.95                | 1.38             | 5                         | 100                         | 100.12               | 0.017   | 0.000              | 0.000              | -0.007  | 0.001   | 0.007   |
| 1A2 Manufacturing industries - Liquid fuels       | CH4       | 4.34                | 0.43             | 5                         | 100                         | 100.12               | 0.005   | 0.000              | 0.000              | -0.016  | 0.000   | 0.016   |
| 1A2 Manufacturing industries - Other fossil fuels | CH4       | 0.00                | 3.84             | 5                         | 100                         | 100.12               | 0.047   | 0.000              | 0.000              | 0.028   | 0.002   | 0.028   |
| 1A2 Manufacturing industries - Solid fuels        | CH4       | 7.16                | 0.41             | 5                         | 100                         | 100.12               | 0.005   | 0.000              | 0.000              | -0.029  | 0.000   | 0.029   |
| 1A3a Domestic aviation - All fuels                | CH4       | 0.00                | 0.00             | 5                         | 100                         | 100.12               | 0.000   | 0.000              | 0.000              | 0.000   | 0.000   | 0.000   |
| 1A3b Road transport - All Fuels                   | CH4       | 54.06               | 20.05            | 5                         | 100                         | 100.12               | 0.244   | -0.001             | 0.001              | -0.093  | 0.010   | 0.094   |
| 1A3c Railways - All Fuels                         | CH4       | 1.04                | 0.15             | 5                         | 250                         | 250.05               | 0.004   | 0.000              | 0.000              | -0.009  | 0.000   | 0.009   |
| 1A3d Domestic navigation - All Liquid fuels       | CH4       | 0.84                | 0.02             | 5                         | 50                          | 50.25                | 0.000   | 0.000              | 0.000              | -0.002  | 0.000   | 0.002   |

| CRF  | Pollutant | Base year emissions | Year t emissions | Activity data uncertainty | Emission factor uncertainty | Combined uncertainty | Combined uncertainty as % of total national emissions in the year t | Type A sensitivity | Type B sensitivity | Uncertainty introduced in trend in national emissions introduced by emission factor uncertainty | Uncertainty introduced in trend in national emissions introduced by activity data uncertainty | Uncertainty introduced in trend in national emissions |
|--|-----------|---------------------|------------------|---------------------------|-----------------------------|----------------------|---|--------------------|--------------------|---|---|---|
| 1A3e Other Transportation (as specified in table 1A(a) sheet 3) - Pipeline, only gaseous | CH4       | 0.069               | 0.056            | 5                         | 100                         | 100.12               | 0.001   | 0.000              | 0.000              | 0.000   | 0.000   | 0.000   |
| 1A4 Other sectors - Biomass  | CH4       | 153.20              | 409.15           | 20                        | 100                         | 101.98               | 5.076   | 0.023              | 0.030              | 2.329   | 0.852   | 2.479   |
| 1A4 Other sectors - Gaseous fuels  | CH4       | 8.97                | 22.48            | 5                         | 100                         | 100.12               | 0.274   | 0.001              | 0.002              | 0.126   | 0.012   | 0.126   |
| 1A4 Other sectors - Liquid fuels   | CH4       | 20.38               | 2.56             | 5                         | 100                         | 100.12               | 0.031   | -0.001             | 0.000              | -0.072  | 0.001   | 0.072   |
| 1A4 Other sectors - Other Fossil Fuels   | CH4       | 0.00                | 1.21             | 5                         | 100                         | 100.12               | 0.015   | 0.000              | 0.000              | 0.009   | 0.001   | 0.009   |
| 1A4 Other sectors - Solid fuels  | CH4       | 870.79              | 18.17            | 5                         | 100                         | 100.12               | 0.221   | -0.037             | 0.001              | -3.740  | 0.009   | 3.740   |
| 1A5b Other - Mobile  | CH4       | 0.00                | 0.09             | 10                        | 100                         | 100.50               | 0.001   | 0.000              | 0.000              | 0.001   | 0.000   | 0.001   |
| 1B1 Solid fuels  | CH4       | 1,598.88            | 31.65            | 5                         | 200                         | 200.06               | 0.770   | -0.069             | 0.002              | -13.751   | 0.016   | 13.751  |
| 1B2a Oil   | CH4       | 194.56              | 49.58            | 0                         | 88                          | 88.32                | 0.533   | -0.005             | 0.004              | -0.443  | 0.000   | 0.443   |
| 1B2b Natural Gas   | CH4       | 1,400.61            | 1,322.15         | 0                         | 288                         | 288.22               | 46.361  | 0.035              | 0.097              | 10.064  | 0.000   | 10.064  |
| 1B2c Venting and flaring   | CH4       | 590.61              | 186.46           | 0                         | 65                          | 65.33                | 1.482   | -0.013             | 0.014              | -0.821  | 0.000   | 0.821   |
| 1B2d Other (Thermal water extraction + NatGas storage)                                   | CH4       | 129.25              | 70.24            | 5                         | 200                         | 200.06               | 1.710   | -0.001             | 0.005              | -0.117  | 0.037   | 0.122   |
| 2B8 Petrochemical and carbon black production  | CH4       | 20.40               | 44.35            | 3                         | 10                          | 10.44                | 0.056   | 0.002              | 0.003              | 0.024   | 0.014   | 0.027   |
| 2C1 Iron and Steel Production  | CH4       | 10.89               | 4.27             | 10                        | 10                          | 14.14                | 0.007   | 0.000              | 0.000              | -0.002  | 0.004   | 0.005   |
| 2C2 Ferroalloys Production   | CH4       | 0.25                | 0.00             | 5                         | 38                          | 37.83                | 0.000   | 0.000              | 0.000              | 0.000   | 0.000   | 0.000   |
| 3A Enteric Fermentation  | CH4       | 4,151.36            | 2,095.03         | 0                         | 13                          | 12.60                | 3.211   | -0.031             | 0.154              | -0.384  | 0.000   | 0.384   |
| 3B Manure Management   | CH4       | 1,258.92            | 639.06           | 0                         | 14                          | 14.15                | 1.100   | -0.009             | 0.047              | -0.127  | 0.000   | 0.127   |
| 3C Rice Cultivation  | CH4       | 81.23               | 20.16            | 5                         | 75                          | 75.61                | 0.185   | -0.002             | 0.001              | -0.161  | 0.010   | 0.161   |
| 3F Field Burning of Agricultural Residues  | CH4       | 46.39               | 0.25             | 40                        | 50                          | 64.03                | 0.002   | -0.002             | 0.000              | -0.102  | 0.001   | 0.102   |
| 5A Solid waste disposal  | CH4       | 2,094.36            | 2,906.76         | 10                        | 33                          | 34.48                | 12.194  | 0.120              | 0.214              | 3.976   | 3.025   | 4.996   |

| CRF                                       | Pollutant | Base year emissions | Year t emissions | Activity data uncertainty | Emission factor uncertainty | Combined uncertainty | Combined uncertainty as % of total national emissions in the year t | Type A sensitivity | Type B sensitivity | Uncertainty introduced in trend in national emissions introduced by emission factor uncertainty | Uncertainty introduced in trend in national emissions introduced by activity data uncertainty | Uncertainty introduced in trend in national emissions |
|---|-----------|---------------------|------------------|---------------------------|-----------------------------|----------------------|---|--------------------|--------------------|---|---|---|
| 5B Biological Treatment of Solid Waste    | CH4       | 5.00                | 102.76           | 10                        | 140                         | 140.36               | 1.755   | 0.007              | 0.008              | 1.028   | 0.107   | 1.033   |
| 5C Incineration and open burning of waste | CH4       | 0.40                | 0.09             | 10                        | 100                         | 100.50               | 0.001   | 0.000              | 0.000              | -0.001  | 0.000   | 0.001   |
| 5D Wastewater Treatment and Discharge     | CH4       | 868.47              | 235.36           | 30                        | 40                          | 50.00                | 1.432   | -0.021             | 0.017              | -0.853  | 0.735   | 1.126   |
|   |           | $\Sigma C$          | $\Sigma D$       |                           |                             |                      | $(\Sigma H^2)^{1/2}$  |                    |                    |   |   | $(\Sigma M^2)^{1/2}$                                  |
| <b>TOTAL excluding LULUCF</b>             |           | <b>13,589.67</b>    | <b>8,219.73</b>  |                           |                             |                      | <b>48.44</b>  |                    |                    |   |   | <b>18.41</b>  |

**Table A2-4** Uncertainty calculation for N<sub>2</sub>O without LULUCF, Tier 1 method

| CRF  | Pollutant | Base year emissions<br>Gg CO2 eq | Year t emissions<br>Gg CO2 eq | Activity data uncertainty | Emission factor uncertainty | Combined uncertainty | Combined uncertainty as %<br>of total national emissions in<br>the year t | Type A sensitivity | Type B sensitivity | Uncertainty introduced in<br>trend in national emissions<br>introduced by emission<br>factor uncertainty | Uncertainty introduced in<br>trend in national emissions<br>introduced by activity data<br>uncertainty | Uncertainty introduced in<br>trend in national emissions |
|--|-----------|----------------------------------|-------------------------------|---------------------------|-----------------------------|----------------------|---|--------------------|--------------------|--|--|--|
|  |           |                                  |                               |                           |                             |                      |   | %                  |                    |  |  |  |
| 1A1 Energy Industries - Biomass  | N2O       | 0.94                             | 28.76                         | 5                         | 200                         | 200.06               | 1.148   | 0.003              | 0.003              | 0.509  | 0.018  | 0.509  |
| 1A1 Energy Industries - Gaseous fuels  | N2O       | 3.07                             | 3.09                          | 1                         | 200                         | 200.00               | 0.123   | 0.000              | 0.000              | 0.031  | 0.000  | 0.031  |
| 1A1 Energy Industries - Liquid fuels   | N2O       | 12.53                            | 0.88                          | 1                         | 200                         | 200.00               | 0.035   | 0.000              | 0.000              | -0.086   | 0.000  | 0.086  |
| 1A1 Energy Industries - Other fossil fuels   | N2O       | 0.94                             | 2.91                          | 1                         | 200                         | 200.00               | 0.116   | 0.000              | 0.000              | 0.045  | 0.000  | 0.045  |
| 1A1 Energy Industries - Solid fuels  | N2O       | 63.36                            | 17.43                         | 1                         | 200                         | 200.00               | 0.695   | -0.001             | 0.002              | -0.199   | 0.002  | 0.199  |
| 1A2 Manufacturing industries - Biomass   | N2O       | 0.90                             | 12.08                         | 5                         | 200                         | 200.06               | 0.482   | 0.001              | 0.001              | 0.210  | 0.008  | 0.210  |
| 1A2 Manufacturing industries - Gaseous fuels   | N2O       | 4.70                             | 1.64                          | 5                         | 200                         | 200.06               | 0.065   | 0.000              | 0.000              | -0.009   | 0.001  | 0.009  |
| 1A2 Manufacturing industries - Liquid fuels  | N2O       | 13.98                            | 10.36                         | 5                         | 200                         | 200.06               | 0.413   | 0.000              | 0.001              | 0.073  | 0.007  | 0.073  |
| 1A2 Manufacturing industries - Other fossil fuels  | N2O       | 0.00                             | 6.10                          | 5                         | 200                         | 200.06               | 0.243   | 0.001              | 0.001              | 0.110  | 0.004  | 0.110  |
| 1A2 Manufacturing industries - Solid fuels   | N2O       | 12.70                            | 1.55                          | 5                         | 200                         | 200.06               | 0.062   | 0.000              | 0.000              | -0.075   | 0.001  | 0.075  |
| 1A3a Domestic aviation - All fuels   | N2O       | 0.03                             | 0.04                          | 5                         | 150                         | 150.08               | 0.001   | 0.000              | 0.000              | 0.000  | 0.000  | 0.000  |
| 1A3b Road transport - All Fuels  | N2O       | 52.86                            | 127.61                        | 5                         | 200                         | 200.06               | 5.093   | 0.009              | 0.011              | 1.865  | 0.081  | 1.866  |
| 1A3c Railways - All Fuels  | N2O       | 84.02                            | 12.03                         | 5                         | 300                         | 300.04               | 0.720   | -0.002             | 0.001              | -0.695   | 0.008  | 0.695  |
| 1A3d Domestic navigation - All Liquid fuels  | N2O       | 2.87                             | 0.08                          | 5                         | 140                         | 140.09               | 0.002   | 0.000              | 0.000              | -0.015   | 0.000  | 0.015  |
| 1A3e Other Transportation (as specified in table 1A(a) sheet 3) - Pipeline, only gaseous | N2O       | 0.08                             | 0.07                          | 5                         | 200                         | 200.06               | 0.003   | 0.000              | 0.000              | 0.001  | 0.000  | 0.001  |
| 1A4 Other sectors - Biomass  | N2O       | 24.35                            | 65.04                         | 20                        | 200                         | 201.00               | 2.608   | 0.005              | 0.006              | 0.971  | 0.165  | 0.985  |
| 1A4 Other sectors - Gaseous fuels  | N2O       | 2.14                             | 5.36                          | 5                         | 200                         | 200.06               | 0.214   | 0.000              | 0.000              | 0.079  | 0.003  | 0.079  |

| CRF                                       | Pollutant | Base year emissions | Year t emissions | Activity data uncertainty | Emission factor uncertainty | Combined uncertainty | Combined uncertainty as % of total national emissions in the year t | Type A sensitivity | Type B sensitivity | Uncertainty introduced in trend in national emissions introduced by emission factor uncertainty | Uncertainty introduced in trend in national emissions introduced by activity data uncertainty | Uncertainty introduced in trend in national emissions |
|---|-----------|---------------------|------------------|---------------------------|-----------------------------|----------------------|---|--------------------|--------------------|---|---|---|
| 1A4 Other sectors - Liquid fuels          | N2O       | 29.31               | 16.01            | 5                         | 200                         | 200.06               | 0.639   | 0.000              | 0.001              | 0.051   | 0.010   | 0.052   |
| 1A4 Other sectors - Other Fossil Fuels    | N2O       | 0.00                | 1.93             | 5                         | 200                         | 200.06               | 0.077   | 0.000              | 0.000              | 0.035   | 0.001   | 0.035   |
| 1A4 Other sectors - Solid fuels           | N2O       | 57.48               | 1.10             | 5                         | 200                         | 200.06               | 0.044   | -0.002             | 0.000              | -0.445  | 0.001   | 0.445   |
| 1A5b Other - Mobile                       | N2O       | 0.12                | 0.28             | 10                        | 200                         | 200.25               | 0.011   | 0.000              | 0.000              | 0.004   | 0.000   | 0.004   |
| 1B2c Venting and flaring                  | N2O       | 0.89                | 0.28             | 0                         | 573                         | 573.28               | 0.032   | 0.000              | 0.000              | -0.006  | 0.000   | 0.006   |
| 2B2 Nitric Acid Production                | N2O       | 4,365.71            | 32.97            | 8                         | 8                           | 10.61                | 0.070   | -0.173             | 0.003              | -1.297  | 0.031   | 1.297   |
| 2G Other Product Manufacture and Use      | N2O       | 156.32              | 230.69           | 3                         | 3                           | 4.24                 | 0.195   | 0.014              | 0.021              | 0.043   | 0.088   | 0.098   |
| 3B Manure Management                      | N2O       | 926.70              | 435.23           | 0                         | 130                         | 130.07               | 11.293  | 0.002              | 0.039              | 0.210   | 0.000   | 0.210   |
| 3D Agricultural Soils                     | N2O       | 5,144.09            | 3,867.88         | 0                         | 187                         | 187.10               | 144.370   | 0.139              | 0.347              | 25.960  | 0.000   | 25.960  |
| 3F Field Burning of Agricultural Residues | N2O       | 14.34               | 0.08             | 40                        | 50                          | 64.03                | 0.001   | -0.001             | 0.000              | -0.029  | 0.000   | 0.029   |
| 5B Biological Treatment of Soild Waste    | N2O       | 3.58                | 43.98            | 10                        | 130                         | 130.38               | 1.144   | 0.004              | 0.004              | 0.495   | 0.056   | 0.498   |
| 5C Incineration and open burning of waste | N2O       | 1.64                | 0.37             | 10                        | 100                         | 100.50               | 0.007   | 0.000              | 0.000              | -0.003  | 0.000   | 0.003   |
| 5D Wastewater Treatment and Discharge     | N2O       | 154.87              | 86.92            | 15                        | 200                         | 200.56               | 3.478   | 0.002              | 0.008              | 0.309   | 0.166   | 0.350   |
|   |           | $\Sigma$ C          | $\Sigma$ D       |                           |                             |                      | $(\Sigma H^2)^{1/2}$  |                    |                    |   |   | $(\Sigma M^2)^{1/2}$                                  |
| <b>TOTAL excluding LULUCF</b>             |           | <b>11,134.51</b>    | <b>5,012.73</b>  |                           |                             |                      | <b>144.98</b>   |                    |                    |   |   | <b>26.11</b>  |

## ANNEX 3 Detailed methodological descriptions for individual source or sink categories

### A3.1 Fugitive emissions

| GREENHOUSE GAS SOURCE AND SINK CATEGORIES   | ACTIVITY DATA   |      |  | Source of EMISSION FACTORS   |                                  | Recovery/Flaring <sup>(2)</sup>                  |
|---|---|------|--|--|----------------------------------|--|
|   | Description   | Unit | Source   | CH <sub>4</sub> <sup>(1)</sup>   | CO <sub>2</sub>                  | -  |
| <b>1. B. 1. a. Coal mining and handling</b> |   |      |  |  |                                  |  |
| i. Underground mines <sup>(4)</sup>         | Underground coal production                                       | kt   | IEA  | -  | Recovery/flaring of Mecsek basin | Data from the Hungarian Office for Mining (2007) |
| Mining activities                           | Coal production in Mecsek basin - <b>including surfaces mines</b> | Mt   | MBFH (Hungarian Office for Mining and Geology) | CS: Regional Centre for Energy Policy Research, 2005 ( <a href="http://www.rekk.eu/images/stories/letoltheto/uhg-ag-vol2.pdf">http://www.rekk.eu/images/stories/letoltheto/uhg-ag-vol2.pdf</a> ) | -                                | -  |
|   | Coal production from all other underground Mines                  | Mt   | MBFH (Hungarian Office for Mining and Geology) | CS: Regional Centre for Energy Policy Research, 2005 ( <a href="http://www.rekk.eu/images/stories/letoltheto/uhg-ag-vol2.pdf">http://www.rekk.eu/images/stories/letoltheto/uhg-ag-vol2.pdf</a> ) | -                                | -  |
| Post-mining activities                      | Underground coal production                                       | kt   | IEA  | -  | -                                | -  |
|   | Coal production in Mecsek basin - <b>including surfaces mines</b> | Mt   | MBFH (Hungarian Office for Mining and Geology) | CS: 10% of the mining emission factor - like IPCC 2006 GLs T1 methodology  | -                                | -  |
|   | Coal production from all other underground Mines                  | Mt   | MBFH (Hungarian Office for Mining and Geology) | CS: 10% of the mining emission factor - like IPCC 2006 GLs T1 methodology  | -                                | -  |

|  |  |  |   |  |     |     |
|--|--|--|---|--|-----|-----|
| Abandoned underground mines                          | Abandoned and still unflooded mines  | number of abandoned and unflooded mines year by year | Mecsek Mining Resources and Extraction Nonprofit Ltd. | IPCC 2006 GLs, T1 emission factors (extended with the 2019 Refinement) | -   | -   |
| ii. Surface mines <sup>(4)</sup>                     | Mined Hungarian lignite is relatively young in the coalification therefore - according to the research project conducted by Regional Centre for Energy Policy Research - mining activities do not cause emissions. |  |   | -  | -   | -   |
| Mining activities                                    |  |  |   | -  | -   | -   |
| Post-mining activities                               |  |  |   | -  | -   | -   |
| 1. B. 1. b. Solid fuel transformation <sup>(5)</sup> | Coke production  | Mt   | IEA   | Refinement Table 4.3.7   | ETS | ETS |
| 1. B. 1. c. Other (please specify) <sup>(6)</sup>    | -  | -  | -   |  |     | -   |

| GREENHOUSE GAS SOURCE AND SINK CATEGORIES | ACTIVITY DATA                                  |         |   | Source of EMISSION FACTORS                 |  |                  |
|---|--|---------|---|--|--|------------------|
|   | Description                                    | Unit    | Source of data                                    | CO <sub>2</sub>                            | CH <sub>4</sub>                            | N <sub>2</sub> O |
| 1. B. 2. a. Oil                           |  |         |   |  |  |                  |
| 1. Exploration                            |  | NA      | IE to 1B2c  |  |  |                  |
| 2. Production                             | Conventional oil production                    | 1000 m3 | IEA, data converted kt to thousand m <sup>3</sup> | IPCC 2006 GLs, production                  | IPCC 2006 GLs, production                  |                  |
| 3. Transport                              | Oil transported by pipeline                    | 1000 m3 | MOL Hungary                                       | IPCC 2006 GLs, pipelines                   | IPCC 2006 GLs, mpipelines                  |                  |
|   | Oil transported by tanker trucks and rail cars | 1000 m3 | MOL Hungary                                       | IPCC 2006 GLs, tanker trucks and rail cars | IPCC 2006 GLs, tanker trucks and rail cars |                  |
|   | Condensate and Pentanes Plus transport         | 1000 m3 | MOL Hungary                                       | IPCC 2006 GLs, condensates                 | IPCC 2006 GLs, condensates                 |                  |

