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Early CO_2 emission estimates for 2016 based on Eurostat monthly energy data

Annual project report

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List of Abbreviations

CO_2	Carbon dioxide
CRF	Common Reporting Format
EU	European Union
GCV	Gross calorific value
Gg	Gigagram = 10^9 g = 1 kt (kiloton) = 1000 tons
GHG	Greenhouse Gas
IPCC	Intergovernmental Panel on Climate Change
kt	Kiloton (1 kt = 1000 t)
MS	Member State
NCV	Net calorific value
NIR	National inventory report
QA/QC	Quality assurance and quality control
TJ	Terajoule
UNFCCC	United Nations Framework Convention on Climate Change

1. Introduction and background

In order to improve the timeliness of the EU carbon dioxide emissions data, Eurostat initiated an action some years ago called “Early Estimates of CO_2 Emissions”. The aim is to provide estimates of CO_2 emissions from energy use (combustion of fossil fuels) only four to five months after the reference year (t+4), instead of the usual 16 months. These first estimates are based on a harmonised method and monthly energy statistics already available through the Energy Statistics Regulation. This information is particularly relevant because CO_2 emissions from fossil fuel combustion make up nearly 80% of the total GHG emissions and, on average, around 80% of the annual change in EU greenhouse gas emissions.

The first objective of this project is to test whether the trend method developed to estimate early CO_2 emissions continues to produce valuable results based on the use of monthly energy data. For this purpose, early CO_2 estimates at t+4 months were calculated in April 2017 for the year 2016. In addition, the early CO_2 estimates calculated for 2015 were verified by comparison with subsequent official CO_2 emission data reported in the GHG inventory submissions to the UNFCCC under CRF table 1.A (b)[1], available since 27 May 2017.

The second objective of this project is to analyse the quality level of monthly Eurostat energy data on fuel consumption compared to annual Eurostat data and to energy data used by Member States for their GHG inventories. Based on this comparison it is assessed whether the quality of the monthly data improved in 2015 and in which areas substantial deviations continue to occur.

This report includes a description of the method used, a verification of the early CO_2 emission estimates for the year 2015 and the calculation of the 2016 early CO_2 emission estimates.

[1] CRF (Common Reporting Format) table 1.A (b) SECTORAL BACKGROUND DATA FOR ENERGY: CO_2 from Fuel Combustion Activities - Reference Approach (IPCC Worksheet 1-1), Common Reporting Format - a set of standardised spread sheet data tables containing mainly numerical information and submitted electronically. These form one component of annual inventory submissions to the EU and the UNFCCC.

2. Method for early CO_2 estimates

2.1. Calculating early CO_2 emissions from fossil fuel combustion based on Eurostat monthly energy data

2.1.1. Method to calculate early CO_2 emission estimates

The method used to calculate early CO_2 estimates is based on the reported IPCC (2006) reference approach for the CO_2 emissions from fuel consumption of EU Member States and uses up-to-date Eurostat monthly energy data on fuel consumption.

The method estimates the consumption of cumulated liquid fuels, solid fuels, peat and gaseous fuels for the previous year and the year before and calculates the trend changes of consumption by dividing the year t-1 by the year t-2. The trend changes for liquid, solid, gaseous fuels and peat consumption are applied to the CO_2 emissions of the same aggregate fuel categories of the latest available reported year in Member States' GHG inventories as reported in the CRF reference approach table 1.A.(b) [2].

The first step of this method calculates the percentage changes in the consumption of fossil fuels over the last two years for solid, liquid, gaseous fuels and peat for each Member State based on Eurostat's monthly energy data in kilotons (kt) and in TJ NCVs for natural gas. According to the methodology for the IPCC reference approach, fossil fuel consumption is calculated differently for primary and for secondary fuels and also differs from the method of calculating gross inland consumption used by Eurostat:

Apparent consumption for primary fuels (IPCC): production + imports – exports – stock change.

Apparent consumption for secondary fuels (IPCC): imports – exports – stock changes – international marine and aviation bunkers.

This definition differs from the calculated gross inland consumption calculated by Eurostat under the flow code B_100900.

- Recovered products etc. are not taken into account under the IPCC definition.
- The use of kerosene type jet fuel without bio-components (product code 3247) for international flights is not to be taken into account and is therefore subtracted from the apparent consumption following the IPCC definition.

Biofuels should not be included in the calculation of the apparent consumption for liquid fuels, as the CO_2 emission factor for biofuels is zero.

In the second step, the percentage changes of consumption are applied to the published CO_2 fuel combustion emissions for the most recent year available, as reported by Member States to the UNFCCC as part of their GHG inventories in CRF table 1.A (b), which is the reference approach calculation of CO_2 emissions.

The early CO_2 emission estimate calculations are conducted for each fossil fuel group and for each Member State. The sum of Member States' CO_2 emissions then represents the emissions for the energy sector for the EU-28.

[2] http://unfccc.int/national_reports/annex_i_ghg_inventories/national_inventories_submissions/items/8108.php

Equation 1

$$E_{CO2}^{Y} = \frac{C_{solid}^{Y}}{C_{solid}^{Y-1}} \cdot E_{solid,CO2}^{Y-1} + \frac{C_{peat}^{Y}}{C_{peat}^{Y-1}} \cdot E_{peat,CO2}^{Y-1} + \frac{C_{liquid}^{Y}}{C_{liquid}^{Y-1}} \cdot E_{liquid,CO2}^{Y-1} + \frac{C_{gaseous}^{Y}}{C_{gaseous}^{Y-1}} \cdot E_{gaseous,CO2}^{Y-1}$$

with

E_{CO2}^{Y} CO_2 *emissions in reference approach table 1A(b)*

$C_{solid/peat/liquid/gaseous}^{Y}$ *consumption of solid/peat/liquid/gaseous fuels*

$C_{solid/peat/liquid/gaseous}^{Y-1}$ *consumption of solid/peat/liquid/gaseous fuels in the previous year*

$E_{...,CO2}^{Y-1}$ CO_2 *emissions in the respective fuel category in the previous year*

The advantage of the method is the simplicity that ensures a fast and straightforward calculation for each Member State and better results than a bottom-up calculation of CO_2 emissions based on Eurostat monthly energy data and fuel-specific emission factors for each Member State. The trend change method also means that discrepancies between the Eurostat monthly energy data and (annual) energy data used in the GHG inventories are smoothened out when such discrepancies persist through the entire time series of fuel consumption data.

However, the application of the trend change method requires consistent reporting of monthly data for at least two consecutive years. Changes or improvements in the data may affect the trend change method in a negative way, leading to higher deviations between early CO_2 estimates and CO_2 emission data reported in the GHG inventories.

2.1.2. Allocation of fuels from monthly data

The method requires an accurate correspondence of fuel categories between Eurostat monthly data, Eurostat annual data and the fuel consumption data used in the GHG inventories reported in the CRF table 1.A.(b).

There are corresponding categories for almost all fuel types. However, the following fuels are not provided in Eurostat monthly data at the level of disaggregation required by the IPCC reference approach:

- Orimulsion is not reported separately in the Eurostat monthly energy data, but reported under ‘Other hydrocarbons’ in Eurostat monthly energy data.
- Shale oil is not reported separately in the Eurostat monthly energy data, but reported under ‘Other hydrocarbons’ in Eurostat monthly energy data.
- Bitumen and lubricants are not reported individually, but are included under ‘Other products’ in Eurostat monthly energy data.
- Hard coal is reported as an aggregate category in Eurostat monthly energy data covering anthracite, coking coal, other bituminous coal and sub-bituminous coal.
- Oil shale and oil sands are reported under “Lignite”.
- Eurostat monthly energy data do not include fossil waste whereas the new Eurostat database for annual data and the new reporting under the 2006 IPCC Guidelines CRF table (1.A(b) will include fossil waste as a separate category.

- Monthly and annual Eurostat energy data do not include the category “Other fossil fuels” whereas the new reporting under the IPCC 2006 Guidelines includes this category in the CRF table 1.A(b).

2.1.3. Units of measurement / Conversion factors

Eurostat data provide liquid and solid fuel consumption in physical units (mass units kt) while natural gas is reported in energy units (TJ GCV). The calculation of the trend changes used for calculating early CO_2 emissions are therefore based on trend changes in kt for liquid and solid fuels and peat. The trend changes for natural gas consumption are calculated from Terajoule (TJ) based on Net calorific values (NCV).

The energy data on fuel consumption in the GHG inventories for the reference approach (CRF Table 1.A(b)) are provided in physical or energy units (TJ) in the CRF table 1.A(b). For the year 2015 13 of the 28 Member States (Czech Republic, Germany, Denmark, Hungary, Italy, Lithuania, Latvia, Malta, the Netherlands, Poland, Portugal, Romania and United Kingdom) report fuel consumption data for calculating CO_2 emissions from fuel combustion only in energy units (TJ). Sweden reports energy consumption data in the CRF table 1.A(b) partly in volumetric units (m^3).[3] For these Member States, fuel consumption data reported in the CRF table 1.A (b) in the GHG inventories were converted to physical mass units (kt) to allow for the comparison with Eurostat monthly and annual fuel consumption data. The Net calorific values (NCVs) used for this purpose were taken from Member States’ national inventory reports (NIR) as submitted to the UNFCCC, if available. If these were not available, NCVs as reported to Eurostat for annual fuel consumption were used. Nevertheless, the selection of NCVs is a source of uncertainty and can affect the comparison of the fuel consumption data; with regard to the latter, the use of different NCVs can have a large impact on the results, especially for coal consumption. This is only relevant for the comparison of fuel consumption data and the calculation of trend changes in energy units (TJ), which is used as a quality check of the CO_2 emission estimates. The calculation of the early CO_2 emission estimates is not affected by this conversion.

Data for natural gas are provided in Eurostat monthly energy data in TJ based on gross calorific values (GCVs), whereas natural gas consumption reported in the GHG inventories in the CRF table 1.A(b) are provided in TJ based on NCVs. For the comparison of Eurostat data with GHG inventory data, Eurostat data was multiplied with the factor 0.9 to convert to TJ NCV. Again, because the calculations are based on trend changes, the early CO_2 emission estimates are not affected by this conversion.

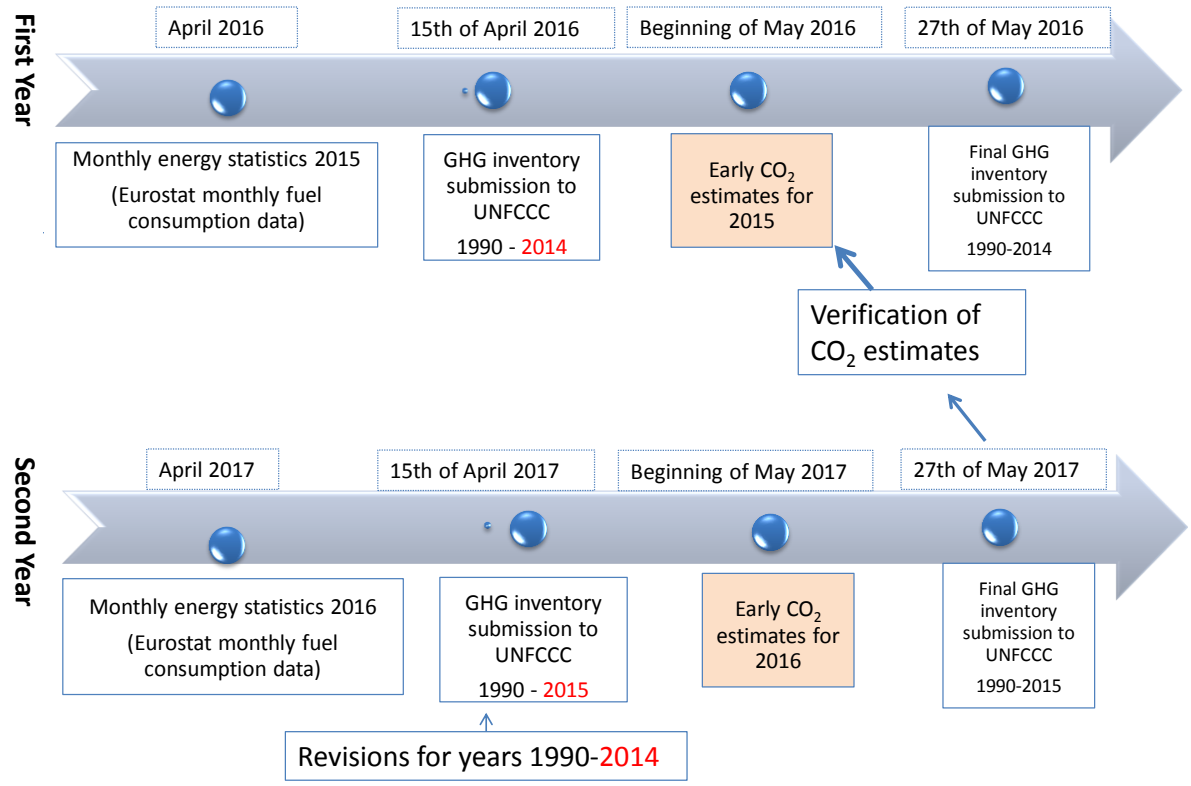
[3] *Sweden reports the reference approach table 1.A(b) in the GHG inventory in m^3 instead of kt or TJ. This leads to confusion with regard to the NCVs used, as it is not clear that this is reported in GJ/m3. Checking the Annex of the 2017 NIR submission makes clear that the values used are in m^3. However not for all fuels NCVs in tonnes/GJ are provided, thus this might lead to inconsistencies due to the calculation in physical units (kt).*

2.2. Data sources and data evaluation

2.2.1. Availability of data to calculate early CO_2 emissions and for verification of results

The estimation of early CO_2 emissions and the verification of results are based on a specific timeline depending on the availability of data sources used. Figure 2-1 shows the data sources used to calculate the 2016 early estimates and to verify results of the early estimates of the year 2015.

Figure 2-1: Availability of data sources, example CO_2 estimate for reference year 2016 and verification of results of the CO_2 estimate for reference year 2015



Source: Authors' own compilation

Calculation of early CO_2 estimates 2016

To estimate CO_2 emissions four months after the reference year for the year 2016, three data sources are used:

1) Eurostat monthly energy data 2015 (as available in April 2016).
2) Eurostat monthly energy data 2016 (as available in April 2017).
3) GHG inventory data for CO_2 emissions for 2015 based on the reference approach (Table 1.A(b)) as available under UNFCCC on 15th April 2017.

Verification of results from early CO_2 estimates 2015

To assess the quality of the early CO_2 estimates for the year 2015, the following data sources are compared:

1) Early CO_2 estimates for the year 2015.
2) GHG inventory data for CO_2 emissions based on the reference approach (CRF Table 1.A(b)) as reported to the UNFCCC for the year 2015 (as available on 27th May 2017).

The closeness of results for the early CO_2 estimate for reference year 2015 with the respective inventory data can be influenced by a number of factors. The application of the trend change method requires consistent reporting of monthly data for at least two consecutive years. Change (improvement or deterioration) of data quality may affect the trend change method in a negative way, leading to higher deviations between early CO_2 estimates and CO_2 emission data reported in the GHG inventories. Large differences related to the reporting of monthly Eurostat data can be due to:

1) Quality of Eurostat monthly energy data for 2014 (available in April 2015).
2) Quality of Eurostat monthly energy data for 2015 (available in April 2016).

Further differences between trend changes of early CO_2 estimates and GHG inventory data are due to reporting issues for the GHG inventory and include:

1) Differences in the amount of carbon stored in the total carbon content of the fuel consumption
2) Data revision for the year x-3[4].

With the application of the 2006 IPCC guidelines since reporting year 2013 (submission year 2015) the quantity of carbon stored increased in some countries and were therefore excluded. According to the IPCC Guidelines quantities of coke delivered to the iron and steel and non-ferrous metals industries as well as fuels used for non-energy use and feedstocks should be excluded from total carbon in the IPCC reference approach. In Member States where the share of carbon stored is not changing over the years there is no influence on the trend change. However, in some Member States the share of carbon stored shows inter-annual changes, which leads to differences in the trend changes that are not related to the quality of the reported monthly Eurostat data. It seems that some countries are using this new margin excessively (e.g. Austria, Belgium), while others do not change the carbon stored figures.

Differences in the trend change related to GHG inventory are not influenced by the reporting quality of monthly Eurostat data, but it increases the uncertainty of the results.

Quality of monthly data

To assess the quality of the Eurostat monthly energy data for the year 2015 (as available in April 2016), it is compared with:

1) Annual Eurostat data 2015 (as available in April 2017).

[4] For the calculation of the early CO_2 estimates for the year 2015 the inventory data for the year 2014 (2016 submission) is used as a reference point. In 2017 the results of the early CO_2 estimates 2015 are verified by using the 2017 GHG inventory submission. Some Member States revised the data for the year 2014 to have a constistent time series. But this introduces a level of uncertainty for the comparison of the early CO_2 estimates.

2) GHG inventory data on fuel consumption as reported to the UNFCCC for the year 2015 (as available on 27th May 2017).

This is performed at the level of aggregated fuel consumption in physical units for liquid and solid fuels and in energy units for gaseous fuels. If differences exceed ±3 % in 2015, a detailed comparison is carried out.

