

# Analysis of Member States' 2020 GHG projections

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## **Abstract**

This report provides a summary of the quality analysis of the EU Member States' submission under Article 14 of the Monitoring Mechanism Regulation (MMR) in 2020. Under this obligation EU Member States have to submit updated GHG projections and related information biennially – in so called 'mandatory reporting years'. However, in 'non-mandatory' reporting years Member States shall communicate any substantial changes to the information previously submitted. The reported information undergoes several phases of quality assurance and quality control (QA/QC) checks consisting of checks on timeliness, accuracy, completeness, consistency and comparability. To ensure consistency, the 'non-mandatory submissions' are also quality checked in line with the standard QA/QC procedure including the provision of a feedback to the Member States on the quality of their data. Details on the underlying QA/QC procedure are described in ETC/CME Eionet Report 2019/7 "MMR Article 14 QA/QC procedure for national and Union GHG projections (2019)", available here: <http://cdr.eionet.europa.eu/help/mmr>.

## Abbreviations

CDR	Central Data Repository
CRF	Common Reporting Format
DG CLIMA	Directorate-General for Climate Action
EC	European Commission
EEA	European Environment Agency
ES/ESD/ESR	Effort Sharing (Decision/Regulation)
ETC/CME	European Topic Centre on Climate Change Mitigation and Energy
ETS	Emission Trading System
EU	European Union
Gov.Reg.	Governance of the Energy Union and Climate Action
FRL	Forest Reference Level
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GWP	Global Warming Potential
IPCC	Intergovernmental Panel on Climate Change
IPPU	Industrial Processes and Product Use
LULUCF	Land Use, Land-Use Change and Forestry
MMR	Monitoring Mechanism Regulation
MS	Member State
NECP	National Energy and Climate Plan
NIR	National Inventory Report
PaMs	Policies and Measures
QA	Quality Assurance
QC	Quality Control
RY	Reference Year
SWD	Commission Staff Working Document
TCCCA	Transparency, Consistency, Completeness, Comparability, Accuracy
UNFCCC	United Nations Framework Convention on Climate Change
WAM	With Additional Measures
WEM	With Existing Measures
WOM	Without Measures

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## 1. Summary of the results from the 2020 quality control procedure

In the non-mandatory 2020 reporting cycle 13 Member States (MS) including Austria, Belgium, Cyprus, Denmark, Estonia, Greece, Hungary, Ireland, Latvia, Lithuania, Luxembourg, Poland and Slovenia provided submissions on GHG projections. The final dataset from this year's cycle is available here: [Member States' greenhouse gas \(GHG\) emission projections — European Environment Agency \(europa.eu\)](https://europea.eu).

During the communication process the European Topic Centre on Climate Change Mitigation and Energy (ETC/CME) sent out 215 questions to these MS. The number of questions per MS was ranging between 13 and 22 questions (vs. 13-42 in 2019). Regarding the checks, most questions were referring to Completeness checks (81 questions), followed by Consistency checks (32 questions) and ETS/ES checks (22 questions). The responsiveness of MS and the collaboration with them allowed the ETC/CME to provide a timely delivery of the updated EU projections data set in 2020.

In 2020, three Member States (Austria, Estonia and Ireland) reported earlier or on time and 10 Member States (Belgium, Cyprus, Denmark, Greece, Hungary, Latvia, Lithuania, Poland and Slovenia) reported after the reporting deadline. Four Member States (Belgium, Greece, Hungary and Latvia) provided a resubmission during the QA/QC procedure with an average time between initial and final submission of 14 days. The last submission was provided by early July, exactly 115 days after the deadline (Denmark).

The majority of MS reported a lot of blank and/or zero values. Only three MS (Austria, Latvia and Estonia) filled out all cells of the template with either a number or a notation key. Due to the circumstance of a non-mandatory reporting year, countries focused more on reporting of updated projection numbers than other reporting obligations, therefore the level of completeness was lower than in normal reporting years. The completeness of voluntary information reported was mixed with only Estonia providing indicators. On the other hand, 11 out of 13 countries submitted a scenario with additional measures (WAM), which can be attributed to the National Energy and Climate Plan (NECP) compilation process. Slovenia also reported a scenario without measures (WOM).

Regarding the completeness of the time series two MS (Belgium and Denmark) did not report all mandatory years of the time series from 2015 to 2040, three MS (Denmark, Greece and Hungary) also did not report intermediate years. Missing values for the mandatory time series were gap-filled by the ETC/CME according to the QA procedure. Typical gap-filling and correction activities of the ETC/CME in 2020 were: calculation of intermediate years, gap-filling of missing information (LULUCF, Memo items Int. Navigation and Aviation, missing years), and deletion of historical figures if no projections are available and related corrections to avoid sum errors. Gap-filling procedures were applied to seven MS because of reporting of historical values (of the GHG inventory) when projections are not available for the sector (typical included elsewhere). This causes jumps in the EU aggregated dataset and therefore need to be corrected.

In 2020, seven Member States chose 2017 as reference year, followed by 2016 (four countries) and 2018 (two countries). The deviation of the reference year of the EU aggregated projections (2017) compared to the final EU inventory (submission 2020) is similar to the 2019 dataset. There are quite large deviations for the LULUCF sector, which could be explained by the high inter-annual variations.

In terms of ETS/ES reporting, for all 13 MS, difference between projection reference year and historical ETS split is less than 1%. The largest difference between projection reference year and historical ETS split is -0.76%. ETS and ES emissions for the projection reference year are generally well aligned with historic inventory data.

Sum errors have been a major problem in past reporting cycles; therefore the EEA has implemented automated CDR sum checks in 2017. In 2020, the overall sum check triggered only four questions to the Member States. The overall outliers check resulted in a total of four questions to the Member States. The recalculation checks highlighted that all countries have submitted (slightly) changed data. For eight MS the differences were larger than +/-4% compared to previous submissions and in most cases the recalculations are related to the update of assumptions, new models or new policies.

Parameter tables were submitted by nine Member States (Belgium, Cyprus, Estonia, Greece, Hungary, Ireland, Latvia, Poland and Slovenia). Generally, parameters were submitted in the correct units. In addition, some Member States use a modified version of parameters (e.g. population in private households rather than total population) as driver in their modelling, resulting in a deviation the expected historic parameter values. These issues were solved however, through communication with the Member States. In 2020, with the exception of a few Member States, recommended and suggested parameters are not used as drivers for national projections and it appears that Member States use their own parameter sets.

## 2. Introduction

### 2.1. The Union System for projections

The Union system for policies and measures and for projections (Figure 1) represents the institutional, legal and procedural arrangements established for reporting on policies and measures and projections of anthropogenic emissions by sources and removals by sinks of greenhouse gases not controlled by the Montreal Protocol.

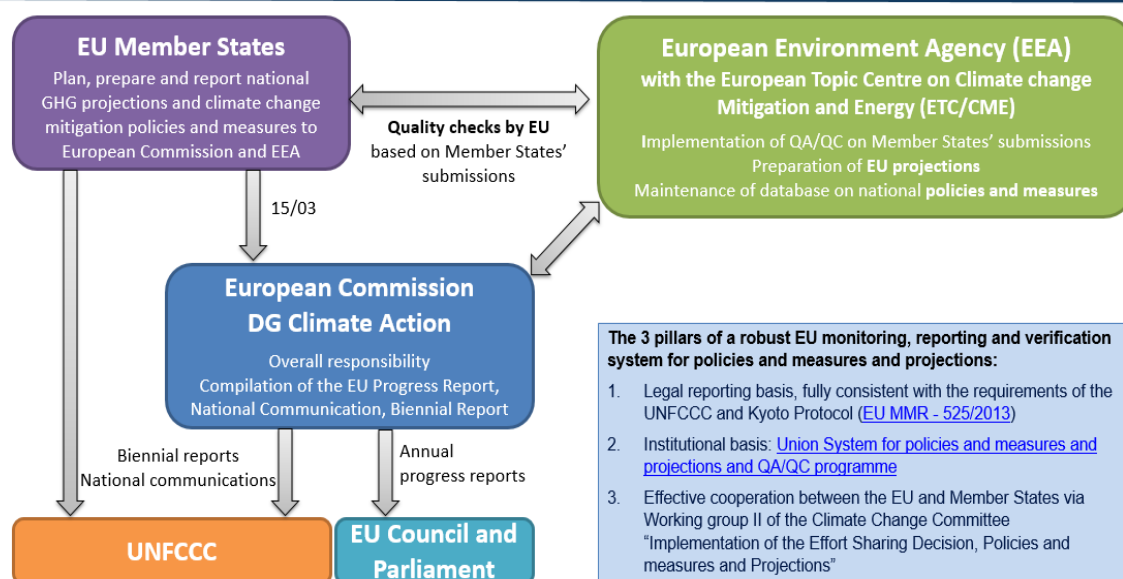
Overall responsibility for the Union system for policies and measures and projections of anthropogenic greenhouse gas emissions by sources and removals by sinks rests with the European Commission, more specifically its Directorate-General for Climate Action (DG CLIMA). The outcome of the system provides data for the evaluation of progress towards EU and international commitments, as per Article 21 of MMR and 4 and 12 of the UNFCCC and 3 of the Kyoto Protocol.