| GREENHOUSE GAS SOURCE AND SINK CATEGORIES | ACTIVITY DATA                  |            |   | Source of EMISSION FACTORS    |                                    |                  |
|---|--------------------------------|------------|---|-------------------------------|------------------------------------|------------------|
|   | Description                    | Unit       | Source of data  | CO <sub>2</sub>               | CH <sub>4</sub>                    | N <sub>2</sub> O |
|   | LPG                            | 1000 m3    | MOL Hungary   | IPCC 2006 GLs, LPG            |                                    |                  |
| 4. Refining/storage                       | Oil refined                    | 1000 m3    | IEA, data converted kt to thousand m <sup>3</sup>             |                               | IPCC 2006 GLs, refining            |                  |
| 5. Distribution of oil products           |                                | NA         | NA  |                               |                                    |                  |
| 6. Other                                  |                                | NO         | NO  |                               |                                    |                  |
| <b>1. B. 2. b. Natural gas</b>            |                                |            |   |                               |                                    |                  |
| 1. Exploration                            |                                | NA         | IE  |                               |                                    |                  |
| 2. Production                             | Gas production                 | million m3 | IEA   | IPCC 2006 GLs, gas production | IPCC 2006 GLs, gas production      |                  |
| 3. Processing                             | Sweet gas plants-raw gas feed  | million m3 | MOL Hungary   | IPCC 2006 GLs, gas processing | IPCC 2006 GLs, gas processing      |                  |
|   | Sour Gas Plants - raw gas feed | million m3 | MOL Hungary   | IPCC 2006 GLs, gas processing | IPCC 2006 GLs, gas processing      |                  |
|   | Deep cut Plants - raw gas feed | million m3 | MOL Hungary   | IPCC 2006 GLs, gas processing | IPCC 2006 GLs, gas processing      |                  |
| 4. Transmission and storage               | Inland consumption             | million m3 | IEA/ Hungarian Energy and Public Utility Regulatory Authority | IPCC 2006 GLs, transmission   | CS + 2019 Refinement: transmission |                  |
|   | Inland consumption             | million m3 | IEA/ Hungarian Energy and Public Utility Regulatory Authority | IPCC 2006 GLs, storage        | CS + 2019 Refinement: storage      |                  |

| GREENHOUSE GAS SOURCE AND SINK CATEGORIES | ACTIVITY DATA                |                        |   | Source of EMISSION FACTORS  |  |                  |
|---|------------------------------|------------------------|---|---|--|------------------|
|   | Description                  | Unit                   | Source of data                                    | CO <sub>2</sub>   | CH <sub>4</sub>                        | N <sub>2</sub> O |
| 5. Distribution                           | Pipeline length              | km                     | Mining and Geological Survey of Hungary           | IPCC 2006 GLs, gas distribution                                     | CS + 2019 Refinement: gas distribution |                  |
| 6. Other                                  |                              | NO                     | NO  |   |  |                  |
| <b>1. B. 2. c. Venting and flaring</b>    |                              |                        |   |   |  |                  |
| <b>Venting</b>                            |                              |                        |   |   |  |                  |
| i. Oil                                    | Conventional oil production  | 1000 m <sup>3</sup>    | IEA, data converted kt to thousand m <sup>3</sup> | IPCC 2006 GLs, oil production venting                               | IPCC 2006 GLs, oil production venting  |                  |
| ii. Gas                                   | Sour gas plants-raw gas feed | million m <sup>3</sup> | MOL Hungary                                       | IPCC 2006 GLs, gas production venting (raw CO <sub>2</sub> venting) |  |                  |
| iii. Combined                             |                              | NO                     | IE to 1B2c1.Venting i. Oil                        |   |  |                  |

| Flaring               |                                 |            |  |  |  |  |
|-----------------------|---------------------------------|------------|--|--|--|--|
| i. Oil                | Conventional oil production     | 1000 m3    | IEA, data converted kt to thousand m <sup>3</sup>                      | IPCC 2006 GLs, oil production flaring                                  | IPCC 2006 GLs, oil production flaring                    | IPCC 2006 GLs, oil production flaring                    |
|                       | Conventional oil production     | 1000 m3    | IEA, data converted kt to thousand m <sup>3</sup>                      | IPCC 2006 GLs, wells drilling  | IPCC 2006 GLs, wells drilling                            |  |
|                       | Conventional oil production     | 1000 m3    | IEA, data converted kt to thousand m <sup>3</sup>                      | IPCC 2006 GLs, wells testing   | IPCC 2006 GLs, wells testing                             | IPCC 2006 GLs, wells testing                             |
|                       | Conventional oil production     | 1000 m3    | IEA, data converted kt to thousand m <sup>3</sup>                      | IPCC 2006 GLs, wells servicing   | IPCC 2006 GLs, wells servicing                           | IPCC 2006 GLs, wells servicing                           |
|                       | Gas flared                      | million m3 | EU ETS: 2006-2018, extrapolation with IEA "refinery intake": 1985-2004 | EU ETS: 2006-2018, extrapolation with IEA "refinery intake": 1985-2005 | IPCC 2006 GLs, oil refinery flaring                      | IPCC 2006 GLs, oil refinery flaring                      |
| ii. Gas               | Gas production                  | million m3 | IEA  | IPCC 2006 GLs, gas production flaring                                  | IPCC 2006 GLs, gas production flaring                    | IPCC 2006 GLs, gas production flaring                    |
|                       | Sweet Gas Plants - raw gas feed | million m3 | MOL Hungary  | IPCC 2006 GLs, gas processing - sweet gas plants flaring               | IPCC 2006 GLs, gas processing - sweet gas plants flaring | IPCC 2006 GLs, gas processing - sweet gas plants flaring |
|                       | Sour Gas Plants - raw gas feed  | million m3 | MOL Hungary  | IPCC 2006 GLs, gas processing - sour gas plants flaring                | IPCC 2006 GLs, gas processing - sour gas plants flaring  | IPCC 2006 GLs, gas processing - sour gas plants flaring  |
|                       | Deep cut Plants - raw gas feed  | million m3 | MOL Hungary  | IPCC 2006 GLs, gas processing -deep-cut plants flaring                 | IPCC 2006 GLs, gas processing -deep-cut plants flaring   | IPCC 2006 GLs, gas processing - deep-cut plants flaring  |
| iii. Combined         |                                 | NA         | IE to 1B2c2. Flaring i. Oil  |  |  |  |
| <b>1.B.2.d. Other</b> |                                 |            |  |  |  |  |

|   |                               |                        |  |   |  |  |
|---|-------------------------------|------------------------|--|---|--|--|
| Groundwater extraction and CO <sub>2</sub> mining | Annual freshwater abstraction | million m <sup>3</sup> | EUROSTAT, HCSO                                 |   | MFGI (Geological and Geophysical Institute of Hungary) |  |
|   | CO <sub>2</sub> mined in HU   | million m <sup>3</sup> | MBFH (Hungarian Office for Mining and Geology) | IPCC 2006 GLs, natural gas production<br>CO <sub>2</sub> EF |  |  |

A3.2 IPPU sector

| Year: 2020   | Unit                                       | Solids |         |           |           |                       |              |         | Liquids |          |        |         |           |         |           | Gas        |       |         |               |         |           |
|--|--|--------|---------|-----------|-----------|-----------------------|--------------|---------|---------|----------|--------|---------|-----------|---------|-----------|------------|-------|---------|---------------|---------|-----------|
|  |  | Coal   | Coke    | Coal tars | Coal oils | BF/OF gas (CO gas) b) | Total solids | Naphtha | Gas oil | Fuel Oil | Ethane | LPG b)  | Pet. coke | Other   | Chem. gas | Lubricants | Waxes | Bitumen | Total liquids | Nat Gas | Total gas |
| A: Declared NEU (from commodity balance)                     | TJ   | 0.0    | 17172.8 | 304.0     | 0.0       | 0.0                   | 0.0          | 46998.0 | 0.0     | 0.0      | 0.0    | 13611.3 | 0.0       | 10173.0 | 0.0       | 2825.8     | 572.8 | 10408.0 | 27865.3       |         |           |
| B: Carbon Content  | kg C/GJ                                    | 25.8   | 29.2    | 22.0      | 29.1      | 70.8                  | 70.8         | 20.0    | 20.2    | 21.1     | 16.8   | 17.2    | 26.6      | 20.0    | 20.0      | 20.0       | 22.0  |         | 15.3          |         |           |
| C: Total supplied for feedstock/non-energy                   | [C = A * B / 1000]<br>Gg C                 | 0.0    | 5014.4  | 6.7       | 0.0       | 0.0                   | 0.0          | 508.1   | 940.0   | 0.0      | 0.0    | 234.1   | 0.0       | 203.5   | 0.0       | 56.5       | 11.5  | 229.0   | 1674.5        | 426.3   | 426.3     |
| D: Total supplied for feedstock/non-energy                   | [D = C * 44/12]<br>Gg CO <sub>2</sub> -eq. | 0.0    | 1838.6  | 24.5      | 0.0       | 0.0                   | 0.0          | 1863.2  | 3446.5  | 0.0      | 0.0    | 858.4   | 0.0       | 746.0   | 0.0       | 207.2      | 42.0  | 839.6   | 6139.8        | 1563.2  | 1563.2    |
| E: Implied carbon fraction oxidised                          | [E = F / D * 100]<br>%                     |        | 1.0     | 0.0       |           |                       | 1.0          | 0.0     |         |          | 0.0    |         | 0.0       |         | 0.2       | 0.2        | 0.0   | 0.2     | 1.0           | 1.0     |           |
| F: Total fossil IPPU CO <sub>2</sub> reported                | Emissions a)<br>CO <sub>2</sub>            | 4658.2 |         |           |           |                       |              |         |         |          |        |         |           |         |           |            |       |         |               |         |           |
| 2 INDUSTRIAL PROCESSES                                       | IEF<br>CO <sub>2</sub>                     |        |         |           |           |                       |              |         |         |          |        |         |           |         |           |            |       |         |               |         |           |
| 2A: Mineral Industry   | Gg CO <sub>2</sub>                         | 0.0    | 0.0     | 0.0       | 0.0       | 0.0                   | 0.0          | 0.0     | 0.0     | 0.0      | 0.0    | 0.0     | 0.0       | 0.0     | 0.0       | 0.0        | 0.0   | 0.0     | 0.0           | 0.0     | 0.0       |
| (Please specify the subcategory.)                            | Gg CO <sub>2</sub>                         |        |         |           |           |                       |              |         |         |          |        |         |           |         |           |            |       |         |               |         |           |
| 2B: Chemical Industry  | Gg CO <sub>2</sub>                         | 2681.4 | 0.0     | 0.0       | 0.0       | 0.0                   | 0.0          | 0.0     | 0.0     | 0.0      | 0.0    | 0.0     | 0.0       | 0.0     | 0.0       | 0.0        | 0.0   | 0.0     | 1240.3        | 1441.1  | 1441.1    |
| 2B1: Ammonia Production                                      | Gg CO <sub>2</sub>                         | 1297.0 |         |           |           |                       |              |         |         |          |        |         |           |         |           |            |       |         |               | 1297.0  | 1297.0    |
| 2B5: Carbide Production                                      | Gg CO <sub>2</sub>                         |        |         |           |           |                       |              |         |         |          |        |         |           |         |           |            |       |         |               |         |           |
| 2B6: Titanium Dioxide Production                             | Gg CO <sub>2</sub>                         |        |         |           |           |                       |              |         |         |          |        |         |           |         |           |            |       |         |               |         |           |
| 2B8: Petrochemical and Carbon Black Production               | Gg CO <sub>2</sub>                         | 1384.5 | 0.0     | 0.0       | 0.0       | 0.0                   | 0.0          | 0.0     |         |          |        |         |           |         |           |            |       |         | 1240.3        | 144.1   | 144.1     |
| 2B8a: Methanol   | Gg CO <sub>2</sub>                         |        |         |           |           |                       |              |         |         |          |        |         |           |         |           |            |       |         |               |         |           |
| 2B8b: Ethylene   | Gg CO <sub>2</sub>                         |        |         |           |           |                       |              |         |         |          |        |         |           |         |           |            |       |         |               |         |           |
| 2B8f: Carbon Black   | Gg CO <sub>2</sub>                         |        |         |           |           |                       |              |         |         |          |        |         |           |         |           |            |       |         |               |         |           |
| 2B10: Other  | Gg CO <sub>2</sub>                         |        |         |           |           |                       |              |         |         |          |        |         |           |         |           |            |       |         |               |         |           |
| 2C: Metal Industry   | Gg CO <sub>2</sub>                         | 918.9  | 848.9   | 0.0       | 0.0       | 0.0                   | 0.0          | 848.9   | 0.0     | 0.0      | 0.0    | 0.0     | 0.0       | 0.0     | 0.0       | 0.0        | 0.0   | 0.0     | 0.0           | 70.1    | 70.1      |
| 2C1: Iron and Steel Production                               | Gg CO <sub>2</sub>                         | 918.9  | 848.9   |           |           |                       |              | 848.9   |         |          |        |         |           |         |           |            |       |         |               | 70.1    | 70.1      |
| 2C2: Ferroalloys Production                                  | Gg CO <sub>2</sub>                         |        |         |           |           |                       |              |         |         |          |        |         |           |         |           |            |       |         |               |         |           |
| 2C3: Aluminium Production                                    | Gg CO <sub>2</sub>                         |        |         |           |           |                       |              |         |         |          |        |         |           |         |           |            |       |         |               |         |           |
| 2C5: Lead Production   | Gg CO <sub>2</sub>                         |        |         |           |           |                       |              |         |         |          |        |         |           |         |           |            |       |         |               |         |           |
| 2C6: Zinc Production   | Gg CO <sub>2</sub>                         |        |         |           |           |                       |              |         |         |          |        |         |           |         |           |            |       |         |               |         |           |
| 2C7: Other   | Gg CO <sub>2</sub>                         |        |         |           |           |                       |              |         |         |          |        |         |           |         |           |            |       |         |               |         |           |
| 2D: Non-Energy Products from Fuels and Solvent Use           | Gg CO <sub>2</sub>                         | 49.6   | 0.0     | 0.0       | 0.0       | 0.0                   | 0.0          | 0.0     | 0.0     | 0.0      | 0.0    | 0.0     | 0.0       | 0.0     | 0.0       | 41.2       | 8.4   | 0.0     | 49.6          | 0.0     | 0.0       |
| 2D1: Lubricant Use   | Gg CO <sub>2</sub>                         | 41.2   |         |           |           |                       |              |         |         |          |        |         |           |         |           | 41.2       |       |         | 41.2          |         |           |
| 2D2: Paraffin Wax Use  | Gg CO <sub>2</sub>                         | 8.4    |         |           |           |                       |              |         |         |          |        |         |           |         |           |            | 8.4   |         | 8.4           |         |           |
| 2D3: Solvent Use   | Gg CO <sub>2</sub>                         |        |         |           |           |                       |              |         |         |          |        |         |           |         |           |            |       |         | 0.0           |         |           |
| 2D4: Other   | Gg CO <sub>2</sub>                         |        |         |           |           |                       |              |         |         |          |        |         |           |         |           |            |       |         | 0.0           |         |           |
| 2H: Other  | Gg CO <sub>2</sub>                         | 0.0    | 0.0     | 0.0       | 0.0       | 0.0                   | 0.0          | 0.0     | 0.0     | 0.0      | 0.0    | 0.0     | 0.0       | 0.0     | 0.0       | 0.0        | 0.0   | 0.0     | 0.0           | 0.0     | 0.0       |
| 2H1: Pulp and Paper Industry                                 | Gg CO <sub>2</sub>                         |        |         |           |           |                       |              |         |         |          |        |         |           |         |           |            |       |         |               |         |           |
| 2H2: Food and Beverages Industry                             | Gg CO <sub>2</sub>                         |        |         |           |           |                       |              |         |         |          |        |         |           |         |           |            |       |         |               |         |           |
| 2F3: Other   | Gg CO <sub>2</sub>                         |        |         |           |           |                       |              |         |         |          |        |         |           |         |           |            |       |         |               |         |           |
| EXCEPTIONS REPORTED ELSEWHERE                                | Gg CO <sub>2</sub>                         |        |         |           |           |                       |              |         |         |          |        |         |           |         |           |            |       |         |               |         |           |
| 1A FUEL COMBUSTION ACTIVITIES                                | Gg CO <sub>2</sub>                         | 1008.2 | 0.0     | 1008.2    | 0.0       | 0.0                   | 0.0          | 1008.2  | 0.0     | 0.0      | 0.0    | 0.0     | 0.0       | 0.0     | 0.0       | 0.0        | 0.0   | 0.0     | 0.0           | 0.0     | 0.0       |
| 1A1a: Main Activity Electricity and Heat Production          | Gg CO <sub>2</sub>                         | 1008.2 |         | 1008.2    |           |                       |              | 1008.2  |         |          |        |         |           |         |           |            |       |         |               |         |           |
| 1A1b: Petroleum Refining                                     | Gg CO <sub>2</sub>                         |        |         |           |           |                       |              |         |         |          |        |         |           |         |           |            |       |         |               |         |           |
| 1A1c: Manufacture of Solid Fuels and Other Energy Industries | Gg CO <sub>2</sub>                         |        |         |           |           |                       |              |         |         |          |        |         |           |         |           |            |       |         |               |         |           |
| 1A2: Manufacturing Industries and Construction               | Gg CO <sub>2</sub>                         |        |         |           |           |                       |              |         |         |          |        |         |           |         |           |            |       |         |               |         |           |

### A3.3 WASTE sector

Activity data used in the IPCC Waste model and the resulting methane emissions are summarized in the table below.

| Year            | Food | Garden | Paper | Wood | Textile | Nappies/<br>Clinical | Sludge | C&D  | Total | CH4<br>Emission |
|-----------------|------|--------|-------|------|---------|----------------------|--------|------|-------|-----------------|
| 1950            | 366  | 37     | 270   | 95   | 61      | 1                    | 25     | 364  | NE    | -               |
| 1960            | 429  | 43     | 307   | 93   | 78      | 1                    | 25     | 364  | NE    | -               |
| 1970            | 532  | 51     | 355   | 90   | 102     | 1                    | 42     | 611  | NE    | -               |
| 1980            | 951  | 90     | 611   | 121  | 196     | 1                    | 69     | 993  | NE    | -               |
| 1985-87         | 1272 | 121    | 807   | 131  | 275     | 1                    | 77     | 1109 | 19351 | 83.8            |
| 1990            | 1265 | 119    | 787   | 110  | 279     | 1                    | 77     | 993  | 19414 | 93.1            |
| 1991            | 1240 | 100    | 608   | 94   | 113     | 15                   | 68     | 843  | 18524 | 97.5            |
| 1992            | 1309 | 105    | 658   | 97   | 159     | 29                   | 65     | 803  | 16935 | 101.3           |
| 1993            | 1124 | 102    | 591   | 94   | 233     | 42                   | 65     | 784  | 17354 | 105.1           |
| 1994            | 1131 | 107    | 659   | 98   | 198     | 58                   | 67     | 835  | 16866 | 107.3           |
| 1995            | 1167 | 104    | 601   | 97   | 158     | 71                   | 59     | 711  | 17493 | 110.0           |
| 1996            | 1135 | 111    | 711   | 102  | 135     | 112                  | 61     | 751  | 17944 | 112.0           |
| 1997            | 1043 | 118    | 764   | 108  | 237     | 138                  | 69     | 805  | 17602 | 114.4           |
| 1998            | 1161 | 118    | 730   | 108  | 261     | 119                  | 70     | 900  | 17373 | 116.3           |
| 1999            | 1157 | 121    | 822   | 110  | 214     | 122                  | 60     | 953  | 17257 | 118.6           |
| 2000            | 1452 | 112    | 521   | 103  | 139     | 50                   | 76     | 998  | 16940 | 121.3           |
| 2001            | 1429 | 111    | 601   | 102  | 101     | 75                   | 83     | 1062 | 16188 | 124.2           |
| 2002            | 1108 | 115    | 635   | 105  | 124     | 89                   | 77     | 1198 | 15436 | 127.2           |
| 2003            | 1104 | 119    | 629   | 109  | 128     | 100                  | 88     | 1269 | 14685 | 128.0           |
| 2004            | 1111 | 116    | 596   | 106  | 121     | 86                   | 35     | 1337 | 13933 | 132.1           |
| 2005            | 1157 | 81     | 575   | 93   | 126     | 94                   | 67     | 1526 | 11151 | 135.5           |
| 2006            | 962  | 74     | 567   | 97   | 134     | 101                  | 51     | 1842 | 10970 | 136.6           |
| 2007            | 856  | 63     | 397   | 93   | 131     | 90                   | 53     | 1784 | 10898 | 138.1           |
| 2008            | 828  | 55     | 452   | 86   | 145     | 118                  | 48     | 1932 | 9864  | 137.5           |
| 2009            | 814  | 57     | 419   | 67   | 150     | 147                  | 39     | 1373 | 8912  | 137.9           |
| 2010            | 659  | 20     | 380   | 53   | 135     | 127                  | 27     | 939  | 7549  | 136.8           |
| 2011            | 645  | 20     | 360   | 50   | 132     | 127                  | 25     | 755  | 8639  | 137.8           |
| 2012            | 623  | 16     | 356   | 42   | 126     | 126                  | 22     | 491  | 6952  | 136.5           |
| 2013            | 672  | 3      | 350   | 33   | 120     | 135                  | 22     | 144  | 5942  | 130.5           |
| 2014            | 599  | 3      | 440   | 31   | 113     | 122                  | 21     | 82   | 5161  | 133.3           |
| 2015            | 454  | 2      | 320   | 41   | 97      | 109                  | 20     | 37   | 5078  | 126.1           |
| 2016            | 430  | 2      | 304   | 51   | 100     | 121                  | 14     | 37   | 4796  | 122.6           |
| 2017            | 438  | 1      | 322   | 61   | 98      | 126                  | 17     | 47   | 4155  | 121.1           |
| 2018            | 509  | 1      | 377   | 67   | 113     | 139                  | 9      | 40   | 4159  | 117.4           |
| 2019            | 508  | 3      | 397   | 78   | 138     | 142                  | 8      | 78   | 4109  | 117.5           |
| 2020            | 414  | 10     | 381   | 80   | 133     | 145                  | 8      | 72   | 4204  | 116.3           |
| Trend 1990-2020 | -67% | -91%   | -52%  | -27% | -52%    | 12258%               | -90%   | -93% | -78%  | 25%             |
| Trend 2005-2020 | -64% | -87%   | -34%  | -15% | 0%      | 55%                  | -89%   | -95% | -62%  | -14%            |

## ANNEX 4 The national energy balance for the most recent inventory year

In the following page, the aggregated energy balance of Hungary is presented. This energy balance was produced by the energy statistics provider (i.e. Hungarian Energy and Public Utility Regulatory Authority) and was downloaded from their site:

[http://mekh.hu/download/5/1e/01000/7\\_2\\_annual\\_national\\_energy\\_balance\\_2014\\_2020.xlsx](http://mekh.hu/download/5/1e/01000/7_2_annual_national_energy_balance_2014_2020.xlsx)

In addition, the time series of the primary energy balance as published by the HCSO is presented in the table below.