As there are only very few data sources available that deliver data as soon as 4 months after the reference year, the quality of the monthly data (for the year t-1) is analysed in terms of completeness, outliers and gaps.

2.2.2. Data revisions

Member States can submit revised data that affect the comparison of energy data on fossil fuel consumption and also the closeness of results of early CO_2 emission estimates. Data revisions can be submitted by Member States during the year and for any historic year for monthly and annual Eurostat energy data as well as for GHG inventory data.

Revisions of Eurostat monthly energy data

Within the data preparation and processing for calculating early CO_2 emissions data, checks for the most recent year of Eurostat monthly energy data are carried out. These include checks on completeness, consistency, outliers and gaps. If there are issues identified, Eurostat contacts the Member State(s) and asks either for confirmation or for a revision of monthly data. In some cases, Member States send a revised set of monthly questionnaires that is uploaded to the Eurostat database; in other cases, information on revisions of monthly data is only provided via email and included manually in the project file.

For this project normally the earliest data available is used. However, many Member States revise their data often. Eurostat processes these revisions and makes them available in Eurobase. Older data are overwritten by younger data. Therefore, a user cannot extract the data used for the calculation of the CO_2 emission estimate from Eurostat's database. Throughout the year there might be new revisions of monthly data available that are uploaded to the Eurostat database. Thus, monthly data for 2014 that has been available in April 2015 might have been revised and is not necessarily identical with monthly data for 2014 available in the database in April 2016.

To ensure consistency in calculating early CO_2 emissions for the year 2016, the checked monthly data 2015 as available in April 2016 and the checked monthly data 2016 as available in April 2017 were used to establish the trend change.

Revision of annual Eurostat data

Member States also revise their annual data and Eurostat incorporates these revised annual data in its database as described for monthly data. However, revisions of annual data are not as frequent as revisions of monthly data. As annual Eurostat data is only used for verification of the quality of monthly data, revisions of annual data do not have a large effect. A retracing of original annual data (as available in April for the year t-2) used for the comparison with monthly data is not possible if Member States have revised their annual data.

Revision and recalculation of GHG inventory data

Member States have to report their GHG inventory data to the UNFCCC by the 15th April for the year t-2 including the entire time series beginning in 1990. Until the 27th May Member States have time to make additional changes (error fixing etc.) and submit a final version to the UNFCCC. This final version submitted by the 27th May is reviewed by UNFCCC review experts.

Member States' inventory submissions are based on a quality control and quality assurance system. Additionally, the inventories are reviewed by external review experts from the EU and from the UNFCCC. Therefore, revisions of inventory data are common. In most cases Member States' inventory submissions include the most recent year (i.e. the data for reference year 2015 is available in Member States' submissions since April 2017) and revised data for the years 1990-2014. This ensures consistent reporting along the time series. When new data sources for activity data or new country-specific emission factors become available they can be applied consistently to all years in the time series.

2.3. Evaluation of Eurostat monthly energy data

2.3.1. Data tool, quality assurance and quality control

For consistency and comparability, the project improved the analysis and builds up a new spreadsheet for each Member State including the data sets for monthly data 2015 and 2016. The data used is drawn from Eurostat monthly energy data on fuel consumption from the Eurostat database as of April 2017 (for reference year 2016).

Eurostat monthly energy data are imported from the raw data files (as extracted from Eurostat's production database) and analysed with standard Excel features and functions such as pivot tables, conditional formatting, filters and formulas. Pivot tables are used to view and analyse the data in a convenient monthly table with separate sheets for each Member State, including rows for all fuels and flows.

The spreadsheet tool is also subject to quality control practices whereby each member of the team independently reviews the work of others and verifies data flows, calculations and results.

2.3.2. Completeness and Outliers in Eurostat monthly energy data for reference year 2016

Eleven Member States provided complete datasets for monthly 2016 Eurostat data already in the beginning of March 2017. The first checks for these eleven Member States were completed by 10th of March 2017. In the first checking round some general issues on completeness as some monthly oil questionnaires for November and December were still missing (Netherlands, Ireland) were found and some further inconsistencies could be identified (stock changes peat Finland). In the beginning of April monthly Eurostat data was complete and until the 7th of April the outlier and gap analysis has been finished.

The analysis of data gaps was based on a pivot table with formulas and conditional formatting configured to identify possible gaps. These results were then assessed for plausibility based on our own expert opinion. The first part of the analysis on the Eurostat monthly data set was to identify missing data (no values). The analysis was conducted on the Eurostat monthly data of the 28 Member States for six flows (primary production, total imports, stock change, total exports, international marine bunkers and deliveries to international aviation) and 33 fuels. While not all the fuel categories are directly relevant for the calculation of CO_2 early estimates, it was however assumed useful to apply the search for data gaps to the complete fuel list provided, independently of the use in the early CO_2 emissions calculations.

The gap analysis tries to identify gaps of a single month or for all months from one flow. The analysis of gaps uses the reporting of the year before (2015) as a reference. If single fuels or flows are not reported in the year before, the non-reporting in the recent year analysed (2016) is not identified as a gap. However, if fuels or flows have been reported in the previous year (2015), then the non-reporting in the recent year is identified as a gap. The same goes for gaps identified in a single month. If in the year before and in the recent year there is no import of natural gas in the summer months this is not identified as gap. The following Table 2-1 shows an example for the gap analysis. The analysis shows that the Member State reports in 2015 919 kilotons export from refinery feedstocks. In 2016 no export is reported. So it is not clear if there is really no export in 2016 or if this is just a gap in the monthly data.

Table 2-1: Example for gap analysis

Name	Flow	201501	201502	201503	201504	201505	201506	201507	201508	201509	201510	201511	201512	Summe
Refinery feedstocks	**Gross Inland Co**	**-81**	**-97**	**-20**	**-47**	**-31**	**100**	**-56**	**123**	**-138**	**-155**	**-89**	**31**	**-460**
	Total Exports	0	145	109	0	107	0	0	0	69	195	294	0	**919**
	Total Imports	0	0	0	0	0	33	48	72	45	35	0	0	**233**
	Stock changes	81	-48	-89	47	-76	-67	104	-51	114	-5	-205	-31	**-226**

Name	Flow	201601	201602	201603	201604	201605	201606	201607	201608	201609	201610	201611	201612	Summe
Refinery feedstocks	**Gross Inland Co**	**-14**	**38**	**17**	**11**	**-1**	**-206**	**125**	**111**	**99**	**54**	**-65**	**194**	**363**
	Total Exports	0	0	0	0	0	0	0	0	0	0	0	0	**0**
	Total Imports	0	15	68	34	0	0	35	26	26	0	0	0	**204**
	Stock changes	14	-23	51	23	1	206	-90	-85	-73	-54	65	-194	**-159**

Source: Eurostat monthly data 2015 (April 2016) and 2016 (April 2017)

For the outlier analysis two tests are applied, focusing on the twelve reported months in the recent year (2016). On average every month should equal 1/12 of the total. Values are identified as outliers if the value deviates from the median by 10% or by more than 2.5 of the standard deviation. The following Table 2-2 gives an example for the outlier analysis.

Table 2-2: Example for outlier analysis

			Outlier Value (kt)	**Month**	**Range of other months**	**% of total**	threshold is set for 2,5 STDEV > median	percent outlier test
							2.5	*10%*
Name	Flow	**Summe**						
Crude Oi	**Gross Inland Consumpti**	**6,914**						
	Indigenous Production	**6,926**	434	2	500 - 625	6%	434	
	Total Exports	**3,876**	470	4	182 - 401	12%		470
	Total Imports	**3,837**	26	4	239 - 468	1%	26	26
	Stock changes	**-27**						

Name	Flow	201601	201602	201603	201604	201605	201606	201607	201608	201609	201610	201611	201612	Summe
Crude Oil	**Gross Inland Consumption**	**678**	**595**	**559**	**311**	**348**	**573**	**639**	**642**	**642**	**624**	**622**	**681**	**6,914**
	Indigenous Production	572	434	625	597	601	622	589	623	500	612	586	565	**6,926**
	Total Exports	394	182	321	470	366	322	401	387	229	353	235	216	**3,876**
	Total Imports	412	332	285	26	273	239	468	450	316	418	331	287	**3,837**
	Stock changes	-88	-11	30	-158	160	-34	17	44	-55	53	60	-45	**-27**

Source: Eurostat monthly data 2016 (April 2017)

Due to large variations in the reporting of stock changes, results from the outlier analysis of stock changes are not taken into account.

After identifying gaps Member States were asked if they could confirm the data where potential gaps and outliers have been identified. Member States responded very quickly and confirmed the data in most cases.

The resulting list of data gaps, included as Table 5-3 (see annex 5.1), was further examined with Eurostat, with the consensus that no data gaps and outliers were filled.

3. Main findings

3.1. Comparisons of early CO_2 estimates for 2015 with inventory data

The overview provided in Table 3-1 shows the closeness of results of the early CO_2 emission estimates based on Eurostat monthly energy data with final[5] GHG inventory data (CRF table 1.A.(b)) submitted to the UNFCCC for the year 2015. The comparison is based on trend changes calculated for CO_2 emissions from fossil fuel combustion. A comparison of calculated CO_2 emissions in kilotons (kt) is not conclusive due to data revisions and recalculations of UNFCCC inventory data (see chapter 2.2.2). The analysis of results is therefore based on the trend change analysis and not on absolute CO_2 emissions in kt.

Table 3-1: Closeness of early CO_2 emission estimates with final GHG inventory CO_2 emissions (CRF table 1A(b)) for 2015

	2015
Number of MS with a difference to final inventory of ≤ ±2%	16 MS
Contribution of those MS' to total EU-28 emissions	77%
Number of MS with a difference to final inventory of ± >2 and ≤ 5%,	10 MS
Contribution of those MS' to total EU-28 emissions	22%
Number of MS with a difference to final inventory of > ± 5%	2 MS
Contribution of those MS' to total EU-28 emissions	1%
Closeness at EU28 level	**-0.2%**

Source: Authors' own compilation based on Eurostat early CO_2 estimates and MS' GHG inventory submissions to UNFCCC

Table 3-1 and Table 3-2 indicate that the closeness of the early CO_2 estimates to the final GHG inventory data on CO_2 emissions from fossil fuel combustion for EU aggregates was quite good for reference year 2015. The contribution of CO_2 emissions from Member States with less than 2 % difference in trend change was 77 % of total EU-28 emissions in 2015. Additionally, Member States with differences in trend change above 5 % represent only 1 % of the total EU-28 emissions in 2015. The closeness of -0.2 % at EU 28 level is also a result of the closeness of results for big Member States but also of balancing differences between Member States. Some Member States show positive differences, while other Member States show negative differences.

[5] For the verification of the early CO_2 estimates that final inventory data which becomes available on the 27th of May each year is used.

Table 3-2: Comparison of changes in CO_2 emissions from total fossil fuels

Member States	Trend changes of early CO_2 estimates	Trend changes in CO2 emissions based on GHG inventory data (submission 2017)	Differences trend changes early estimates-GHG inventory	MS share in EU 28 total emission from fuel combustion
	2015/2014		2015/2014	2015
Belgium*	4.7%	6.3%	-1.6%	2.5%
Bulgaria[1]	4.6%	5.4%	-0.8%	1.5%
Czech Republic	0.0%	3.8%	-3.8%	3.0%
Denmark[3]	-9.9%	-7.6%	-2.2%	1.0%
Germany	0.0%	0.3%	-0.3%	22.7%
Estonia[1;2]	-16.0%	-13.6%	-2.4%	0.5%
Ireland[3;4]	3.9%	5.9%	-2.0%	1.2%
Greece	-5.0%	-4.6%	-0.3%	2.2%
Spain	2.3%	6.9%	-4.6%	7.6%
France	1.7%	0.2%	1.4%	9.7%
Croatia	3.1%	2.7%	0.4%	0.5%
Italy	3.5%	2.1%	1.4%	10.4%
Cyprus	1.0%	0.8%	0.3%	0.2%
Latvia	1.2%	-2.0%	3.2%	0.2%
Lithuania	-0.2%	-2.6%	2.4%	0.3%
Luxembourg	-3.9%	-5.4%	1.5%	0.3%
Hungary[1]	6.7%	6.8%	0.0%	1.3%
Malta[2]	-26.9%	-20.4%	-6.5%	0.1%
Netherlands[5]	2.1%	5.6%	-3.5%	4.9%
Austria[3]	3.3%	3.2%	0.2%	1.6%
Poland	1.6%	0.1%	1.5%	9.0%
Portugal	8.6%	13.1%	-4.5%	1.4%
Romania[3]	2.4%	5.6%	-3.3%	2.1%
Slovenia	0.5%	1.5%	-1.0%	0.4%
Slovakia	9.5%	-0.6%	10.1%	0.8%
Finland	-7.4%	-10.5%	3.0%	1.3%
Sweden	-12.8%	-12.5%	-0.3%	1.1%
United Kingdom	-2.9%	-3.7%	0.8%	12.3%
EU 28	**0.6%**	**0.8%**	**-0.2%**	

Note: Green: difference ≤ ± 2%, Yellow: difference ± >2 and ≤ 5%, Red: difference > ± 5% .

* For Belgium the Inventory data for the year 2014 shows implausible results for CO_2 emissions from liquid fuels due to very high negative emissions from Other liquid fossils (unspecified mix), this has been corrected to compare the closeness of results

1 Trend changes for solid fuel consumption are calculated in TJ

2 Trend changes for liquid fuel consumption are calculated in TJ

3 Inventory submission as available under EIONET has been used

4 Solid fuel consumption has been adapted

5 Market inland deliveries observed are used for hard coal consumption

GHG inventory CO_2 emissions from CRF table 1A(b) without CO_2 emissions from waste and other fossils

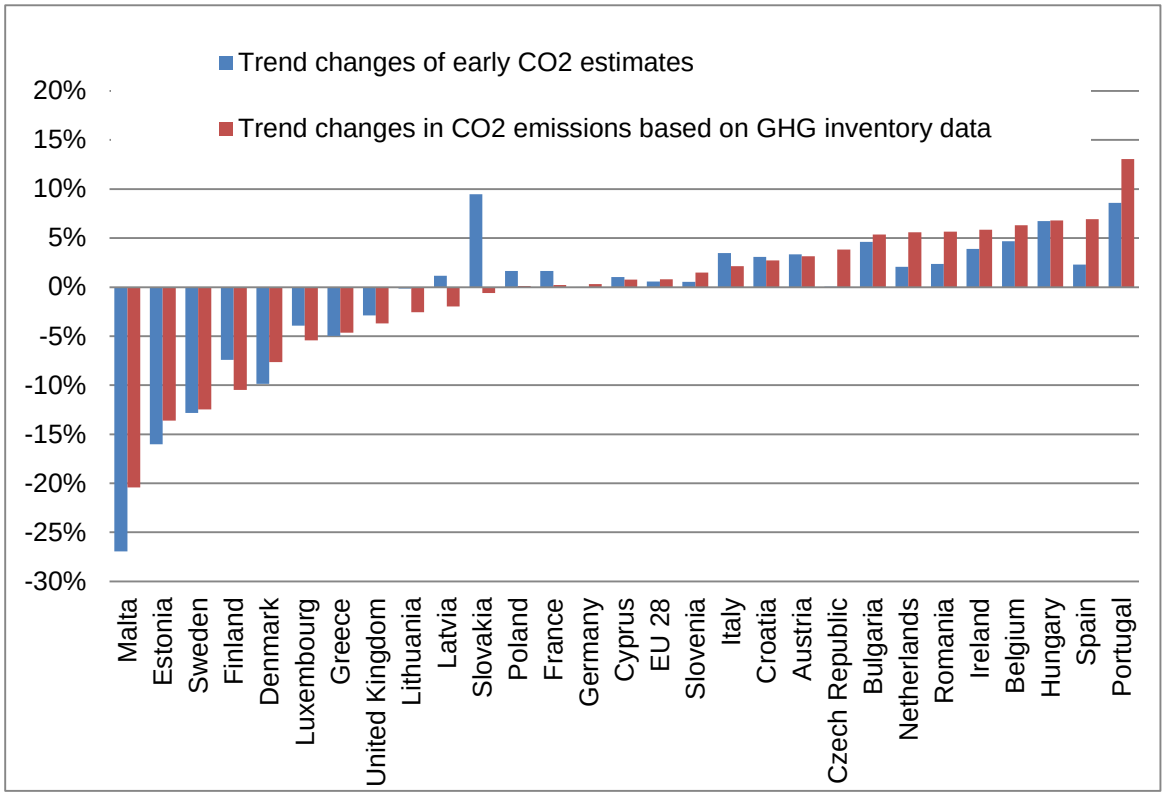
Germany, Spain, France, Italy, Netherlands, Poland and the United Kingdom each have a share of more than 5 % and together contributed 77% of EU CO_2 emissions from fossil fuel combustion.

Source: Eurostat early CO_2 estimates, MS GHG inventory submissions to UNFCCC 27th of May 2017

EU CO_2 emissions from fossil fuel combustion are dominated (see table 3-2) by six Member States each of which have a share of more than 5 % of the total. Germany, France, Italy, Poland and the United Kingdom show a very good match between the trend changes of the early CO_2 estimates and the trend changes from the GHG inventory with differences of 1.5 % or less. However, Spain with 7.6 % of EU total CO_2 emissions shows a difference of -4.6 %, which has implications on the result for total EU 28 CO_2 emissions. Differences above 5 % can only be found for Malta and Slovakia, which have only a very low share in EU 28 total CO_2 emissions from fuel combustion.