In accordance with Article 26(1) of Regulation (EU) No 525/2013, the Climate Change Committee established under Article 3 of Regulation (EU) No 182/2011 assists the Commission. The Committee is composed of representatives of the Member States and chaired by a representative of the Commission.

Working Group 2 'Implementation of the Effort Sharing Decision, Policies and Measures and Projections' was established under the Climate Change Committee as a regular body for exchange of information on projections and policies and measures between the Commission, the EEA and the Member States (EC, 2015).

Figure 1 Union System for Policies and Measures and Projections

### *The Union's system for policies and measures and projections*



Source: (EC, 2015)

### 2.2. Reporting requirements

Article 14 of the MMR and Article 23 and Annex XII of its Implementing Regulation set out the details for Member States to provide information on national GHG projections. Every two years starting from 2015 MS have to report GHG projections and accompanying information to the European Union.



The main mandatory elements of this reporting obligation are:

- GHG projections reported by gas (Total GHGs, Total ETS GHGs, Total ES GHGs, CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O, HFC, PFC, SF<sub>6</sub>, NF<sub>3</sub>)
- For the reference year, 2015, 2020, 2025, 2030 and 2035
- Split by sectors in line with the common reporting format (CRF) format
- Sectoral split into ETS and ES emissions
- Report a with existing measures scenario (WEM)
- Provision of a model factsheet
- Provision of a sensitivity analysis of the total GHG
- Provision of a description of methodologies, models and underlying assumptions
- Provision of input and/or output parameters
- the impact of policies and measures identified pursuant to Article 13 indicators, if used

Where available, voluntary reporting items are:

- With additional measures scenario (WAM)
- Without measures scenario (WOM)
- Intermediate years

### 2.3. Scope of the QA/QC

The European Commission (DG CLIMA) is responsible for coordinating QA/QC activities on GHG projections at EU level and to ensure that the objectives of the QA/QC programme are fulfilled (see ETC/CME Eionet Report 2019/7). The European Environment Agency (EEA) is responsible for the annual implementation of the QA/QC procedures and is assisted by the ETC/CME.

The Union projections are compiled as the sum of all EU Member States projections, therefore it is very important that the Member States data meet certain quality objectives. The data quality objectives pursued by this QA/QC procedure are based on the core principles of data quality: transparency, completeness, consistency, comparability and accuracy. These quality principles have been initially defined by the IPCC to characterise the quality of historical emission inventories. They have a slightly different scope in the context of emission projections.

**Transparency:** means to ensure that transparent information is provided on underlying assumptions, methodologies used and sensitivity analysis performed in MS' national projections to enable further assessment by users of the reported information and for the purpose of the compilation of Union GHG projections.

**Completeness:** means to ensure that projections are reported by MS for all years, sources and sinks, gases and sectors as required under the MMR so that projections are available for the entire EU area to enable further assessment by users of the reported information and for the purpose of the Union GHG projections compilation (see also reporting requirements in Chapter 2.2)

**Consistency:** means to ensure that projections are reported by MS for all years, sources and sinks, gases and sectors as required under the MMR so that projections are available for the entire EU area to enable further assessment by users of the reported information and for the purpose of the Union GHG projections compilation.

**Comparability:** means to ensure that national estimates of projected emissions and removals reported by MS are comparable across MS. The allocation of different sources and sink categories by

gas follows the split in accordance with the MMR and recommendations by the Commission with regard to projections horizon, reference year (starting year), ETS/ES split, EU policies and measures to be taken into account and harmonised key assumptions are followed as appropriate.

**Accuracy:** means that projected estimates are accurate in the sense that they are plausible and neither systematically over- nor underestimated as far as can be judged and that uncertainties inherent to the methodology and input data are reduced as far as practicable. In addition, it should be ensured that an accurate aggregation of sectors for national GHG projections and an accurate aggregation of MS for the Union GHG projections are provided.

An additional quality principle used in this context is **timeliness** and it means that national GHG projections are submitted by 15 March for each reporting year in accordance with the MMR. Further details on the QA/QC procedure are provided in the ETC/CME Eionet Report 2019/7.

In order to support the EU MS with the submission procedure, the EEA and the ETC/CME prepare and provide guidance documents such as a checklist for quality control, guidance for reporting parameters, guidance for reporting the ETS/ES split, etc. The documents can be found under: <http://cdr.eionet.europa.eu/help/mmr>

The following table (Table 1) provides an overview of the sectors and included in the EU aggregated dataset:

**Table 1 Sector codes and sector names of the EU aggregated projections dataset**

Sector code	Sector name	Sector code	Sector name
1	Energy	1.B	Fugitive emissions from fuels
1.A.1	Energy industries	1.C	CO <sub>2</sub> transport and storage
1.A.2	Manufacturing industries and construction	2	Industrial processes and product use
1.A.3	Transport	3	Agriculture
1.A.3.a	Domestic aviation	4	Land use, land use change and forestry (LULUCF)
1.A.3.b	Road transportation	5	Waste
1.A.3.c	Railways	M.IB aviation	Memo item: International bunkers aviation
1.A.3.d	Domestic navigation	M.IB navigation	Memo item: International bunkers navigation
1.A.3.e	Other transportation	M.IB aviation in the EU ETS	Memo item: International aviation in the EU ETS
1.A.4	Other sectors	Total	Total w.out LULUCF
1.A.5	Other		

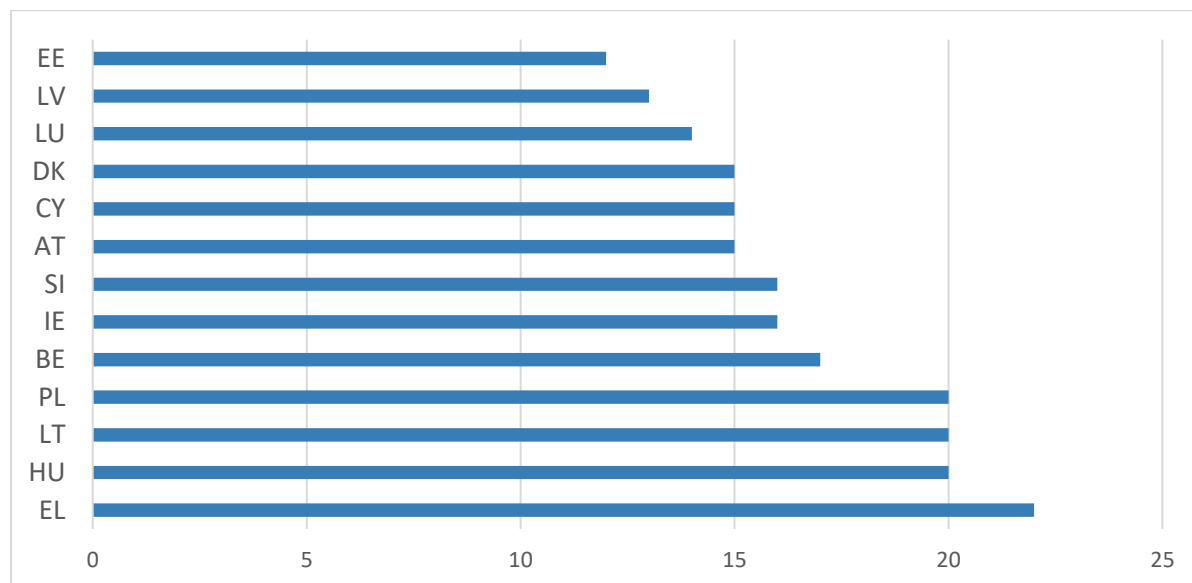
### 3. Results from the quality checking procedure

In 2020, 13 Member States provided non-mandatory submissions of updated GHG projections. Most new submissions included a WAM scenario.

#### 3.1. Communication with Member States

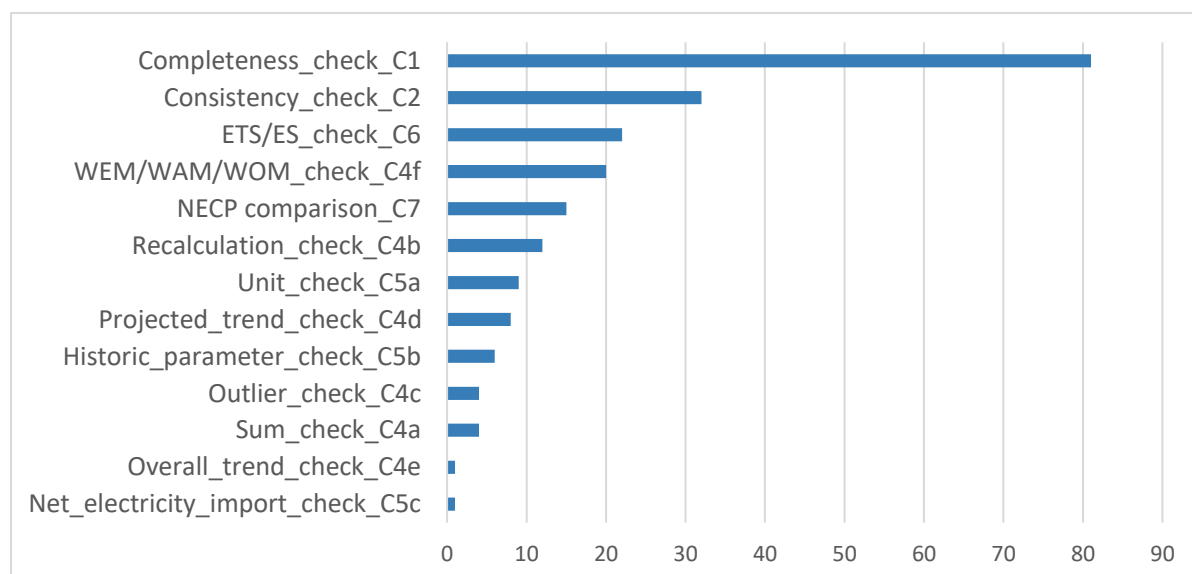
In total 215 questions were identified which needed further clarification with the MS. The number of questions per MS was ranging between 13 and 22 questions (Figure 2).