[https://www.ksh.hu/stadat\\_files/ene/en/ene0002.html](https://www.ksh.hu/stadat_files/ene/en/ene0002.html)



### 6.1.1.2. Primary energy balance\*

| Year | Production <sup>a</sup> | Imports <sup>b</sup> | Exports <sup>c</sup> | Change in stocks (-) <sup>d</sup> | Energy consumption, total <sup>e</sup> |
|------|-------------------------|----------------------|----------------------|-----------------------------------|--|
|      | petajoules              |                      |                      |                                   |  |
| 1990 | 614.9                   | 665.4                | 72.6                 | 3.1                               | 1,210.9                                |
| 1991 | 604.7                   | 580.5                | 51.8                 | 21.9                              | 1,155.3                                |
| 1992 | 582.6                   | 532.8                | 65.2                 | 6.0                               | 1,056.2                                |
| 1993 | 573.5                   | 604.3                | 91.5                 | -4.0                              | 1,082.3                                |
| 1994 | 556.2                   | 594.1                | 103.2                | 4.8                               | 1,051.9                                |
| 1995 | 581.6                   | 623.7                | 103.5                | -10.8                             | 1,091.0                                |
| 1996 | 571.2                   | 666.2                | 93.5                 | -24.8                             | 1,119.2                                |
| 1997 | 557.9                   | 658.4                | 96.0                 | -22.5                             | 1,097.8                                |
| 1998 | 521.8                   | 684.3                | 92.7                 | -29.9                             | 1,083.5                                |
| 1999 | 499.0                   | 672.5                | 97.8                 | 2.6                               | 1,076.4                                |
| 2000 | 486.4                   | 685.2                | 104.6                | -10.5                             | 1,056.5                                |
| 2001 | 473.2                   | 703.2                | 126.4                | 30.6                              | 1,080.7                                |
| 2002 | 468.9                   | 753.3                | 138.9                | -2.7                              | 1,080.6                                |
| 2003 | 435.9                   | 816.2                | 131.8                | -17.4                             | 1,102.8                                |
| 2004 | 428.6                   | 804.0                | 131.8                | 0.5                               | 1,101.2                                |
| 2005 | 455.1                   | 910.4                | 172.0                | -7.9                              | 1,185.6                                |
| 2006 | 452.5                   | 911.6                | 185.8                | -3.0                              | 1,175.3                                |
| 2007 | 449.3                   | 885.3                | 192.3                | 8.5                               | 1,150.8                                |
| 2008 | 456.2                   | 897.3                | 186.0                | -31.0                             | 1,136.5                                |
| 2009 | 490.3                   | 750.0                | 127.9                | -33.1                             | 1,079.4                                |
| 2010 | 496.9                   | 789.2                | 156.4                | -9.9                              | 1,119.8                                |
| 2011 | 493.2                   | 732.5                | 185.1                | 55.2                              | 1,095.7                                |
| 2012 | 492.1                   | 720.8                | 201.8                | 30.2                              | 1,041.3                                |
| 2013 | 480.4                   | 721.4                | 220.3                | 25.8                              | 1,007.3                                |
| 2014 | 464.1                   | 806.1                | 210.2                | -55.0                             | 1,005.1                                |
| 2015 | 472.9                   | 757.2                | 189.4                | 21.5                              | 1,062.2                                |
| 2016 | 480.2                   | 808.3                | 212.5                | -0.3                              | 1,075.8                                |
| 2017 | 474.7                   | 1,011.1              | 311.7                | -49.9                             | 1,124.1                                |
| 2018 | 462.4                   | 1,029.3              | 379.7                | 12.5                              | 1,124.6                                |
| 2019 | 460.9                   | 1,219.9              | 440.8                | -112.4                            | 1,127.5                                |
| 2020 | 451.7                   | 946.3                | 326.2                | 31.6                              | 1,103.4                                |
| 2021 | 440.8                   | 818.8                | 207.2                | 80.5                              | 1,132.9                                |



## 7.2 Annual National Energy Balance, 2020

Select the Unit of Measure: terajoule

| Name                               | Coal and coal products | Oil and petroleum products | Natural gas | Combustible renewables and waste | Nuclear  | Water | Wind   | Other non-combustible renewables | Electricity | Heat   | Total     |
|------------------------------------|------------------------|----------------------------|-------------|----------------------------------|----------|-------|--------|----------------------------------|-------------|--------|-----------|
| <b>Production</b>                  | 39,047                 | 43,228                     | 55,281      | 119,479                          | 175,649  | 878   | 2,358  | 15,753                           | 0           | 0      | 451,673   |
| <b>Import</b>                      | 38,690                 | 399,098                    | 426,474     | 12,997                           | 0        | 0     | 0      | 0                                | 69,034      | 0      | 946,293   |
| <b>Export</b>                      | -7,913                 | -126,617                   | -148,981    | -15,691                          | 0        | 0     | 0      | 0                                | -26,996     | 0      | -326,198  |
| <b>International aviation</b>      | 0                      | -4,214                     | 0           | 0                                | 0        | 0     | 0      | 0                                | 0           | 0      | -4,214    |
| <b>Stocks changes</b>              | 653                    | -2,836                     | 34,173      | -389                             | 0        | 0     | 0      | 0                                | 0           | 0      | 31,601    |
| <b>Domestic supply</b>             | 70,477                 | 308,659                    | 366,947     | 116,396                          | 175,649  | 878   | 2,358  | 15,753                           | 42,038      | 0      | 1,099,155 |
| <b>Interproduct transfers</b>      | 0                      | 160                        | 0           | 0                                | 0        | 0     | 0      | 0                                | 0           | 0      | 160       |
| <b>Statistical difference</b>      | 114                    | -53                        | 7,048       | -41                              | 0        | 0     | 0      | 0                                | -1,163      | -200   | 5,705     |
| <b>Transformation sector</b>       | -56,375                | 820                        | -99,699     | -34,437                          | -175,649 | -878  | -2,358 | -12,517                          | 125,582     | 48,575 | -206,936  |
| <b>Energy sector own use</b>       | -5,417                 | -15,973                    | -9,109      | -600                             | 0        | 0     | 0      | 0                                | -11,380     | -3,107 | -45,586   |
| <b>Network losses</b>              | -1,015                 | 0                          | -3,830      | 0                                | 0        | 0     | 0      | 0                                | -11,300     | -3,977 | -20,122   |
| <b>Final consumption</b>           | 7,784                  | 293,614                    | 261,359     | 81,318                           | 0        | 0     | 0      | 3,236                            | 143,776     | 41,291 | 832,378   |
| <b>Industry</b>                    | 4,984                  | 30,141                     | 57,671      | 14,844                           | 0        | 0     | 0      | 64                               | 63,061      | 14,854 | 185,619   |
| Iron and steel                     | 2,218                  | 43                         | 2,530       | 6                                | 0        | 0     | 0      | 0                                | 2,308       | 1,327  | 8,432     |
| Chemical and petrochemical         | 0                      | 15,651                     | 10,118      | 82                               | 0        | 0     | 0      | 0                                | 12,506      | 10,607 | 48,964    |
| Non-ferrous metals                 | 0                      | 43                         | 2,731       | 0                                | 0        | 0     | 0      | 0                                | 1,325       | 1      | 4,100     |
| Non-metallic minerals              | 1,063                  | 3,313                      | 8,122       | 5,241                            | 0        | 0     | 0      | 0                                | 5,227       | 107    | 23,073    |
| Transport equipment                | 0                      | 46                         | 2,759       | 18                               | 0        | 0     | 0      | 5                                | 5,440       | 463    | 8,731     |
| Machinery                          | 16                     | 400                        | 8,202       | 145                              | 0        | 0     | 0      | 12                               | 10,948      | 227    | 19,950    |
| Mining and quarrying               | 0                      | 980                        | 146         | 1                                | 0        | 0     | 0      | 0                                | 389         | 0      | 1,516     |
| Food, beverages and tobacco        | 59                     | 719                        | 13,649      | 3,551                            | 0        | 0     | 0      | 18                               | 9,792       | 1,061  | 28,849    |
| Paper, pulp and printing           | 1,461                  | 89                         | 2,282       | 2,680                            | 0        | 0     | 0      | 0                                | 3,175       | 633    | 10,320    |
| Wood and wood products             | 0                      | 390                        | 221         | 2,770                            | 0        | 0     | 0      | 0                                | 1,508       | 0      | 4,889     |
| Construction                       | 151                    | 8,290                      | 2,007       | 116                              | 0        | 0     | 0      | 20                               | 1,865       | 159    | 12,608    |
| Textiles and leather               | 0                      | 0                          | 707         | 8                                | 0        | 0     | 0      | 0                                | 734         | 10     | 1,459     |
| Not elsewhere specified (Industry) | 16                     | 177                        | 4,197       | 226                              | 0        | 0     | 0      | 9                                | 7,844       | 259    | 12,728    |
| <b>Transport</b>                   | 0                      | 167,290                    | 2,567       | 11,686                           | 0        | 0     | 0      | 0                                | 4,371       | 0      | 185,914   |
| Road                               | 0                      | 165,712                    | 325         | 11,686                           | 0        | 0     | 0      | 0                                | 220         | 0      | 177,943   |
| Domestic aviation                  | 0                      | 44                         | 0           | 0                                | 0        | 0     | 0      | 0                                | 0           | 0      | 44        |
| Rail                               | 0                      | 1,406                      | 0           | 0                                | 0        | 0     | 0      | 0                                | 4,111       | 0      | 5,517     |
| Pipeline transport                 | 0                      | 0                          | 2,242       | 0                                | 0        | 0     | 0      | 0                                | 40          | 0      | 2,282     |
| Domestic navigation                | 0                      | 128                        | 0           | 0                                | 0        | 0     | 0      | 0                                | 0           | 0      | 128       |
| Non-specified - transport          | 0                      | 0                          | 0           | 0                                | 0        | 0     | 0      | 0                                | 0           | 0      | 0         |
| <b>Other sectors</b>               | 2,496                  | 22,577                     | 178,125     | 54,788                           | 0        | 0     | 0      | 3,172                            | 76,344      | 26,437 | 363,939   |
| Residential                        | 2,359                  | 3,312                      | 126,720     | 53,009                           | 0        | 0     | 0      | 616                              | 43,664      | 19,682 | 249,362   |
| Commercial and public services     | 50                     | 1,454                      | 44,478      | 1,310                            | 0        | 0     | 0      | 930                              | 28,681      | 6,628  | 83,531    |
| Agriculture/forestry/fishing       | 62                     | 17,341                     | 6,266       | 469                              | 0        | 0     | 0      | 1,626                            | 3,686       | 15     | 29,465    |
| Not elsewhere specified (Other)    | 25                     | 470                        | 661         | 0                                | 0        | 0     | 0      | 0                                | 313         | 112    | 1,581     |
| <b>Non-energy use</b>              | 304                    | 73,606                     | 22,996      | 0                                | 0        | 0     | 0      | 0                                | 0           | 0      | 96,906    |

## ANNEX 5 Additional information

### Quality Assurance and Quality Control

QA/QC activities are explained in Chapter 1.6. The update of the QC Plan entered into force on 4th January 2013 (HMS ISO document n.: ELFO 401.01), which was updated several times due to the changes of the Guidebook and legislation. Please see below the English translation of the QA/QC Plan.

#### HUNGARIAN METEOROLOGICAL SERVICE



## QA - QC PLAN

### ÉLFO/NELO 401

**Preparation of Emission Inventories required by United Nations Framework Convention on Climate Change (UNFCCC) and Convention on Long-range, Transboundary Air Pollution (CLRTAP)**

|                                      | <b>Name</b>      | <b>signature</b>   |
|--------------------------------------|------------------|--------------------|
| <b>Prepared (and translated) by:</b> | Katalin Lovas    | expert             |
| <b>Reviewed by:</b>                  | Gábor Kis-Kovács | Head of Unit       |
| <b>Approved by:</b>                  | Gyula Horváth    | Head of Department |
| <b>Version:</b>                      | <b>02</b>        |                    |
| <b>Pages:</b>                        | <b>22</b>        |                    |

**11 February 2020**

## **Content**

OBJECTIVE

TASKS AND RESPONSIBILITIES

DESCRIPTION OF THE ACTIVITIES / ANNUAL INVENTORY CYCLE

1. Principles
  - 1.1. Main steps of the annual inventory cycle
  - 1.2. Tasks and responsibilities of persons involved in the inventory preparation
2. Main steps of the annual inventory cycle
  - 2.1. Choice of estimation method
  - 2.2. Data collection
  - 2.3. Calculations i.e. estimation of emissions and removal by sinks
  - 2.4. Uncertainty and key category analysis
  - 2.5. Compilation, approval and submission of the report

- 2.6. International reviews
- 2.7. Documentation and archiving
- 2.8. Development Plan
3. Further notes on CLRTAP reporting
4. Requirements relating to external experts

#### LIST OF QUALITY RECORDS

#### REFERENCES

#### ANNEXES

Annex 1 : Summary table

Annex 2 : Structure of directory used by the NEI

Annex 3: Outline of the process

Annex 4 : Abbreviations and inventory principles

## **OBJECTIVE**

The Unit of National Emission Inventories (hereafter NEI) of Hungarian Meteorological Service (HMS) has been assigned by the Ministry of Agriculture as the ministry responsible for A1.1A1.1 environmental protection to compile GHG inventory required by United Nations Framework Convention on Climate Change and the Air Pollutants Emission Inventory required by Convention on Long-range, Transboundary Air Pollution (CLRTAP). Several parts of the inventories, such as transport and Land use, land-use change and forestry (LULUCF) are delegated to other institutions by law.

The NEI of the HMS is appointed as Inventory Compiler within the National System by Act LX of 2007 on the implementation of United Nations Framework Convention on Climate Change and the Govt. Decree 278/2014. (XI.14.) on the content and preparation of national reports concerning greenhouse gas emissions and climate change, on the rules of data provision, and on the penalty for violation of the reporting obligations

HMS is indicated as compiler of the inventory of air pollutants (required by the Convention on Long-range, Transboundary Air Pollution) by Govt. Decree 277/2005 (XII.20.) on the Hungarian Meteorological Service, which lists this task in addition to the task of preparation of reporting on air quality data required by any international reporting obligation.

Present ISO document (hereinafter QA-QC Plan) aims to fulfill both the requirements of quality management system ISO 9001:2008 and the QA-QC requirements of the Conventions mentioned above. Therefore, the relevant parts of the former annual QA-QC Plans and the former Documentation and Archiving Manual are integrated into this single document. The former QA-QC Plan was the ÉLFO/ÜHG 401.02 document.

## **TASKS AND RESPONSIBILITIES**

Tasks and responsibilities connected to the implementation of activities defined within this QA-QC Plan:

- preparation of QA-QC Plan: expert appointed by the Head of the NEI
- implementation of the QA-QC Plan: expert(s) appointed by the Head of the NEI,
- supervision of the implementation of QA-QC Plan: Head of the NEI,
- internal audit of the implementation of activities defined within this QA-QC Plan: QA/QC manager of HMS.

The names of sectoral experts, QA-QC coordinator, archiving manager and inventory compiler are specified in the quality record NELO 04.

## DESCRIPTION OF THE ACTIVITIES / ANNUAL INVENTORY CYCLE

### Principles

All domestic and international reporting obligations in connection to the inventory of greenhouse gases and air pollutants to be submitted to any local or international organizations are meant as „Report” hereinafter. Guidelines and Guidebooks specified by the Conventions or Protocols have to be applied for the preparation of the reports

|                                  | UNFCCC   | CLRTAP+ NEC                                 |
|----------------------------------|--|---|
| Guidelines                       | UNFCCC: 24/CP.19, 3/CMP.11 Decisions<br>EU Regulation No 525/2013 and<br>Commission Regulation No. 79/2014 | ECE/EB.AIR/125 + 81/2001/EC<br>directive    |
| updated Guidelines<br>since 2015 | 2006 IPCC Guidelines (See References)  | 2013 EMEP/EEA Guidebook<br>(See References) |

The format and content of the reports are determined by CRF (Common Reporting Form) in the case of UNFCCC and NFR (Nomenclature For Reporting) in the case of CLRTAP. Both are detailed in the Guidelines and Guidebooks mentioned above. The reports consist of tables (hereinafter: CRF/NFR Table) and text documents (hereinafter: NIR/IIR) containing descriptions specified in the Guidelines as well. The names, content, deadlines, process of the submission, public availability of the reports are summarized in Annex 1.

Inventory principles (TCCCA) included in Annex 4 as defined by the Conventions should always be taken into account during the inventory process:

- Transparency,
- Completeness,
- Comparability,
- Consistency,
- Accuracy,
- *in addition to timeliness and improvement.*

### Main steps of the annual inventory cycle

- data collection and choice of estimation method;
- calculations i.e. estimation of emissions and removal by sinks;
- uncertainty analysis;
- QA/QC activities;

- compilation of the report;
- submission of the report;
- documentation and archiving;
- reviews;
- compilation of a development plan.

The outline of the process is included in Annex 3.

### **Tasks and responsibilities of persons involved in the inventory preparation**

#### **Sectoral experts:**

- choice of emission estimation methods;
- collection, documentation and archiving of data needed for the calculations as detailed below and in chapter 2 and in Documentation and Archiving Regulation of HMS;
- data quality check using quality record NELO 02 (Data quality check) relating to the sector;
- communication with external experts;
- calculation and documentation and archiving of calculation files as detailed below and in chapter 2;
- compilation of QC checklists using quality record NELO 01 (QA/QC checklist);
- compilation of CRF Reporter Program relating to the sector use of QA/QC functions of the CRF Reporter and the implementation of the required corrections;
- providing input into the NIR/IIR relating to the sector;
- providing input for the responses of the review questions relating to the sector;
- providing input into the Development Plan.