The analysis for the year 2015 shows, that the results of the early CO_2 estimates appear to be reliable because they largely correspond with increase or decrease in reported CO_2 emissions (see Figure 3-1). The exceptions were Latvia and Slovakia where the trend change of the early CO_2 estimates showed increasing CO_2 emissions, while final GHG inventory data showed decreasing emissions. In 2015 17 Member States showed increasing emissions and the early CO_2 estimates for the year 2015 indicated this increase in emissions, but underestimated the extent of the increase in most of the cases.

Figure 3-1: Analysis of differences for the year 2015



Source: Eurostat early CO_2 estimates 2015 and GHG inventory data 2017 submission

The detailed analysis of differences between Eurostat early CO_2 estimates and final GHG inventory data is carried out separately for liquid, solid and gaseous fuels. Table 3-3 shows the differences in trend changes for the aggregated fuel categories. All Member States except Cyprus, Poland and the United Kingdom show differences for the trend changes of above 2 % in at least one of the fuel categories.

While emissions from liquid, solid or gaseous fuels are all relevant, the relative contribution varies according to national circumstance. The share of CO_2 emissions from liquid, solid, gaseous fuels in

Member State's total CO_2 emissions from fuel consumption indicates the importance of the fuel in the Member State.

In all Member States except Estonia more than 20 % of CO_2 emissions originate from liquid fuel consumption. Differences in the trend change for liquid fuel consumption in Estonia are not as relevant as the differences in the trend changes for liquid fuel consumption in Sweden or in other Member States. Liquid fuel consumption in Estonia contributes only 4 % to total CO_2 emissions of fossil fuel consumption in Estonia, while for Sweden liquid fuels make up 83 % of total CO_2 emissions.

Solid fuel consumption is relevant in Bulgaria, the Czech Republic, Germany, Estonia, Greece and Poland. In these Member States the share of CO_2 emissions from solid fuel consumption in total national CO_2 emissions is above 40 %. Member States with a low share of CO_2 emissions from solid fuel consumption (< 10 % of total CO_2 emissions) are Belgium, Latvia, Lithuania, Luxembourg and Austria. In Cyprus and Malta almost no solid fuels are consumed.

Member States with emissions from natural gas consumption contributing more than 40 % to total national CO_2 emissions include Italy, Latvia, Hungary and the Netherlands. In Estonia, Greece and Sweden CO_2 emissions from natural gas consumption are below 10 % of total national CO_2 emission. In Cyprus and Malta there is no natural gas consumption.

Table 3-3: Comparison of changes in CO_2 emissions from liquid, solid and gaseous fuels

Member States	Eurostat early CO2 estimates	Member States GHG inventory emission data (CRF Table 1.A(b))	Difference	Share of liquid fuels in total CO2 emission of MS	Eurostat early CO2 estimates	Member States GHG inventory emission data (CRF Table 1.A(b))	Difference	Share of solid fuels in total CO2 emission of MS	Eurostat early CO2 estimates	Member States GHG inventory emission data (CRF Table 1.A(b))	Difference	Share of gaseous fuels in total CO2 emission of MS
	Liquid fuels				Solid fuels				Gaseous fuels			
	Change 2015/2014		%		Change 2015/2014		%		Change 2015/2014		%	
Belgium	2.1%	5.1%	-3.0%	55%	-1.3%	-2.1%	0.8%	7%	9.8%	9.8%	0.0%	38%
Bulgaria	6.4%	8.7%	-2.3%	26%	2.9%	3.7%	-0.8%	63%	10.4%	7.5%	2.9%	11%
Czech Republic	-2.2%	4.5%	-6.7%	21%	-0.4%	3.3%	-3.8%	63%	4.9%	4.9%	0.0%	16%
Denmark	-0.5%	0.6%	-1.1%	55%	-33.6%	-28.0%	-5.6%	23%	1.7%	1.9%	-0.2%	22%
Germany	1.0%	0.1%	0.9%	33%	-2.0%	-1.6%	-0.4%	46%	3.1%	5.2%	-2.0%	21%
Estonia	-14.9%	-35.2%	20.3%	4%	-16.5%	-12.6%	-3.8%	91%	-10.4%	-11.1%	0.8%	6%
Ireland	4.9%	6.3%	-1.4%	49%	9.4%	9.6%	-0.3%	26%	-3.3%	1.4%	-4.7%	25%
Greece	4.5%	4.3%	0.3%	49%	-15.9%	-15.3%	-0.6%	42%	7.8%	10.2%	-2.4%	8%
Spain	3.2%	5.1%	-1.9%	54%	-2.0%	15.5%	-17.5%	22%	3.7%	4.0%	-0.3%	24%
France	0.0%	2.3%	-2.3%	62%	-2.8%	-4.1%	1.3%	12%	8.3%	-2.6%	10.8%	26%
Croatia	2.7%	5.0%	-2.3%	60%	-8.3%	-6.5%	-1.8%	15%	11.9%	3.6%	8.3%	25%
Italy	1.7%	-1.6%	3.3%	44%	-4.3%	-4.4%	0.1%	15%	9.1%	9.6%	-0.5%	40%
Cyprus	1.0%	0.7%	0.3%	100%	-	-	-	0%	-	-	-	-
Latvia	2.9%	-3.2%	6.1%	58%	-29.4%	-21.9%	-7.5%	3%	1.6%	1.7%	-0.1%	40%
Lithuania	3.0%	0.8%	2.2%	68%	-25.1%	-20.2%	-5.0%	7%	0.4%	-5.0%	5.5%	25%
Luxembourg	-2.6%	-4.4%	1.7%	77%	1.3%	-8.4%	9.7%	2%	-8.8%	-8.8%	0.0%	21%
Hungary	8.9%	6.1%	2.9%	37%	3.1%	4.8%	-1.8%	23%	6.8%	8.6%	-1.8%	40%
Malta	-26.9%	-20.4%	-6.5%	100%	-	-	-	-	-	-	-	-
Netherlands	-8.9%	0.9%	-9.7%	31%	24.2%	22.6%	1.6%	27%	-1.1%	0.0%	-1.1%	41%
Austria	0.9%	2.0%	-1.1%	62%	9.9%	-1.1%	11.0%	8%	6.5%	6.8%	-0.2%	31%
Poland	7.3%	6.5%	0.8%	21%	0.0%	-2.0%	2.0%	70%	1.8%	2.8%	-0.9%	10%
Portugal	2.0%	6.4%	-4.4%	54%	21.7%	21.7%	0.0%	28%	11.1%	22.7%	-11.6%	18%
Romania	4.7%	7.6%	-2.9%	35%	5.9%	8.2%	-2.3%	35%	-3.7%	0.8%	-4.5%	30%
Slovenia	-1.2%	-1.0%	-0.2%	52%	1.5%	3.8%	-2.4%	36%	5.9%	6.1%	-0.2%	12%
Slovakia	12.3%	-2.2%	14.5%	31%	-2.6%	0.1%	-2.7%	38%	21.1%	0.2%	20.9%	31%
Finland	-4.4%	-11.1%	6.7%	49%	-10.1%	-8.7%	-1.3%	39%	-11.4%	-13.7%	2.3%	12%
Sweden	-15.6%	-12.0%	-3.6%	83%	-3.6%	-16.8%	13.2%	12%	-8.9%	-9.5%	0.5%	5%
United Kingdom	3.4%	2.0%	1.5%	42%	-20.0%	-21.3%	1.3%	20%	2.2%	2.4%	-0.2%	38%

Source: Eurostat early CO_2 estimates, MS GHG inventory submissions to UNFCCC

3.2. Analysis of differences

The analysis in the following sub-sections addresses liquid, solid and gaseous fuels and follows the same structure for each fuel type.

Firstly, the differences for the trend changes for the CO_2 emissions for the year 2015 are shown. The trend changes that are based on monthly Eurostat data are calculated for total fuel consumption in kt in comparison to the GHG inventory submission data where trend changes are calculated based on CO_2 emissions from fuel consumption.

Secondly, because the results of the trend change method depends on the data quality of two consecutive years, we provide a comparison of the data quality for the reporting of total liquid, solid or fossil fuel consumption for the years 2014 and 2015.

Finally, if this comparison shows differences above ±3 % for the year 2015 a detailed analysis of the fuel(s) that contributes to the differences on the level of aggregated fuel consumption is carried out.

3.2.1. Analysis of differences for liquid fuels

Table 3-4 provides an overview of the trend changes for CO_2 emissions from liquid fuel consumption. The comparison between trend changes calculated with Eurostat monthly data for the early CO_2 estimates and final GHG inventory data shows that more than half of the Member States have differences in trend changes above 2 %. Large differences above 5 % can be found for the Czech Republic, Estonia, Latvia, Malta, the Netherlands, Slovakia and Finland.

Table 3-4: Comparison of trend changes in CO_2 emissions from liquid fuel consumption

Member States	Trend changes of early CO_2 estimates	Trend changes in CO_2 emissions based on GHG inventory data (submission 2017)	Differences trend changes early CO_2 estimates-GHG inventory	Share of liquid fuels in total CO_2 emission of MS
	2015/2014			
	liquid fuels			
Belgium	2.1%	5.1%	-3.0%	55%
Bulgaria	6.4%	8.7%	-2.3%	26%
Czech Republic	-2.2%	4.5%	-6.7%	21%
Denmark	-0.5%	0.6%	-1.1%	55%
Germany	1.0%	0.1%	0.9%	33%
Estonia*	-14.9% (-54%)	-35.2%	20.3%	4%
Ireland	4.9%	6.3%	-1.4%	49%
Greece	4.5%	4.3%	0.3%	49%
Spain	3.2%	5.1%	-1.9%	54%
France	0.0%	2.3%	-2.3%	62%
Croatia	2.7%	5.0%	-2.3%	60%
Italy	1.7%	-1.6%	3.3%	44%
Cyprus	1.0%	0.7%	0.3%	100%
Latvia	2.9%	-3.2%	6.1%	58%
Lithuania	3.0%	0.8%	2.2%	68%
Luxembourg	-2.6%	-4.4%	1.7%	77%
Hungary	8.9%	6.1%	2.9%	37%
Malta*	-26.9% (-28%)	-20.4%	-6.5%	100%
Netherlands	-8.9%	0.9%	-9.7%	31%
Austria	0.9%	2.0%	-1.1%	62%
Poland	7.3%	6.5%	0.8%	21%
Portugal	2.0%	6.4%	-4.4%	54%
Romania	4.7%	7.6%	-2.9%	35%
Slovenia	-1.2%	-1.0%	-0.2%	52%
Slovakia	12.3%	-2.2%	14.5%	31%
Finland	-4.4%	-11.1%	6.7%	49%
Sweden	-15.6%	-12.0%	-3.6%	83%
United Kingdom	3.4%	2.0%	1.5%	42%
EU 28	**1.2%**	**1.5%**	**-0.3%**	42%

* Trend changes for Liquid fuel consumption for Estonia and Malta have been calculated in TJ, the trend changes in brackets represent the trend changes for liquid fuels calculated in kt

Source: Own Calculation based on extraction from Eurostat database, MS inventory submission to UNFCCC, CRF table 1.A(b)
For Estonia we need an explanation for this big difference!

Carbon stored

Trend changes of liquid fuel consumption are affected by changing shares of carbon stored, especially if the share is changing between years. If the share is rather high (e.g. 40 % in the

Netherlands) also changes of 1 % in the share of carbon stored do have large effects on the trend changes for liquid fuel consumption.

Table 3-5 shows all Member States with high shares of carbon stored. Was ist das? Plastik?

Table 3-5: Member States with high shares (=> 15 % in 2015) of carbon stored in total carbon content of liquid fuels consumed in 2014 and 2015

Member States	Carbon content (kt)	Carbon stored (kt C)	Share of carbon stored in total Carbon content (%)	Carbon content (kt)	Carbon stored (kt C)	Share of carbon stored in total Carbon content (%)
	2014			2015		
Belgium	18,402	6,157	33%	18,940	7,135	38%
Czech Republic	7,236	2,034	28%	7,109	1,673	24%
Germany	81,725	17,449	21%	81,220	16,896	21%
Estonia	314	82	26%	212	64	30%
France	61,361	10,933	18%	62,053	10,462	17%
Italy	45,698	6,015	13%	45,801	6,773	15%
Hungary	5,232	1,360	26%	5,602	1,496	27%
Netherlands	22,220	9,165	41%	21,767	8,600	40%
Poland	17,442	2,565	15%	18,605	2,766	15%
Portugal	7,583	1,255	17%	7,927	1,192	15%
Slovakia	2,546	394	15%	2,649	544	21%
Finland	6,968	1,036	15%	6,215	940	15%

Source: GHG inventory data (CRF Table 1.A.(b)) for the year 2014 and 2015 from the 2017 submission to UNFCCC

Differences in trend changes in Table 3-4 for Belgium, the Czech Republic, Estonia and Slovakia are strongly influenced by changes of the reported share of carbon stored. Also trend changes of the other Member States listed in Table 3-5 are partly influenced by changed shares of carbon stored.

Differences in the data reported

As pointed out above the trend changes are influenced by the reporting quality of two consecutive years and any changes in the quality of reporting affects the trend changes. Additionally there are some Member States that show good matches for the level of trend changes calculated with Eurostat monthly data and GHG inventory data, but only due to systematic differences in the reporting of monthly Eurostat data throughout the years. This becomes obvious in Table 3-6 that shows the differences in the reporting of liquid fuel consumption between Eurostat monthly data, Eurostat annual data and GHG inventory data for the years 2014 and 2015.

The comparison in Table 3-6 indicates that the quality of the reporting of liquid fuel consumption under monthly Eurostat data is not consistent over the years for most Member States. The fluctuation in the reporting quality results in inconsistencies and causes differences in trend changes in the period 2015/2014 (as shown in Table 3-4). The basis for the calculation of differences is aggregated liquid fuel consumption data calculated in kt. The differences are displayed as deviations from annual Eurostat data (which is 100 %), which is supposed to be the best reporting standard. GHG inventory data are close to annual Eurostat data in most Member States.

For France, Luxembourg, Hungary, Malta, the Netherlands, Portugal, Romania, Finland and the United Kingdom the consistency in reporting of total liquid fuel consumption between monthly and annual Eurostat data improved in 2015 in comparison to 2014 by more than 1 %. Nevertheless the Netherlands and Portugal still show differences above +/-5 % for aggregated liquid fuel consumption. In Bulgaria, the Czech Republic, Denmark, Estonia, Greece, Spain, Croatia, Italy, Lithuania and Slovakia differences between monthly and annual Eurostat data increased by more than 1 % in 2015. The Czech Republic, Germany, Spain, Romania, Finland and Sweden show a fluctuation in the reporting of monthly data as the differences between monthly and annual Eurostat data change from positive in 2014 to negative in 2015 or the other way around. The highest absolute differences in the reporting of liquid fuel consumption in 2015 are found for the Netherlands, Italy, Spain and Portugal.

The trend changes for the early CO_2 estimates are more affected by differences between monthly Eurostat data and GHG inventory data. More Member States show differences on this level than between monthly and annual Eurostat reporting. Member States that show a good match between monthly and annual reporting but show relevant (> 3 % in 2015) differences between monthly Eurostat reporting and GHG inventory reporting include Belgium, Germany, France, Italy, Lithuania, Malta, Poland, Romania, Finland and Sweden.