Figure 2 Number of questions per Member State



Regarding the checks, most questions were referring to Completeness (C1) check, followed by Consistency (C2) check and ETS/ES (C6) check (Figure 3). This is mostly related to the fact that 2020 was a non-mandatory reporting year and the MS focussed on the reporting of the projections data only.

Figure 3 Number of questions per QA/QC check

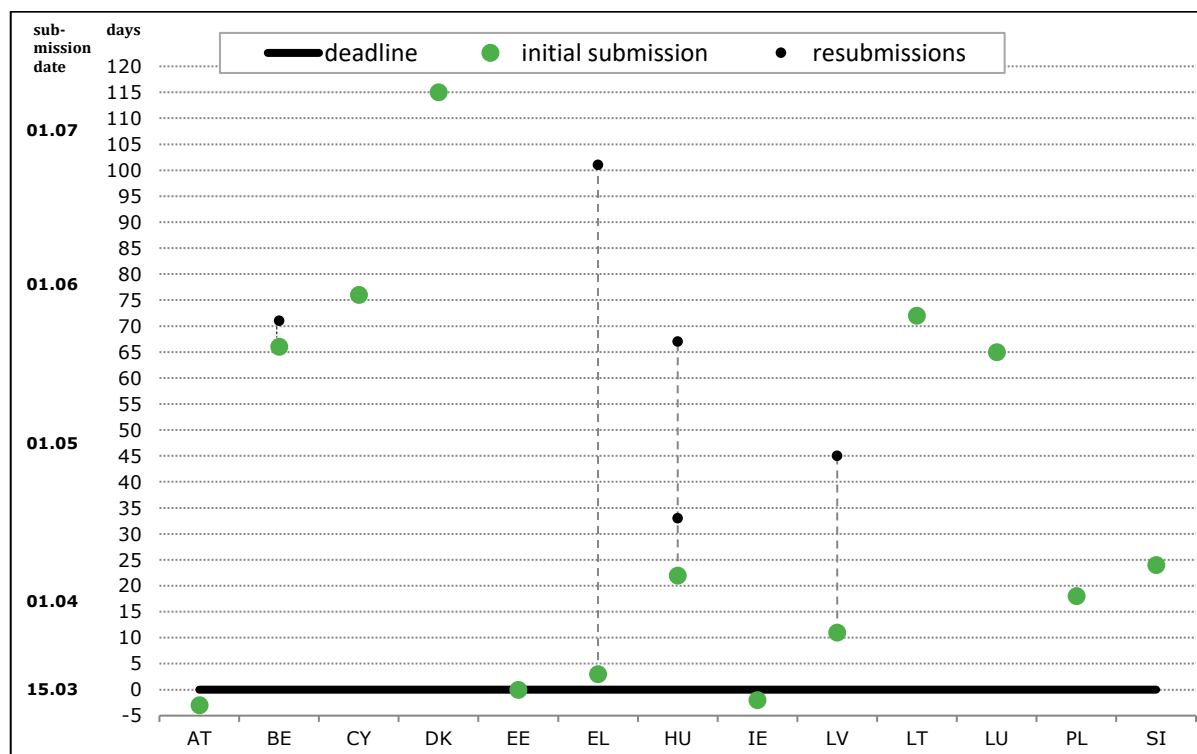


## 3.2 Completeness and Timeliness

### 3.2.1. Date of submission and resubmissions

Only three MS reported before March 15 which is usually the official reporting deadline for this reporting obligation. As 2020 was a non-mandatory reporting year, most countries submitted after this date. Four MS provided resubmissions as a result of the QA/QC. Hungary provided a summary report in a separate envelope and one resubmission of the projections data. Therefore, in total three submissions are shown in the Figure 4 below.

Figure 4 Timeliness of submissions in 2020 by EU Member States



### 3.2.2. General completeness of submissions

Table 2 below gives an overview of general completeness of MS submissions in this cycle. Mandatory information such as complete sector split at least for the categories at aggregated level as outlined in Table 1, GHG split and WEM scenario was provided by all received submissions. Out of the 13 countries which provided projections, four MS did not submit provision of parameters, 10 MS did not submit a sensitivity analysis, four MS did not submit the model factsheet and six MS did not submit a report, but three countries referred to their NECP or Biennial Report during the QA/QC. Due to the circumstance of a non-mandatory reporting year, countries focused more on reporting of updated projection numbers than other reporting obligations.

Completeness of voluntary information reported stays mixed with only EE reporting on provision of indicators. On the other hand, 11 out of 13 countries submitted a WAM scenario, which can be attributed to the NECP compilation process. Four countries which did not provide a WAM scenario in 2019, reported a WAM in 2020 (AT, LU, PL and SI). SI also reported a WOM scenario.

It is important to note that this Table 2 presents the results after the QA/QC procedure which means that this includes information only for the final submissions.

Table 2 Overview of completeness

	Updated projections	Required sector split	Required GHG split	Scenarios			Provision of parameters	Sensitivity analysis	Model factsheet/ description	Report	Provision of indicators	Reporting of the year 2040
				WEM	WAM	WOM						
AT												
BE												
BG	No projections reported in 2020											
HR	No projections reported in 2020											
CY												
CZ	No projections reported in 2020											
DK												
EE												
FI	No projections reported in 2020											
FR	No projections reported in 2020											
DE	No projections reported in 2020											
EL												
HU												
IE												
IT	No projections reported in 2020											
LV												
LT												
LU												
MT	No projections reported in 2020											
NL	No projections reported in 2020											
PL												
PT	No projections reported in 2020											
RO	No projections reported in 2020											
SK	No projections reported in 2020											
SI												
ES	No projections reported in 2020											
SE	No projections reported in 2020											
UK	No projections reported in 2020											

Legend:	
	Yes, reported
	Not reported (mandatory reporting items)
	Not reported (voluntary reporting items)

Table 3 summarizes the completeness of mandatory emissions data by gas and Table 4 by sectors. It counts the amount of numerical values (excluding notation keys and empty cells) provided by the MS for all applicable sectors/gases combinations. Completeness is generally high for all GHGs. The majority of missing data is linked to a lack of reported notation keys, with either zero or blank values provided, rather than missing projection estimates (HU, BE, CY).

**Table 3 Completeness of reported emissions data per gas for the year 2020**

	CO2	N2O	CH4	HFC	NF3	PFC	SF6	Total ES GHGs	Total ETS GHGs	Total GHGs
AT	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
BE	62.3%	62.7%	64.2%	63.3%	66.7%	63.0%	62.5%	66.7%	54.4%	66.7%
CY	47.5%	47.5%	43.5%	40.0%	40.0%	22.2%	50.0%	50.0%	100.0%	100.0%
DK	98.4%	98.3%	98.4%	90.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
EE	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
EL	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
HU	74.3%	68.4%	67.7%	40.0%	0.0%	44.4%	50.0%	84.3%	58.3%	77.8%
IE	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
LV	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
LT	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
LU	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
PL	98.6%	99.7%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
SI	98.4%	98.3%	98.4%	90.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