#### *Sectoral experts regarding documentation and archiving:*

- all the incoming documents containing data used during the preparation of the inventory should be registered in the central register of the HMS as required by the Documentation and Archiving Regulation of HMS;
- all the data used during the preparation of the inventory and information on the source of these data should be documented and archived as detailed in chapter 2;
- all the calculation files and compiled reports should be archived ensuring tracking of changes (due to checks and reviews);
- continuous update of the documentation of all subsectors assigned, archiving of data and other documentation;
- recording, organizing, archiving and removing the files relating to their sector;

#### **Head of NEI:**

- check of input provided by sectoral experts;
- compilation, finalization of reports, forwarding for approval and submission in the case of UNFCCC;
- communication and finalization of responses to be sent during the international reviews;
- finalization of Development Plan.

**QA/QC coordinator:**

- updating present QA/QC Plan and the quality records;
- documentation and archiving relating to QA/QC activities.

*QA/QC coordinator regarding documentation and archiving:*

- recording, organizing, archiving and removing files relating to QA/QC activities,
- control of QA/QC folder within directory of NEI as included in Annex 2.

**Archiving coordinator:**

- development of archiving processes and tasks, and making proposals on it;
- support for the sectoral experts and the head of unit relating to archiving problems,
- follow-up of the requirements relating to archiving and incorporation of new elements into the QA/QC Plan if needed

**Main steps of the annual inventory cycle****Choice of estimation method**

Sectoral experts are required to choose the appropriate estimation method or to coordinate it with external experts and to document it. Methods are to be improved continuously and to be amended or corrected if needed. Methods might be chosen from different tier methods (i.e. methods with different level of complexity) presented in the Guidebooks depending on the results of key source category analysis of the previous year or performed preliminary (as higher tier methods are suggested for key categories), the issues included in the Development Plan and the review results especially regarding recommended changes of methods.

The choice of the estimation method means in fact the choice of activity data set and emission factors to be applied for the calculations. Those methods are appropriate where the whole set of activity data is available and consistent or at least it is possible to apply an extrapolation technique and transparent, documented emission factors are available. Even if country specific emission factors and/or plant specific data (higher tier methods) might result in more realistic estimations, these are only applicable if consistency, comparability and transparency principles are also fulfilled.

The need for change of method might arise anytime during the preparation of the inventory (e.g. new data available, recommendations of the review, etc.), which causes the recalculation of the whole time series. Recalculations should be documented in CRF Table8 and in the appropriate chapter of the NIR/IIR.

The methods applied by subsector have to be documented transparently in the sector-specific chapters of the NIR/IIR, in the CRF and in the calculation files (at least activity data and its source + emission factor and its source).

It is necessary to consider the consistency of activity data, emission factors (and the results) among international reporting obligation (e.g. UNFCCC, CLRTAP, IEA, NAMEA) and the comparability of results with reports of other countries (and the EU).

Sectoral experts consult all general and sector specific issues including choice of method with the Head of NEI either during division meetings or individually. Head of NEI informs all the other experts eventually concerned regarding changes of methods.

In addition, NIR/IIR chapters might be amended by sectoral experts only using “track change” mode. Head of NEI accepts the changes before submission.

### **Data collection**

Sectoral experts/institutions are required to ensure the appropriate quantity, quality, format and timeliness of the data needed for the estimation method. Data might be collected from public databases, based on authorization by law or by data provision agreements with institutions or organizations.

The Act and Govt. Decree 278/2014. (XII.14.) authorizes HMS to collect data needed for the preparation of the inventory, even for the collection of confidential data and to expose penalty in the case of non-compliance.

Special care is needed in the case where the number of data providers is less than three as *Govt. Decree 170/1993 (XII.3.) on the implementation of Act XLVI of 1993 on statistics* (hereafter Statistical Law) requires the Hungarian Statistical Office not to publish data - not even in an aggregated way- in such cases<sup>1</sup>.

Sectoral experts may communicate also via e-mail, phone and mail with external experts, data providers and other persons involved in the National System.

Incoming documents that contain data used by the preparation of the inventory are to be registered in the central register of the HMS as required by the HMS Regulation on documentation and archiving where special provisions are included regarding the NEI.

---

<sup>1</sup> With the exception of article (2) of Section 18 and Section 16 of Statistical Law

#### Section 18

(2) Individual data on the activities of organs, social organizations and state budget organs performing activities of public interest, may be made public also without prior written consent of the data supplier if the respective data relates to the activities of public interest of the organs above.

#### Section 16

(1) Collections of statistical data based on voluntary data supply may be performed without permission.

(2) The attention of those requested to supply data shall be called to the voluntary character of the supply of the data.

Any data base, reference or document relating to the preparation of the inventory either hard copies or electronically should be documented and archived as described in chapter 2.7 in order to ensure replicability and transparency of the reports. It is needed to document (e.g. in form of „minutes of meeting/phone call/etc\_\_IPCCcode\_date\_doc”) verbal information as well if it is used by the preparation of the inventory.

Check of the quality of incoming data might be documented using checklist included in quality record NELO 02. Separate quality records should be created preferably for every data provider which should be saved within the directory used by the NEI as described in chapter 2.7.

Information regarding the sources of data should be documented on quality record *NELO05 Data source logbook*. This record should be completed by year and by sector with information on data sources (date of enquiry and receipt, contact person, Reg. No. etc.) in the case of mails, e-mails arriving thank to Govt. Decree 278/2014. and with information on the download (e.g. url, website, date, etc.) in the case the data source is on-line.

### **Calculations i.e. estimation of emissions and removal by sinks**

Compilation of the inventory is the task of sectoral experts or external experts contracted by the HMS. Sectoral experts work in calculation files (separate for every year) which are saved in a specific place in the directory used by the NEI and treated as it is described in 2.7. Calculation files should contain in a transparent way the estimation method, activity data together with their source, emission factors together with their source and uncertainty together with their source (in addition to NIR/IIR and CRF/NFR Tables to be compiled in a later stage). This will ensure the reproducibility of emission estimates and enables substitution or replacement of sectoral experts when necessary.

Further QA/QC recommendations regarding the content of the calculation files:

- it is favorable to include notes and/or to apply different coloring for the cells of the table that contain data from different sources;
- possibility automatic checks should be included in the calculation files (e.g. conditional formatting, crosschecks, references, macro, etc.) in order to minimize calculation or mistype errors;
- summary tables in the calculation files should possibly follow exactly the outline of the appropriate CRF Table in order to enable the final crosscheck with the compiled CRF
- the year to which the data relates should always be indicated clearly (e.g. above/next to the data set)

- activity data, emission factors, conversion factors, other parameters, units should be indicated separately, unit conversions should be presented step by step;
- the tables should be compiled in a way that makes possible to track the steps of the calculation based on the formulas or references (in the case the formula is on other worksheet or work file);
- data from external source should be clearly separated from elaborated data (i.e. unit conversions, after calculation steps, etc.);
- emission factors, conversion factors and other parameters should not be built in the formulas, but in a separate cell referenced by the formula;
- units of the dataset should be noted in the beginning of all the rows;
- special attention is needed for the update of conversion factors and temporary coefficients if necessary.

Beyond the above recommendations, calculations should be checked.

The quality record NELO 01 contains QC checklists based on recommendation of IPCC Guidelines. Consequently, use of it ensures the execution of the required QC procedures. The check should be performed annually using the QC checklist, on as many categories as possible, and in line with the recommendation of the 2006 IPCC Guidelines, key categories and recalculated categories due to methodological changes should be checked with the utmost care. In the course of planning of annual QC procedures, it should take into account that every category should be checked within 5 years. Errors, differences and the corrective measures have to be registered on the quality record NELO 01.

The quality record NELO 01 might be included in the calculation sheets or might be handled separately.

All errors discovered during the inventory cycle (even for earlier years) might be indicated on the appropriate section of the quality record NELO 01 together with the results of reviews. These notes are the rationales of recalculations in the case the correction has been executed before compilation of the current inventory report. In the case it was not possible to perform the correction in the same year, they are to be copied into quality record NELO 03 Development Plan together with the planned improvements.

It is also favorable to perform possible verification, using external data such as NIR/IIR of EU and other countries and to document the results in the appropriate section of the quality record NELO 01.

### *Recalculations*

In the case estimation method has been changed (either activity data or emission factor) the whole time-series need to be recalculated. Correction of data of earlier years is regarded as recalculation as well. The reasons for recalculations have to be presented in the appropriate chapter of the NIR/IIR. While the sectoral experts are encouraged to present comparison table including the old and the new time series together with their difference in the NIR/IIR. It is recommended to clearly note (e.g. different coloring) the old and the new time series also in the calculation files. In addition, the new time series should be copied possibly from the final (before submission) state of the compiled CRF.

### **Uncertainty and key category analysis**

Uncertainty analysis has to be performed using the sector list suggested by 2006 IPCC Guidelines. Sectoral experts either copy the uncertainties associated to the sectors into one common file which has the format determined in quality record NELO 06 and/or revise the table compiled by the expert responsible for the uncertainty analysis. The responsible expert calculates the aggregated uncertainty, the aggregated uncertainty by gas and uncertainty by main sectors. These results are to be included in the NIR. The responsible expert updates the relevant chapter of the NIR and the Annex containing the full calculation table.

Possibly any deviation from the sector list for key category analysis suggested by 2006 IPCC Guidelines should be explained. Obviously, the Tier2 key category analysis can be performed only on the sector list of uncertainty analysis.

The expert responsible for key category analysis updates the references in the common file which have the format determined in quality record NELO 07 and performs the analysis using both Tier1 and Tier2 (with uncertainty) methods. Full tables are to be included in Annex of the NIR and summary tables are to be included in CRF Table7 and appropriate chapter of the NIR/IIR where also the comparison with results of last year should be indicated.

### **Compilation, approval and submission of the report**

Sectoral experts export the time series developed in the calculation files (and checked using the quality record UHG01) into the CRF Reporter program and run the available automatic control functions, and they subsequently make the corrections needed.

In the case of NECD and CLRTAP, the sectoral experts copy the sectoral data from the calculation files into a specified common file.

In the same time the sectoral experts update the chapters of the NIR/IIR assigned to them and include also the descriptions and comparison tables of recalculations into the appropriate

chapters. The treatment and archiving of NIR/IIR working files is described in chapter 2.7.4. Head of Division checks and finalizes the reports.

The process of approval and submission of the reports is determined by the Act and the implementing Govt. Decree 278/2014. In the case of UNFCCC reporting, the Head of NEI submits the reports to UNFCCC secretariat and the EU Commission. In the case of CLRTAP reporting, HMS sends the report to the Ministry of Agriculture (responsible for the environment) for submission.

Comments or opinions eventually arrived from the authorizing ministries, or other external experts, committees, institutions before submission of the reports should be documented on the quality record NELO 08 QA Activities logbook.

### **International reviews**

During international reviews (as detailed in Annex1) all the communication is managed by the Head of NEI. Questionnaires are saved in the assigned GHG directory. After the sectoral experts prepare the concerning answers, the head of unit checks and finalizes the official response. Responses prepared by sectoral experts should be sent only after the approval of the Head of Division in the case of on-line review as well.

### **Documentation and archiving**

All the data, information and documents arising during the processes and activities of the NEI should be collected, treated, documented and archived in a way that the reports remain transparent and reproducible.

#### **HMS Regulations regarding documentation and archiving**

Documents and data of the NEI are registered, processed, treated, stored and archived within the central register and IT network of the HSM. Therefore, central regulations are valid for the NEI as well. The HMS Regulation on documentation and archiving in force includes special provisions regarding the data collected by the NEI for the compilation of the inventory. Present QA/QC Plan includes only provisions not included in the general HMS Regulations mainly regarding sectoral experts and emission inventorying.

#### **Collection, processing and storage of data and documents**

Hard copies of documents and any hardware containing data are to be ordered by sector and located in the premises of the HMS. It is suggested to store an electronic version of the hard copies too (by scanning). Sectoral experts are required to store the electronic version of such documents together with other electronic data described later.

Electronic documents should be saved in the directory of the server of the NEI as described in Annex 2. and the following chapters. Sectoral experts are responsible for the organization,

archiving and cancellation of the documents within their folders.

Electronic documents are collected, stored and archived in a password protected server accessible only for sectoral experts working for the NEI. Within the directory of the server of the NEI every expert and the Head of Unit have the same access (both for writing and reading) in order that experts might be substituted or replaced if needed. However additional security measures might be applied by the Head of Unit for the documents archived in the OFFICIAL ARCHIVE section of the directory especially where the submitted documents are archived in order to avoid any unintentional modification.

General principles for managing files and other recommendations

### **Names**

Consistency, unambiguity and the inclusion of CRF/NFR sector codes should be aimed by naming the files and folders. Either the name of the file or the name of the folder should contain the CRF/NFR code. (In the case of incoming data files, it is suggested to name the folder rather than change the original name of the file while in the case of calculation files CRF/NFR codes should be included in the filename.) Abbreviations of CRF/NFR codes and names should be consistent and homogenous. Different versions of the file might be distinguished by adding „v” and/or month of the submission within the filename (obviously in addition to the year within the name of the file or folder). Older versions of the calculation files should be stored temporarily at least within the annual inventory cycle. The storage of different versions and the names including the version number and/or month of submission allows tracking changes within the year. In the case the calculation file contains more sub-sectors, it is suggested to use the name/code of the lowest obvious level of sector. Calculation files should be distinguished from original data files by using „Calc\_xxx” within the filename.

Capital letters might be used for name of a folder, while the rules of English grammar for writing titles might be followed for filenames. Separation of words might be noted with the character „\_”. Based on the above, it is suggested to name the folders and (calculation files\*):

Topic\_CRF/NFRcode\_year\_(version/submission month\*)

It is suggested to include into the name of a draft NIR/IIR together with name of the report, date of planned submission and version number (or month of planned submission).

### **Allocation of files within the directory of the server of the NEI**

*Files relating data collection*

However, data provision is a legally binding obligation, HMS is usually sending reminder letters. The documents regarding mailing should be stored in the GHG directory.

Incoming documents containing data and databases directly used in the inventory should be stored in folder A. OFFICIAL ARCHIVE\ DATABASE\1-7. SECTORS.

#### *Calculation files and text files*

Sectoral experts work within the folders D. WORKING FOLDER\1-7. SECTORS folders. Files for uncertainty analysis and key category analysis are to be located within the folder D. WORKING\0. GENERAL folder as well as draft text files of NIR/IIR.

#### *QA//QC documents*

QA/QC documents including blank versions of quality records and documents relating to internal and external audits, etc. are stored within the folder E. QA-QC\A. GHG QA/QC PLAN. folder. Compiled quality records are to be located in a place clearly noted in the file *Quality\_records\_logbook.xls* within this folder.

#### *Archiving of data and background documents and submissions at the end of the annual inventory cycle*

Data and documents to be archived should be provided by the sectoral experts, while the appropriate execution is monitored by the archiving coordinator. It should be possible to reproduce the reports fully from the archived files. Towards reproducibility worksheets and interim calculation used in the production of the inventory have to be archived by the sectoral experts in their own working folders or in the folders used for storage of background documents (U:\GHG\A. OFFICIAL ARCHIVE\B. BACKGROUND DOCUMENTS). The final, submitted CRF/NFR Tables and NIR/IIR files have to be stored within A. OFFICIAL ARCHIVE\C. SUBMISSIONS

.

#### **Development Plan**

Planned improvements and corrections might be collected and noted on sector specific quality records NELO01 throughout the year, especially regarding:

- recommendations, encouragements and suggestions received during the reviews,
- errors discovered during the previous year,
- results of key-category analysis,

- lessons learned during previous inventory cycle,
- new data available (e.g. new data provisions, new international obligation)
- follow-up of regulatory changes affecting the inventory,
- continuous improvement.

All the mid-term and long-term planned improvements and the necessary corrections that had not been possible to perform in a given inventory cycle (collected on NELO 01) should be included into the quality record NELO 03 Development Plan by the sectoral experts and into the „Planned improvements” chapter of the NIR/IIR after the approval of the Head of NEI. Sectoral experts should update the quality record NELO 03 Development Plan with further planned improvements and corrections (eventually collected on NELO 01) emerged after the submission regarding their sector.

Development Plan should reflect the review results (especially EU and UNFCCC). Planned improvements and corrections should be categorized as mid-term or long-term.

### **Further notes on CLRTAP reporting**

Activities described above should be applied in the case of CLRTAP reporting too, evidently except for CRF Reporter program, uncertainty analysis and quality records.

For the preparation of reports to be submitted under CLRTAP and NEC, sectoral experts include the most up-to-date (eventually recalculated) time series into the worksheets of the appropriate pollutant within the Excel workbook to be found in folder D. WORKING FOLDER\0. GENERAL.

This file is referenced by the file in order to convert the time series into NFR Table format as required by Annex IV Table 1 of ECE/EB.AIR/97 and 81/2001/EC Directive too.

During compilation of record NELO 05 Data source logbook, sectoral experts are encouraged to include additional data sources needed for CLRTAP reporting or to note if the data is used for both purposes.

Sectoral experts are also encouraged to apply the appropriate sections of the following records too:

- NELO 01 QA/QC checklist
- NELO 02 Data quality check

By the time being, key category and uncertainty analysis are performed without application of quality records in the case of CLRTAP reporting.

**Requirements relating to external experts**

Contracts with external experts providing input into the inventory should possibly include the following:

- external experts should deliver all the documentation (background documents and calculations) and transparency is to be taken into account also for external experts;
- external experts should be available during international reviews;
- inclusion of indemnity in the case of non-keeping the deadline.

**Legal background:**

- HMS Regulation on organizational structure and operation;
- Govt. Decree 277/2005. (XII.20.) on the Hungarian Meteorological Service;
- Act LX of 2007 on the implementation of United Nations Framework Convention on Climate Change;
- Govt. Decree 528278/20132014. (XII.3014.) on the content and preparation of national reports concerning greenhouse gas emissions and climate change, on the rules of data provision, and on the penalty for violation of the reporting obligations;
- 525/2013/EC Regulation and implementing regulations;
- Commission Implementing Regulation (Eu) No 749/2014

**Documents created as output of the activities described above:**

- working files containing all the details of the calculations;..Excel files generated by CRF Reporter, annually, (official inventory data);
- national inventory report (HU\_NIR\_MonthSubmissionYear.pdf files);
- annexes to the national inventory report ( HU\_NIR\_ANNEXES\_MonthSubmissionYear.pdf files);
- Executive summary in Hungarian );
- Reports required by the above mentioned rules and regulations;
- Approximated GHG inventory for the EU submitted until 31th of July;
- Air pollutant emission inventories (NFR files);
- Informative Inventory Reports on emissions of air pollutants (IIR\_HU\_InventoryYear\_version.doc);
- files containing tables or text required by international reviews.

**Responsible:** experts working at NEI as it is specified in their contract

**Deadline:** As included in Annex1.

**Check points, monitoring, quality control points:**

**Accessibility checks:** only experts assigned by the Head of NEI have access

**Operational checks:** checks built-in the processes, self-checking, checks of the activities and data.

**Hierarchical checks:** Experts report on progress to the Head of NEI during meetings of the NEI. Inputs provided by sectoral experts are controlled by the Head of Division.