Table 3-6: Differences in liquid fuel consumption between monthly and annual Eurostat data and GHG inventory data

Member States	Eurostat monthly vs. Annual Eurostat		Difference monhtly-annual Eurostat in kt		Eurostat monthly vs. GHG inventory		GHG inventory vs. Eurostat annual	
	2014	2015	2014	2015	2014	2015	2014	2015
Belgium	3%	2%	675	559	0%	3%	3%	0%
Bulgaria	-5%	-6%	- 178	- 265	-4%	-6%	0%	-1%
Czech Republic	0%	-1%	13	- 110	0%	-1%	0%	0%
Denmark	7%	8%	387	451	8%	7%	-1%	1%
Germany	0%	0%	- 450	237	-1%	3%	0%	-3%
Estonia	-23%	-45%	- 82	- 104	-23%	-45%	0%	0%
Ireland	1%	1%	34	32	4%	2%	-3%	-2%
Greece	0%	-2%	- 24	- 236	0%	0%	0%	-2%
Spain	0%	-2%	158	- 938	2%	0%	-2%	-2%
France	2%	1%	1,312	552	-3%	-3%	5%	4%
Croatia	-2%	-5%	- 52	- 160	-5%	-6%	3%	1%
Italy	0%	-2%	- 211	- 1,317	-4%	-3%	4%	1%
Cyprus	-1%	0%	- 13	- 9	-1%	-1%	1%	1%
Latvia	-7%	-8%	- 94	- 108	-1%	-2%	-6%	-6%
Lithuania	1%	-4%	31	- 115	-6%	-6%	8%	1%
Luxembourg	-1%	0%	- 23	8	-1%	1%	0%	0%
Hungary	-3%	-2%	- 178	- 117	-2%	-1%	-1%	0%
Malta	-5%	-1%	- 39	- 6	-4%	-4%	-1%	1%
Netherlands	-10%	-8%	- 3,007	- 1,998	1%	-9%	-11%	1%
Austria	-1%	-1%	- 69	- 78	-2%	-2%	2%	2%
Poland	0%	1%	76	253	-1%	0%	1%	1%
Portugal	10%	9%	923	835	9%	6%	1%	3%
Romania	2%	-1%	192	- 113	-1%	-3%	4%	1%
Slovenia	-4%	-3%	- 87	- 67	-4%	-3%	0%	0%
Slovakia	2%	5%	68	152	-4%	4%	6%	1%
Finland	-5%	2%	- 402	125	1%	8%	-6%	-6%
Sweden	1%	-1%	146	- 84	-2%	-3%	4%	3%
United Kingdom	-2%	0%	- 869	- 186	-2%	0%	1%	0%
EU 28	**0%**	**-1%**	**- 1,763**	**- 2,807**	**-1%**	**-1%**	**1%**	**0%**
<+/- 2%	15 MS	15 MS			12 MS	9 MS	16 MS	22 MS
+/-2-5%	7 MS	6 MS			12 MS	11 MS	7 MS	4 MS
> +/- 5%	6 MS	7 MS			4 MS	8 MS	5 MS	2 MS

Note: The data for GHG inventory submission for the year 2014 is based on the 2016 submission, the data for 2015 based on the 2017 submission, as this table focuses on the comparison in the specific year. Data used in this table might not reflect the trend changes for the GHG inventory as shown in Table 3-4 due to data revisions and recalculations between 2016 and 2017 GHG inventory submissions.
Data does not include the reporting of biofuels.
Differences are based on liquid fuel consumption in kt for all data sources
Annual Eurostat data is 100%

Source: Own compilation based on extraction from Eurostat database in the specific year, GHG inventory submission CRF table 1.A(b)

For Member States that show differences above 3 % in the reporting of liquid fuel consumption in the different data sources for the year 2015 data is further analysed in the following tables. Table 3-7 shows detailed differences on the level of the single fuel categories for liquid fuel consumption. Table 3-8 provides a description of the differences and if available further explanations.

Table 3-7: Detailed differences for liquid fuel consumption between monthly and annual Eurostat data and GHG inventory data for 2015

Member State	Fuel Consumption	Monthly Eurostat	Annual Eurostat	GHG inventory data	Diffference between monthly-annual Eurostat data		Difference Monthly Eurostat - GHG inventory data		Differences GHG inventory - annual Eurostat data	
		Apparent fuel consumption in kt			kt	%	kt	%	kt	%
Belgium	**Total liquids**	**22,943**	**22,384**	**22,379**	***559***	2%	***564***	3%	***-5***	0%
	Gasoline	-3,589	-3,858	-3,858	*269*		*269*		*0*	
	Other oil	-732	-927	-932	*195*		*200*		*-5*	
Bulgaria	**Total liquids**	**3,914**	**4,179**	**4,148**	***-265***	-6%	***-234***	-6%	***-31***	-1%
	Crude Oil	5,986	6,037	6,037	*-51*		*-51*		*0*	
	Gas/diesel oil	-126	-83	-83	*-43*		*-43*		*0*	
	Other oil	160	232	202	*-72*		*-42*		*-30*	
Denmark	**Total liquids**	**6,120**	**5,669**	**5,711**	***451***	8%	***409***	7%	***42***	1%
	Jet or other Kerosene	471	-97	-86	*568*		*557*		*11*	
Germany	**Total liquids**	**98,438**	**98,201**	**95,370**	***237***	0%	***3,068***	3%	***-2,831***	-3%
	Crude Oil	93,801	93,636	93,257	*165*		*544*		*-379*	
	Gasoline	-2,526	-2,543	-2,880	*17*		*354*		*-337*	
	Gas/diesel oil	8,892	8,694	8,473	*198*		*419*		*-221*	
	Other oil	-1,535	-1,636	-3,007	*101*		*1,472*		*-1,371*	
Estonia	**Total liquids**	**125**	**229**	**229**	***-104***	-45%	***-104***	-45%	***0***	0%
	Shale Oil	-747	-769	-769	*22*		*22*		*0*	
	Residual fuel oil	-3	13	13	*-16*		*-16*		*0*	
	Other oil (Bitumen)	0	74	74	*-74*		*-74*		*0*	
France	**Total liquids**	**71,180**	**70,628**	**73,722**	***552***	1%	***-2,542***	-3%	***3,094***	4%
	Crude Oil	57,461	57,423	58,188	*38*		*-727*		*765*	
	Jet or other Kerosene	-841	-2,519	-2,524	*1,678*		*1,683*		*-5*	
	Residual fuel oil	-4,761	-4,791	-4,060	*30*		*-701*		*731*	
	Naphtha	-831	-824	-382	*-7*		*-449*		*442*	
	Other oil	441	452	2,759	*-11*		*-2,318*		*2,307*	
Croatia	**Total liquids**	**2,982**	**3,142**	**3,174**	***-160***	-5%	***-192***	-6%	***32***	1%
	Residual fuel oil	-339	-272	-393	*-67*		*53*		*-121*	
	Refinery feedstocks	326	383	-	*-57*		-		-	
Italy	**Total liquids**	**52,175**	**53,492**	**53,821**	***-1,317***	-2%	***-1,646***	-3%	***329***	1%
	Crude Oil	67,083	66,995	65,656	*88*		*1,427*		*-1,339*	
	Gasoline	-8,248	-7,944	-7,878	*-304*		*-370*		*66*	
	Residual fuel oil	-5,576	-5,095	-5,042	*-481*		*-534*		*53*	
	Refinery Feedstocks	5,580	5,619	7,365	*-39*		*-1,785*		*1,746*	
	Other oil	-2,606	-2,196	-2,489	*-410*		*-117*		*-293*	

Member State	Fuel Consumption	Monthly Eurostat	Annual Eurostat	GHG inventory data	Diffference between monthly-annual Eurostat data		Difference Monthly Eurostat - GHG inventory data		Differences GHG inventory - annual Eurostat data	
		Apparent fuel consumption in kt			kt	%	kt	%	kt	%
Latvia	**Total liquids**	**1,232**	**1,340**	**1,254**	***-108***	-8%	***-22***	-2%	***-86***	-6%
	Gas/diesel oil	846	947	858	*-101*		*-12*		*-89*	
Lithuania	**Total liquids**	**2,455**	**2,570**	**2,603**	***-115***	-4%	***-148***	-6%	***33***	1%
	Gas/diesel oil	-2,451	-2,395	-2,384	*-56*		*-67*		*11*	
	Other oil (Bitumen)	-79	-32	-70	*-47*		*-9*		*-38*	
Malta	**Total liquids**	**527**	**533**	**548**	***-6***	-1%	***-21***	-4%	***15***	3%
	Residual fuel oil	255	262	270	*-7*		*-15*		*8*	
Netherlands	**Total liquids**	**24,297**	**26,295**	**26,569**	***-1,998***	-8%	***-2,272***	-9%	***274***	1%
	NGL	6,631	7,149	7,150	*-518*		*-519*		*1*	
	LPG	2,125	2,855	2,855	*-730*		*-730*		*0*	
	Naphtha	3,421	4,082	4,081	*-661*		*-660*		*-1*	
Portugal	**Total liquids**	**9,918**	**9,083**	**9,322**	***835***	9%	***596***	6%	***239***	3%
	Crude Oil	13,973	13,847	13,994	*126*		*-21*		*147*	
	Jet or other Kerosene	-447	-1,009	-1,009	*562*		*562*		*0*	
Romania	**Total liquids**	**8,617**	**8,730**	**8,859**	***-113***	-1%	***-242***	-3%	***129***	1%
	Refinery feedstocks	524	532	628	*-8*		*-104*		*96*	
	Other oil	311	602	623	*-291*		*-312*		*21*	
Slovenia	**Total liquids**	**2,161**	**2,228**	**2,228**	***-67***	-3%	***-67***	-3%	***0***	0%
	Petroleum Coke	0	66	66	*-66*		*-66*		*0*	
Slovakia	**Total liquids**	**3,278**	**3,126**	**3,156**	***152***	5%	***122***	4%	***30***	1%
	Gas/diesel oil	-1,303	-1,616	-1,616	*313*		*313*		*0*	
	Other oil (Bitumen)	-13	87	78	*-100*		*-91*		*-9*	
Finland	**Total liquids**	**7,838**	**7,713**	**7,274**	***125***	2%	***564***	8%	***-439***	-6%
	Gas/diesel oil	-1,268	-1,248	-1,824	*-20*		*556*		*-576*	
Sweden	**Total liquids**	**9,558**	**9,642**	**9,894**	***-84***	-1%	***-336***	-3%	***252***	3%
	Gas/diesel oil	-4,104	-4,215	-3,865	*111*		*-239*		*350*	
	Jet or other Kerosene	174	73	84	*101*		*90*		*11*	
	Residual fuel oil	-3,749	-3,421	-3,339	*-328*		*-410*		*82*	
	Refinery feedstocks	-785	-789	-980	*4*		*195*		*-191*	
	Other oil	-844	-848	-636	*4*		*-208*		*212*	

Note: Apparent consumption is calculated as production (only for primary fuels) + imports-exports-stock changes-international bunkers, negative numbers in total apparent consumption indicate that exports, stock changes or international bunkers are higher than imports.
The table shows only the fuels that contribute most to the differences. There are other fuels that show also differences and are not shown in this table.

Source: Eurostat database in the specific year, GHG inventory submission 2017 for the year 2015

There are up to seventeen fuel categories reported under liquid fuel consumption by Member States. Thus the reporting of liquid fuel is complex and fluctuations of data quality between years appear. In some Member States a random levelling out of differences in the reporting of liquid fuels might lead to a reduction of differences in the reporting of aggregated total liquid fuel consumption. Especially for France, Italy and Sweden Table 3-7 shows that the good matches between monthly and annual Eurostat data or GHG inventory data are rather randomly. On the basis of the single fuel consumption there are large differences.

Systematic differences can be found for the reporting of international bunkers in Denmark, France and Portugal. This might not strongly affect the trend changes but results in large differences in the reporting of apparent consumption for the affected fuels under monthly Eurostat data, in comparison to annual Eurostat data and GHG inventory data. Consumption of international bunker fuels is one area for which several Member States report much lower quantities in Eurostat monthly compared to annual energy data. The under-reporting of international bunker fuels in a Member State's monthly Eurostat data has the effect that the combined monthly total fuel consumption in the reference approach calculation is higher than in the annual total. This is

because international bunker fuels are subtracted from each Member State's total fuel consumption for internal consumption. This becomes obvious if Member States report systematically higher monthly oil consumption than reported under annual Eurostat data – Denmark and Portugal (see Table 3-6).

Table 3-8: Description and further explanation of differences for liquid fuel consumption as shown in Table 3-7 for the year 2015

Member state	
Belgium	Differences between annual and monthly Eurostat data occur for gasoline, gas/diesel oil, residual fuel oil and other oil. In comparison to annual Eurostat data and GHG inventory the monthly Eurostat data overestimates liquid fuel consumption in 2014 and 2015. The differences in the reporting between monthly Eurostat data and GHG inventory data influence the trend changes of liquid fuels. Changing amounts of carbon stored influence the trend changes from liquid fuel consumption (Table 3-5). In comparison to last year the reporting of NGL and naphtha improved.
Bulgaria	Differences between annual and monthly Eurostat data occur for crude oil, gas/diesel oil and other oil. In comparison to annual Eurostat data and GHG inventory the monthly Eurostat data underestimates liquid fuel consumption in 2014 and 2015. Trend changes of liquid fuels are influenced by the differences in reporting between monthly Eurostat data and GHG inventory data.
Denmark	There are systematic differences in the reporting of international bunkers from Jet Kerosene. Differences in the reporting of international bunker fuels do not strongly affect the trend changes, as they are systematic. *The reporting of international bunker fuels is not mandatory for monthly energy statistics. However most Member States report sufficient data for international bunkers under monthly Eurostat data.* In comparison to last year the reporting of gas/diesel oil improved.
Germany	Differences between monthly/annual Eurostat and GHG inventory data occur for crude oil, gasoline, gas/diesel oil and other oil. The highest differences are found for the reporting of stock changes from other oil (lubricants). The effect in the trend changes is very low, showing differences in trend changes below 1 %. *Germany reports the reference approach data in TJ instead of kt. Some uncertainties can be related to different NCVs used for the conversion of GHG inventory data into kt.*
Estonia	There are increasing differences for the reporting of gas/diesel oil imports. Although annually bitumen is reported, in monthly data bitumen is not reported under Other oil. Changing amounts of carbon stored influence the trend changes from liquid fuel consumption (Table 3-5). The effects of the differences in carbon stored reporting are quite strong. However the share of CO_2 emissions from liquid fuel consumption in total CO_2 emission of Estonia is only 4 %. Thus the differences in carbon stored reporting have only a small impact on the results of the total early CO_2 estimates for Estonia. In comparison to last year the reporting of shale oil and residual fuel oil improved.
France	Differences between monthly/annual Eurostat and GHG inventory data occur for crude oil, jet kerosene, residual fuel oil, naphtha and other oil. The slight increase in differences for the reporting of liquid fuels and the changes in the share of carbon stored from liquid fuel consumption affect the trend changes from total liquid fuels (Table 3-5).
Italy	Differences between monthly and annual Eurostat data occur for crude oil, gasoline, residual fuel oil, refinery feedstocks and other oil. At the level of aggregated liquid fuel consumption the differences between annual Eurostat

	data and GHG inventory data are levelled out. The slight increase in differences for the reporting of liquid fuels and the changes in the share of carbon stored from liquid fuel consumption affect the trend changes from total liquid fuels (Table 3-5). *Italy reports the reference approach data in TJ instead of kt. In the Inventory report there are no country specific conversion factors reported. For the reason of comparison conversion factors calculated using Eurostat annual data are used. Some uncertainties may therefore be related to different NCVs used for the conversion of GHG inventory data into kt.*
Latvia	Systematic differences between monthly and annual reporting of gas/diesel oil. Only small differences between monthly Eurostat and GHG inventory data. Even if the differences between monthly Eurostat and GHG inventory data are very small (< 2 %) the trend changes of the early CO_2 estimates are affected and show higher differences in comparison to GHG inventory data. *It seems that Latvia uses monthly statistics for the reporting of GHG inventory data for the most recent year (2014 in the 2016 submission). However in the next year Latvia revises inventory data on gas/diesel oil and uses data close to the annual Eurostat reporting for the year 2014 (2017 submission). This influences the trend changes on the level of the GHG inventory data.*
Lithuania	Differences between monthly and annual Eurostat data are related to the reporting of gas/diesel oil and other oil (bitumen). Differences between monthly/annual Eurostat data and GHG inventory data are found for crude oil, NGL, residual fuel oil and refinery feedstocks. At the level of aggregated liquid fuel consumption the differences between annual Eurostat data and GHG inventory data are levelled out. Differences in the reporting between monthly Eurostat data and GHG inventory data have small effects on the trend changes.
Malta	There are differences in the reporting of gas/diesel oil and residual fuel oil. However, the total differences for liquid fuel consumption between monthly Eurostat data and GHG inventory data account only to 21 kt in 2015. As total liquid fuel consumption in Malta is very low, these small differences in reporting affect the trend changes. GHG inventory data for 2014 has been revised. This influences the trend changes on the level of GHG inventory data and shows differences to the trend changes calculated with monthly Eurostat data.
Netherlands	Large differences in the reporting of imports for NGL, LPG and naphtha under monthly Eurostat data in comparison to annual Eurostat data/GHG inventory data. Differences are mainly based on the reporting of imports, which are underestimated in monthly Eurostat data. *The reporting of lower imports in comparison to annual Eurostat data and GHG inventory data leads to an underestimation of CO_2 emissions. Thus the trend change in* Table 3-4 *shows a strong decline in CO_2 emission from liquid fuels under the early CO_2 estimates, while GHG inventory data show a small increase.* Changing amounts of carbon stored influence the trend changes from liquid fuel consumption (Table 3-5).
Portugal	There are systematic differences in the reporting of international bunkers from jet kerosene. In 2015 further differences appear for the reporting of crude oil. In comparison to 2014 the reporting of international bunkers from residual fuel oil improved again, which results in decreasing differences between monthly Eurostat data and GHG inventory data and affects the trend changes. Changing amounts of carbon stored influence the trend changes from liquid fuel consumption (Table 3-5). *The reporting of international bunker fuels is not mandatory for monthly energy statistics.*

	However most Member States report sufficient data for international bunkers under monthly Eurostat data.
Romania	Differences between monthly and annual Eurostat data occur for other oil, but are levelled out at the level of aggregated liquid fuel consumption. Differences between monthly/annual Eurostat data and GHG inventory data are mainly based on the reporting of refinery feedstocks. In comparison to the year 2015 differences in the reporting on the level of aggregated liquid fuel consumption between monthly Eurostat data and GHG inventory data increased and thus affect the trend changes.
Slovenia	Petroleum coke is systematically not reported under monthly Eurostat data. As this is a systematic issue and petroleum coke has only a small share in liquid fuel consumption trend changes of liquid fuel consumption are not affected.
Slovakia	Liquid fuel consumption is overestimated under monthly Eurostat data due to underreporting of exports from gas/diesel oil in comparison to annual Eurostat data and GHG inventory data. In 2014 monthly Eurostat data underestimates liquid fuel consumption as exports from residual fuel oil have been over reported. This influences the trend changes from liquid fuel consumption. Changing amounts of carbon stored influence the trend changes from liquid fuel consumption (Table 3-5).
Finland	There are systematic differences in the reporting of gas/diesel oil between monthly/annual Eurostat data and GHG inventory data. In 2014 differences in the reporting of gas/diesel oil between monthly Eurostat data and GHG inventory data levelled out due to differences reported for crude oil. In 2015 the reporting of crude oil improved and the differences are not levelled out. This leads to increasing differences between monthly Eurostat data and GHG inventory data and has large effects on the trend changes for liquid fuel consumption. Changing amounts of carbon stored influence the trend changes from liquid fuel consumption (Table 3-5). *Finland is aware of differences that turn out when comparing the Reference approach (RA) and the sectoral approach (SA) in the GHG inventory data. In their inventory report 2017 (p. 68, 69) they mention: "In recent years, new challenges for the RA-SA comparison have emerged, when more bio components have been included in transport fuels. It is not always clear, whether these bio components and biogenic are included in import and export data. This subject may become more important in coming years, because production and also import and export of transport biofuels are growing substantially in Finland.* *We have started a project to understand the reasons behind large statistical differences and different figures in oil balance, import/export statistics and Reference Approach. The work has started in 2017.*
Sweden	There are large differences in the reporting of many liquid fuels between monthly and annual Eurostat data and GHG inventory data. Main differences are found for the reporting of gas/diesel oil and residual fuel oil. The differences in reporting also affect the trend changes for liquid fuel consumption.