**Table 4 Completeness of reported emissions data per sector for the year 2020**

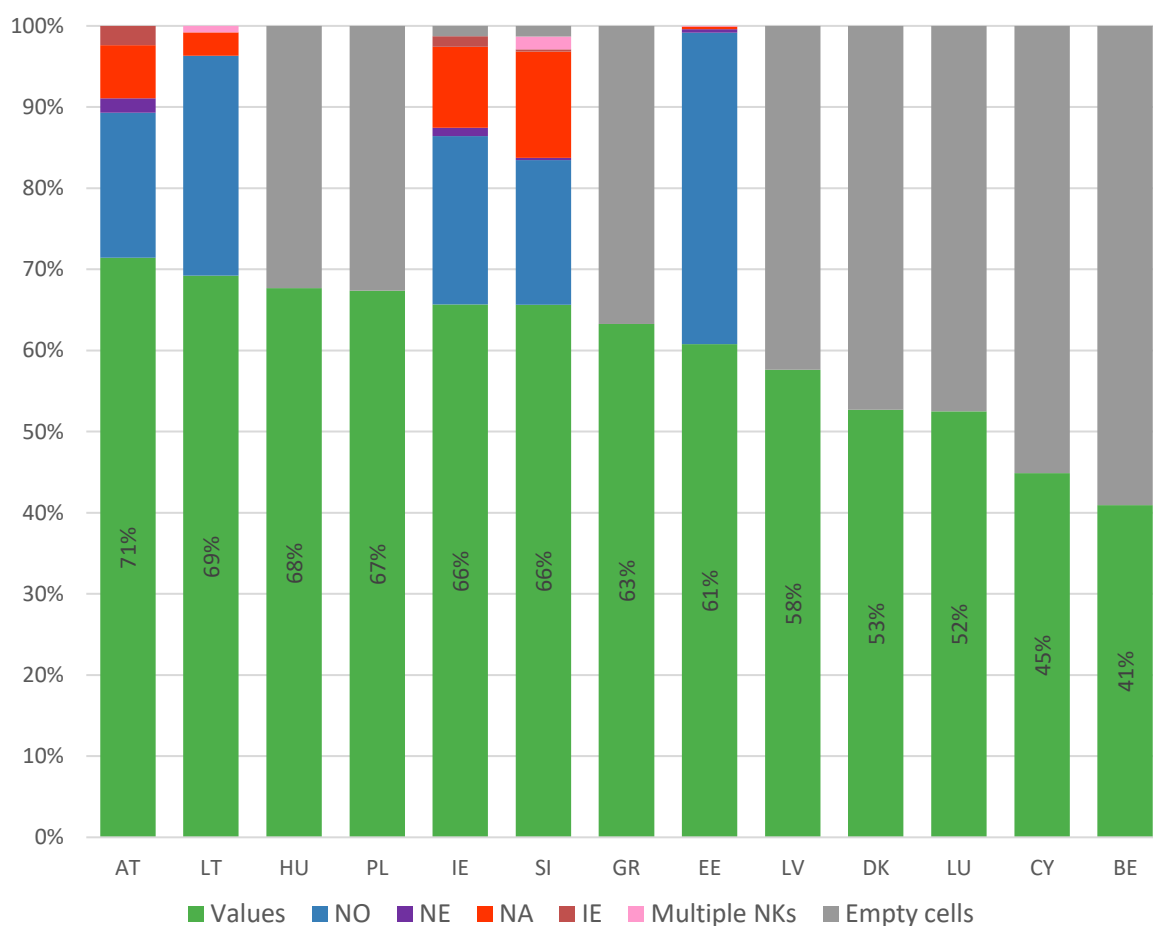
	Energy	IPPU	Agriculture	LULUCF	Waste	Total w. LULUCF	Total w.out LULUCF	Memo
AT	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
BE	81.8%	56.3%	52.3%	61.1%	79.2%	100.0%	100.0%	33.3%
CY	56.8%	30.5%	52.3%	5.6%	59.2%	80.0%	80.0%	33.3%
DK*	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
EE	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
EL	81.5%	52.2%	61.4%	22.2%	79.2%	70.0%	90.0%	33.3%
HU	86.8%	47.8%	70.5%	66.7%	79.2%	90.0%	90.0%	22.2%
IE	100.0%	100.0%	100.0%	86.1%	100.0%	100.0%	100.0%	100.0%
LV	65.2%	27.3%	52.3%	77.8%	75.8%	80.0%	80.0%	66.7%
LT	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
LU	66.7%	37.1%	43.2%	55.6%	59.2%	70.0%	80.0%	24.4%
PL	77.9%	52.1%	61.4%	66.7%	79.2%	90.0%	90.0%	44.4%
SI	99.2%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	88.9%

\*Note: DK did not provide data for the year 2020 due to the unexpected impacts of the Covid-crisis.

Figure 5 illustrates the use of the standard IPCC notation keys (not occurring (NO), not estimated (NE), not applicable (NA), included elsewhere (IE), and combinations of these notation keys), as well as empty cells as reported by the different Member States. In this figure, all cells of the reporting template are considered, in which an emission estimate could be expected in accordance with the

IPCC Guidelines. The figure shows that only three countries completed all cells either with a value or a notation key and did not report blanks (AT, LT and EE). IE and SI only reported very few empty cells. The most commonly used notation keys are NO (not occurring) and NA (not applicable). It is striking that eight MS do not use any notation key but rather report empty cells. The overall completeness in terms of share of quantitative information provided (values) there is a substantial discrepancy between the countries, with a range of 41% for the lowest level of completeness to 71% for the highest level of completeness.

**Figure 5 Use of notation keys per Member State (WEM scenario and mandatory reporting years)**



### 3.2.3. Completeness of time series and gap-filling

Table 5 shows nine MS reported a complete time series from 2015 to 2040 including intermediate years. Three MS (DK, EL, HU) did not provide intermediate years and these were gap-filled by the ETC/CME: BE did not report the mandatory years 2015 and 2035. The values for 2015 were gap-filled by the ETC/CME by using the data from the previous projections submission, as the GHG inventory does not provide the required ETS/ES split by sector. The numbers for 2035 were gap-filled by applying linear extrapolation of the trend 2025-2030 in agreement with the country experts. DK did not report the year 2020 explaining that the COVID-19 impacts cannot be estimated at this date and that the uncertainty of this year is very high. For this reason the ETC/CME applied the standard gap-filling procedure and applied linear interpolation between 2018 and 2025, being aware that this might not provide correct results.

Table 5 Completeness of time series for Total without LULUCF (Total GHGs, WEM) as reported in the final submissions

WEM/ Total GHGs	2015	2016	2017	2018	2019	2020	2021-2024	2025	2026-2029	2030	2031-2034	2035	2036-2039	2040
AT			RY											
BE	G	RY									E	E		
CY			RY											
DK		I	I	RY	I	G	I		I		I		I	
EE		RY												
EL		RY	I	I	I		I		I		I		I	
HU		RY		I	I		I		I		I		I	
IE				RY										
LV			RY											
LT			RY											
LU			RY											
PL			RY											
SI			RY											

Legend

	reported
RY	reference year
I	gap-filling of intermediate years
G	gap-filling of mandatory information
E	extrapolation of mandatory information
	Not reported/not gap-filled

In 2020, gap-filling procedures were applied to seven MS which were on the one hand related to the missing reporting years as shown in Table 6, but on the other hand to the common problem that MS report historical values (of the GHG inventory) when projections are not available for the sector (typically included elsewhere). This causes jumps in the EU aggregated dataset and therefore needs to be corrected. The ETC/CME and the EEA tried to raise awareness in for this issue in the WGII meeting, but unfortunately this has so far not led to major improvements. Such reporting errors usually have further consequences, e.g. on the ETS/ES split or the sums of the overarching sector and therefore imply further corrections by the ETC/CME.



Table 6 Overview of gap-filling and corrective actions applied to final submissions

	other gap-filling and corrections WEM			gap-filling related to the WAM scenario
	Total GHG	ETS	ES	
<b>AT</b>	no	no	no	no
<b>BE</b>	yes (2015, 2035)	Values for 2015, 2035 were gap-filled with historical data and extrapolation of trend. Historic values for 1B were deleted because no projections were provided.	Values for 2015, 2035 were gap-filled with historical data and extrapolation of trend. For sector 1A3b the ETS/ES split was not consistent and the ES values were corrected (=Total GHG value). Sector 1B was adjusted for 2016 because of correction in ETS emissions.	Gap-filling of 2015 with 2019 projections data, 2035 gap-filled with linear trend extrapolation. 1A3b ETS/ES split was not consistent, therefore the ES was corrected (=Total GHG value).
<b>CY</b>	no	no	no	no
<b>DK</b>	Gap-filling of 2020 based on interpolation of 2019 and 2025	Gap-filling of 2020 based on interpolation of 2019 and 2025	Gap-filling of 2020 based on interpolation of 2019 and 2025	Gap-filling of 2020 based on interpolation of 2019 and 2025
<b>EE</b>	no	no	no	no
<b>EL</b>	Sectors 1A3, 1A4, 1A3e) were adjusted due to deletion of historical value in 1A3e (no projections available for the sector but historical value was reported)	1A3a was subtracted from ETS	Sectors 1A3, 1A4, 1A3e) were adjusted due to deletion of historical value in 1A3e (no projections available for the sector but historical value was reported)	Deletion of historical value for 1A3e and adjustment of the sums
<b>HU</b>	no	The ETC/CME deleted the historical values for sector 1A3e ES, because no projections were reported and adjusted the sums accordingly, also we added the small amount to the sector ETS so the ETS/ES split is consistent.	The ETC/CME deleted the historical values for sector 1A3e ES, because no projections were reported and adjusted the sums accordingly, also we added the small amount to the sector ETS so the ETS/ES split is consistent.	The ETC/CME deleted the historical values for sector 1A3e ES, because no projections were reported and adjusted the sums accordingly, also we added the small amount to the sector ETS so the ETS/ES split is consistent.
<b>IE</b>	no	no	no	no
<b>LV</b>	no	no	no	no
<b>LT</b>	no	no	ES emissions were adjusted, because ETS/ES split did not match the total GHGs.	no

	other gap-filling and corrections WEM			gap-filling related to the WAM scenario
	Total GHG	ETS	ES	
<b>LU</b>	MIB aviation in EU ETS added to total GHGs, MIB navigation gap-filled for Total GHGs	no	no	MIB navigation gap-filled for Total GHGs
<b>PL</b>	Historic values replaced by the notation key IE and the sectors 1A3c/1A3d added to 1A3b for Total GHGs and Total ES by the ETC/CME	no	Historic values replaced by the notation key IE and the sectors 1A3c/1A3d added to 1A3b for Total GHGs and Total ES by the ETC/CME	Historic values replaced by the notation key IE and the sectors 1A3c/1A3d added to 1A3b for Total GHGs and Total ES by the ETC/CME
<b>SI</b>	Deletion of int. aviation in the EU ETS from Total GHGs and ETS because SI reported total int. aviation only	Deletion of int. aviation in the EU ETS from Total GHGs and ETS because SI reported total int. aviation only	Deletion of sector 4/MIB Navigation from ES,	Deletion of sector 4/MIB Navigation from ES, deletion of int. aviation in the EU ETS from Total GHGs and ETS because SI reported total int. aviation only