**Financial or accounting issues:** n/a

### **LIST OF QUALITY RECORDS**

- NELO 01 QA/QC checklist
- NELO 02 Data quality check
- NELO 03 Development Plan
- NELO 04 Responsibility
- NELO 05 Data source logbook
- NELO 06 Uncertainty
- NELO 07 Key category analysis
- NELO 08 QA activities logbook

### **REFERENCES**

- HMS Regulation on procedures of the departments and the presidency of HSM
- HMS Regulation on documentation and archiving
- HMS QA/QC Manual  
<http://www.ipcc-nggip.iges.or.jp/public/gpplulucf/gpplulucf.html>
- Intergovernmental Panel on Climate Change (IPCC), 2006: 2006 IPCC Guidelines for National Greenhouse Gas Inventories,  
<http://www.ipcc-nggip.iges.or.jp/public/2006gl/index.html>
- EMEP/EEA air pollutant emission inventory guidebook -2013 (Technical report No 12/2013, European Environmental Agency) <http://www.eea.europa.eu/publications/emep-eea-guidebook-2013>
- Elements of the union system for policies and measures and projections and the quality assurance and control (QA/QC) Programme as required under regulation (EU) No.25/2013;  
[http://ec.europa.eu/clima/policies/strategies/progress/monitoring/docs/union\\_pams\\_projections\\_en.pdf](http://ec.europa.eu/clima/policies/strategies/progress/monitoring/docs/union_pams_projections_en.pdf)

**ANNEXES****Annex 1: Summary table**

| Documents, deadlines and QA/QC activities in connection with reporting to UNFCCC and Kyoto Protocol, CLRTAP and its Protocols and NEC directive |   |   |                         |                     |  |  |
|---|---|---|-------------------------|---------------------|--|--|
| Deadline  | Task  | QC  | Document /Report        |                     |  | QA   |
|   |   |   | name                    | route of submission | availability   |  |
| May - Nov   | search for new data available;<br><br>data collection, documentation    | Quality record: NELO 02 (Data quality);<br><br>Legal authorization- Govt.Decree 345/2009. (XII.20.) ;<br><br>Documentation and archiving;   | n.a.(data input)        | n.a. (internal)     | A. OFFICIAL ARCHIVE\<br>A. DATABASE and/or hard copies |  |
| Sept - Dec<br>(- April)   | methodological changes (if needed) ;<br><br>calculation, recalculation; | NELO 01 (T1, T2 checklists, verifications);<br><br>Division meetings;<br><br>documentation  | n.a.(calculation files) | n.a. (internal)     | D. WORKING FOLDER ...                                  | possibly review by third parties, external experts |
| Sept - Dec<br>(- April)   | final results and calculations from external experts                    | HMS quality record ME-06 (Evaluation of contractors);<br><br>documentation  | n.a.(incoming files)    | n.a. (internal)     | A. OFFICIAL ARCHIVE\<br>A. DATABASE ...                | checks performed by sectoral expert                |
| Jan-April   | compilation of CRF<br><br>compilation of CollectER                      | Completeness check<br><br>Recalculation check incorporated into CRF Reporter; possibly cross-check among <i>CALC files and sectoral experts</i> ; <i>checks using EU's sectoral cheking tools</i> |                         |                     |  |  |

| Documents, deadlines and QA/QC activities in connection with reporting to UNFCCC and Kyoto Protocol, CLRTAP and its Protocols and NEC directive |  |   |   |  |   |  |
|---|--|---|---|--|---|--|
| Deadline  | Task   | QC  | Document /Report  |  |   | QA   |
|   |  |   | name  | route of submission  | availability  |  |
| 15.Jan.   | <b>compilation and submission of preliminary report required by 525/2013/EC</b>                          | Documentation and archiving<br><br>Consistency checks in accordance with Article 7 (1) of Regulation 525/2013/ and the Regulation EU No 749/2014 (MMR Implementing Regulation)<br><br>Completeness check of the LULUCF sector | <b>preliminary report required by 525/2013/EC (CRF table, preliminary NIR, indicators, SEF and MMR tables required by the MMR Implementing Regulations)</b> | Ministry of National Development →<br><br>EU Commission (DG Climate Action)  | <a href="http://cdr.eionet.europa.eu/hu/eu/ghgmm">http://cdr.eionet.europa.eu/hu/eu/ghgmm</a>                                   |  |
| 15.Febr.  | <i>compilation and submission of CLRTAP report</i>   | <i>Documentation and archiving;<br/><br/>RepDab check</i>   | <b>CLRTAP NFR Table</b>   | <i>Ministry of Agriculture →<br/><br/>EMEP Centre on Emission Inventories and Projections (CEIP) + letter to UNECE Secretariat</i> | <a href="http://www.ceip.at/overview-of-submissions-under-clrtap/">http://www.ceip.at/overview-of-submissions-under-clrtap/</a> | <i>CLRTAP review process:<br/><br/>1. Status + 2. Synthesis and Assessment (Reports: <a href="http://www.ceip.at/review-results/">http://www.ceip.at/review-results/</a> (password protected))<br/><br/>(3. Centralized review in every 5 years)</i> |
| 15. Jan-<br>28. Febr  | <i>EU Team QA/QC checks (STEP 1 and initial cheks)</i>   | Checks in accordance with the Art. 29 of the MMR Implementing Regulation  | <b>EU ESD Review Report</b>   | <b>EEA→HMS using the EEA Emission Review Tool (EMRT)</b>   | <a href="https://emrt-esd.eionet.europa.eu/">https://emrt-esd.eionet.europa.eu/</a> (password protected)                        | Checks in accordance with the Art. 29 of the MMR Implementing Regulation   |
| 15. Jan-<br>15. March   | <i>Providing responses to the EU Team;<br/><br/>Correction actions based on the observations made by</i> | Identification and elimination of causes of problems identified by the EU team; actions to prevent their recurrence in the future.  | <b>EU ESD Review Report</b>   | <b>HMS→EEA using the EEA Emission Review Tool (EMRT)</b>   | <a href="https://emrt-esd.eionet.europa.eu/">https://emrt-esd.eionet.europa.eu/</a> (password protected)                        |  |

| Documents, deadlines and QA/QC activities in connection with reporting to UNFCCC and Kyoto Protocol, CLRTAP and its Protocols and NEC directive |   |  |  |   |  |   |
|---|---|--|--|---|--|---|
| Deadline  | Task  | QC   | Document /Report   |   |  | QA  |
|   |   |  | name   | route of submission   | availability   |   |
|   | <i>the EU team during the STEP 1 and initial checks</i>             |  |  |   |  |   |
| 15.March  | <i>compilation and submission of CLRTAP report</i>                  | Documentation and archiving  | <b>CLRTAP IIR (+grid+LPS every 5 years)</b>  | <b>Ministry of Agriculture → EMEP Centre on Emission Inventories and Projections (CEIP) - nek + letter to UNECE Secretariat</b> | <b><a href="http://www.ceip.at/overview-of-submissions-under-clrtap/">http://www.ceip.at/overview-of-submissions-under-clrtap/</a></b> |   |
| 15.March  | <b>compilation and submission of report required by 525/2013/EC</b> | Documentation and archiving<br>Consistency checks in accordance with Article 7 (1) of Regulation 525/2013/ | <b>report required by 525/2013/EC(CRF Tables, NIR, indicators, SEF and MMR tables required by the MMR Implementing Regulations )</b> | <b>Ministry of National Development → EU Commission DG Climate Action)</b>  | <a href="http://cdr.eionet.europa.eu/hu/eu/mmr/art07_inventory">http://cdr.eionet.europa.eu/hu/eu/mmr/art07_inventory</a>              |   |
| 15 March-<br>19 April   | <b>EU Team checks</b>   |  | <b>EU ESD Review Report</b>  | <b>EEA→HMS using the EMRT</b>   | <a href="https://emrt-esd.eionet.europa.eu/">https://emrt-esd.eionet.europa.eu/</a><br>(password protected)                            | EU Team identifies Potential Significant Issues (PSI); prepares estimates for data missing from the national inventory (gap filling);<br>QA experts send follow up questions to HU. |
| 31 March-<br>7 April  | <b>Providing responses and comments to the EU Team</b>              | Correction actions based on the observations made by the EU team;  | <b>EU ESD Review Report</b>  | <b>HMS→EEA using the EMRT;</b>  | <a href="https://emrt-esd.eionet.europa.eu/">https://emrt-esd.eionet.europa.eu/</a><br>(password protected)                            |   |

| Documents, deadlines and QA/QC activities in connection with reporting to UNFCCC and Kyoto Protocol, CLRTAP and its Protocols and NEC directive |   |  |                                      |   |   |  |
|---|---|--|--------------------------------------|---|---|--|
| Deadline  | Task  | QC   | Document /Report                     |   |   | QA   |
|   |   |  | name                                 | route of submission                                   | availability  |  |
|   |   | Check of the EEA/Comission estimates for missing data (Gap filling) or providing revised estimate; |                                      | supervision by the Ministry of National Development   |   |  |
| 15.April  | compilation and submission of UNFCCC report | Documentation and archiving  | UNFCCC report (CRF Tables, NIR, SEF) | Ministry of National Development → UNFCCC Secretariat | <a href="http://unfccc.int/national_reports/annex_i_ghg_inventories/national_inventories_submissions/items/492.php">http://unfccc.int/national_reports/annex_i_ghg_inventories/national_inventories_submissions/items/492.php</a> | <p>Before submission:</p> <p>Approval by Ministry of Agriculture, National Development and National Economy</p> <p>After submission: <b>UNFCCC review process:</b></p> <p>1. Status (Reports: <a href="http://unfccc.int/national_reports/annex_i_ghg_inventories/inventory_review_reports/items/8109.php">http://unfccc.int/national_reports/annex_i_ghg_inventories/inventory_review_reports/items/8109.php</a>)</p> <p>2. Synthesis and Assessment (Reports: <a href="http://unfccc.int/documentation/documents/advanced_search/items/6911.php?prirref=600008003#beg">http://unfccc.int/documentation/documents/advanced_search/items/6911.php?prirref=600008003#beg</a>)</p> |

| Documents, deadlines and QA/QC activities in connection with reporting to UNFCCC and Kyoto Protocol, CLRTAP and its Protocols and NEC directive |   |   |   |  |   |  |
|---|---|---|---|--|---|--|
| Deadline  | Task  | QC  | Document /Report                            |  |   | QA   |
|   |   |   | name  | route of submission  | availability  |  |
| 15 April – end of April   | <b>EU ESD step 2 review, if applicable;</b>   | Providing responses to the EU ESD Step 2 team and calculating revised estimate or providing comments on potential technical corrections | <b>EU ESD Review Report</b>                 | <b>Communication between the EEA and the HMS using the EMRT and supervised by the Ministry of National Development</b> | <b><a href="https://emrt-esd.eionet.europa.eu/">https://emrt-esd.eionet.europa.eu/</a> (password protected)</b>   | Step 2 team identifies and calculates technical corrections and send questions to HU |
| 8 May   | <b>compilation and resubmission of GHG inventory to the EU and the UNFCCC, if applicable)</b> | Documentation and archiving   | <b>UNFCCC report (CRF Tables, NIR, SEF)</b> | <b>Ministry of National Development → UNFCCC Secretariat and EU Commission (DG Climate Action)</b>                     | <b><a href="http://unfccc.int/national-reports/annex_i_ghg_inventories/national_inventories_submissions/items/492.php">http://unfccc.int/national-reports/annex_i_ghg_inventories/national_inventories_submissions/items/492.php</a><br/><br/><a href="http://cdr.eionet.europa.eu/hu/eu/mmr/art07_inventory">http://cdr.eionet.europa.eu/hu/eu/mmr/art07_inventory</a></b> |  |

| Documents, deadlines and QA/QC activities in connection with reporting to UNFCCC and Kyoto Protocol, CLRTAP and its Protocols and NEC directive |   |  |  |  |   |   |
|---|---|--|--|--|---|---|
| Deadline  | Task  | QC   | Document /Report   |  |   | QA  |
|   |   |  | name   | route of submission  | availability  |   |
| 30-31 May   | <b>Quattro-lateral QA/QC meeting on GHG-inventory</b>                                     |  | <b>MINUTES FROM QUATTRO-LATERAL MEETING</b>  | <b>Organizing country → Other countries</b>                                | u:\GHG\E. QA-QC\C. INTERNATIONAL REVIEWS\Quattro Lateral Meeting\   | review of chapters of the GHG-inventory by members of the GHG.inventory team of Slovakia, Czech Republic and Poland |
| 31.July   | <b>Compilation and submission of preliminary report required by Art 8. of 525/2013/EC</b> | Documentation and archiving<br><br>Consistency checks in accordance with Article 7 (1) of Regulation 525/2013/ (if it is relevant) | <b>preliminary report required by Art 8. of 525/2013/EC for year x-1</b>                               | <b>Ministry of National Development → EU Commission DG Climate Action)</b> | <a href="http://cdr.eionet.europa.eu/hu/eu/mmr/art08_proxy">http://cdr.eionet.europa.eu/hu/eu/mmr/art08_proxy</a> |   |
| May-August-Oct  | evaluation, corrective actions and planned improvements (incorporating results of         | Additional cheks based on the lessons learned during the UNFCCC, EU review processes and Quattro Lateral meeting;                  | NELO 01 quality record – corrective actions and planned improvements;<br><br>NELO 03 Development Plan; |  | E. QA-QC  |   |

| Documents, deadlines and QA/QC activities in connection with reporting to UNFCCC and Kyoto Protocol, CLRTAP and its Protocols and NEC directive |   |   |   |   |  |  |
|---|---|---|---|---|--|--|
| Deadline  | Task  | QC  | Document /Report  |   |  | QA   |
|   |   |   | name  | route of submission                         | availability   |  |
|   | annual review processes);<br>update of QA/QC documents if needed                            |   | ÉLFO_UHG_401.02   |   |  |  |
| March-Sept.   | HCSO data exchange  |   | GHG - UNFCCC - CRF Tables; Air Pollutants - CLRTAP - NFR Tables; Climate data | Hungarian Central Statistical Office (HCSO) | HCSO Statistical Yearbook and Handbook +<br><a href="http://www.ksh.hu/stadat_eves_5">http://www.ksh.hu/stadat_eves_5</a><br>+ NAMEA | crosscheck with NAMEA  |
| Sept-Oct  | responses to be sent during the UNFCCC review;<br>recalculations and resubmission if needed | Division meetings;<br><br>documentation                                   | responses sent electronically   | UNFCCC Secretariat                          | E. QA-QC\C. INTERNATIONAL REVIEWS\UNFCCC   | <b>UNFCCC review process:</b><br><br>3. Annual centralized/in-country review (Reports: <a href="http://unfccc.int/national_reports/annex_i_ghg_inventories/inventory_review_reports/items/8452.php">http://unfccc.int/national_reports/annex_i_ghg_inventories/inventory_review_reports/items/8452.php</a> ) |
| before the beginning of the new inventory cycle   | archiving   | archiving of all documents and data not yet archived on the server of NEI |   |   |  |  |
| annually  | Quality objectives of NEI for the HMS level quality objectives                              |   |   |   | E. QA-QC\B. HMS ISO\QUALITY PROGRAMME  |  |

| Documents, deadlines and QA/QC activities in connection with reporting to UNFCCC and Kyoto Protocol, CLRTAP and its Protocols and NEC directive |  |    |                  |                     |  |                |
|---|--|----|------------------|---------------------|--|----------------|
| Deadline  | Task   | QC | Document /Report |                     |  | QA             |
|   |  |    | name             | route of submission | availability   |                |
|   |  |    |                  |                     | <a href="http://www.met.hu/en/omsz/minosegiranyitas/">http://www.met.hu/en/omsz/minosegiranyitas/</a>  |                |
| 1-2 years   | External audits within the ISO quality management system |    |                  |                     | Result of the audit<br><a href="http://www.met.hu/doc/minosegiranyitas/OMSZ_I_SO-9001_tanusitvany_2012-15_en.pdf">http://www.met.hu/doc/minosegiranyitas/OMSZ_I_SO-9001_tanusitvany_2012-15_en.pdf</a> | external audit |
| 1-2 years   | Internal audits within ISO quality management system     |    |                  |                     | n.a.   | internal audit |

For abbreviations see Annex 4.

**Annex 2 : Structure of directory used by the NEI**

## A. OFFICIAL ARCHIVE

## A DATABASE

0. GENERAL

1-7.SECTORS

## B BACKGROUND DOCUMENTS

0. GENERAL

1-7.SECTORS

## C SUBMISSIONS

## D. WORKING FOLDER

0. GENERAL

G. NFR Total

1-7.SECTORS E. QA/QC

## E. QA/QC

A. GHG QA/QC PLAN

B. HMS ISO

C. INTERNATIONAL REVIEWS

D. NATIONAL AUDITS REVIEWS

E. WORKING

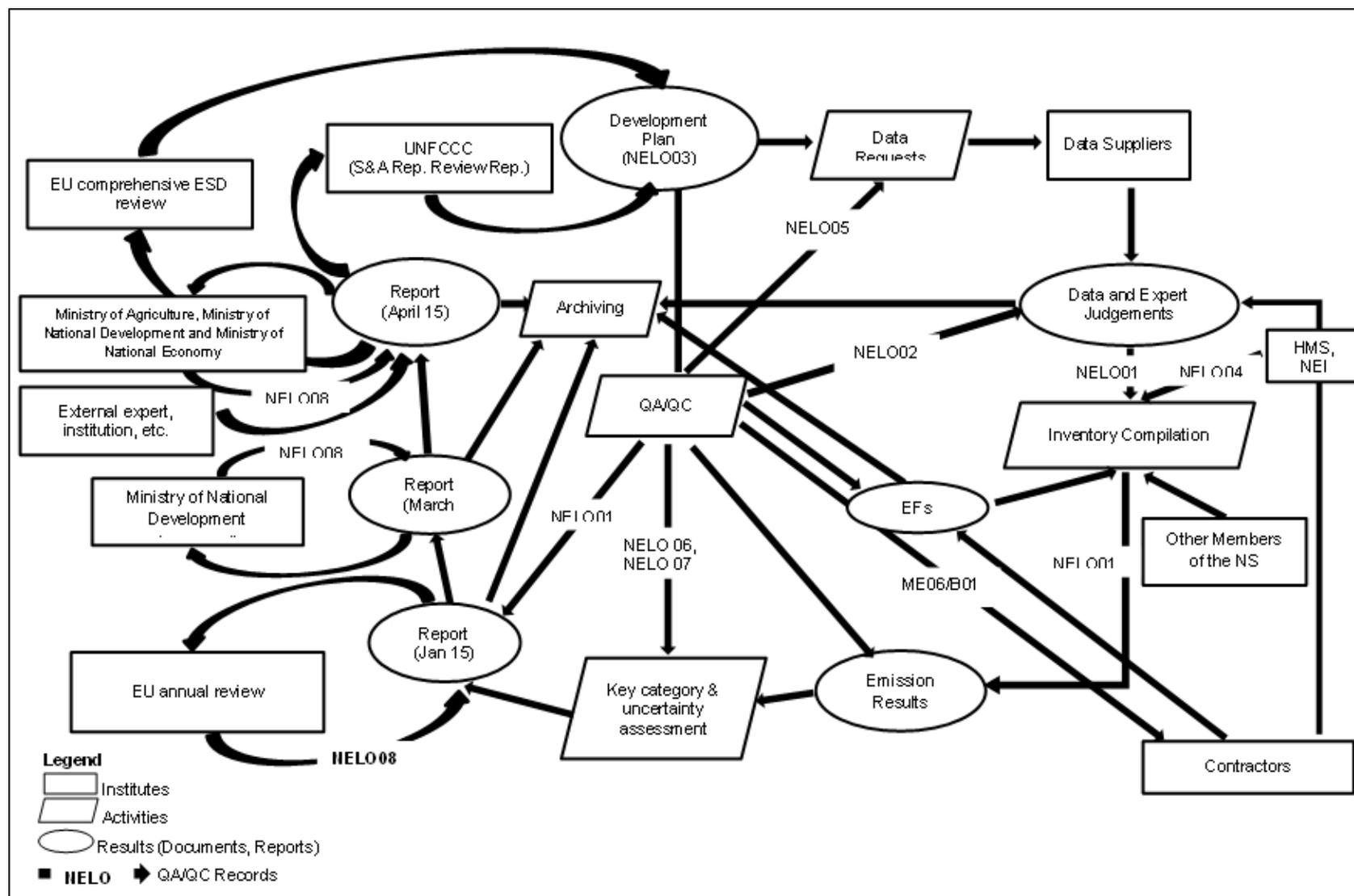
F. ARCHIVE

## F. MANAGEMENT

A. DATA REQUESTS

## G. OTHERS

Annex 3: Outline of the process



**Annex 4: Abbreviations and inventory principles**

|        |  |
|--------|--|
| CRF    | Common reporting format = table (UNFCCC)   |
| NIR    | National Inventory Report = text (UNFCCC)  |
| SEF    | Standard electronic format = table on the Registry (UNFCCC) (it is NOT a HMS task)   |
| NEI    | Unit of National Emission Inventories  |
| NFR    | Nomenclature for reporting = table (CLRTAP)  |
| IIR    | Informative Inventory Reports = text (CLRTAP)  |
| NEC    | National Emission Ceiling Directive - 2001/81/EC of The European Parliament And Of The Council of 23 October 2001 on national emission ceilings for certain atmospheric pollutants |
| UNFCCC | United Nations Framework Convention on Climate Change (1992)   |
| CLRTAP | Convention on Long-range, Transboundary Air Pollution (1979, Geneva)   |
| GHG    | greenhouse gas   |

| CLRTAP (EMEP/EEA 2009. )  | UNFCCC (18/CP.8 )   |
|---|---|
| <b>Transparency</b> means that Parties should provide clear documentation and report a level of disaggregation that sufficiently allows individuals or groups other than the designated emission expert or the compiler of the inventory to understand how the inventory was compiled and assure it meets good practice requirements. The transparency of emission reporting is fundamental to the effective use, review and continuous improvement of the inventory. | <i>Transparency</i> means that the assumptions and methodologies used for an inventory should be clearly explained to facilitate replication and assessment of the inventory by users of the reported information. The transparency of inventories is fundamental to the success of the process for the communication and consideration of information; |

|  |   |
|--|---|
| <p><b>Consistency</b> means that estimates for any different inventory years, pollutants (2) and source categories are made in such a way that differences in the results between years and source categories reflect real differences in emissions. Annual emissions, as far as possible, should be calculated using the same method, and data sources for all years, and resultant trends should reflect real fluctuations in emissions and not the changes resulting from methodological differences. Consistency also means that, as far as practicable and appropriate, the same data are reported under different international reporting obligations.</p> | <p><i>Consistency</i> means that an inventory should be internally consistent in all its elements with inventories of other years. An inventory is consistent if the same methodologies are used for the base and all subsequent years and if consistent data sets are used to estimate emissions or removals from sources or sinks. Under certain circumstances referred to in paragraphs 15 and 16, an inventory using different methodologies for different years can be considered to be consistent if it has been recalculated in a transparent manner, in accordance with the Intergovernmental Panel on Climate Change (IPCC) <i>Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories and Good Practice Guidance for Land Use, Land-Use Change and Forestry</i>;<sup>1</sup></p> |
| <p><b>Comparability</b> means that the national inventory is reported in such a way that allows it to be compared with national inventories of other Parties. This can be achieved by using accepted methodologies as elaborated in the Reporting Guidelines by using the reporting templates and through the use of the harmonized Nomenclature For Reporting (NFR), as specified in Annex IV of the Reporting Guidelines.</p>  | <p><i>Comparability</i> means that estimates of emissions and removals reported by Annex I Parties in inventories should be comparable among Annex I Parties. For this purpose, Annex I Parties should use the methodologies and formats agreed by the COP for estimating and reporting inventories. The allocation of different source/sink categories should follow the split of the <i>Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories</i>,<sup>2</sup> and the IPCC <i>Good Practice Guidance for Land Use, Land-Use Change and Forestry</i>, at the level of its summary and sectoral tables;</p>   |
| <p><b>Completeness</b> means that estimates are reported for all pollutants, all relevant source categories and all years and for the entire territorial areas of the Parties covered by the reporting requirements set forth in the provisions of the Convention and its protocols. Where numerical information on emissions under any source category is not provided, the appropriate notation key defined in Annex I of the Reporting Guidelines should be used when filling in the reporting template and their absence should be documented.</p>   | <p><i>Completeness</i> means that an inventory covers all sources and sinks, as well as all gases, included in the IPCC Guidelines as well as other existing relevant source/sink categories which are specific to individual Annex I Parties and, therefore, may not be included in the IPCC Guidelines. <b>Completeness</b> also means full geographic coverage of sources and sinks of an Annex I Party.</p>   |

|  |   |
|--|---|
|  |   |
| <p><b>Accuracy</b> means that emissions are neither systematically overestimated nor underestimated, as far as can be judged. This implies that Parties will endeavour to remove bias from the inventory estimates and minimize uncertainty.</p> | <p><i>Accuracy</i> is a relative measure of the exactness of an emission or removal estimate. Estimates should be accurate in the sense that they are systematically neither over nor under true emissions or removals, as far as can be judged, and that uncertainties are reduced as far as practicable. Appropriate methodologies should be used, in accordance with the IPCC good practice guidance, to promote <i>accuracy</i> in inventories.</p> |