Source: Own compilation

The comparison shows, that the differences in the reporting of liquid fuel consumption is either based on changes in the data quality or due to systematic reporting issues. This is the case for Estonia where other oil is constantly not reported under Eurostat monthly data or Denmark and Portugal where international bunkers from jet kerosene are systematically underreported in Eurostat monthly data. Besides this, it also shows that there are Member States (France, Italy (annual Eurostat – GHG inventory data) and Sweden) that have general problems in the reporting of liquid fuels, as there are differences for many liquid fuel categories.

3.2.2. Analysis of differences for solid fuels

Table 3-9 provides an overview on the trend changes used to calculate CO_2 emissions from solid fuel consumption. The comparison between trend changes calculated with Eurostat monthly data and GHG inventory data shows that almost half of the Member States show differences in trend changes above 2 %. Large differences above 5 % can be found for Denmark, Spain, Latvia, Luxemburg, Austria and Sweden.

However, Luxembourg, Austria and Sweden show good results on the level of total CO_2 emission (see Table 3-2). Luxembourg has a rather low share of CO_2 emissions from solid fuel consumption in total CO_2 emissions, while for Austria and Sweden larger differences in the reporting of solid fuels are randomly levelled out by differences in liquid or gaseous fuel consumption.

Table 3-9: Comparison of trend changes in CO_2 emissions from solid fuel consumption

Member States	Trend changes of early CO_2 estimates	Trend changes in CO_2 emissions based on GHG inventory data (submission 2017)	Differences trend changes early CO_2 estimates-GHG inventory	Share of solid fuels in total CO_2 emission of MS
	2015/2014			
	solid fuels			
Belgium	-1.3%	-2.1%	0.8%	6.7%
Bulgaria*	2.9% (11%)	3.7%	-0.8%	62.8%
Czech Republic	-0.4%	3.3%	-3.8%	62.8%
Denmark	-33.6%	-28.0%	-5.6%	23.1%
Germany	-2.0%	-1.6%	-0.4%	45.7%
Estonia*	-16.5% (-15%)	-12.6%	-3.8%	90.9%
Ireland	9.4%	9.6%	-0.3%	25.9%
Greece	-15.9%	-15.3%	-0.6%	42.4%
Spain	-2.0%	15.5%	-17.5%	21.8%
France	-2.8%	-4.1%	1.3%	12.2%
Croatia	-8.3%	-6.5%	-1.8%	15.4%
Italy	-4.3%	-4.4%	0.1%	15.5%
Cyprus	NO	NO	NO	-
Latvia	-29.4%	-21.9%	-7.5%	2.9%
Lithuania	-25.1%	-20.2%	-5.0%	7.1%
Luxembourg	1.3%	-8.4%	9.7%	2.0%
Hungary*	3.1% (0%)	4.8%	-1.8%	22.7%
Malta	NO	NO	NO	-
Netherlands	24.2%	22.6%	1.6%	27.3%
Austria	9.9%	-1.1%	11.0%	7.8%
Poland	0.0%	-2.0%	2.0%	69.7%
Portugal	21.7%	21.7%	0.0%	28.0%
Romania	5.9%	8.2%	-2.3%	35.1%
Slovenia	1.5%	3.8%	-2.4%	35.7%
Slovakia	-2.6%	0.1%	-2.7%	37.6%
Finland	-10.1%	-8.7%	-1.3%	39.3%
Sweden	-3.6%	-16.8%	13.2%	12.3%
United Kingdom	-20.0%	-21.3%	1.3%	20.3%
EU 28	-3.0%	-2.3%	**-0.6%**	32.6%

* Trend changes for solid fuel consumption for Bulgaria, Estonia and Hungary have been calculated in TJ, the trend changes in brackets represent the trend changes for solid fuels calculated in kt

Source: Own calculation based on extraction from Eurostat database, MS inventory submission to UNFCCC, CRF table 1.A(b)

For Bulgaria, Estonia and Hungary the trend changes for solid fuels have been corrected for the calculation of the 2015 early estimates. Instead of using the trend changes calculated from the consumption of solid fuels in kilotons, the trend changes are calculated based on consumption in TJ. This was done due to changes in the consumption between solid fuel categories with different NCVs. The results show that for Bulgaria and Hungary the correction of the trend change result in

improved trend changes between monthly Eurostat and GHG inventory data, while for Estonia the differences are lower for the trend changes calculated in kilotons.

Carbon stored

Trend changes can also be influenced by the share of carbon stored in solid fuels if the share is changing between years. The influence on the trend change is stronger the higher the share of carbon stored in total carbon content from solid fuel consumption. Table 3-5 shows the share of carbon stored in total carbon for Member States with relevant shares of carbon stored in solid fuels.

Table 3-10: Member States with high shares (=> 15 % in 2015) of carbon stored in total carbon content of solid fuels consumed in 2014 and 2015

Member States	Carbon content (kt)	Carbon stored (kt C)	Share of carbon stored in total Carbon content (%)	Carbon content (kt)	Carbon stored (kt C)	Share of carbon stored in total Carbon content (%)
	2014			2015		
Belgium	3,572	2,112	59%	3,452	2,024	59%
Luxembourg	58	8	14%	54	8	15%
Austria	3,438	2,328	68%	3,639	2,541	70%
Slovakia	3,741	1,219	33%	3,620	1,096	30%
Finland	3,393	501	15%	3,059	480	16%
Sweden	1,951	671	34%	1,722	652	38%

Source: GHG inventory data (CRF Table 1.A.(b)) for the year 2014 and 2015 from the 2017 submission to UNFCCC

For Belgium and Luxembourg the effects of carbon stored on the trend changes of CO_2 emissions from solid fuel consumption are very small. For Belgium there are no inter annual changes in the share of carbon stored and for Luxembourg the share is rather low. Strong influences on the trend changes of solid fuel consumption can be found for Austria and Sweden.

Differences in the data reported

Besides the effects of carbon stored on the trend changes from the GHG inventory data, trend changes are influenced by the reporting quality of two consecutive years and any changes in the quality of reporting affects the trend changes. Additionally there are some Member States that show good matches for the level of trend changes calculated with Eurostat monthly data and GHG inventory data, but only due to systematic differences in the reporting of monthly Eurostat data throughout the years. This becomes obvious in **Table 3-11** that shows the differences in the reporting of solid fuel consumption between Eurostat monthly data, Eurostat annual data and GHG inventory data for the years 2014 and 2015.

Table 3-11 shows - similarly to liquid fuels – a fluctuating data quality between the years that affect the trend changes from solid fuel consumption in many Member States.

In comparison to the reporting in 2014 Belgium, Denmark, Italy, Lithuania, Luxembourg, Romania and Slovenia showed improvements in the quality of the monthly Eurostat data of above 1 % in 2015. However the difference between monthly and annual Eurostat data is still above +/- 5 % in Denmark, Lithuania, Luxembourg and Slovenia. In Germany, Estonia, Ireland, Greece, Spain

Latvia, Hungary, Netherlands, Austria, Poland, Portugal, Slovakia, Finland and Sweden the differences between monthly and annual Eurostat data increased by more than 1 % (see Table 3-9). For those Member States the changing data quality (improvement or deterioration) affect the trend changes.

The highest absolute differences in the reporting of solid fuel consumption between monthly and annual Eurostat data in 2015 are found for Germany, Greece, Spain, the Netherlands and Poland in 2015.

The trend changes for the early CO_2 estimates are more effected by differences between monthly Eurostat data and GHG inventory data. More Member States have differences on this level than between monthly and annual Eurostat reporting. Member States that show a good match between monthly and annual reporting but show relevant (> 3 % in 2015) differences between monthly Eurostat reporting and GHG inventory reporting include the Czech Republic, Italy, Portugal and Sweden.

Table 3-11 shows that there is no constant good reporting quality for solid fuel consumption under annual Eurostat and GHG inventory. France and the Netherlands show systematic differences for the reporting of solid fuel consumption, while for some other Member States the differences in 2015 increased.

Table 3-11: Differences in solid fuel consumption between monthly and annual Eurostat data and GHG inventory data for the years 2014 and 2015

Member States	Eurostat monthly vs. Annual Eurostat			Difference monhtly-annual Eurostat in kt		Eurostat monthly vs. GHG inventory		GHG inventory vs. Eurostat annual	
	2013	2014	2015	2014	2015	2014	2015	2014	2015
Belgium	-20%	-4%	-1%	- 170	- 42	-4%	-2%	0%	1%
Bulgaria	-1%	0%	0%	- 88	94	0%	0%	0%	0%
Czech Republic	2%	0%	0%	224	- 117	0%	-4%	0%	4%
Denmark	2%	10%	-6%	406	- 202	4%	-6%	6%	0%
Germany	-4%	-3%	-5%	- 6,638	- 10,921	-2%	-4%	-1%	0%
Estonia	-1%	-2%	-4%	- 350	- 671	-2%	-4%	0%	0%
Ireland	2%	10%	12%	563	727	10%	10%	0%	2%
Greece	-3%	-6%	-7%	- 2,952	- 3,176	-6%	-7%	0%	0%
Spain	-1%	2%	-13%	484	- 3,121	2%	-13%	0%	0%
France	7%	7%	6%	978	847	-7%	-5%	15%	12%
Croatia	1%	0%	-1%	- 4	- 13	0%	-1%	0%	0%
Italy	1%	0%	1%	- 82	189	-2%	-3%	2%	4%
Cyprus	NA	0%	0%	-	-	-4%	0%	4%	0%
Latvia	1%	-5%	-15%	- 5	- 12	2%	-15%	-7%	1%
Lithuania	0%	17%	14%	61	40	-3%	23%	21%	-7%
Luxembourg	-5%	-13%	-6%	- 12	- 5	-14%	-6%	1%	0%
Hungary	1%	0%	-1%	45	- 119	1%	-2%	0%	0%
Malta	NO	NO	NO	-	-	NO	NO	NO	NO
Netherlands	-1%	-10%	-22%	- 1,476	- 3,979	-14%	-25%	4%	3%
Austria	-9%	3%	4%	122	196	3%	4%	0%	0%
Poland	0%	0%	2%	- 454	1,939	-1%	0%	1%	1%
Portugal	0%	0%	1%	- 7	72	3%	3%	-3%	-2%
Romania	-3%	-4%	-2%	- 1,139	- 538	-4%	-2%	0%	0%
Slovenia	-10%	-13%	-12%	- 454	- 419	-13%	-11%	0%	0%
Slovakia	-4%	0%	-1%	- 2	- 63	3%	-1%	-3%	0%
Finland	-1%	-1%	-3%	- 94	- 290	-3%	-4%	2%	2%
Sweden	-11%	1%	-2%	26	- 65	3%	21%	-2%	-19%
United Kingdom	0%	0%	1%	59	376	-2%	2%	2%	-1%
EU 28	**-1.7%**	**-1.5%**	**-2.7%**	**- 10,959**	**- 19,273**	**-2.0%**	**-3.3%**	**0%**	**1%**
<+/- 2%	14 MS	13 MS	13 MS			7 MS	8 MS	19 MS	19 MS
+/-2-5%	7 MS	6 MS	4 MS			14 MS	9 MS	4 MS	5 MS
> +/- 5%	5 MS	8 MS	10 MS			6 MS	10 MS	4 MS	3 MS

Note: The reporting of coal tar is not included under the monthly coal Questionnaire. In the annual Eurostat data and in the GHG inventory data coal tar is reported. The data presented above does not include coal tar, as this is not included under the reporting for monthly Eurostat data.

Differences are based on solid fuel consumption in kt for all data sources

For Ireland own aggregates for hard coal and peat consumption are included under monthly Eurostat data

Source: Own compilation based on extraction from Eurostat database in the specific year, GHG inventory submission CRF table 1.A(b)

For Member States that show differences above 3 % in the reporting of solid fuel consumption in the different data sources for the year 2015 data is further analysed in the following tables. Table 3-12 shows detailed differences on the level of the single fuel categories for solid fuel consumption. Table 3-13 provides a description of the differences and if available further explanations.

Table 3-12: Detailed differences for solid fuel consumption between monthly and annual Eurostat data and GHG inventory data for 2015

Member State	Fuel Consumption	Monthly Eurostat	Annual Eurostat	GHG inventory data	Diffference between monthly-annual Eurostat data		Difference Monthly Eurostat - GHG inventory data		Difference GHG inventory data - annual Eurostat data	
		Apparent fuel consumption in kt			kt	%	kt	%	kt	%
Czech Republic	**Total solids**	**45,516**	**45,633**	**47,309**	***-117***	0%	***-1,793***	-4%	***1,676***	4%
	Hard Coal	7,283	7,769	7,921	*-486*		*-638*		*152*	
	Lignite	38,213	37,821	39,349	*392*		*-1,136*		*1,528*	
Denmark	**Total solids**	**2,952**	**3,154**	**3,154**	***-202***	-6%	***-202***	-6%	***0***	0%
	Hard coal	2,937	3,137	3,137	*-200*		*-200*		*0*	
Germany	**Total solids**	**228,927**	**239,848**	**239,333**	***-10,921***	-5%	***-10,406***	-4%	***-515***	0%
	Hard coal	50,476	61,549	60,617	*-11,073*		*-10,141*		*-932*	
	BKB and Patent fuels	-1,317	-1,240	-96	*-77*		*-1,221*		*1,144*	
	Coke oven/gas coke	2,821	2,569	1,854	*252*		*967*		*-715*	
Estonia	**Total solids**	**17,381**	**18,052**	**18,061**	***-671***	-4%	***-680***	-4%	***9***	0%
	Oil shale	17,347	17,899	17,899	*-552*		*-552*		*0*	
Ireland	**Total solids**	**6,567**	**5,840**	**5,981**	***727***	12%	***586***	10%	***141***	2%
	Peat	4,190	3,499	3,667	*691*		*523*		*168*	
Greece	**Total solids**	**41,372**	**44,548**	**44,548**	***-3,176***	-7%	***-3,176***	-7%	***0***	0%
	Lignite	41,083	44,267	44,267	*-3,184*		*-3,184*		*0*	
Spain	**Total solids**	**21,520**	**24,641**	**24,653**	***-3,121***	-13%	***-3,133***	-13%	***12***	0%
	Hard coal	20,222	24,414	24,426	*-4,192*		*-4,204*		*12*	
	Lignite	1,075	-	-	-		-		-	
France	**Total solids**	**14,367**	**13,520**	**15,113**	***847***	6%	***-746***	-5%	***1,593***	12%
	Hard coal	13,898	13,067	13,856	*831*		*42*		*789*	
	Coke oven/gas coke	254	250	1,046	*4*		*-792*		*796*	
Italy	**Total solids**	**20,083**	**19,894**	**20,735**	***189***	1%	***-652***	-3%	***841***	4%
	Hard coal	19,594	19,456	20,290	*138*		*-696*		*834*	
Latvia	**Total solids**	**70**	**82**	**83**	***-12***	-15%	***-13***	-15%	***1***	1%
	Hard coal	69	81	82	*-12*		*-13*		*1*	
Lithuania	**Total solids**	**328**	**288**	**267**	***40***	14%	***61***	23%	***-21***	-7%
	BKB and Patent fuels	47	0	NO						
Luxembourg	**Total solids**	**79**	**84**	**84**	***-5***	-6%	***-5***	-6%	***0***	0%
	Lignite	6	0	9	*6*		*-3*		*9*	
	BKB and Patent fuels	0	10	1	*-10*		*-1*		*-9*	
Netherlands	**Total solids**	**14,005**	**17,984**	**18,602**	***-3,979***	-22%	***-4,597***	-25%	***618***	3%
	Hard coal	14,003	17,998	18,617	*-3,995*		*-4,614*		*619*	
Austria	**Total solids**	**4,998**	**4,802**	**4,802**	***196***	4%	***196***	4%	***0***	0%
	Hard coal	3,660	3,751	3,751	*-91*		*91*		*0*	
	Peat	103	1	1	*102*		*103*		*-1*	
	Coke oven/gas coke	1,147	1,019	1,019	*128*		*128*		*0*	
Portugal	**Total solids**	**5,499**	**5,427**	**5,326**	***72***	1%	***173***	3%	***-101***	-2%
	Hard coal	5,497	5,419	5,326	*78*		*171*		*-93*	
Slovenia	**Total solids**	**3,209**	**3,628**	**3,614**	***-419***	-12%	***-405***	-11%	***-14***	0%
	Hard coal	0	387	373	*-387*		*-373*		*-14*	
Finland	**Total solids**	**9,712**	**10,002**	**10,154**	***-290***	-3%	***-442***	-4%	***152***	2%
	Hard coal	3,975	3,993	4,115	*-18*		*-140*		*122*	
	Peat	5,291	5,724	5,758	*-433*		*-467*		*34*	
Sweden	**Total solids**	**3,259**	**3,324**	**2,686**	***-65***	-2%	***573***	21%	***-638***	-19%
	Hard coal	2,707	2,802	2,283	*-95*		*424*		*-519*	
	Coke oven/gas coke	153	71	-19	*82*		*172*		*-90*	
	Peat	399	451	423	*-52*		*-24*		*-28*	

Note: Apparent consumption is calculated as production (only for primary fuels) + imports – exports - stock changes.