### 3.3. Consistency and Comparability

#### 3.3.1. Reporting of indirect CO<sub>2</sub> emissions

Following up a recommendation from the UNFCCC review of the 3rd EU Biennial Report, all Member States are asked to clarify whether they have included or excluded indirect CO<sub>2</sub> emissions from the Total (wout LULUCF). For the 2020 non-mandatory submissions four Member States confirmed that they include indirect CO<sub>2</sub> emissions in their projections: DK, EE, HU and IE. The other Member States replied that they do not include indirect CO<sub>2</sub> emissions in their GHG projections.

#### 3.3.2. Reference year

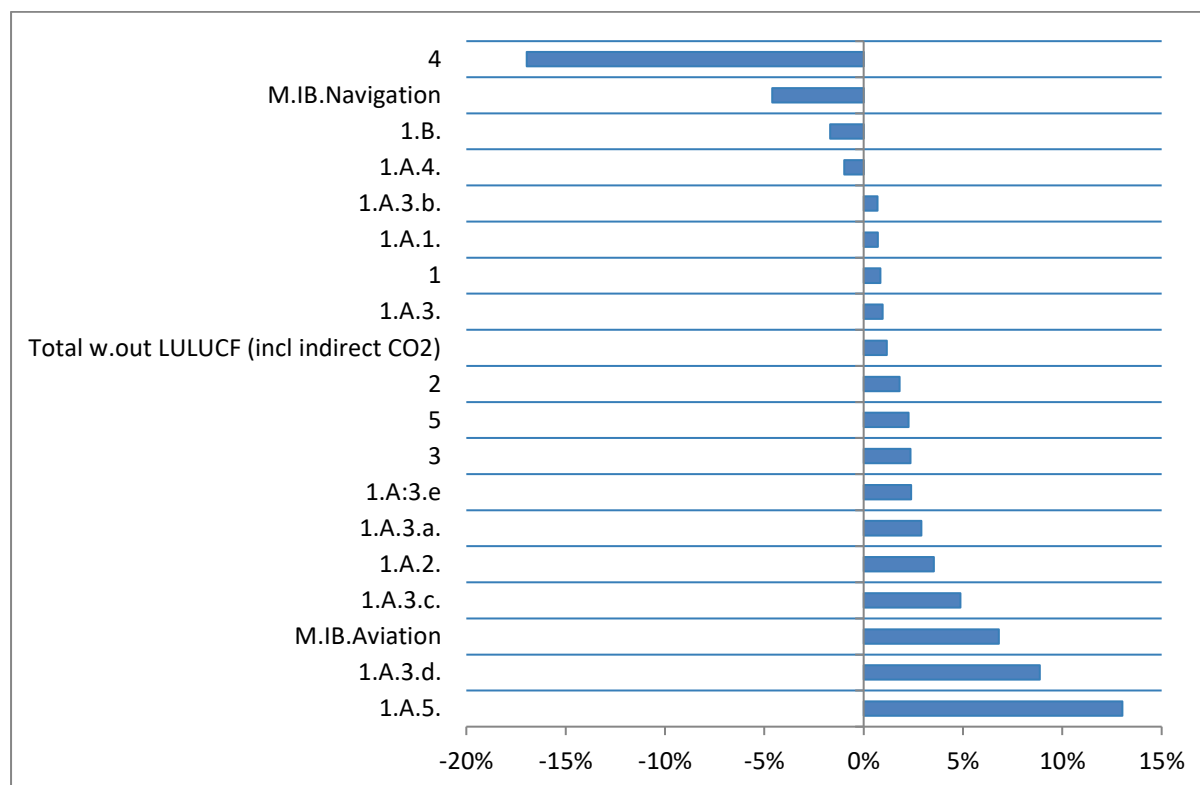
Some MS updated the reference year compared to the 2019 submissions: CY, DK, IE, LV, LT, PL and SI chose a more recent reference year (Table 7).

**Table 7 Reference year reported by Member States**

AT	2017	EL	2016	LT	2017
BE	2016	HU	2016	LU	2017
CY	2017	IE	2018	PL	2017
DK	2018	LV	2017	SI	2017
EE	2016				

The deviation of the reference year of the EU aggregated projections (2017) compared to the final EU inventory (submission 2020) is similar to the 2019 dataset. There are quite large deviations for the LULUCF sector, which could be explained by the high interannual variations, recalculations that have large impacts on the time series but also the fact that LULUCF projections are very expensive and carried out less frequent than other sector's projections (Figure 6). Sectors like 1.A.5, 1.A.5. are often combined and reported together (in 1.A.4) which causes then also high differences in the reference years, typically having higher inventory numbers for 1.A.5 and a lower inventory numbers for 1.A.4 compared to the reference year. Reasons for deviations in the Memo items are often related to (recent) recalculations of the inventory data, which could be related with the high dynamics in these sectors. The sub-sectors of 1.A.3 are not reported completely by all MS, some countries include e.g. 1.A.3.d in other transport sectors, which explain that the inventory is typically higher than the EU RY.

Figure 6 Percentage difference of the EU reference year compared to the 2020 inventory by sector (for year 2017)



### 3.3.3. ETS and ES emissions

Historical ETS splits were calculated based on the total verified emissions under the EU ETS<sup>(1)</sup> and GHG inventory data from the 2020 submission. For historical ETS emissions on sectoral level, Member State reporting under Implementing Regulation (EU) No 749/2014, Annex V, have been taken into account. In this report, verified emissions under the EU ETS are compared to inventory emissions on subcategory level for the latest inventory year.

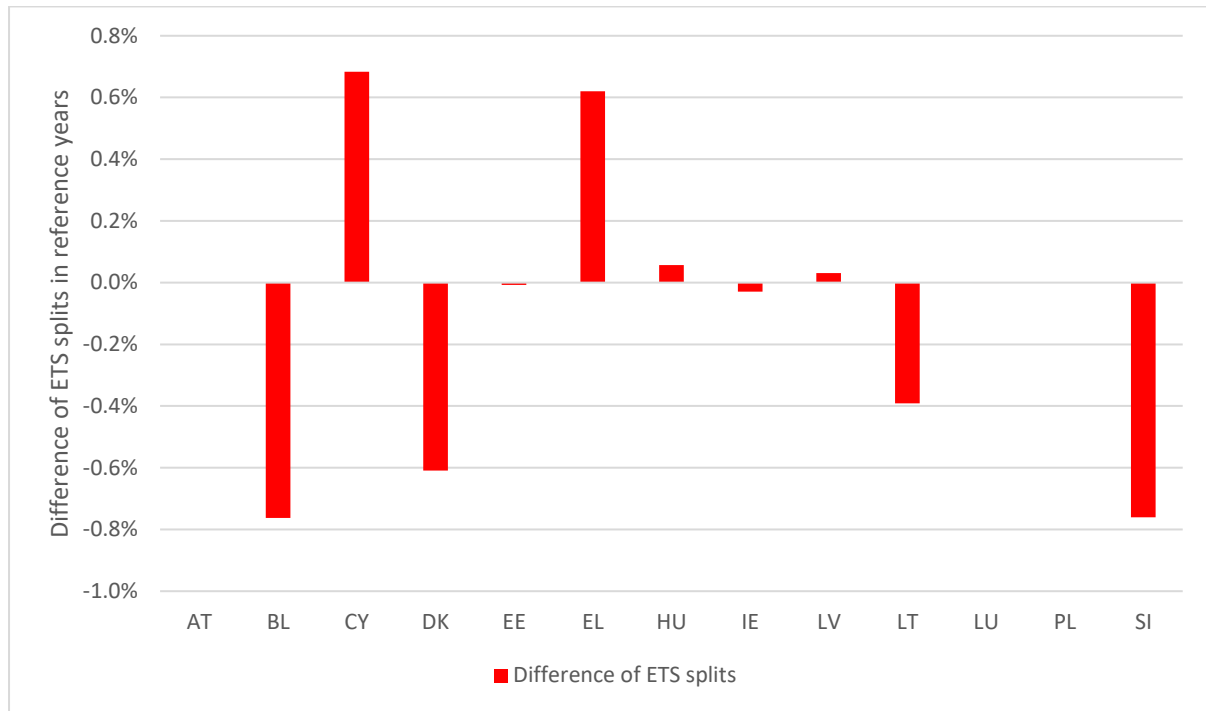
In the following the main results of the 2020 QA/QC procedure are presented.