List of quality records used for documentation of QA/QC activities as required by QC Plan of the GHG Division (HMS ISO document n.: ELFO 401.01):

**NELO 01****QA/QC checklist**

| T1 QC checklist  |  |  |                            |                 |
|--|--|--|----------------------------|-----------------|
| QC checklist<br>Sector:  | Y (no<br>problem<br>identified) /N<br>/n.a | Notes,<br>explanation,<br>supporting<br>documents,<br>further details... | Date<br>of<br>the<br>check | Correction date |
| Check that AD is properly recorded, archived and referenced  |  |  |                            |                 |
| Check that EF is properly recorded, archived and referenced  |  |  |                            |                 |
| Check for transcription errors   |  |  |                            |                 |
| Check units and conversion factors   |  |  |                            |                 |
| Check integrity of database files (e.g.: processing steps are correct and represented in the calculation file)                       |  |  |                            |                 |
| Check data consistency between source categories (e.g.: subtractions to avoid double counts)   |  | Other sector(s) where the data is used:                                  |                            |                 |
| Check movement of data between steps correct (e.g. calculation file consistency with CRF?)   |  |  |                            |                 |
| Check uncertainties are estimated correctly  |  |  |                            |                 |
| Undertake review of documentation (e.g. replicability is assured?)   |  |  |                            |                 |
| Check recalculations (e.g. time-series consistency is assured? comparison table created, difference is explained, included in NIR?)  |  |  |                            |                 |
| Check the completeness (e.g.: Every year, every element of the sub-source is included? Base year correct? Data gaps are documented?) |  |  |                            |                 |

|  |  |  |  |  |
|--|--|--|--|--|
| Compare estimates to previous ones (e.g.: differences from expected trends are explainable?) |  |  |  |  |
|--|--|--|--|--|

| Corrective actions and improvements - OPTIONAL                      |      |                |  |  |                 |  |
|---|------|----------------|--|--|-----------------|--|
| ERRATA (errors noticed by sectoral experts?)                        | date | Years affected | Included in "Development plan" for year... | Actions/resources/data input needed for the correction | Correction date | If it causes recalculation, it is included in NIR submission year... |
|   |      |                |  |  |                 |  |
|   |      |                |  |  |                 |  |
| Change required by review report (both UNFCCC and EU?)              | date | Years affected | Included in "Development plan" for year... | Actions/resources/data input needed for the correction | Correction date | If it causes recalculation, it is included in NIR submission year... |
|   |      |                |  |  |                 |  |
|   |      |                |  |  |                 |  |
| Other (expert peer reviews, audits, non-binding improvements, etc.) | date | Years affected | Included in "Development plan" for year... | Actions/resources/data input needed for the correction | Correction date | If it causes recalculation, it is included in NIR submission year... |
|   |      |                |  |  |                 |  |
|   |      |                |  |  |                 |  |

| Verification - OPTIONAL |    |    |          |            |       |
|-------------------------|----|----|----------|------------|-------|
|                         | AD | EF | Emission | Allocation | Other |
| NFR consistency?        |    |    |          |            |       |
| ETS consistency?        |    |    |          |            |       |
| E-PRTR consistency?     |    |    |          |            |       |
| EU preliminary GHG?     |    |    |          |            |       |
| NIRs of other countries |    |    |          |            |       |
|                         |    |    |          |            |       |

| T2 QC checklist - OPTIONAL  |  |   |                            |                    |
|---|--|---|----------------------------|--------------------|
| A2. CATEGORY-SPECIFIC QC CHECKLIST<br>(CHECKS TO BE DESIGNED FOR EACH CATEGORY)                             | Y (no<br>problem<br>identified)<br>/N /n.a | Notes,<br>explanation,<br>supporting<br>documents,<br>further<br>details... | Date<br>of<br>the<br>check | Correction<br>date |
| Category-specific checklist - Part A: Data gathering and selection  |  |   |                            |                    |
| EMISSION DATA QUALITY CHECKS  |  |   |                            |                    |
| 1. Emission comparisons: historical data for source, significant sub-source categories                      |  |   |                            |                    |
| 2. Checks against independent estimates or estimates based on alternative methods                           |  |   |                            |                    |
| 3. Reference calculations   |  |   |                            |                    |
| 4. Completeness   |  |   |                            |                    |
| 5. Other (detailed checks)  |  |   |                            |                    |
| EMISSION FACTOR QUALITY CHECK   |  |   |                            |                    |
| 6. Assess representativeness of emission factors, given national circumstances and analogous emissions data |  |   |                            |                    |
| 7. Compare to alternative factors (e.g., IPCC default, cross-country, literature)                           |  |   |                            |                    |
| 8. Search for options for more representative data  |  |   |                            |                    |
| 9. Other (detailed checks)  |  |   |                            |                    |
| ACTIVITY DATA QUALITY CHECK: NATIONAL LEVEL ACTIVITY DATA   |  |   |                            |                    |
| 10. Check historical trends   |  |   |                            |                    |
| 11. Compare multiple reference sources  |  |   |                            |                    |
| 12. Check applicability of data   |  |   |                            |                    |
| 13. Check methodology for filling in time series for data that are not available annually                   |  |   |                            |                    |
| 14. Other (detailed checks)   |  |   |                            |                    |
| ACTIVITY DATA QUALITY CHECK: SITE-SPECIFIC ACTIVITY DATA  |  |   |                            |                    |
| 15. Check for inconsistencies across sites  |  |   |                            |                    |
| 16. Compare aggregated and national data  |  |   |                            |                    |

|  |  |  |  |  |
|--|--|--|--|--|
| 17. Other (detailed checks)  |  |  |  |  |
| Category-specific checklist - Part B: Secondary data and direct emission measurement   |  |  |  |  |
| SECONDARY DATA: SAMPLE QUESTIONS REGARDING THE QUALITY OF INPUT DATA   |  |  |  |  |
| 1. Are QC activities conducted during the original preparation of the data (either as reported in published literature or as indicated by personal communications) consistent with and adequate when compared against (as a minimum), general QC activities? |  |  |  |  |
| 2. Does the statistical agency have a QA/QC plan that covers the preparation of the data?  |  |  |  |  |
| 3. For surveys, what sampling protocols were used and how recently were they reviewed?   |  |  |  |  |
| 4. For site-specific activity data, are any national or international standards applicable to the measurement of the data? If so, have they been employed?   |  |  |  |  |
| 5. Have uncertainties in the data been estimated and documented?   |  |  |  |  |
| 6. Have any limitations of the secondary data been identified and documented, such as biases or incomplete estimates? Have errors been found?  |  |  |  |  |
| 7. Have the secondary data undergone peer review and, if so, of what nature?   |  |  |  |  |
| 8. Other (detailed checks)   |  |  |  |  |
| DIRECT EMISSION MEASUREMENT: CHECKS ON PROCEDURES TO MEASURE EMISSIONS   |  |  |  |  |
| 9. Identify which variables rely on direct emission measurement  |  |  |  |  |
| 10. Check procedures used to measure emissions, including sampling procedures, equipment calibration and maintenance.  |  |  |  |  |
| 11. Identify whether standard procedures have been used, where they exist (such as IPCC methods or ISO standards).   |  |  |  |  |
| 12. Other (detailed checks)  |  |  |  |  |

## NELO 02

## Data quality check

|   |  |
|---|--|
| Kérdőív adatminőség ellenőrzéshez és bizonytalanság becsléshez/ Questionnaire for quality check of secondary data and direct measurements |  |
| Adat/ adatkör megnevezése / Revised data or dataset:  |  |
| I. Adat minőség/ Data quality   |  |
| 1.  | Ellenőrzik-e valamilyen módon a szolgáltatott adatokat?<br>Is the quality of your data checked somehow?  |
| 2.  | Verifikálják-e az adatokat?/<br>Is the data verified?  |
| 3.  | Van-e az adatszolgáltatónak olyan minőségbiztosítási rendszere, amely kiterjed az adat gyűjtésére és feldolgozására? /<br>Does the data supplier have a QA/QC procedure that covers the collection and processing of data?   |
| 4.  | Az adatgyűjtés hazai vagy nemzetközi szabvány/ jogszabály alapján történt-e? /<br>Are there any national or international rules and regulations relating to the data collection?   |
| 5.  | Az adat gyűjtéséhez létezik-e módszertani előírás / rendszeresített kérdő ív? Ha igen, milyen gyakran vizsgálják azt felül? /<br>Is there any methodological description or questionnaire relating to the data collection? If yes, how often is it revised?                                  |
| 6.  | Tapasztaltak-e valamilyen hibát az adatgyűjtéskor, feldolgozáskor?/<br>Have errors or limitations been found relating to the data collection and the data processing?  |
| II. Megbízhatóság/<br>Uncertainty   |  |
| 1.  | Történik-e számszerű becslés az adat megbízhatóságára vonatkozóan?/<br>Is there any quantitative analysis relating to the uncertainty of the data?   |
| 2.  | Végeznek-e statisztikai elemzést az adat megbízhatóságára vonatkozóan? (Konfidencia intervallum, hibahatárok)/<br>Have the data undergone on statistical analysis to estimate the uncertainty?   |
| 3.  | Ha nem, az adat bizonytalansága összehasonlítható-e/ összefüggésbe hozható-e más ismert bizonytalanságú adattal? Melyik adat az, és milyen kapcsolat ismert?/<br>If no, is there any other correlating data, which uncertainty is known? Which one and what is the correlation between them? |

|   |  |                 |
|---|--|-----------------|
| 4   | Mekkora az adatszolgáltató szerint a közölt adat megbízhatósági tartománya?<br>(Lehetőség szerint 95%-os konfidencia intervallum határait kérjük megadni.)/<br>What is the confidence range of the data in the opinion of the data supplier? (Please, provide the range from lower to upper 95% confidence limits, if it is possible.) |                 |
| A következő részt a szektorfelelős tölti ki!/ The follows are filled by the expert of the sector  |  |                 |
| A szektorfelelős szerint az adat minősége alapján a leltárkészítésre az adat felhasználható (I/N):/<br>Is the data usable for making inventory? (Y/N)                 |  |                 |
| Az adat alapértelmezett bizonytalansága:/<br>Default uncertainty of the data in accordance with the IPCC guidelines   |  |                 |
| A számított/becsült ország-specifikus érték:/<br>Calculated or estimated value of the uncertainty   |  |                 |
| Az alapértelmezett bizonytalanságtól való eltérés indoklása:/<br>Reasons for the difference between the country-specific value of the uncertainty and the default one |  |                 |
| Dátum:/<br>Date:  |  | Aláírás<br>Sign |

## NELO 03

## Development Plan (Fejlesztési terv)

|   |          |     |     |          |          |                         |
|---|----------|-----|-----|----------|----------|-------------------------|
|   |          |     |     |          | Updated: |                         |
| SHORT TERM (WITHIN ONE INVENTORY CYCLE) |          |     |     |          |          |                         |
| GENERAL                                 |          | Who |     | Deadline | Compl.   | Cause of non-compliance |
|   |          |     |     |          |          |                         |
| ENERGY                                  | Category | Who | Key | Deadline | Compl.   | Cause of non-compliance |
|   |          |     |     |          |          |                         |
| INDUSTRIAL PROCESSES                    | Category | Who | Key | Deadline | Compl.   | Cause of non-compliance |
|   |          |     |     |          |          |                         |
| AGRICULTURE                             | Category | Who | Key | Deadline | Compl.   | Cause of non-compliance |
|   |          |     |     |          |          |                         |

|                      |          |     |     |          |        |                         |
|----------------------|----------|-----|-----|----------|--------|-------------------------|
|                      |          |     |     |          |        |                         |
| LULUCF               | Category | Who | Key | Deadline | Compl. | Cause of non-compliance |
|                      |          |     |     |          |        |                         |
|                      |          |     |     |          |        |                         |
| WASTE                | Category | Who | Key | Deadline | Compl. | Cause of non-compliance |
|                      |          |     |     |          |        |                         |
|                      |          |     |     |          |        |                         |
| LONG TERM            |          |     |     |          |        |                         |
| GENERAL              | Category | Who | Key | Timeline | Status | Remarks                 |
|                      |          |     |     |          |        |                         |
|                      |          |     |     |          |        |                         |
| ENERGY               | Category | Who | Key | Timeline | Status | Remarks                 |
|                      |          |     |     |          |        |                         |
|                      |          |     |     |          |        |                         |
| INDUSTRIAL PROCESSES | Category | Who | Key | Timeline | Status | Remarks                 |
|                      |          |     |     |          |        |                         |
|                      |          |     |     |          |        |                         |
| AGRICULTURE          | Category | Who | Key | Timeline | Status | Remarks                 |
|                      |          |     |     |          |        |                         |
|                      |          |     |     |          |        |                         |
| LULUCF               | Category | Who | Key | Timeline | Status | Remarks                 |
|                      |          |     |     |          |        |                         |
|                      |          |     |     |          |        |                         |
| WASTE                | Category | Who | Key | Timeline | Status | Remarks                 |
|                      |          |     |     |          |        |                         |
|                      |          |     |     |          |        |                         |

**NELO 04****Responsibilities**

| Task                               | Name | Date |
|------------------------------------|------|------|
| Compiler                           |      |      |
| QA/QC                              |      |      |
| Archiving                          |      |      |
| Sector experts                     |      |      |
| Energy                             |      |      |
| Industry, solvents                 |      |      |
| Agriculture                        |      |      |
| LULUCF                             |      |      |
| Waste                              |      |      |
| Uncertainty, key category analysis |      |      |

**NELO 05****Data source logbook**

| Data | Email/Letter<br><i>/Internet</i> | Institution/<br>Database,<br>stb. | Officer | Contact<br>details/<br>exact source<br>of<br>downloaded<br>data | Date of<br>enquiry | Date of<br>receipt/<br><i>download</i> | Reg.<br>n. | Name of file<br>received/<br><i>downloaded</i> |
|------|----------------------------------|-----------------------------------|---------|---|--------------------|--|------------|--|
|      |                                  |                                   |         |   |                    |  |            |  |
|      |                                  |                                   |         |   |                    |  |            |  |

**NELO 06 Uncertainty** – As Tables in Annex 2

**NELO 07 Key category analysis** – As Tables in Annex 1

**NELO 08 QA Activities logbook**

| Document name                    | Document sent to (name of the person/authority/institution/committee, etc.) | Comments arrived / No comments | Action needed / No action needed |
|----------------------------------|---|--------------------------------|----------------------------------|
| NIR 201x XXXMONTH submission     |   |                                |                                  |
| NIR 201x XXXMONTH submission ES. |   |                                |                                  |
|                                  |   |                                |                                  |
| IIR 201x submission              |   |                                |                                  |
| IIR 201x submission ES.          |   |                                |                                  |

## ANNEX 6 Responses to the review of the 2021 inventory submission

| CRF category / issue  | Review recommendation   | Review report / paragraph | MS response / status of implementation   | Chapter/section in the NIR |
|---|---|---------------------------|--|----------------------------|
| 1.A.2.g Other (manufacturing industries and construction) – all fuels – CO <sub>2</sub> , CH <sub>4</sub> and N <sub>2</sub> O 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.   | E.3                       | All autoproducers are allocated to the relevant end-use category in the period 1998-2020, i.e. also in the latest inventory year, and to the extent possible also for earlier years.   |                            |
| 1.A.4.b Residential – liquid fuels – CO <sub>2</sub> , CH <sub>4</sub> and N <sub>2</sub> O (E.9, 2020) (E.11, 2019) Accuracy                               | Review the assumption that the number of households in Hungary is constant across the time series. If this assumption cannot be justified, either revise the estimates or the assumption based on which the emissions are estimated to be constant, and provide the result of the key category analysis for this subcategory that can justify the proposed approach.  | E.4                       | We do not plan to change our approach to use constant AD in the time series. As the used AD are based on an order of magnitude estimate, we do not believe that introducing any trend would increase the accuracy of the calculated emissions. Our reasons are described in the NIR. | 3.2.8.2                    |
| 1.B.2 Oil, natural gas and other emissions from energy production – liquid and gaseous fuels – CO <sub>2</sub> and CH <sub>4</sub> (E.13, 2020) Consistency | Identify the most appropriate method for ensuring a smooth transition in the time series between the default EFs in the 2006 IPCC Guidelines (vol. 2, chap. 4.2.2.3) for developing countries and economies in transition applied in the early 1990s and the IPCC default EFs for developed countries applied from 1995 onward (e.g. by taking into account the splicing techniques from the 2006 IPCC Guidelines (vol. 1, chap. 5.3.3)). | E.5                       | It is planned to address this issue together with the application of the 2019 Refinement.  |                            |
| 2.A.1 Cement production – CO <sub>2</sub> (I.11, 2020) Transparency   | Include information on the type of carbonate inputs at the aggregated level in the NIR.   | I.1                       | This issue is planned to be addressed in the 2023 submission, data need to be collected.   | Chapter 4.3.1.3.           |

| CRF category / issue   | Review recommendation  | Review report / paragraph | MS response / status of implementation  | Chapter/section in the NIR                         |
|--|--|---------------------------|---|--|
| 2.A.4 Other process uses of carbonates – CO2<br>(I.3, 2020) (I.12, 2019)<br>Consistency  | 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.  | I.3                       | This issue is planned to be addressed in the 2023 submission.   | Chapter 4.3.4.6.                                   |
| 3. General (agriculture) – CH4 and N2O<br>(A.10, 2020)<br>Convention reporting adherence | Correct the editorial issues and errors in measurement units in section 5.1 (reference to category 3.E), figures 5.1.3–5.1.4 (colour coding), figure 5.2.2 (unit of measurement for milk production) and tables 5.2.1 (unit of measurement for population) and 5.3.16–5.3.18 (unit of measurement for volatile solids (kg DM/head/day)) of the NIR.  | A.1                       | The reference to 3.E has been corrected in chapter 5.1. Tables 5.3.17 and 5.3.18 of the 2021 submission have been revised, merged into one table and the editorial issue is corrected. The merged table is presented as table 5.3.18 in the 2022 submission.                                    | HU's NIR 2022, Chapter 5.1 and Section 5.3.2.3.1.1 |
| 3.B Manure management – CH4 and N2O<br>(A.6, 2020) (A.10, 2019)<br>Transparency          | 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.3                       | Resolved. The use of "NO" is clarified in this submission. (The manure used in the biogas plant is already reported in this submission, starting from 2004, when the first biogas plant using animal manure was established in Hungary. For the years before 2004 we report "NO" for digester.) | HU's NIR 2022, Section 5.3.2.2.1                   |
| 3.B Manure management – CH4 and N2O<br>(A.11, 2020)<br>Accuracy                          | (a) Finalize a procedure for reporting manure processed in anaerobic digesters, estimate the corresponding CH4 and N2O emissions using the most appropriate methods from the 2006 IPCC Guidelines (vol. 4, chap. 10) (if necessary applying the splicing techniques set out in vol. 1, chap. 5, to ensure time-series consistency) and replace “IE” in CRF tables 3.B(a)s2 and 3.B(b) with the appropriate figures when data on biodigesters become available. | A.4                       | Resolved. Emissions from anaerobic digested cattle, swine and poultry manure have been reported in this submission.   | HU's NIR 2022, Section 5.3.2.2.1                   |