For Ireland own aggregates for hard coal and peat consumption are included under monthly Eurostat data.

The table shows only the fuels that contribute most to the differences. There are other fuels that show also differences and are not shown in this table.

Source: Eurostat database in the specific year, GHG inventory submission 2017 for the year 2015

High amounts of consumption are mainly reported under hard coal and in some Member States under lignite. According to Table 3-12 in most Member States differences in the reporting of solid fuel consumption are due to differences in the reporting of hard coal.

Table 3-13: Description and further explanation of differences for solid fuel consumption as shown in Table 3-12

Member State	
Czech Republic	Differences occur in the reporting of hard coal and lignite between monthly and annual Eurostat and GHG inventory data. These differences appear for the first time. At the level of total solid fuels the differences between monthly and annual Eurostat reporting are levelled out, because monthly Eurostat data underestimates hard coal consumption and overestimates lignite consumption. The difference for hard coal is small between annual Eurostat data and GHG inventory data, but larger between monthly Eurostat data and GHG inventory data. Large differences are found for the reporting of lignite between GHG inventory data and monthly/annual Eurostat data mainly for production.
Denmark	Since 2014 there are larger differences found for hard coal reporting between monthly and annual Eurostat data. In 2014 there are large differences in the reporting of imports and stock changes for hard coal. In 2015 import data improved, but differences for stock changes still occur.
Germany	There are systematic differences in the reporting of hard coal and coke oven coke between monthly Eurostat data and annual Eurostat data and GHG inventory data. In 2015 the differences for apparent consumption of total solid fuels are 4.6 % based on the reporting of hard coal imports. Germany systematically underestimates hard coal imports in the monthly Eurostat data by almost 10,000 kt. Table 3-9 shows that due to the systematic underreporting of hard coal imports the trend changes of total solid fuels are not affected. Germanys CO_2 emissions from solid fuel consumption have a share of 10 % in EU 28 total CO_2 emissions and are very important for the results of the early estimates. *The use of the trend change method levels out the differences in the reporting of solid fuels.*
Estonia	Differences between monthly and annual Eurostat data are due to differences of stock changes in oil shale.
Ireland	Due to confidentiality reasons peat and hard coal consumption are not completely reported under Eurostat monthly data. However, hard coal and peat deliveries to main activity producer power plants are reported under monthly Eurostat data. For the calculation of early CO_2 estimates for Ireland an approximation on the share of peat and hard coal deliveries to power plants was used. For hard coal it was assumed that 80 % of total hard coal consumption is delivered to power plants, while for peat it was assumed that deliveries to power plants represent 73 % of total peat consumption in 2015. For hard coal the results are matching rather well in 2015, while for peat consumption the results show a mismatch for 2013, 2014 and 2015. As peat consumption is systematically overestimates, the trend changes are not affected and show differences below 1 % for total solid fuel consumption. *The use of the trend change method levels out the differences in the reporting of solid fuels.*
Greece	In Greece lignite production is systematically underreported. In 2015 the differences between monthly Eurostat and annual Eurostat and GHG inventory data for solid fuel consumption increased from 5.7 % in 2014 to 7.1 %. The influence on the trend change for solid fuel consumption in Greece is rather low, showing differences below 1 % between early CO_2 estimates and GHG inventory data.

	The use of the trend change method levels out the differences in the reporting of solid fuels.
Spain	In 2015 the differences between annual and monthly Eurostat data for total solid fuels increased to 12.7 %. The differences occur in the reporting of hard coal, mainly due to an overestimation of stock changes in monthly Eurostat data. CO_2 emissions from solid fuel consumption contribute 22 % to total CO_2 emissions of Spain. This has large effects on the level of trend changes for solid fuels and also affects the closeness of results on total Spanish CO_2 emissions. Under monthly Eurostat data Spain reports production and stock changes from lignite. Under annual Eurostat and GHG inventory data the amount of lignite produced equals the amount of sub-bituminous coal production. In 2015 large differences occur as the amount of stock changes reported under lignite is different from the stock changes reported under sub-bituminous coal.
France	France shows systematic over reporting of hard coal in the monthly Eurostat data in comparison to annual Eurostat data. In 2015 the reported quantities of hard coal under monthly Eurostat data are close to the quantities reported under GHG inventory data. In comparison to the previous years the reporting of coke oven/gas coke between monthly and annual Eurostat data improved, but shows increasing differences between annual Eurostat and GHG inventory data and continuous differences for monthly Eurostat data and GHG inventory data. The differences in reporting for 2014 and 2015 are only partly reflected in the trend changes for total solid fuel consumption and make up only 1.3 %.
Italy	Italy shows a good match between annual and monthly Eurostat data for solid fuel consumption for all years. But the differences between monthly/annual Eurostat data and GHG inventory data are higher and exceed the level of 3 % in the year 2015. Differences occur due to differences in the reporting of hard coal imports. The effect on the trend change is small, as differences between monthly and GHG inventory data occurred also in the previous year.
Latvia	For the year 2015 Latvia shows a difference of -15 % on the level of total solid fuel consumption between the reporting of monthly and annual Eurostat data. This difference is based on the reporting of stock changes from hard coal and makes up only 12 kilotons. The share of CO_2 emissions from solid fuel consumption in Latvia is only 3 % and thus not relevant for the results of the early CO_2 estimates.
Lithuania	BKB and patent fuels are not reported under annual Eurostat data and GHG inventory data, while under monthly Eurostat data BKB and patent fuels are reported. The differences make up only 40 kilotons. The share of CO_2 emissions from solid fuel consumption in Lithuania's total CO_2 emission is only 7 %.
Luxembourg	There are differences of 5 kt between annual and monthly Eurostat data for total solid fuel consumption, which make up 6 %. Differences are based on the reporting of lignite and patent fuels. The share of CO_2 emissions from solid fuel consumption in Luxembourg is only 2 % and thus not relevant for the results of the early CO_2 estimates.
Netherlands	Systematic differences in imports and exports of hard coal, deterioration of data quality in 2014 and 2015. Trend change for 2015 and 2016 early CO_2 estimates have been calculated based on market inland deliveries observed instead of hard coal consumption. *In their early national statistic available at http://statline.cbs.nl/StatWeb/dome/?LA=EN the Netherlands provide other data for hard coal consumption. This issue was also raised by the energy expert of the Netherlands explaining that hard coal data reported under Eurostat monthly data is not reliable. Closeness of results would increase if market inland deliveries observed are used instead of hard coal consumption. The data referenced in the*

	NIR from the NL energy balance and the NEA is consistent with Eurostat annual data and the NCVs used in our analysis.
Austria	There are differences in the reporting of imports from hard coal under monthly Eurostat data in comparison to annual Eurostat data and GHG inventory data for many years in the time series. The amount of the differences changes between the years and lead to deviations of 9 % in 2013, 3 % in 2014 and 4 % in 2015 between monthly and annual Eurostat data. Besides the differences for hard coal imports there are systematic differences in the reporting of peat. Under monthly Eurostat data 100 kt of peat imports are reported, while under annual Eurostat data and GHG inventory data only 1 kt of peat export are reported. In 2015 there are further differences in the reporting of coke oven/gas coke between monthly Eurostat data and annual Eurostat/GHG inventory data. Trend changes are affected by the differences in reporting, but stronger effects on the trend changes have the changes in the share of carbon stored (Table 3-10). Almost 70 % of total carbon from solid fuels consumed in Austria are stored and do not turn into CO_2 emissions. Between 2014 and 2015 the share of carbon stored from solid fuels changes from 68 % to 70 %, which affects the trend changes. Due to the high amount of carbon stored the share of CO_2 emissions from solid fuel consumption in Austria's total CO_2 emission is only 7.8 %.
Portugal	Portugal shows differences in the reporting of hard coal. Under annual Eurostat data no exports and stock changes are reported, while under monthly Eurostat data imports are overestimated and levelled out by exports and stock changes. Under GHG inventory data imports, exports and stock changes are reported and large differences can be found for imports. The trend change is not affected by the differences in reporting as these differences existed already in 2014.
Slovenia	Hard coal is systematically not reported under monthly Eurostat data. In the last years (2013, 2014, 2015) the reporting of lignite improved, but as still no hard coal is reported, there is an underreporting of solid fuel consumption under monthly Eurostat data, that results in differences of -12 % at the level of total solid fuel consumption. The trend change is also affected by the differences in reporting and shows differences of 2 % between early CO_2 estimates and GHG inventory data. Slovenia provided an explanation for the data differences for hard coal, but still the sum of total solid fuel consumption is not correct for monthly Eurostat data, as consumption of hard coal is missing and not included under lignite consumption. *In an earlier project Slovenia pointed out that: in the monthly tables there are the following categories: Hard Coal, Lignite, Peat, Coke, Patent Fuels, BKB and import of Hard Coal. Slovenia is reporting on a monthly basis inland deliveries of domestic lignite and brown coal under category "Lignite". Since we are importing and using sub-bituminous coal (ca. 400.000 t/year) we add the quantities also to "Lignite" category. Although it should be entered into the sub-bituminous coal category – but there is none in the monthly questionnaire. In annual reporting we enter the sub-bituminous coal import into the separate category (not into the lignite/brown coal anymore) and that is why there is a difference in data.*
Finland	There are differences in the reporting of peat between monthly Eurostat data and annual Eurostat and GHG inventory data. Highest differences can be found for production and stock changes. Further differences can be found for the reporting of hard coal. Trend changes are affected by the differences in reporting, but also due to changes in the share of carbon stored (Table 3-10).
Sweden	Large differences can be found for the reporting of hard coal and coke oven/gas/coke between monthly/annual Eurostat data and GHG inventory data for the year 2015 leading to differences of almost 20 % between GHG inventory data and Eurostat data on the level

of total solid fuel consumption.

Trend changes are affected by the differences in reporting, but also due to the changes in the share of carbon stored (Table 3-10). Almost 40 % of total carbon from solid fuels consumed in Sweden are stored and do not turn into CO_2 emissions. Between 2014 and 2015 the share of carbon stored from solid fuels changes from 34 % to 38 %, which affects the trend change. Due to the high amount of carbon stored the share of CO_2 emissions from solid fuel consumption in Sweden's total CO_2 emission is only 12.3 %.

Source: Own compilation

3.2.3. Analysis of differences for gaseous fuels

Table 3-14 shows the results and the differences for the trend changes calculated based on monthly Eurostat data and GHG inventory data for the year 2015/2014. Differences above 2 % are found for 11 Member States. Large differences above 5 % can be found for France, Croatia, Lithuania, Portugal and Slovakia.

Table 3-14: Comparison of trend changes in CO_2 emission from gaseous fuel consumption

Member States	Trend changes of early CO_2 estimates	Trend changes in CO_2 emissions based on GHG inventory data (submission 2017)	Differences trend changes early CO_2 estimates-GHG inventory	Share of gaseous fuels in total CO_2 emission of MS
	2015/2014			
	gaseous fuels			
Belgium	9.8%	9.8%	0.0%	38.3%
Bulgaria	10.4%	7.5%	2.9%	10.9%
Czech Republic	4.9%	4.9%	0.0%	15.9%
Denmark	1.7%	1.9%	-0.2%	21.9%
Germany	3.1%	5.2%	-2.0%	21.2%
Estonia	-10.4%	-11.1%	0.8%	5.5%
Ireland	-3.3%	1.4%	-4.7%	24.9%
Greece	7.8%	10.2%	-2.4%	8.4%
Spain	3.7%	4.0%	-0.3%	24.3%
France	8.3%	-2.6%	10.8%	25.5%
Croatia	11.9%	3.6%	8.3%	24.5%
Italy	9.1%	9.6%	-0.5%	40.4%
Cyprus	NO	NO	NO	-
Latvia	1.6%	1.7%	-0.1%	39.5%
Lithuania	0.4%	-5.0%	5.5%	25.4%
Luxembourg	-8.8%	-8.8%	0.0%	21.3%
Hungary	6.8%	8.6%	-1.8%	40.2%
Malta	NO	NO	NO	-
Netherlands	-1.1%	0.0%	-1.1%	41.3%
Austria	6.5%	6.8%	-0.2%	30.5%
Poland	1.8%	2.8%	-0.9%	9.7%
Portugal	11.1%	22.7%	-11.6%	17.8%
Romania	-3.7%	0.8%	-4.5%	30.0%
Slovenia	5.9%	6.1%	-0.2%	12.1%
Slovakia	21.1%	0.2%	20.9%	31.1%
Finland	-11.4%	-13.7%	2.3%	11.5%
Sweden	-8.9%	-9.5%	0.5%	4.6%
United Kingdom	2.2%	2.4%	-0.2%	37.7%
EU 28	4.3%	3.9%	**0.4%**	25.9%

Source: Own calculation based on extraction from Eurostat database, MS inventory submission to UNFCCC, CRF table 1.A(b)

Carbon stored

Trend changes can also be influenced by the share of carbon stored in gaseous fuels if the share is changing between years. The influence on the trend change is stronger the higher the share of carbon stored in total carbon content. Table 3-15 shows the share of carbon stored in total carbon from gaseous fuel consumption for Member States with relevant shares of carbon stored in gaseous fuels.

Table 3-15: Member States with high (=>15 % in 2015) shares of carbon stored in total carbon content of gaseous fuels consumed in 2014 and 2015

Member States	Carbon content (kt)	Carbon stored (kt C)	Share of carbon stored in total Carbon content (%)	Carbon content (kt)	Carbon stored (kt C)	Share of carbon stored in total Carbon content (%)
	2014			2015		
Bulgaria	1,495	238	16%	1,648	296	18%
Croatia	1,295	283	22%	1,334	286	21%
Lithuania	1,302	551	42%	1,311	597	46%
Poland	8,587	1,320	15%	8,824	1,358	15%
Portugal	2,239	454	20%	2,644	452	17%
Slovakia	2,398	309	13%	2,464	370	15%

Source: GHG inventory data (CRF Table 1.A.(b)) for the year 2014 and 2015 from the 2017 submission to UNFCCC

Table 3-15 shows that most Member States with a relevant share of carbon stored in total carbon content from gaseous fuels show large differences on the level of trend changes from gaseous fuel consumption. Besides the data quality of monthly Eurostat data differences in trend changes can also be explained by changing shares of carbon stored. For Lithuania the only explanation for the differences in trend changes is the amount of carbon stored.

Differences in the data reported

According to Table **3-16** the differences in the reporting of natural gas under different data sources are rather small in most Member States. The comparison on the level of consumption of natural gas shows, that there are only six Member States that show differences in the reporting of natural gas of above 2 % in 2015. For the year 2015 improvements could be found for Croatia, Ireland and Slovakia, while data quality deteriorated slightly in Belgium, Germany and Romania. The highest absolute differences between Eurostat monthly and annual natural gas consumption are found for Germany, followed by Romania in 2015.