<sup>(1)</sup> from EEA EU ETS data viewer (EEA, 2020): <http://www.eea.europa.eu/data-and-maps/data/data-viewers/emissions-trading-viewer>

## 1. ETS splits

In 2020, 13 MS reported ETS and ES emissions in the GHG projections. In most GHG projections the reported ETS emissions for the reference year match very well with the historical values from the GHG inventory. Figure 7 shows the percentage differences between the projection reference year ETS splits and historical ETS splits.

**Figure 7** Difference of ETS splits for the reference years of total GHG projections compared to historic ETS splits in respective reference years.

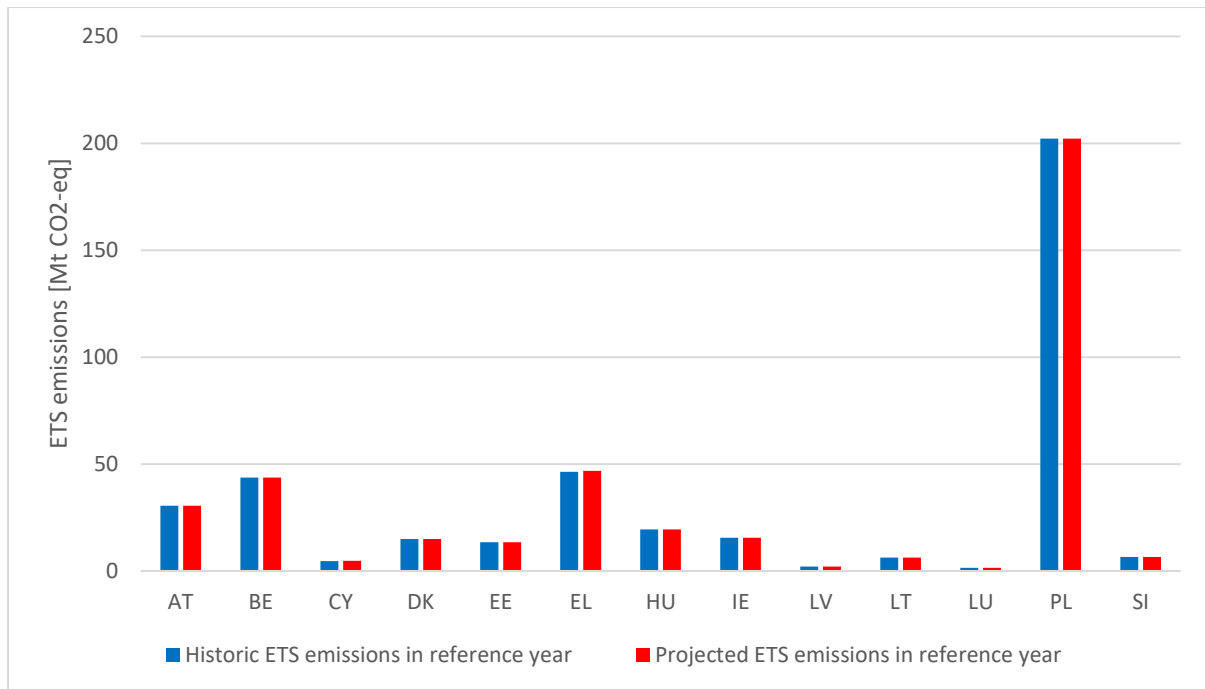


In general, for all 13 MS, difference between projection reference year and historical ETS split is less than 1%. The largest difference between projection reference year and historical ETS split is identified for BE and SI (-0.76%).

## 2. Absolute ETS and ES emissions

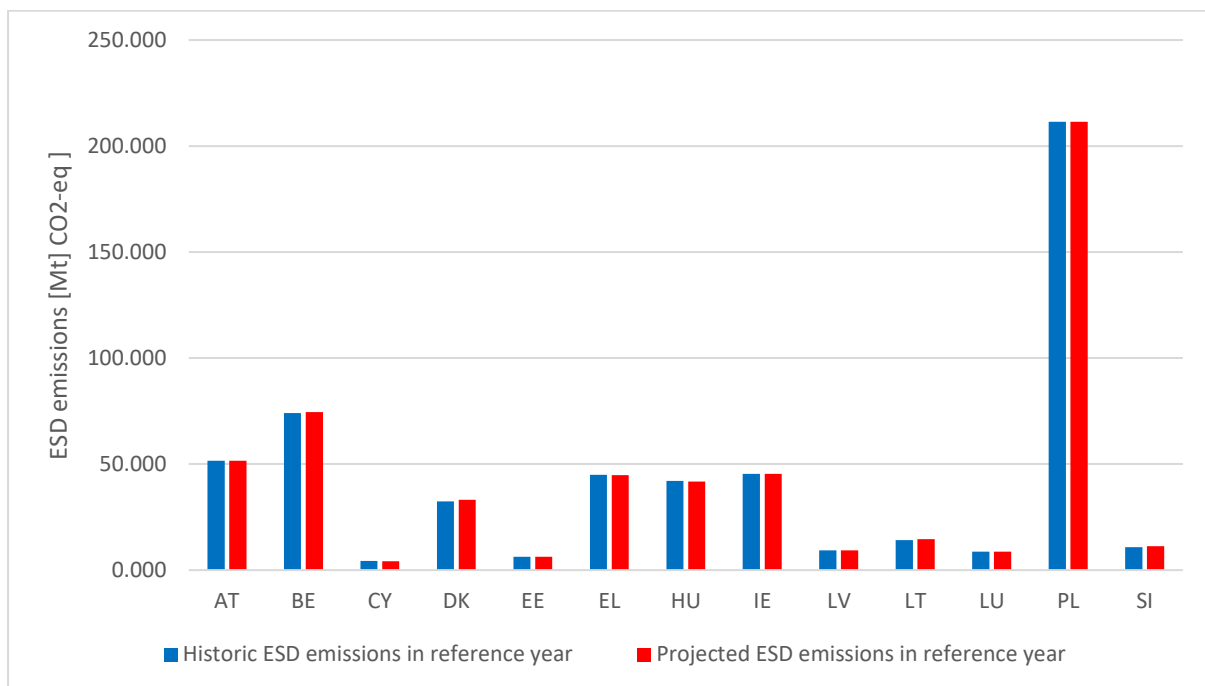
In Figure 8 historic and projected absolute ETS emissions are compared for the reference year used by each of the MS. The aggregate of ETS emissions of 13 MS projections across all reference years is 407 Mt CO<sub>2</sub>-eq, differing only -0.15 % from historic ETS emissions for these 13 MS.

**Figure 8 Historic and projected absolute ETS emissions for reference years**



In Figure 9 historic and projected ES emissions are compared for the reference year used by each of the MS. MS projections are very close to the historical emissions. Aggregated historical ES emissions of the reporting MS add up to approximately 555 Mt CO<sub>2</sub>-eq, with only a difference of -0.27% between historic emissions and emissions reported in the projections.

**Figure 9 Historic and projected absolute Effort Sharing emissions by reference year.**



### 3. Development of ETS and ES emissions

ETS split changes (i.e. changes in the share of ETS emissions relative to Total emissions) were calculated along the projected timeline to analyse the development of ETS and ES emission projections and to check the time series consistency (Table 8).

**Table 8 Changes in ETS splits from MS reference year to 2035 in WEM scenario**

MS	Ref year - 2015	2020-2015	2025-2020	2030-2025	2035-2030
AT	0%	-1%	-1%	0%	0%
BE			4%	4%	
CY		3%	-8%	2%	-3%
DK	-2%			-3%	0%
EE	3%	-3%	2%	-12%	-1%
EL		-6%	-4%	-2%	-5%
HU	0%	5%	-4%	-3%	-2%
IE	-3%	-1%	-1%	0%	4%
LV	-2%	3%	-1%	1%	-1%
LT	-3%	-2%	-1%	0%	0%
LU	-2%	-2%	-1%	-1%	-1%
PL	-2%	-1%	0%	0%	-3%
SI	1%	0%	0%	1%	2%

Legend:	
	decreases of ETS splits in 5-year steps of more than 3%
	increases of ETS splits in 5-year steps of more than 3%
	not reported

Note: No ETS data for 2015 has been provided by BE, CY and EL. BE did not provide projection data for 2035. DK did not provide projection data for 2020. Due to rounding, threshold values that are not colour coded are within the acceptable range.

Source: MMR MS Projections 2020.

High increases or decreases in ETS splits have been highlighted Table 8: Decreases of more than 3% in blue and increases of more than 3% in pink. For nearly all of these higher changes explanations have been given by Member States. For smaller countries the closure or start-up of a single plant might affect heavily the share of ETS emissions. With this, projected ETS splits might change considerably from one year to the next. For example, in the case of CY, the decreasing of emission is due to the introduction of natural gas for the production of electricity from the end of 2021. For EL the strong decrease in the ETS emissions is due to changes in electricity production. According to the electricity production company's development plan oil shale pulverized combustion plants are planned to be shut down during the period 2025-2030. For IE, projected ETS emissions are largely underpinned by the energy demand projections which increases post 2030 for electricity generation and manufacturing industries and construction.