| CRF category / issue  | Review recommendation  | Review report / paragraph | MS response / status of implementation   | Chapter/section in the NIR  |
|---|--|---------------------------|--|---|
| 4. General (LULUCF) – CO2 (L.3, 2020) (L.11, 2019) Accuracy     | Review the calculation which results in zero emissions/removals for C 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.1                       | The activity data was corrected where necessary, and the text in NIR has been improved   | 6.7.2.3 and 6.8.2   |
| 4. General (LULUCF) – CO2 (L.4, 2020) (L.18, 2019) Accuracy     | 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.  | L.2                       | We believe that the formula we use to calculate the area of forest land converted to other land use categories (i.e., FLL) is correct since it assumes a 20-year-long transition period which means that a given “piece” of deforested areas leaves FLL category 20 years after entering it and in this way each piece of deforested area is regarded as FLL for exactly 20 years. Subtracting cumulative areas instead of annual ones would mean that we subtract annual areas not only once but several times. | We provide an extended version of NIR Table 6.5.2; see also the text in NIR section 6.5.6 |
| 4. General (LULUCF) (L.16, 2020) Convention reporting adherence | Conduct a quantitative assessment of the emissions and removals for each LULUCF category for at least the base year and the latest inventory year and a trend uncertainty assessment between these two years using at least approach 1, and report the results within the uncertainties discussion for each land-use category in the NIR as well as in NIR table A2-2. | L.3                       | The development of the uncertainty analysis for the forestry sector is in progress, Hungary can provide updated (and extended) results later. Concerning the non-forest categories, we report the uncertainty analysis for the first time in section 6.11.   | NIR 6.11.   |
| Land representation – CO2, CH4 and N2O (L.18, 2020)             | Correct the data to ensure that the total areas reported in CRF tables 4.A, 4.B, 4.C, 4.D and 4.E match those reported in CRF table 4.1, performing QA/QC checks to ensure correctness of the reported data.   | L.4                       | We have found the source of these minor errors and most of them have been corrected in this submission. The  | 6.3   |

| CRF category / issue  | Review recommendation  | Review report / paragraph | MS response / status of implementation   | Chapter/section in the NIR |
|---|--|---------------------------|--|----------------------------|
| Convention reporting adherence  |  |                           | remaining will be corrected in the next submission.  |                            |
| Land representation – CO <sub>2</sub> , CH <sub>4</sub> and N <sub>2</sub> O (L.19, 2020)<br>Accuracy | Develop a consistent time series for all IPCC land-use categories for 1966 onward, on the basis of available national data and following the 2006 IPCC Guidelines to ensure time-series consistency; adopt a 20-year transition period, as per the 2006 IPCC Guidelines, for all IPCC categories; and report GHG emissions and removals on the basis of the recalculated time series of land-use category areas. | L.5                       | Since the ERT of 2021 accepted our approach, we continue to apply a 20-year-long transition period (which means that Hungary reports zero carbon stock changes for the years before 1985), so there is no need to recalculate the time series. The text of the NIR is modified accordingly. We also note here that this also means that, as reported earlier, the emission estimates for the years 1985-2004 might include bias, therefore, we continue to use the shading of the bars for these years on the respective charts. | NIR 6.1.1. and 6.3.2       |
| 4.A Forest land – CO <sub>2</sub> (L.7, 2020) (L.14, 2019)<br>Accuracy                                | 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.  | L.6                       | See updated NIR sections 6.5.1 and 6.5.2.  | NIR 6.5.1. and 6.5.2       |
| 4.A Forest land – CO <sub>2</sub> (L.8, 2020) (L.14, 2019)<br>Accuracy                                | Recalculate, for the entire time series, C stock changes in all pools under forest land remaining forest land (4.A.1) and land converted to forest land (4.A.2).   | L.7                       | See updated NIR sections 6.5.1 and 6.5.2.  | NIR 6.5.1. and 6.5.2       |
| 4.A.1 Forest land remaining forest land – CO <sub>2</sub> (L.9, 2020) (L.15,                          | Change the notation key from “NO” to “NE” for the dead organic matter and mineral soils pools for forest land remaining forest land in CRF table 4.A.  | L.8                       | The notation key was changed from “NO” to “NE” for the DOM (DW and LI) and mineral soils pools for forest land remaining forest land in CRF table 4.A  |                            |

| CRF category / issue  | Review recommendation  | Review report / paragraph | MS response / status of implementation   | Chapter/section in the NIR |
|---|--|---------------------------|--|----------------------------|
| 2019)<br>Convention reporting adherence   |  |                           |  |                            |
| 4.A.2 Land converted to forest land – CO2 (L.10, 2020) (L.17, 2019)<br>Convention reporting adherence | Correct the figures for land converted to forest land in NIR tables 6.5.3 and 6.5.11 so that the figures are consistent in tables 6.5.3 and 6.5.11 and CRF table 4.A for category 4.A.2 and address the problem that occurred in the underlying database for inventory year 2017 (i.e. which resulted in some figures for 2017 in NIR table 6.5.11 showing a slight increase from the figures in the previous year).   | L.9                       | The figures in tables 6.5.3 and 6.5.11 and CRF table 4.A for category 4.A.2 are now consistent and address the problem that occurred in the underlying database for inventory year 2017 (i.e. which resulted in some figures for 2017 in NIR table 6.5.11 showing a slight increase from the figures in the previous year).  | 6.5.2; 6.5.5.2.1           |
| 4.C.1 Grassland remaining grassland – CO2 (L.20, 2020)<br>Transparency                                | Explain in the NIR how the distribution of the area of various grassland subcategories is assessed and used as a basis to determine changes in management practices.   | L.10                      | Hungary corrected the necessary AD and updated the emission and removal estimates and the NIR (Table 6.7.3, section 6.7.2).  | 6.7.2                      |
| 4.D.1 Wetlands remaining wetlands – CO2 (L.13, 2020) (L.5, 2019) (L.9, 2017)<br>Accuracy              | If the country-specific C stock changes are estimated for 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 soils C stock changes under wetlands remaining wetlands with grass vegetation, examine the ways to report C 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. | L.11                      | Following the recommendation by the ARR, Hungary reports on carbon stock changes in lands under peat extraction (i.e., 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 soils carbon stock changes under wetlands remaining wetlands with grass vegetation) under “other wetlands” with a notification in the documentation box, together with a clear explanation in the section 6.8.2 of the NIR, where in the CRF | 6.8.2                      |

| CRF category / issue   | Review recommendation   | Review report / paragraph | MS response / status of implementation   | Chapter/section in the NIR |
|--|---|---------------------------|--|----------------------------|
|  |   |                           | tables the emissions from those lands are reported.  |                            |
| 4(II)<br>Emissions/removals from drainage and rewetting and other management of organic/mineral soils – CO2<br>(L.14, 2020) (L.7, 2019) (L.13, 2017)<br>Accuracy | Correct the reporting of CO2 emissions from peat extraction in CRF table 4(II) and provide the correct value or a notation key.   | L.12                      | The source of the erroneous high emission factor value was identified, the correct value from Hahn (1984) was implemented, and the entire time series of emissions was recalculated. | 6.8.2.1                    |
| 4(II)<br>Emissions/removals from drainage and rewetting and other management of organic/mineral soils – CO2<br>(L.15, 2020) (L.16, 2019)<br>Accuracy             | Provide justification for the high value used to convert from wet peat to air-dry peat (0.8 t/m <sup>3</sup> ) and, if the value cannot be justified, try to obtain a more accurate value and recalculate the emissions from off-site emissions from managed peatlands accordingly. | L.13                      | The source of the erroneous high emission factor value was identified, the correct value from Hahn (1984) was implemented, and the entire time series of emissions was recalculated. | 6.8.2.1                    |
| 5.D Wastewater treatment and discharge – CH4<br>(W.8, 2020) (W.16, 2019)<br>Transparency   | Include in the NIR the tables that indicate the main AD and parameters used in the calculations for CH4 emissions from both domestic and industrial wastewater treatment.   | W.4                       | The text in the NIR has been extended. Clarification on annual data on the number of dwellings connected to public sewerage systems is provided in the NIR.                          | 7.5.2                      |

| CRF category / issue  | Review recommendation   | Review report / paragraph | MS response / status of implementation  | Chapter/section in the NIR |
|---|---|---------------------------|---|----------------------------|
| 5.D.2 Industrial wastewater – CH4 (W.12, 2020) (W.18, 2019)<br>Transparency | Provide an explanation of the EFs for industrial wastewater treatment, including a reason for adopting the methane correction factors applied, in the NIR.  | W.5                       | Explanation is provided in the NIR.   | 7.5.2                      |
| FM – CO2, CH4 and N2O (KL.4, 2020)<br>Transparency                          | Correct the values for the FM areas reported in NIR table 6.5.1 for 2008–2018, and enhance the transparency of the NIR by including a detailed section on “found forest” as applied to KP-LULUCF reporting, reporting a time series of the areas, as well as the parameters and C factors used in the estimation process. | KL.3                      | We corrected and extended the table 6.5.1. We also provided detailed information about “found forest”.  | NIR 6.5.2                  |
| FM – CO2 (KL.7, 2020)<br>KP reporting adherence                             | Enhance the transparency of the NIR by including transparent and verifiable information demonstrating that the litter pool is not a source, following the guidance provided in the Kyoto Protocol Supplement (section 2.3.1).   | KL.5                      | We extended the demonstration for soil and DOM pool in the NIR section 6.5.5.2.2. and 6.5.4.2.2., but as we write in the section 11.3.1.2, Hungary does not have and won't have in the near future reliable monitoring for litter. Therefore, we must assume that like the deadwood and soil pools the litter pool is not a source. | 11.3.1.2 and 6.5.5.2.2     |
| FM – CO2 (KL.8, 2020)<br>KP reporting adherence                             | Enhance the transparency of the NIR by including transparent and verifiable information demonstrating that the soils pool is not a net source on the basis of the ongoing analysis of the Hungarian Soil Protection and Monitoring System measurements.   | KL.6                      | See updated NIR sections 6.4.1 and 6.5.4.2.3.   | NIR 6.4.1. and 6.5.4.2.3   |
| KP-LULUCF supplementary information,<br>Transparency                        | The ERT recommends that the Party include information in NIR section 6.5.4.2.4 showing how emissions and removals resulting from changes in the HWP pool accounted for do not include imported HWP.   | G.5                       | We will provide the required information on calculation method of the HWP pool.   | 11.5.2.5                   |

| CRF category / issue  | Review recommendation  | Review report / paragraph | MS response / status of implementation  | Chapter/section in the NIR |
|---|--|---------------------------|---|----------------------------|
| Inventory management  | The ERT encourages the Party to compile a national inventory improvement plan and report information on the status of planned improvements and the timeline for their expected implementation, to the extent possible, as part of its inventory management.                                    | G.6                       | A formal improvement plan as an ISO document is under development.  |                            |
| AD Transparency   | The ERT recommends that the Party enhance the transparency of the NIR by including information in section 1.4 on key data sources and the existing data collection mechanisms used, and documenting how additional data not covered by any formal data-sourcing agreements are sourced.        | G.7                       | Relevant description has been added to the NIR.   | 1.4                        |
| QA/QC and verification, Convention reporting adherence  | The ERT recommends that Hungary improve consistency between the CRF tables and the NIR by correcting the areas for improvement identified and enhance its QA/QC procedures and describe any changes made thereto in the NIR.   | G.8                       | We'll try to avoid inconsistencies between the CRF and the NIR.   |                            |
| Key category analysis, KP reporting adherence   | The ERT recommends that Hungary improve consistency between the CRF tables and the NIR by providing the consistent information in the NIR and the CRF tables.  | G.9                       | We'll ensure consistency for the May submission.  |                            |
| 1.A.3.e.i Pipeline transport – Gaseous fuels – CO <sub>2</sub> , CH <sub>4</sub> , N <sub>2</sub> O, Transparency | The ERT recommends that the Party provide information on the sources of AD used across the times series, including the detailed information on the new extrapolation method for AD and an explanation for the significant increase in emissions from pipeline transport between 1990 and 2010. | E.6                       | The required information is provided in the NIR.  | 3.2.7.2                    |
| 1.B.2.c Venting and flaring – CH <sub>4</sub> , Transparency  | The ERT recommends that the Party include in the NIR the reason for reporting emissions for category 1.B.2.c.1.ii as "IE" in CRF table 1.B.2 and explain where these emissions are allocated.  | E.7                       | For this submission, leakage and venting emissions from gas transmission and storage are reported separately on the basis of TABLE 4A.2.7 of the 2019 Refinement. |                            |

| CRF category / issue  | Review recommendation   | Review report / paragraph | MS response / status of implementation                        | Chapter/section in the NIR       |
|---|---|---------------------------|---|----------------------------------|
| 2.A.4 Other process uses of carbonates – CO <sub>2</sub> , Consistency          | The ERT recommends that the Party assess the time-series consistency of IEFs for CO <sub>2</sub> emissions from 2.A.4.a ceramics and revise the estimates for the years prior to 2005.  | I.8                       | This issue is planned to be addressed in the 2023 submission. | Chapter 4.3.4.6.                 |
| 2.B.1 Ammonia production –CO <sub>2</sub> , Transparency                        | The ERT recommends that the Party include in its NIR a description of the method for calculating the country-specific CCF applied for 1985–2006.  | I.9                       | It will be provided in the March submission of NIR.           | Chapter 4.4.1.2. first paragraph |
| 2.F.1 Refrigeration and air conditioning – HFCs, Convention reporting adherence | The ERT recommends that the Party correct the lifetime for subcategory 2.F.1.c to 20 years in its NIR.  | I.10                      | It has been corrected for the current submission of the NIR.  | Chapter 4.9.2.2., Table 4.9.5.   |
| 2.F.1 Refrigeration and air conditioning – HFC-32, Accuracy                     | The ERT recommends that the Party include information in the NIR on the method for calculating emissions from mobile air conditioning on trams and correct the emission estimates for 2008–2019.  | I.11                      | Explanation is provided in the latest submission of the NIR.  | Chapter 4.9.2.4.                 |
| 2.F.1 Refrigeration and air conditioning – HFCs, Transparency                   | The ERT recommends that the Party explain in its NIR the methodology used to calculate the recovery efficiencies across the time series.  | I.12                      | Explanation is provided in the latest submission of the NIR.  | Chapter 4.9.2.2.                 |
| 2.F.1 Refrigeration and air conditioning – HFCs, PFCs, Transparency             | The ERT recommends that the Party explain in the NIR the source of its country-specific parameters, particularly those that are outside of the IPCC default ranges, e.g. including documented expert judgements.  | I.13                      | Explanation is provided in the latest submission of the NIR.  | Chapter 4.9.2.2.                 |
| 2.F.1 Refrigeration and air conditioning – HFCs, Transparency                   | The ERT recommends that the Party provide in its NIR further information on the methodology used for calculating the refrigerant charge of mobile air-conditioning units in cars and include a transparent presentation of recalculations including all changes made, in line with paragraphs 43–45 of the UNFCCC reporting guidelines. | I.14                      | Explanation is provided in the latest submission of the NIR.  | Chapter 4.9.2.4.                 |

| CRF category / issue  | Review recommendation  | Review report / paragraph | MS response / status of implementation  | Chapter/section in the NIR    |
|---|--|---------------------------|---|-------------------------------|
| 3. General (agriculture)  | The ERT encourages the Party to address these typographical errors within the NIR.   | A.6                       | The typos listed in the recommendation have been corrected for this submission.   | HU's NIR, 2022, Chapter 5.    |
| 3.A.3 Swine – CH4 and N2O, Transparency                                       | The ERT recommends that the Party explain the reasons for the lower CH4 IEF for swine for 1985–2000 compared with the IPCC default values.   | A.7                       | The requested explanation have been provided in the 2022 submission of HU's NIR.  | HU's NIR, 2022, Chapter 5.3.4 |
| 4.A.1 Forest land remaining forest land – CO2, Transparency                   | The ERT recommends that Hungary include in NIR section 6.5.2 the additional information provided during the review on the application of a stock change method for forest land. The ERT also encourages Hungary to use NFI data with longer survey cycles, which may be more reliable than those resulting from the annual update via yield tables.  | L.15                      | In section 6.5.1.1, we provide information on our forest-related databases as well as on the question of change our data source to the Hungarian National Forest Inventory.   | NIR 6.5.11                    |
| 4.A.1 Forest land remaining forest land – CO2, Convention reporting adherence | The ERT recommends that the Party correct the figures in table 6.5.5 and ensure consistency between the NIR and CRF table 4.A.   | L.16                      | We have corrected the necessary values and table 6.5.5 (P. 379 NIR 2021) and CRF Table 4A include the same values now.  | 6.5.4.1                       |
| 4.B.1 Cropland remaining cropland – CO2, Consistency                          | The ERT recommends that Hungary continue to estimate C stock changes in mineral soils for category 4.B.1, include information on its progress in the next annual submission. Furthermore, since the method used by the Party for estimating C stock changes in mineral pools may have greater applicability across the LULUCF sector, the ERT further recommends that Hungary report the revised estimates in CRF tables 4.A–4.E and describe the methodological improvements in the respective chapters in NIR. | L.17                      | Hungary continued its efforts to increase the accuracy of the carbon stock change estimates for mineral soils. The description of the estimation process for soil carbon stock changes in NIR section 6.4.1 is updated so that, to increase transparency, the SOC used to estimate these changes for the different land-use transition categories are now included in Table 6.4.2 of the NIR. The revision of the SOC values and the associated SOC-change values due to land-use change is | 6.4.1, 6.6.2.3.               |

| CRF category / issue  | Review recommendation   | Review report / paragraph | MS response / status of implementation  | Chapter/section in the NIR |
|---|---|---------------------------|---|----------------------------|
|   |   |                           | under way and is planned to be implemented in the next submission. See also NIR section 6.6.2.3.                          |                            |
| 4(II) Emissions/removals from drainage and rewetting and other management of organic/mineral soils – CO <sub>2</sub> , Transparency | The ERT recommends that the Party include in the next annual submission the information provided during the review explaining the fluctuation of the CO <sub>2</sub> IEF per area of drained organic soils, as well as any other evidence it may have in support of its high CO <sub>2</sub> IEF per area of drained organic soils.   | L.18                      | See comments for L.12 and L.13 above; and section 6.8.2.1 of the NIR.   | 6.8.2.1                    |
| 4(V) Biomass burning – CO <sub>2</sub> , N <sub>2</sub> O, CH <sub>4</sub> , Transparency   | The ERT recommends that the Party include in the next annual submission the information provided during the review on the reporting of AD and emissions from wildfires on forest land, cropland and grassland remaining in the same categories for the years prior to 1997, as well as any other evidence it may have in support of the assumptions made when extrapolating emissions from wildfires for the years prior to 1997. | L.19                      | Hungary improved the text of section 6.4.3 of the NIR to increase transparency.   | 6.4.3                      |
| 5.A Solid waste disposal on land – CH <sub>4</sub> , Convention reporting adherence   | The ERT recommends that Hungary correct the information regarding categorization number W091 in its NIR.  | W.6                       | Information has been corrected for the current submission of the NIR.   | 7.2.2                      |
| 5.A Solid waste disposal on land – CH <sub>4</sub> , Transparency   | The ERT recommends that the Party transparently provide in its NIR information on the recalculations performed and the reasons for them.  | W.7                       | There was no recalculation this time.   |                            |
| 5.A.1.a Anaerobic – CH <sub>4</sub> , Transparency  | The ERT recommends that Hungary explain in the NIR and CRF table 9 why “NE” is reported for the amount of CH <sub>4</sub> flared for subcategory 5.A.1.a and confirm the assumption that CH <sub>4</sub> flaring did not occur before 2001,   | W.8                       | It is most possible that flaring activity did not occur before 2001 as landfill gas production also started only in 2005. | 7.2.2                      |