Table 3-16: Differences in natural gas consumption between monthly and annual Eurostat data and GHG inventory data for the years 2014 and 2015

Member States	Eurostat monthly vs. Annual Eurostat		Difference monhtly-annual Eurostat in TJ NCV		Eurostat monthly vs. GHG inventory		GHG inventory vs. Eurostat annual	
	2014	2015	2014	2015	2014	2015	2014	2015
Belgium	-1%	-2%	- 6,768	- 13,240	-1%	-2%	0%	0%
Bulgaria	-3%	-3%	- 3,318	- 3,081	-3%	-3%	0%	0%
Czech Republic	0%	0%	- 247	- 40	0%	0%	0%	0%
Denmark	-1%	-1%	- 1,358	- 999	-1%	-1%	0%	0%
Germany	2%	4%	56,216	95,900	2%	0%	0%	3%
Estonia	0%	0%	-	-	2%	3%	-2%	-3%
Ireland	4%	0%	6,676	12	4%	0%	0%	0%
Greece	0%	0%	- 230	- 196	0%	0%	0%	0%
Spain	0%	0%	90	656	0%	0%	0%	0%
France	0%	1%	52	10,600	1%	3%	-1%	-2%
Croatia	-6%	2%	- 4,933	1,920	-6%	2%	0%	0%
Italy	0%	0%	5	40	0%	0%	0%	0%
Cyprus	NO	NO	-	-	NO	NO	NO	NO
Latvia	0%	0%	- 13	22	0%	0%	0%	0%
Lithuania	0%	0%	- 280	- 25	0%	0%	0%	0%
Luxembourg	0%	0%	-	- 1	0%	0%	0%	0%
Hungary	0%	0%	- 150	- 1,486	0%	0%	0%	0%
Malta	NO	NO	-	-	NO	NO	NO	NO
Netherlands	1%	-1%	10,371	- 6,928	1%	-1%	0%	0%
Austria	-1%	-1%	- 2,710	- 3,355	-1%	-1%	0%	0%
Poland	0%	-1%	1,121	- 4,048	0%	-1%	0%	0%
Portugal	3%	-2%	4,478	- 4,072	2%	-4%	1%	1%
Romania	3%	4%	12,625	16,076	3%	4%	0%	0%
Slovenia	0%	0%	31	- 25	0%	0%	0%	0%
Slovakia	-16%	-1%	- 24,687	- 998	-16%	0%	0%	0%
Finland	-1%	-2%	- 1,137	- 1,414	-1%	-2%	0%	0%
Sweden	0%	0%	-	- 17	0%	-1%	0%	1%
United Kingdom	0%	0%	8,712	1,418	0%	0%	0%	0%
EU 28	**0%**	**1%**	**54,545**	**86,716**	**0%**	**0%**	**0%**	**0%**
<+/- 2%	19 MS	20 MS			18 MS	18 MS	25 MS	23 MS
+/-2-5%	5 MS	6 MS			6 MS	8 MS	1 MS	3 MS
> +/- 5%	2 MS	0 MS			2 MS	0 MS	0 MS	0 MS

Note: Differences are based on natural gas consumption in TJ for all data sources

Source: Own compilation based on extraction from Eurostat database in the specific year, GHG inventory submission CRF table 1.A(b)

In comparison to liquid and solid fuel consumption natural gas is already a single fuel. Thus the following Table 3-17 provides a description of the differences and further explanations if available.

Table 3-17: Description and further explanation of differences for gaseous fuel consumption as shown in Table 3-16

Member State	
Bulgaria	Systematic over reporting of natural gas imports and exports under Eurostat monthly data. On the level of total natural gas consumption this levels out, but some uncertainties remain.
Estonia	Natural gas imports are overestimated under Eurostat data in 2014 and 2015. The effects on the trend changes are low, but on the level of total natural gas consumption the difference between Eurostat data and GHG inventory data increases to 3 % in 2015.
Germany	Fluctuating differences in the reporting of natural gas for most flows between monthly and annual Eurostat data and also for some years (e.g. 2013, 2015) between annual Eurostat data and GHG inventory data.
France	Differences appear in 2015 due to the reporting of stock changes between Eurostat data and GHG inventory data. Under monthly and annual Eurostat data stock changes of around -18,000 TJ NCV are reported, while under the GHG inventory data stock changes of +18,000 TJ NCV are reported. This seems to be a problem of the signs.
Portugal	In 2013 and 2014 monthly Eurostat data overestimated natural gas consumption, while in 2015 natural gas consumption was underestimated by monthly Eurostat data. This influences the trend changes. Trend changes are also influences by changing amounts of carbon stored.
Romania	There seem to be systematic differences in the reporting of natural gas production. Monthly Eurostat data overestimates natural gas production, which effects the total consumption of natural gas. The trend change of natural gas consumption is strongly influenced by inter annual changes of the reported share of carbon stored. In the year 2014 9 % of carbon from natural gas consumption is stored, while in 2015 this share decreases to 4 % which has strong influences on the trend changes.

Source: Own compilation

3.3. Priorities

Table 3-18 indicates, on the basis of the results of the early CO_2 estimates and the GHG inventory for the year 2015, for which Member States differences in the reporting between monthly and annual Eurostat data and GHG inventory data reveal. For some Member States that show systematic inconsistencies in the reporting of monthly Eurostat data the results do not reflect the reporting quality.

Table 3-18: Results and differences for the trend changes of CO_2 emissions for the year 2015 and priorities

Member States	Trend changes of early CO_2 estimates	Trend changes in CO_2 emissions based on GHG inventory data (submission 2017)	Differences trend changes early estimates-GHG inventory	Share EU	Priorities
	2015/2014		%	2015	
Belgium	4.7%	6.3%	-1.6%	3%	-
Bulgaria	4.6%	5.4%	-0.8%	1%	-
Czech Republic	0.0%	3.8%	-3.8%	3%	Differences due to changes in the share of carbon stored for liquid fuels.
Denmark	-9.9%	-7.6%	-2.2%	1%	Priority - solid fuels
Germany	0.0%	0.3%	-0.3%	23%	Priority - solid fuels
Estonia	-16.0%	-13.6%	-2.4%	1%	-
Ireland	3.9%	5.9%	-2.0%	1%	-
Greece	-5.0%	-4.6%	-0.3%	2%	-
Spain	2.3%	6.9%	-4.6%	8%	Priority - solid fuels
France	1.7%	0.2%	1.4%	10%	Priority - solid fuels, natural gas
Croatia	3.1%	2.7%	0.4%	0.5%	-
Italy	3.5%	2.1%	1.4%	10%	-
Cyprus	1.0%	0.8%	0.3%	0%	-
Latvia	1.2%	-2.0%	3.2%	0%	Priority - liquid fuels
Lithuania	-0.2%	-2.6%	2.4%	0%	Differences due to changes in the share of carbon stored for natural gas.
Luxembourg	-3.9%	-5.4%	1.5%	0%	-
Hungary	6.7%	6.8%	0.0%	1%	-
Malta	-26.9%	-20.4%	-6.5%	0.05%	Priority - liquid fuels
Netherlands	2.1%	5.6%	-3.5%	5%	Priority - liquid fuels, solid fuels
Austria	3.3%	3.2%	0.2%	2%	-
Poland	1.6%	0.1%	1.5%	9%	-
Portugal	8.6%	13.1%	-4.5%	1%	Priority - liquid fuels, natural gas
Romania	2.4%	5.6%	-3.3%	2%	Priority - liquid fuels, natural gas
Slovenia	0.5%	1.5%	-1.0%	0%	-
Slovakia	9.5%	-0.6%	10.1%	1%	Improved data quality in 2015 and due to changes in the share of carbon stored for liquid fuels and natural gas.
Finland	-7.4%	-10.5%	3.0%	1%	Priority - liquid fuels, solid fuels
Sweden	-12.8%	-12.5%	-0.3%	1%	Priority - solid fuels
United Kingdom	-2.9%	-3.7%	0.8%	12%	-

Note: Green: difference ≤ ± 2%, Yellow: difference ± >2 and ≤ 5%, Red: difference > ± 5% .
Source: Eurostat early CO_2 estimates, MS GHG inventory submissions to UNFCCC

3.3.1. Denmark

For Denmark the trend changes for CO_2 emissions from fossil fuel combustion for the year 2015/2014 between Eurostat early CO_2 estimates and GHG inventory calculation show a difference of -2.2 %.

- The trend change calculated with Eurostat monthly data is -9.9 % and GHG inventory data calculated a trend change of -7.6 %.
- Denmark contributes with a share of 1 % to EU 28 total CO_2 emissions and is a rather small country.
- In Denmark, liquid fuels have a share of 55 %, solid fuels 23% and gaseous fuels 22 % in the total CO_2 emissions from fossil fuel combustion.
- The trend changes for liquid fuels show a difference of -1.1 %, the trend changes for solid fuels show differences of -5.6 % and the trend changes for gaseous fuels show differences of -0.2 %.

Solid fuels

- In 2014 and 2015 the quality of the reporting for hard coal under monthly Eurostat data deteriorated, which affects also the trend changes.
- The reporting quality for solid fuel consumption shows large fluctuations between the years. Thus the effect on the trend change is rather high (Gross inland consumption: 2014 monthly data overestimate annual data by 10 %, while 2015 monthly data underestimate annual data by 6 %).
- Large fluctuation in the amount of coal used between the years. Coal is only used for electricity generation in Denmark, if there are no electricity imports from Norway in very dry years when not enough electricity from hydro-power is available.
- Trend changes for early national statistics show a good match with trend changes based on monthly Eurostat data.

Table 3-19: Reporting of hard coal consumption in Denmark from different data sources for the years 2013, 2014, 2015

Denmark		2013	2014	2015	Trend change 2014/2013	Trend change 2015/2014
Fuel	Data sources	kt			%	
Hard Coal	Monthly Eurostat	5,467	4,424	2,937	81%	66%
	Early national statistics	5,400	4,269	2,879	79%	67%
	Annual Eurostat	5,344	4,028	3,137	75%	78%
	GHG Inventory	5,458	4,274	3,137	78%	73%

Note: National statistics may include updated data, National statistics are total solid fuels

Source: Extraction from Eurostat database, GHG inventory data, CRF table 1.A(b), early national statistics

3.3.2. Germany

For Germany the trend changes for CO_2 emissions from fossil fuel combustion for the years 2015/2014 between Eurostat early CO_2 estimates and GHG inventory calculation show a difference of -0.3 %.

- The trend change calculated with Eurostat monthly data is 0.0 % and GHG inventory data calculated a trend change of 0.3 %.
- Germany contributes with a share of 23 % to EU 28 total CO_2 emissions and is therefore a highly relevant country.
- In Germany, liquid fuels have a share of 33 %, solid fuels 46% and gaseous fuels 21 % in the total CO_2 emissions from fossil fuel combustion.
- The trend changes for liquid fuels show a difference of 0.9 %, the trend changes for solid fuels show differences of -0.4 % and the trend changes for gaseous fuels show differences of -2.0 %.

Solid fuels

- The differences on the level of trend changes are small for total solid fuels, as differences are levelled out by other solid fuel categories. On the disaggregated level of hard coal consumption the differences between the data sources are higher.
- Monthly Eurostat data systematically underestimates hard coal consumption.
- Trend changes of GHG inventory data is affected by recalculations for the year 2014. The data used for hard coal consumption in the GHG resubmission for the year 2014 is closed to the annual Eurostat data.
- Comparison with early national statistics shows, that there are also systematic differences.
- In comparison to all other data sources there is a massive underreporting of hard coal consumption in monthly statistics.

Table 3-20: Reporting of hard coal consumption in Germany from different data sources for the years 2013, 2014, 2015

Germany		2013	2014	2015	Trend change 2014/2013	Trend change 2015/2014
Fuel	Data sources	kt			%	
Hard Coal	Monthly Eurostat	52,950	54,305	50,476	103%	93%
	Early national statistics*	65,255	63,081	62,637	92%	99%
	Annual Eurostat	62,744	61,730	61,549	98%	100%
	GHG Inventory 2016 and 2017 submission	61,629	60,782	60,617	99%	100%
	GHG Inventory recalculation 2017 submission	-	*61,897*	60,617	-	98%

*Early national statistics for 2014 are updated

Source: Extraction from Eurostat database, GHG inventory data, CRF table 1.A(b), early national statistics

3.3.3. Spain

For Spain the trend changes for CO_2 emissions from fossil fuel combustion for the year 2015/2014 between Eurostat early CO_2 estimates and GHG inventory calculation show a difference of -4.6 %.

- The trend change calculated with Eurostat monthly data is 2.3 % and GHG inventory data calculated a trend change of 6.9 %.
- Spain contributes with a share of 8 % to EU 28 total CO_2 emissions and is therefore a highly relevant country.
- In Spain, liquid fuels have a share of 54 %, solid fuels 22% and gaseous fuels 24 % in the total CO_2 emissions from fossil fuel combustion.
- The trend changes for liquid fuels show a difference of -1.9 %, the trend changes for solid fuels show differences of -17.5 % and the trend changes for gaseous fuels show differences of -0.3 %.

Solid fuels

- Large differences in trend changes for solid fuel consumption are based on monthly Eurostat data for hard coal in 2015.
- Hard coal consumption is systematically underreported under monthly Eurostat data, but differences increased in 2015 (Gross inland consumption: 2014 monthly data underestimate annual data by 6 %, while 2015 monthly data underestimate annual data by 17 %)

Table 3-21: Reporting of hard coal consumption in Spain from different data sources for the year 2013, 2014, 2015

Spain		2013	2014	2015	Trend change 2014/2013	Trend change 2015/2014
Fuel	Data sources	kt			%	
Hard Coal	Monthly Eurostat	18,475	20,160	20,222	109%	100%
	Annual Eurostat	20,610	21,385	24,414	104%	114%
	GHG Inventory	20,610	21,385	24,426	104%	114%

Source: Extraction from Eurostat database, GHG inventory data, CRF table 1.A(b), early national statistics

3.3.4. France

For France the trend changes for CO_2 emissions from fossil fuel combustion for the year 2015/2014 between Eurostat early CO_2 estimates and GHG inventory calculation show a difference of 1.4 %.

- The trend change calculated with Eurostat monthly data is 1.7 % and GHG inventory data calculated a trend change of 0.2 %.
- France contributes with a share of 10 % to EU 28 total CO_2 emissions and is therefore a highly relevant country.
- In France, liquid fuels have a share of 62 %, solid fuels 12 % and gaseous fuels 26 % in the total CO_2 emissions from fossil fuel combustion.
- The trend changes for liquid fuels show a difference of -2.3 %, the trend changes for solid fuels show differences of 1.3 % and the trend changes for gaseous fuels show differences of 10.8 % due to reporting in 2015.

Solid fuels

- Large differences in the reported consumption of hard coal between different data sources do not affect the trend changes, as this is a systematic issue.

Natural gas

- The large differences for the trend changes on natural gas consumption can be explained by the recalculation of GHG inventory data.
- Additionally the quality of monthly Eurostat data in 2015 deteriorated in comparison to previous years as differences to annual Eurostat data and GHG inventory data increased.

Table 3-22: Reporting of natural gas consumption in France from different data sources for the years 2013, 2014, 2015

France		2013	2014	2015	Trend change 2014/2013	Trend change 2015/2014
Fuel	Data sources	TJ NCV			%	
Natural gas	Monthly Eurostat	1,570,531	1,364,721	1,477,662	87%	108%
	Annual Eurostat	1,633,145	1,364,669	1,467,062	84%	108%
	GHG Inventory 2016 and 2017 submission	1,629,936	1,355,461	1,434,662	83%	106%
	GHG Inventory recalculations 2017 submission	-	*1,469,612*	1,434,662	-	98%

Source: Extraction from Eurostat database, GHG inventory data, CRF table 1.A(b)

3.3.5. Latvia

For Latvia the trend changes for CO_2 emissions from fossil fuel combustion for the year 2015/2014 between Eurostat early CO_2 estimates and GHG inventory calculation show a difference of 3.2 %.

- The trend change calculated with Eurostat monthly data is 1.2 % and GHG inventory data calculated a trend change of -2.0 %.
- Latvia contributes with a share of 0.2 % to EU 28 total CO_2 emissions and is a very small country.
- In Latvia, liquid fuels have a share of 58 %, solid fuels 3 % and gaseous fuels 40 % in the total CO_2 emissions from fossil fuel combustion.
- The trend changes for liquid fuels show a difference of 6.1 %, the trend changes for solid fuels show differences of -7.5 % and the trend changes for gaseous fuels show differences of -0.1 % due to reporting in 2015.

Liquid fuels

- The large differences for the trend changes on liquid fuel consumption can be explained by the recalculation of GHG inventory data.
    - In the GHG inventory 2017 submission the 2014 data for gas/diesel oil has been revised. This affects the trend changes for total liquid fuel consumption.
- Large differences remain in the absolute figures for aggregated liquid fuel consumption between monthly Eurostat data and annual Eurostat data due to the reporting of gas/diesel oil.

Table 3-23: Reporting of liquid fuel consumption in Latvia from different data sources for the years 2013, 2014, 2015

Latvia		2013	2014	2015	Trend change 2014/2013	Trend change 2015/2014
Fuel	Data sources		kt		%	
Liquids	Monthly Eurostat	1,105	1,197	1,232	108%	103%
	Annual Eurostat	1,254	1,291	1,340	103%	104%
	GHG Inventory 2016 and 2017 submission	1,192	1,213	1,254	102%	103%
	GHG Inventory recalculations 2017 submission	-	*1,280*	1,254	-	98%

Source: Extraction from Eurostat database, GHG inventory data, CRF table 1.A(b)

3.3.6. Malta

For Malta the trend changes for CO_2 emissions from fossil fuel combustion for the year 2015/2014 between Eurostat early CO_2 estimates and GHG inventory calculation show a difference of -6.5 %.