The continued growth in emissions post 2030 in Sector 2 is largely attributed to the growth in emissions from cement production which is projected using GDP growth. For BE, the nuclear phase out is the main explaining factor in the increase of ETS emissions in both WEM and WAM scenario. The increase in electricity consumption can be confirmed. A final example for LV, the amount of ETS

emissions in LV depends to a large extent on the electricity supply structure – the amount of electricity produced by large hydropower plant, electricity imports, and electricity produced by natural gas CHP. In addition, the factor influencing the increase in GHG emissions is the expected increase in production in the manufacturing sector.

#### 4. Reporting of ETS and ES emissions

The reporting of ETS and ES emissions continuously improved since 2015 and became considerably more detailed in the 2017 and 2019 submission years. With regard to absolute ES emissions, most Member States subtracted domestic aviation from total GHG emissions to calculate ES emissions and a considerable number of Member States subtracted NF<sub>3</sub> emissions too. Member States were asked to exclude emissions on ETS aviation from the ETS emissions to allow the calculation of a consistent set of stationary ETS emissions.

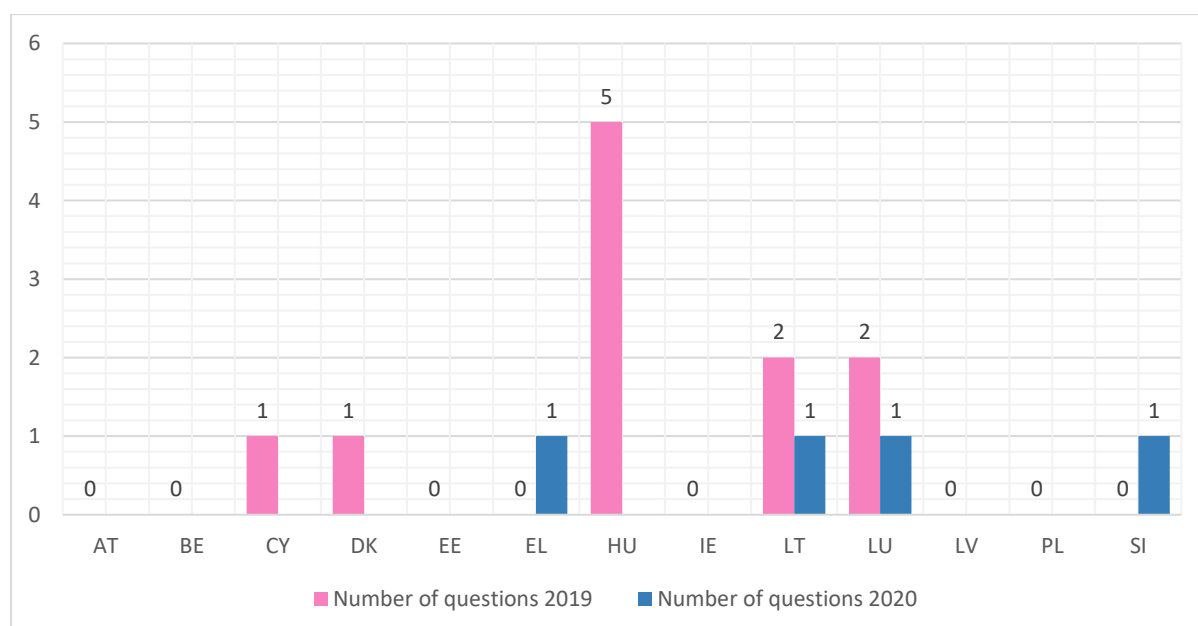
#### 3.4. Accuracy and Transparency

The results of the automated sum check introduced to the CDR in 2017 of the latest Member States' submission have been used. It checks the Member States data after being uploaded to the CDR and before the QA/QC process by the ETC/CME starts. In principal the automatic checks provided feedback to the Member States and it is recommended to adjust the submission if the automatic sum check failed. For the following countries, the sum check did reveal an issue: EL, LT, LU and SI. This resulted in follow-up questions to MS experts in the QA/QC procedure. The issues were sometimes aggregated in case they applied to multiple sectors, years, GHGs and/or scenarios, resulting in four questions in total.

Although the ETC/CME experts use a clear threshold value for the checks, MS are also informed about a difference that is below the threshold value, but in such case the ETC/CME do not ask the MS for a corrective action.

In all cases where the difference was larger than the threshold value, corrective action was applied by the MS (including a resubmission) or by the ETC/CME.

Figure 10 Number of sum check errors



The most important problem was that the sum of the emissions of the subsectors did not correspond with the emission of the parent sector. There could be several reasons for this, including incomplete reporting. However, most of the failed sum checks are related to indirect N<sub>2</sub>O emissions in the LULUCF sector, which is not a reporting error per se, but is related to the reporting of the GHG inventory in which the indirect N<sub>2</sub>O emissions of managed soils cannot be split into the LULUCF sub-categories but only be reported for the Total LULUCF (sector 4)<sup>2</sup>. As most of the MS report their projections consistently with the GHG inventory, this small deviation is occurring in many countries.

### 3.4.1. Outliers and trends

The outcome of the assessment of outliers and trends in MS projections is based on four different checks. These checks are based on the reported projections information in 2020, inventory data and previously reported information on projections. Assessing trends and outliers is difficult if there are few data points in the time series (i.e. if no intermediate years are reported). For smaller Member States changes in emissions can show larger fluctuations in emissions, especially in sectors where emissions are dominated by few point sources.

The checks assume linear trends and use threshold values to indicate that the linear trend deviates from historical trends and previous projection trends. The linear trend line is also used to identify outliers, i.e. emissions in specific years that are much higher or lower than expected based on the linear trend line. It is important to highlight that findings based on these checks are not necessarily revealing an error in projections, but rather point out the need for further clarification, either via visual inspection of the data by the reviewer, consultation of the technical report, or a question to the Member State.

Examples of cases where a potential issue did not result in a question to the Member States are:

- *Non-linear trends*: Visual inspection shows that there is no outlier but that the issue is caused by a non-linear trend in projected emissions.
- *Trends explained in the report*: If the technical report provides an explanation in the technical report.

A limited number of potential issues could not be resolved by inspection of the data or consultation of the technical report. This resulted in a total of four questions to the Member States. As with the sum check, specific issues were aggregated as much as possible per sector, GHG, or even QA/QC check to avoid needless duplication of questions.

### 3.4.2. Recalculations

In the case when projected emissions were markedly different from previous projections and no further information could be found in the report, for reasons of transparency MS experts were requested for an explanation and recommended to incorporate explanations for the recalculations in the technical reports. In total, 12 questions concerning the recalculation check were asked to seven different Member States.

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<sup>2</sup> Indirect N<sub>2</sub>O emissions from managed soils are reported in CRF table 4(IV). In this table Parties can only report the total indirect N<sub>2</sub>O emissions for LULUCF and it is not possible to split them by sub-category.



**Table 9 Recalculation check, comparison total GHG emissions excl. LULUCF for WEM and WAM scenarios for 2020 and 2030 of the 2020 submission against the 2019 submission. Negative values means a decrease between 2019 and 2020 reporting**

	WEM		WAM		Explanation
	2020	2030	2020	2030	
<b>AT</b>	<0.01%	<0.01%	new	new	Deviation below threshold
<b>BE</b>	<0.01%	<0.01%	0.9%	7.8%	Deviation below threshold
<b>CY</b>	6.0%	-4.1%	Not reported	Not reported	Differences due to sector 1A1 and a PaM on efficiency in electricity infrastructure – The fuel switch to natural gas is now projected to be implemented later.
<b>DK</b>	Not reported	36%	Not reported	Not reported	Inclusion of DK energy pact
<b>EE</b>	26%	18%	26%	24%	Projections in line with NECP, report in 2021
<b>EL</b>	-1.6%	-2.2%	-11%	-23%	Explained in BR4 report
<b>HU</b>	8.4%	0.3%	3.0%	1.6%	Used new model (TIMES) for first time
<b>IE</b>	2.6%	-7.8%	3.4%	-17%	The new energy demand projections contributed to differences to energy sector related emissions, change of the reference year caused differences in sector 2, and changed animal numbers in sector 3
<b>LT</b>	<0.01%	<0.01%	0.03%	0.03%	Changes due to new parameters and new modelling assumptions
<b>LU</b>	-0.03%	-0.03%	new	new	Deviation below threshold
<b>LV</b>	0.6%	0.3%	1.8%	-0.2%	asked for confirmation of info provided in the report
<b>PL</b>	-0.3%	-1.3%	new	new	Deviation below threshold
<b>SI</b>	4.4%	4.4%	new	new	Emissions are higher in current projections due to a delayed closure of a coal-fired power plant and the installation of a new gas power plant

On the other hand, this check also identifies submissions that were completely identical to the previous submission, which indicates that the projections were not updated (either completely or only recalibrated to the latest emission inventory data). In 2019 this was the case for Slovenia, who now submitted a revised projection.