| CRF category / issue  | Review recommendation   | Review report / paragraph | MS response / status of implementation   | Chapter/section in the NIR |
|---|---|---------------------------|--|----------------------------|
|   | for example by contacting the relevant national data providers or stakeholders.   |                           | Therefore, we have changed the notation key to "NO".   |                            |
| 5.B.1 Composting – CH4, Comparability                               | The ERT recommends that the Party report "NO" for the amount of CH4 flared if no flaring activity occurs, or, if it continues to use "NE", provide a clear explanation for this in the NIR and CRF table 9.   | W.9                       | As we believe, flaring is not occurring in composting plants, we have replaced the notation key with NO.   | 7.3.1                      |
| 5.B.2 Anaerobic digestion at biogas facilities – CH4, Comparability | The ERT recommends that the Party report "NO" for the amount of CH4 flared no flaring activity occurs, or, if it continues to use "NE", provide a clear explanation for this in the NIR and CRF table 9.  | W.10                      | Explanation on the use of the notation key "NE" is provided in the CRF table 9. Explanation in the NIR will be provided in the next submission. And we might also consider replacing NE with NO. |                            |
| 5.D.1 Domestic wastewater – CH4, Comparability                      | The ERT recommends that the Party report "NO" for the amount of CH4 flared for 1990–2000 and explain its use of "NE" for 2001–2003 in its NIR and CRF table 9.  | W.11                      | For 1990–2000 "NO" is reported. For 2001–2003 explanation on the use of "NE" is provided in CRF table 9 and in the NIR.  | 7.5.2                      |
| 5.D.2 Industrial wastewater – CH4, N2O, Comparability               | The ERT recommends that the Party report the amount of CH4 for energy recovery as "IE" instead of "NE" and provide an explanation for the use of "IE" for the amount of CH4 for energy recovery and "NE" for sludge removed, N in effluent and the amount of CH4 flared and N2O emissions in the NIR and CRF table 9. | W.12                      | The amount of CH4 for energy recovery is reported as "IE". Explanation on notation keys is provided in the CRF tables and in the NIR.  | 7.5.2                      |
| AR – CO2, KP reporting adherence                                    | The ERT recommends that the Party either maintain the notation key and provide more specific, country-based evidence supporting the assumption that the pool is not a source, as referred to in the NIR (section 6.5.4.2.2 and 11.3.1.2), or alternatively provide estimates.   | KL.7                      | We now use the correct notation key and updated the demonstration that the pool is not a source.   | 6.5.4.2.2,<br>11.3.1.2     |
| FM – CO2, KP reporting adherence                                    | The ERT recommends that the Party provide information on the main factors responsible for a higher sink during the commitment period, as compared with the FMRL, in accordance with the good practice outline in the 2013   | KL.8                      | We provide the required information in the NIR.  | 11.5.2                     |

| CRF category / issue                           | Review recommendation   | Review report / paragraph | MS response / status of implementation   | Chapter/section in the NIR |
|--|---|---------------------------|--|----------------------------|
|  | IPCC Kyoto Protocol Supplement and include in the next annual submission detailed information, following the points expressed during the review, on the main factors generating the accounting quantity to show whether the accounting quantity is consistent with those factors.                 |                           |  |                            |
| FM – CO <sub>2</sub> , KP reporting adherence  | The ERT recommends that the Party report “NE” for net C stock changes in mineral soils and provide additional country-based evidence that the pool is not a source, as referred to in the NIR (section 11.3.1.2, page 514 referring to an unpublished study), or alternatively provide estimates. | KL.9                      | We now apply "NE" for net C stock changes in mineral soils and improve the demonstration that this pool is not a source. | 11.3.1.2                   |
| FM – CO <sub>2</sub> , Transparency            | The ERT recommends that the Party correct the figures in NIR table 11.6 and ensure consistency between the NIR and CRF table 4(KP-I)B.1 regarding AD on FM across the time series.  | KL.10                     | We provide an extended version of Table 11.6.  | 11.2.2                     |
| FM – CO <sub>2</sub> , Transparency            | The ERT recommends that the Party provide in NIR section 6.1.4 detailed information regarding the new calculation system put in place by Hungary since the 2020 submission.   | KL.11                     | See updated NIR section 6.1.4.   | 6.1.4                      |
| FM – CO <sub>2</sub> , KP reporting adherence  | The ERT recommends that subject to the solution implemented pursuant to #L.6 above, the Party ensure full consistency of the treatment of carbon stock in FF between Convention Reporting, KP-LULUCF reporting and accounting based on projected FMRL.  | KL.12                     | See updated NIR section 6.5.2.   | NIR 6.5.2                  |
| HWP – CO <sub>2</sub> , KP reporting adherence | The ERT recommends that the Party correct the figures on C stock changes in the HWP pool in the NIR and ensure full consistency between NIR table 6.5.1.7 and CRF table 4(KP-I)C.   | KL.13                     | We now include the corrected Table 6.5.17 in the NIR.  | 6.5.9                      |

| CRF category / issue   | Review recommendation   | Review report / paragraph | MS response / status of implementation  | Chapter/section in the NIR |
|--|---|---------------------------|---|----------------------------|
| N <sub>2</sub> O emissions from N mineralization/immobilization due to carbon loss/gain associated with land-use conversion and management change in mineral soils – N <sub>2</sub> O, Comparability | The ERT recommends that Hungary report “NO” for C stock changes resulting from N <sub>2</sub> O emissions from N mineralization/immobilization due to carbon loss/gain associated with land-use conversions and management change in mineral soils, and provide additional evidence that the soils pool is not a source, complementing the information in NIR section 11.3.1.2, or alternatively provide estimates. | KL.14                     | We changed the notation key from “NE” to “NO” in the CRF table 4(KP-II)3 under FM for carbon stock change resulting from N <sub>2</sub> O emission. | N/A                        |

## ANNEX 7 Summary of the results of the QA activities carried out by the EU

In the following tables, results of the quality checks and reviews of national emission inventories under the Monitoring Mechanism Regulation are summarized for the last years.

| Sector                                      | Detail   | Review Year | Status              |
|---|--|-------------|---------------------|
| 5A Solid waste disposal                     | HUN : for 2016 CH4 emissions from 5A decreased of 137 kt CO2eq (-4,6%) between the previous and the latest submission which is higher than the 2016 threshold of significance. An short explanation is provided ("Change in AD (revised extrapolation")in annex III for Article 8 of the MMR BUT the 2016 values in the MMR recalculation file are different than the values reported in the CRF table | 2019        | closed (Resolved)   |
| 1A1a Public electricity and heat production | 1A1a Solid CO2 IEF   | 2019        | closed (Resolved)   |
| 1A2c Chemicals                              | Identical values for 2016 and 2017 under subcategory 1.A.2.c   | 2019        | closed (Resolved)   |
| 1AB Reference approach                      | Inconsistency found for carbon emission factor in the reference approach   | 2019        | closed (Resolved)   |
| 2F1 Refrigeration and air conditioning      | 2.F.1 increase of emissions in 2017  | 2019        | closed (Resolved)   |
| 1AB Reference approach                      | Inconsistency found for carbon emission factor in the reference approach   | 2019        | closed (Resolved)   |
| 0 Cross cutting                             | Information on MMR IR Art. 8-10 (Annex III-V) is missing from your submission.   | 2019        | closed (Resolved)   |
| 4 Land use, land-use change and forestry    | Variation of total country area reported under the Convention  | 2019        | closed (Resolved)   |
| 4E Settlements                              | Lack of information on activity data for the category 4.E.1  | 2019        | closed (Resolved)   |
| 7 KP LULUCF                                 | Lack of information in the accounting table for non-elected KP activities in the base year.  | 2019        | closed (Resolved)   |
| 7 KP LULUCF                                 | Carbon stock changes in HWP under Deforestation  | 2019        | closed (Resolved)   |
| 4 Land use, land-use change and forestry    | 2018 Reference number: HU-4-2018-0001.<br>For the year 2017, inconsistencies between final area of Cropland, Grassland and Settlements in CRF table 4.1 and total area in CRF table 4.B, 4.C and 4.D   | 2019        | closed (Unresolved) |
| 7 KP LULUCF                                 | Harvest from remaining lands reported in the cell D24 of the CRF table 4(KP-I)C  | 2019        | closed (Resolved)   |
| 1A3b Road transportation                    | Calculation of fossil fuels from biofuels  | 2019        | open                |
| 2C1 Iron and steel production               | Hungary has fluctuating IEFs for 2C1d, sinter production.  | 2019        | closed (Resolved)   |
| 2B1 Ammonia production                      | 2.B.1 Ammonia production – CO2. UNFCCC 2017 Review – allocation of emissions from hydrogen production used for the production of ammonia   | 2019        | closed (Resolved)   |
| 2A3 Glass production                        | 2.A.3 Glass production – CO2 UNFCCC 2017 Review: country-specific method is used to estimate CO2 emissions from glass production   | 2019        | closed (Resolved)   |

| Sector                                      | Detail   | Review Year | Status                   |
|---|--|-------------|--------------------------|
| 7 KP LULUCF                                 | Inconsistency between total areas at the end of the current inventory year in CRF table NIR-2 and this reported in tables 4(KP-I)A.1, 4(KP-I)A.2 and 4(KP-I)B.1  | 2018        | closed (Unresolved)      |
| 4 Land use, land-use change and forestry    | Inconsistency between total land use areas reported in CRF table 4.1 and those reported in tables 4A – 4F<br>Ref. HU-4-2017-0002   | 2018        | closed (Unresolved)      |
| 2A1 Cement production                       | 2.A.1 Cement production – CO2 IEF for 2005 used to extrapolate for earlier years   | 2018        | closed (Resolved)        |
| 1A2a Iron and steel                         | 1A2a - solid fuels CO2 IEF 1998-2016 is much lower than for previous years.  | 2018        | closed (Resolved)        |
| 3D1 Direct N2O emissions from managed soils | 3.D.1.1 - N input from application of inorganic fertilizers to cropland and grassland (AD, Direct N2O Emissions From Managed Soils): Irregularities in the time series have been identified. Years flagged: 1990 | 2018        | closed (Resolved)        |
| 7 KP LULUCF                                 | Blank cells for information on base year of non-elected activities in CRF table Accounting   | 2018        | closed (Partly resolved) |
| 7 KP LULUCF                                 | Blank cells under the KP CRF tables 4 (KP-I) C and 4 (KP-II)4  | 2018        | closed (Resolved)        |
| 2C1 Iron and steel production               | 2017 reference number: HU-2C1-2017-0003. Under 2.C.1, recovery of CO2 from pig iron production is reported.  | 2018        | closed (Resolved)        |
| 7 KP LULUCF                                 | Inconsistency between total areas at the end of current inventory years and total areas at the end of the previous inventory year reported in CRF table NIR-2  | 2018        | closed (Resolved)        |
| 4 Land use, land-use change and forestry    | Inconsistencies between total country area at the end of the current inventory year reported in table NIR-2 and final area reported in table 4.1   | 2018        | closed (Resolved)        |
| 4B2 Land converted to cropland              | Potential error in areas for subcategory 4B 2.1 in 1996, 1997, 1999 and 2000   | 2018        | closed (Resolved)        |
| 5B Biological treatment of solid waste      | N2O emissions from 5.B.2 anaerobic digestion are reported as NE.   | 2018        | closed (Resolved)        |
| 1AB Reference approach                      | Intransparent reporting in CRF table 1A(d)   | 2018        | closed (Resolved)        |
| 5B Biological treatment of solid waste      | Activity data used to calculate CH4 and N2O emissions from 5.B biological treatment of waste lower than reported activity data under Eurostat.   | 2018        | closed (Resolved)        |
| 2G Other product manufacture and use        | Activities and N2O emissions from category "2G3a Medical Applications" are reported as IE.   | 2018        | closed (Resolved)        |
| 2F1 Refrigeration and air conditioning      | 2.F.1 Completeness: Data for 2014?   | 2018        | closed (Resolved)        |
| 2F1 Refrigeration and air conditioning      | 2.F.1 Decrease of emissions in 2016  | 2018        | closed (Resolved)        |

| Sector  | Detail   | Review Year | Status                   |
|---|--|-------------|--------------------------|
| 3D1 Direct N2O emissions from managed soils   | 3.D.1.2.a (Animal Manure Applied to Soils): The amount of N applied with animal manure in 3.D.1.2.a is large as compared to N managed in MMS minus N lost as NH3+NOx or leaching (inverse ratio val:0.9). Years: all | 2017        | closed (Partly resolved) |
| 3B Manure management                          | 3.B.1.4.7 - Methane conversion factor (MCF): Irregularities in the time series have been identified. Years flagged: 2014   | 2017        | closed (Partly resolved) |
| 1B1 Fugitive emissions from solid fuels       | Implied Emission factor for CH4 emissions in 1.B.1.a.1.i (Underground mining - Mining activities)  | 2017        | closed (Resolved)        |
| 1B1 Fugitive emissions from solid fuels       | Implied Emission factor for CH4 emissions in 1.B.1.a.1.ii (Underground mining - post mining activities)  | 2017        | closed (Resolved)        |
| 3H Urea application                           | 3.G.2 - Amount applied (AD): Irregularities in the time series have been identified. Years flagged: 2009   | 2017        | closed (Resolved)        |
| 3D2 Indirect N2O emissions from managed soils | Recalculations in category 3.D.2.1 indirect N2O emissions from atmospheric deposition  | 2017        | closed (Resolved)        |
| 3D1 Direct N2O emissions from managed soils   | 3.D.1.5 - N in mineral soils that is mineralized in association with loss of soil C (AD): Irregularities in the time series have been identified. Years flagged: 2005 2012   | 2017        | closed (Resolved)        |
| 3A Enteric fermentation                       | 3.A.4.6 - Population (POP): Irregularities in the time series have been identified. Years flagged: 2010  | 2017        | closed (Resolved)        |
| 3A Enteric fermentation                       | 3.A.4.1 - Population (POP): Irregularities in the time series have been identified. Years flagged: 1995 2010   | 2017        | closed (Resolved)        |
| 0 Cross cutting                               | CRF Tables have not been submitted for the 15 March submission.  | 2017        | closed (Resolved)        |
| 4B2 Land converted to cropland                | Empty cells in CRF table 4(B)  | 2017        | closed (Partly resolved) |
| 4 Land use, land-use change and forestry      | Potential typo error in reported areas   | 2017        | closed (Partly resolved) |
| 4 Land use, land-use change and forestry      | Blank cells under the CRF tables   | 2017        | closed (Partly resolved) |
| 4 Land use, land-use change and forestry      | Inconsistency between total land use areas reported in CRF table 4.1 and those reported in tables 4B, 4C and 4E.   | 2017        | closed (Partly resolved) |
| 1A3 Transport                                 | Consumption and emissions from lubricants used in 2-stroke engines   | 2017        | closed (Resolved)        |
| 1A3b Road transportation                      | Increase in the value of CH4 IEF   | 2017        | closed (Partly resolved) |
| 1A3a Domestic aviation                        | Recalculation and recommendation from TERT on military aviation  | 2017        | closed (Resolved)        |
| 1A3b Road transportation                      | Recalculation of emissions   | 2017        | closed (Resolved)        |
| 1B1 Fugitive emissions from solid fuels       | Implied Emission factor for CH4 emissions in 1.B.1.a.1.iii (Underground mining - Abandoned coal mines)   | 2017        | closed (Resolved)        |

| Sector                                      | Detail   | Review Year | Status                   |
|---|--|-------------|--------------------------|
| 1A1a Public electricity and heat production | The IEF decreased by 18% compared to 2014  | 2017        | closed (Resolved)        |
| 2C1 Iron and steel production               | The implied emission factor for CO2 emissions from 2C1d sinter shows a substantial increase.   | 2017        | closed (Resolved)        |
| 5D Wastewater treatment and discharge       | Recalculation of N2O emissions from domestic wastewater handling (5.D.1).  | 2017        | closed (Resolved)        |
| 2F4 Aerosols                                | 2.F.4 Aerosols (Other): Invalid product life factor  | 2017        | closed (Partly resolved) |
| 2F1 Refrigeration and air conditioning      | 2.F.1.a Manufacture of domestic refrigeration equipment with R134a in 2015?  | 2017        | closed (Resolved)        |
| 5A Solid waste disposal                     | Recalculation of CH4 emissions from 5.A.1.   | 2017        | closed (Resolved)        |
| 7 KP LULUCF                                 | Inconsistency between total areas at the end of current inventory years and total areas at the end of the previous inventory year reported in CRF table NIR 2    | 2017        | closed (Resolved)        |
| 4 Land use, land-use change and forestry    | Inconsistencies between total country area at the end of the current inventory year reported in table NIR2 and final area reported in table 4.1                  | 2017        | closed (Resolved)        |
| 7 KP LULUCF                                 | Inconsistency between total areas at the end of the current inventory year in CRF table NIR 2 and this reported in table 4(KP-I)A.1                              | 2017        | closed (Resolved)        |
| 2F1 Refrigeration and air conditioning      | 2.F.1 Disposal loss factor values  | 2017        | closed (Resolved)        |
| 2C1 Iron and steel production               | Under 2.C.1, recovery of CO2 from pig iron production is reported  | 2017        | closed (Partly resolved) |
| 2C1 Iron and steel production               | The change in emissions (total of 1A2a+2C1) deviates from the change in pig iron production.   | 2017        | closed (Resolved)        |
| 7 KP LULUCF                                 | HWP originating from the deforestation events should be reported using instantaneous oxidation following paragraph 2 (g) (v) of the Annex II of Decision 2/CMP.8 | 2017        | closed (Resolved)        |

## ANNEX 8 List of abbreviations and units

### A8.1 Abbreviations

|          |  |
|----------|--|
| AED      | anode effect duration in minutes   |
| AEF      | number of anode effects per cellday  |
| Aggr.    | aggregate  |
| BOF      | basic oxygen furnace   |
| CE       | current efficiency   |
| CLRTAP   | Convention on Long-range Transboundary Air Pollution   |
| CORINAIR | CORe INventory of AIR emissions  |
| CKD      | cement kiln dust   |
| CRF      | common reporting format  |
| EAF      | electric arc furnace   |
| EF       | emission factor  |
| ERT      | expert review team   |
| EU       | European Union   |
| ETS      | Emission Trading Scheme  |
| GDP      | gross domestic product   |
| GHG      | greenhouse gas   |
| HCSO     | Hungarian Central Statistical Office   |
| HKVSZ    | Association of Cooling and Air Conditioning Businesses<br>(Hűtő- és Klimatechnikai Vállalkozások Szövetsége) |
| HMBC     | Hungarian Monitoring Body for Certification  |
| IEF      | implied emission factor  |
| IPCC     | Intergovernmental Panel on Climate Change  |
| KTI      | Institute for Transport Sciences<br>(Közlekedéstudományi Intézet Kht.)                                       |
| LULUCF   | land use, land-use change and forestry   |
| LPG      | liquified petroleum gas  |
| MVM Rt.  | Hungarian Power Companies Ltd.   |
| NCV      | net calorific value  |
| NFI      | National Forest Inventory  |

|        |   |
|--------|---|
| OHF    | open hearth furnace                                   |
| QA     | quality assurance                                     |
| QC     | quality control                                       |
| UNFCCC | United Nations Framework Convention on Climate Change |

## A8.2 Chemical formulas

|                               |                                       |
|-------------------------------|---------------------------------------|
| C                             | carbon                                |
| CH <sub>4</sub>               | methane                               |
| CO                            | carbon monoxide                       |
| CO <sub>2</sub>               | carbon dioxide                        |
| HFCs                          | hydrofluorocarbons                    |
| NMVOC                         | non-methane volatile organic compound |
| N <sub>2</sub> O              | nitrous oxide                         |
| NO <sub>x</sub>               | nitrogen oxide                        |
| PFCs                          | perfluorocarbons                      |
| SF <sub>6</sub>               | sulphur hexafluoride                  |
| SO <sub>2</sub>               | sulphur dioxide                       |
| CaCO <sub>3</sub>             | calcium carbonate, limestone          |
| MgCO <sub>3</sub>             | magnesium carbonate                   |
| CaO                           | calcium oxide, quicklime              |
| Ca(OH) <sub>2</sub>           | slack lime                            |
| NH <sub>3</sub>               | ammonia                               |
| HNO <sub>3</sub>              | nitric acid                           |
| CF <sub>4</sub>               | tetrafluoromethane                    |
| C <sub>2</sub> F <sub>6</sub> | hexafluoroethane                      |

## A8.3 Units

|    |                                |
|----|--------------------------------|
| PJ | petajoule (10 <sup>15</sup> J) |
| TJ | terajoule (10 <sup>12</sup> J) |
| Gg | gigagram (10 <sup>9</sup> g)   |
| kt | kilotonnes (1000 t)            |