### *3.4.3. Comparison of MMR and NECP projections*

A comparison was made between the data included in the final NECP (when available during the time of the checks) and the MMR projections data reported by Member States. As there were only 13 MS that reported projections in 2020, comparison was only possible for a small set of Member States. The consistency between the MMR and NECP reporting was much better than previous year. The difference in 2030 between NECP and MMR reporting was mostly either zero or very small (<0.1%). These were linked to small corrections after the NECP submission. Were differences were larger, these were caused by corrections after the NECP (HU, SI), policy developments (DK), or the additional measures scenario in the NECP is a scenario to achieve the targets and goes further than the planned policies and measures included in the WAM scenario (SK).

### *3.4.4. Summary of the quality of the reported gases (CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O, F-gases)*

In 2019 the ETC/CME started preparing an EU dataset for the different gases. However, due to the large additional amount of data and issues to be treated during the QA/QC procedure the ETC/CME did not apply any error correction or gap-filling (except for gap-filling of intermediate years), but it run the basic trend and sum check.

For individual greenhouse gases, the sectoral sum check (assessing whether the sum of emissions in subsectors equals the sectoral emission) of the first submissions of Member States showed that for all countries no differences above the threshold value were found (i.e. not the result of rounding). The only error linked to reported gas was EL that did not include SF<sub>6</sub> emissions in the total emissions excluding LULUCF in 2040.

Most of the findings are not linked to a specific greenhouse gas, but rather to total GHG or ES/ETS emissions. This is because comments are aggregated as much as possible to avoid duplicating comments in our feedback to the Member States. It is also worth noting that Member States not often adjust reporting based on the findings of the ETC, but rather provide a clarification for the observed trends.

## **3.5. Parameters**

### *3.5.1. Most common parameter issues*

As 2020 was only a non-mandatory reporting year, the parameters (IR article 23 Table 3) were submitted by only nine Member States. The overview given in Table 10 summarizes the QA/QC process for each Member State and the parameters that have been checked. Generally, parameters were submitted in the correct units, or otherwise could be converted relatively easily by the ETC/CME reviewers. In addition, some Member States use a modified version of parameters (e.g. population in private households rather than total population) as driver in their modelling, resulting in a deviation the expected historic parameter values. These issues were solved, however, through communication with the Member States.

Table 10 'Heat Map' of QA/QC procedure and most common issues of the parameter checks

MS	Population		GDP		Electricity Imports	
	Initial submission	Follow-up	Initial submission	Follow-up	Initial submission	Follow-up
AT	Yellow	Grey	Yellow	Grey	Yellow	Grey
BE	Purple	Blue	Yellow	Grey	Purple	Grey
CY	Purple	Pink	Yellow	Grey	Yellow	Grey
DK	Yellow	Grey	Yellow	Grey	Yellow	Grey
EE	Green	Grey	Green	Grey	Yellow	Grey
EL	Purple	Grey	Green	Grey	Purple	Grey
HU	Purple	Grey	Green	Grey	Green	Grey
IE	Green	Grey	Orange	Blue	Green	Grey
LT	Yellow	Grey	Yellow	Grey	Yellow	Grey
LU	Yellow	Grey	Yellow	Grey	Yellow	Grey
LV	Purple	Grey	Green	Grey	Green	Grey
PL	Purple	Grey	Green	Grey	Purple	Grey
SI	Orange	Blue	Green	Grey	Green	Grey

<b>Initial submission</b>
value in line with surrogate data
no use of default unit -> corrected by reviewer
no values submitted / values not used
value not in line with surrogate data
<b>Follow up:</b>
no resubmission of MS -> remaining issues not solved
explanation of reason for difference -> issue solved

Note: Data of Member States was checked against surrogate datasets from Eurostat (Eurostat 2020a, 2020b and 2020c) a): Population – Eurostat demo\_pjan; GDP - Eurostat nama\_10\_gdp; net electricity import - Eurostat nrg\_bal\_c. Thresholds for the checks were 2 % for population and GDP and 2 % for net electricity imports.

### 3.5.2. Deviation from recommended parameters

MS projected parameters were compared with recommended supranational parameters on ETS carbon and international oil and coal prices and a number of other parameters (international gas prices, GDP growth, population) provided by the Commission (COM, 2018). Checks were carried out to gain insights into whether Member States experts used the provided values (Table 11). The classification was made by setting deviation threshold for individual parameters. Note however, that the situation can arise that for two projection years parameters do not deviate, but for other projection years they do. In these instances ETC/CME made a qualitative classification. In addition, due to potential exchange rate issues of price data (ETC/CME converts all monetary values to constant EUR 2010), some parameters may have been classified as not following the Commission Guidance. It should be noted that in the 2020 QA procedure this check is of informative nature only and no follow up was made in case parameters deviated from the recommendations of the European Commission. The check was applied only on the parameters presented in the table below.

Generally, in 2020, with the exception of few Member States, recommended and suggested parameters are not used as drivers for national projections and it appears that Member States use their own parameter sets.

**Table 11 Overview: Use of recommended parameters by the European Commission**

MS	Coal price	Gas price	Oil price	Carbon price	Population	GDP
AT						
BE					no	
CY				yes	yes	no
DK						
EE	yes	yes	yes	yes	no	no
EL	yes	yes	yes	yes	close	
HU	no	no	no	no	no	
IE	no	no	no	no	no	no
LV	no	no	no	no	close	no
LT						
LU						
PL	no	no	no	no	yes	no
SI	no	no	yes	no	no	no

Legend:	
no	deviation to COM 2018 guidance > 3 % for prices >0.5 % for population and GDP
yes	deviation to COM 2018 guidance < 3 % for prices, < 0.5 % for population and GDP
close	close to recommended threshold
	parameter not used for projections
	not reported

## 4. Conclusions and outlook for 2021

With 13 non-mandatory submissions by EU MS, the number of submissions in 2020 was relatively high compared to other non-mandatory reporting years (e.g. two MS in 2018, eight EU MS and two EEA countries in 2016). This seems to be triggered by the reporting obligation of National Energy and Climate Plans (NECPs) under the Energy Union Governance Regulation (EU) 2018/1999 which was due by December 31 in 2019 and for which many countries updated their GHG scenarios.

For a non-mandatory reporting year the timeliness was mostly satisfying and the responsiveness of the MS experts was usually very good. The major part of the communication was undertaken via the communication log file, however, for more complicated issues the communication log file is not suitable and bilateral email conversation was used instead. A professional communication platform as it is used for the initial checks of the GHG inventories would be a desirable tool for the future to improve and professionalise the communication between MS and EEA/ETC. In the meantime, the communication log file will be updated with a new status to reflect if an issue was not solved during the QA/QC, due to insufficient time to communicate it with the MS, an unclear response or no response in order to pick the issue up in following years.

Regarding the checks related the accuracy of projections, it can be seen that the number of sum errors is very low in the 2020 submission, including the gases. The new recalculations check which is now implemented for the second year seems to be a useful tool to gain further transparency on how and why projections change from submission to submission. It is planned to keep a list to explain the main changes per MS also in the future.

The level of completeness is lower in non-mandatory reporting years because countries focus more on providing the full dataset than the additional information. The check has been refined for the 2020 checks to count only non-shaded cells of the templates. This increased the overall level of completeness and provides a clearer picture on how the MS report. Due to this change, countries can now achieve a 100% score for completeness when they filled out all cells with either values or notation keys, whereby the latter are also further differentiated.

Consistency and comparability checks have also led to improvements in the MS reporting over the past years. The ETS/ES splits show fewer deviations from the historical data sets and also the disaggregation of ETS and ES emissions is reported in the correct manner by most countries. However, it is important to provide sufficient guidance to the MS, especially for new MS experts. The ETS/ES guidance document is a very useful document and it is important to be further updated for the 2021 reporting. The ETS/ES check is currently done on an aggregated sectoral level and should be further refined. In addition, it should be updated to detect negative values for ETS/ES and highlight if the sum of ETS+ES is higher than the Total GHGs, including guidance for MS how to ensure consistent reporting. Regarding the checks on parameters also future QA/QC will focus on the application of the correct units and the completeness of the information, if reported. In this year, most MS used their own national parameters, which makes these checks even more important. Another common issue is that MS still tend to report historical/reference year values when they do not have any projections for a sector, although this has been communicated to MS via different channels (WGII, communication log, guidance and checklist). It is planned to introduce a new check to increase awareness of this problem, because this is responsible for many manual corrections by the ETC/CME.

The approach for selecting the EU reference year (until now X-2 was used) will be changed in 2021 and we will select the year, which has been selected by most MS as reference year to reduce the deviations for EU aggregated. Furthermore, the new reporting template will ask the MS to state which inventory version they have used to calibrate their projections. This information will be also useful to select the EU reference year and time series.

Additional reporting requirements will come with the reporting year 2021, including more detailed information on LULUCF, additional parameters and the new reporting of the sensitivity analyses. For the new LULUCF information it will be possible to run the same checks as for the other sectors, whereas more attention will need to be paid on the correct reporting in the first submission year (e.g. providing complete information in all mandatory tables). This also applies for the new parameters, where the existing checks can be extended if appropriate. The new information on the sensitivity analysis will be also available in the data base and can be checked in a more automated manner. As a basic check, a completeness check will be important, following up some analysis of the provided information in the next report on the QA/QC.

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