- The trend change calculated with Eurostat monthly data is -26.9 % and GHG inventory data calculated a trend change of -20.4 %.
- Malta contributes with a share of 0.05 % to EU 28 total CO_2 emissions and is a very small country.
- In Malta, liquid fuels have a share of 100 % in the total CO_2 emissions from fossil fuel combustion.
- The trend changes for liquid fuels show a difference of -6.5 %.

Liquid fuels

- The large differences for the trend changes on liquid fuel consumption can be explained by the recalculation of GHG inventory data.
    - In the GHG inventory 2017 submission the 2014 data for residual fuel oil has been revised. This affects the trend changes for total liquid fuel consumption.
- Differences of a few kilotons remain in the absolute figures for aggregated liquid fuel consumption between monthly Eurostat data GHG inventory data in 2015 due to differences in the reporting of residual fuel oil.

Table 3-24: Reporting of liquid fuel consumption in Malta from different data sources for the years 2013, 2014, 2015

Malta		2013	2014	2015	Trend change 2014/2013	Trend change 2015/2014
Fuel	Data sources	kt			%	
Liquids	Monthly Eurostat	712	730	527	103%	72%
	Annual Eurostat	733	769	533	105%	69%
	GHG Inventory 2016 and 2017 submission	773	762	548	99%	72%
	GHG Inventory recalculations 2017 submission	-	*687*	548	-	80%

Source: Extraction from Eurostat database, GHG inventory data, CRF table 1.A(b)

3.3.7. The Netherlands

For The Netherlands the trend changes for CO_2 emissions from fossil fuel combustion for the year 2015/2014 between Eurostat early CO_2 estimates and GHG inventory calculation show a difference of -3.5 %.

- The trend change calculated with Eurostat monthly data is 2.1 % and GHG inventory data calculated a trend change of 5.6 %.
- The Netherland contributes with a share of 5 % to EU 28 total CO_2 emissions and is therefore also relevant for results on the EU 28 level.
- In the Netherlands, liquid fuels have a share of 31 %, solid fuels 27% and gaseous fuels 41 % in the total CO_2 emissions from fossil fuel combustion.
- The trend changes for liquid fuels show a difference of -9.7 %, the trend changes for solid fuels show differences of 1.6 % and the trend changes for gaseous fuels show differences of -1.1 %.

Solid fuels

- The high differences for the trend changes from solid fuels can mainly be explained by differences in the reporting of hard coal.
- There are high uncertainties related to imports and exports of hard coal.
- National statistics show a good match with annual Eurostat data, but may include updates.
- Trend changes on the basis of the flow 'internal market deliveries' show a good match with annual Eurostat and GHG inventory data

Table 3-25: Reporting of hard coal consumption in the Netherlands from different data sources for the years 2013, 2014, 2015

Netherlands		2013	2014	2015	Trend change 2014/2013	Trend change 2015/2014
Fuel	Data sources	kt			%	
Hard Coal	Monthly Eurostat	12,891	13,204	14,003	102%	106%
	Early national statistics	13,560	15,200/ 14,573*	17,977	112%	123%
	Annual Eurostat	12,979	14,610	17,998	113%	123%
	GHG Inventory	13,592	15,195	18,617	112%	123%
	Monthly Eurostat (internal market deliveries (observed)	12,891	14,493	17,980	112%	124%

Early national statistics for 2015 could by only found for trend changes of total solid fuel consumption

*Value for 2014 has been updated to calculate trend change 2014/2015

Source: Extraction from Eurostat database, GHG inventory data, CRF table 1.A(b)

3.3.8. Portugal

For Portugal the trend changes for CO_2 emissions from fossil fuel combustion for the year 2015/2014 between Eurostat early CO_2 estimates and GHG inventory calculation show a difference of -4.5 %.

- The trend change calculated with Eurostat monthly data is 8.6 % and GHG inventory data calculated a trend change of 13.1 %.
- Portugal contributes with a share of 1 % to EU 28 total CO_2 emissions and is a rather small country.
- In Portugal, liquid fuels have a share of 54%, solid fuels 28% and gaseous fuels 18 % in the total CO_2 emissions from fossil fuel combustion.
- The trend changes for liquid fuels show a difference of -4.4 %, the trend changes for solid fuels show differences of 0.0 % and the trend changes for gaseous fuels show differences of -11.6 %.

Liquid fuels

- For liquid fuel consumption the reporting quality in 2014 improved slowly, which also results in differences in the trend changes. Liquid fuel consumption is systematically over reported under monthly Eurostat data (but the size of over reporting varies from year to year) due to differences in the reporting of international bunkers. This results in relative differences between monthly and annual Eurostat data in 2015 of 9 %.

Natural gas

- In comparison to annual Eurostat data and GHG inventory data natural gas consumption reported under monthly Eurostat data is over reported in 2014 and underreported in 2015. This has large effects on the trend changes.
- Further differences can be explained by decreasing shares of carbon stored in 2015 in the GHG inventory data.

Table 3-26: Reporting of natural gas consumption in Portugal from different data sources for the years 2013, 2014, 2015

Portugal		2013	2014	2015	Trend change 2014/2013	Trend change 2015/2014
Fuel	Data sources	TJ NCV			%	
Natural gas	Monthly Eurostat	162,206	149,900	166,504	92%	111%
	Annual Eurostat	157,251	145,422	170,575	92%	117%
	GHG Inventory	157,799	146,369	172,791	93%	118%
	GHG Inventory emissions (after carbon stored is subtracted)	-			-	123%

Source: Extraction from Eurostat database, GHG inventory data, CRF table 1.A(b),

3.3.9. Romania

For Romania the trend changes for CO_2 emissions from fossil fuel combustion for the year 2015/2014 between Eurostat early CO_2 estimates and GHG inventory calculation show a difference of -3.3 %.

- The trend change calculated with Eurostat monthly data is 2.4 % and GHG inventory data calculated a trend change of 5.6 %.
- Romania contributes with a share of 2 % to EU 28 total CO_2 emissions and is a rather small country.
- In Romania, liquid fuels have a share of 35%, solid fuels 35% and gaseous fuels 30 % in the total CO_2 emissions from fossil fuel combustion.
- The trend changes for liquid fuels show a difference of -2.9 %, the trend changes for solid fuels show differences of -2.3 % and the trend changes for gaseous fuels show differences of -4.5 %.

Liquid and solid fuels

- Trend changes for liquid and solid fuel consumption are affected by improved data quality in 2015.
- Trend changes for solid fuel consumption are also influenced by changing shares of carbon stored.

Natural gas

- Trend changes for natural gas consumption are influenced by changing shares of carbon stored in the GHG inventory data.
- In comparison to annual Eurostat data and GHG inventory data natural gas consumption reported under monthly Eurostat data is generally overestimates. Thus the effect on the trend changes is very low.

Table 3-27: Reporting of natural gas consumption in Romania from different data sources for the years 2013, 2014, 2015

Romania		2013	2014	2015	Trend change 2014/2013	Trend change 2015/2014
Fuel	Data sources	TJ NCV			%	
Natural gas	Monthly Eurostat	430,846	404,690	389,761	94%	96%
	Annual Eurostat	410,052	392,065	373,685	96%	95%
	GHG Inventory	410,052	392,065	373,685	96%	95%
	GHG Inventory emissions (after carbon stored is subtracted)	-	-	-	-	101%

Source: Extraction from Eurostat database, GHG inventory data, CRF table 1.A(b),

3.3.10. Finland

For Finland the trend changes for CO_2 emissions from fossil fuel combustion for the year 2015/2014 between Eurostat early CO_2 estimates and GHG inventory calculation show a difference of 3.0 %.

- The trend change calculated with Eurostat monthly data is -7.4 %. With GHG inventory data a trend change of -10.5 % is calculated.
- Finland contributes with a share of 1 % to EU 28 total CO_2 emissions.
- In Finland, liquid fuels have a share of 49 %, solid fuels 39 % and gaseous fuels 12 % in the total CO_2 emissions from fossil fuel combustion.
- The trend changes for liquid fuels show a difference of 6.7 %, the trend changes for solid fuels show differences of -1.3 % and the trend changes for gaseous fuels show differences of 2.3 %.

Liquid fuels

- For liquid fuels the differences between monthly Eurostat data and GHG inventory data increased in 2015, while between monthly and annual Eurostat data the differences are smaller.

Table 3-28: Reporting of liquid fuel consumption in Finland from different data sources for the years 2013, 2014, 2015

Finland		2013	2014	2015	Trend change 2014/2013	Trend change 2015/2014
Fuel	Data sources	kt			%	
Liquids	Monthly Eurostat	7,196	8,196	7,838	114%	96%
	Annual Eurostat	7,187	8,598	7,713	120%	90%
	GHG Inventory	7,647	8,117	7,274	106%	90%

Source: Extraction from Eurostat database, GHG inventory data, CRF table 1.A(b)

3.3.11. Sweden

For Sweden the trend changes for CO_2 emissions from fossil fuel combustion for the year 2015/2014 between Eurostat early CO_2 estimates and GHG inventory calculation show a difference of -0.3 %.

- The trend change calculated with Eurostat monthly data is -12.8 %. With GHG inventory data a trend change of -12.5 % is calculated.
- Sweden contributes with a share of 1 % to EU 28 total CO_2 emissions.
- In Sweden, liquid fuels have a share of 83 %, solid fuels 12 % and gaseous fuels 5 % in the total CO_2 emissions from fossil fuel combustion.
- The trend changes for liquid fuels show a difference of -3.6 %, the trend changes for solid fuels show differences of 13.2 % and the trend changes for gaseous fuels show differences of 0.5 %.

Solid fuels

- For solid fuels the differences between Eurostat data and GHG inventory data increased drastically in 2015, while between monthly and annual Eurostat data the differences are small.

Table 3-29: Reporting of solid fuel consumption in Sweden from different data sources for the years 2013, 2014, 2015

Sweden		2013	2014	2015	Trend change 2014/2013	Trend change 2015/2014
Fuel	Data sources	kt			%	
Solids	Monthly Eurostat	3,252	3,398	3,259	104%	96%
	Annual Eurostat	3,669	3,372	3,324	92%	99%
	GHG Inventory	3,669	3,308	2,686	90%	81%

Source: Extraction from Eurostat database, GHG inventory data, CRF table 1.A(b)

3.4. Early CO_2 emission estimates for the year 2016

3.4.1. Data improvements to correct trend changes of Eurostat monthly data

For calculating early CO_2 estimates for the year 2016 Eurostat monthly energy data for the year 2015 (as available in April 2016) and Eurostat monthly energy data for the year 2016 (as available in April 2017) is used. Due to improvements in the reporting quality and the absence of obvious large outliers in monthly 2015 and 2016 Eurostat data, no gap filling had to be applied.

For improving the trend change analysis used to calculate 2016 CO_2 emissions the following adaptations were made:

- The trend changes were calculated on the basis of physical mass units (kt) and energy units (TJ). For most countries the results are very similar. However, for Estonia, Spain, Hungary and Romania the two approaches resulted in small differences for the trend changes for liquid fuels (Estonia) and solid fuels (Spain, Hungary and Romania). For these countries, trend changes for liquid fuels or solid fuels calculated with energy units (TJ) are used for the 2016 calculation of early CO_2 estimates.
- For the Netherlands, the trend changes calculated for solid fuels showed large differences in recent years. Statistical experts from the Netherlands pointed out that trend changes calculated based on gross inland consumption (calculated as production + imports – exports - stock changes) are unreliable and that the trend changes for internal market inland deliveries would provide better results. Thus for the Netherlands trend changes from market inland deliveries where used for the 2016 calculation of early CO_2 estimates.
- For **Ireland** some **peat consumption** data in the Eurostat monthly database for the year 2015 and 2016 are not shown for confidentiality reasons. However, peat deliveries to main activity producer power plants are reported on a monthly basis. This monthly activity is used to estimate the peat consumption, assuming that peat delivered to power plants represents about 74 % of the total peat consumption. This ratio is derived from annual data of past years (2013-2015) for which a complete set of annual data for peat consumption is available.
- For Ireland **hard coal consumption** data in the Eurostat monthly database are much lower than annual Eurostat data also for confidentiality reasons. This resulted in improbably low CO_2 estimates for Ireland. Similar to the approximation of peat consumption, the reported deliveries to main activity producer power plants are used to estimate monthly hard coal consumption data. It is assumed that this consumption represents about 79 % of the total hard coal consumption. This ratio is also derived from previous data (2013-2015) for which hard coal consumption is available in annual data.
- For Sweden data for liquid fuel consumption has been corrected after communication with the Swedish Energy Agency. Therefore, the consumption of LPG and Ethane are no longer included in the calculation, as this is only used for non-energy purposes in Sweden. Further correction has been applied to the stock changes of gas/diesel oil and residual fuel oil, as these figures have not been updated.

3.4.2. Calculation of early CO_2 estimates for the year 2016

This chapter presents the calculation of early CO_2 emission estimates for the year 2016.

The following steps are taken to calculate early CO_2 emissions for 2016:

1. Calculation of trend changes of the fuel consumption for the aggregated fuel categories (liquid, solid, peat and natural gas) from Eurostat monthly energy data 2015 and 2016;

2. Calculation of CO_2 emissions for the four fuel categories (liquid, solid, gaseous fuels and peat) by multiplying the trend changes with the CO_2 emissions of the GHG inventory data of the Reference Approach (CRF table 1.A(b) for the year 2015 (as available in April 2017).

Table 3-30 and Table 3-31 show the calculation of the early CO_2 emissions according to the different steps.

Table 3-30: Calculation of trend changes for liquid, solid and gaseous fuel consumption, 2016/2015

Member States	Monthly Eurostat data for liquid fuel consumption		Trend change liquids	Monthly Eurostat data for solid fuel consumption		Trend change solids	Monthly Eurostat data for solid fuels without peat consumption		Trend change solids w.o.peat	Monthly Eurostat data for peat consumption		Trend change peat	Monthly Eurostat data for natural gas fuel consumption	
	2015	2016	2016/2015	2015	2016	2016/2015	2015	2016	2016/2015	2015	2016	2016/2015	2015	2016
	kt		%	kt		%	kt		%	kt		%	TJ NCV	
Belgium	22,943	22,662	99%	4,618	4,246	92%	4,618	4,246	92%	0	0	100%	571,535	581,147
Bulgaria	3,914	4,051	104%	37,020	32,110	87%	37,020	32,110	87%	0	0	100%	105,557	109,521
Czech Republic	8,311	7,707	93%	45,516	45,189	99%	45,516	45,189	99%	0	0	100%	271,380	293,756
Denmark	6,120	6,328	103%	2,952	3,406	115%	2,952	3,406	115%	0	0	100%	118,427	119,971
Germany	98,438	98,277	100%	228,927	222,170	97%	228,927	222,170	97%	0	0	100%	2,823,782	3,101,490
Estonia	125	229	183%	17,381	16,774	97%	17,355	16,755	97%	26	19	73%	16,348	17,931
Ireland	6,014	6,522	108%	6,596	5,936	90%	2,406	2,217	92%	4,190	3,719	89%	157,111	175,372
Greece	11,493	11,853	103%	41,372	34,209	83%	41,372	34,209	83%	0	0	100%	111,881	145,707
Spain	46,844	49,251	105%	21,520	20,129	94%	21,520	20,129	94%	0	0	100%	1,028,018	1,048,379
France	71,180	69,994	98%	14,367	14,064	98%	14,367	14,064	98%	0	0	100%	1,477,662	1,603,653
Croatia	2,982	3,022	101%	1,008	1,096	109%	1,008	1,096	109%	0	0	100%	89,085	97,018
Italy	52,175	48,490	93%	20,083	17,723	88%	20,083	17,723	88%	0	0	100%	2,315,403	2,431,642
Cyprus	1,882	2,018	107%	6	1	17%	6	1	17%	0	0	100%	0	0
Latvia	1,232	1,276	104%	70	64	91%	69	63	91%	1	1	100%	46,009	47,678
Lithuania	2,455	2,667	109%	328	347	106%	310	313	101%	18	34	189%	86,536	77,107
Luxembourg	2,151	2,088	97%	79	84	106%	79	84	106%	0	0	100%	32,193	29,689
Hungary	6,583	6,711	102%	10,329	10,140	98%	10,329	10,140	98%	0	0	100%	312,136	336,209
Malta	527	431	82%	0	0	-	0	0	-	0	0	100%	0	0
Netherlands	24,297	26,776	110%	17,980	16,540	92%	17,980	16,540	92%	0	0	100%	1,203,719	1,184,584
Austria	11,252	11,478	102%	4,998	4,868	97%	4,895	4,753	97%	103	115	112%	284,576	300,378
Poland	22,927	25,410	111%	129,973	126,379	97%	129,973	126,379	97%	0	0	100%	572,716	610,722
Portugal	9,918	9,102	92%	5,499	4,822	88%	5,499	4,822	88%	0	0	100%	166,504	187,278
Romania	8,617	8,888	103%	27,359	24,592	90%	27,359	24,592	90%	0	0	100%	389,761	399,032
Slovenia	2,161	2,286	106%	3,209	3,373	105%	3,209	3,373	105%	0	0	100%	27,788	30,053
Slovakia	3,278	3,515	107%	6,350	6,124	96%	6,350	6,124	96%	0	0	100%	161,427	165,481
Finland	7,838	8,461	108%	9,712	11,016	113%	4,421	5,035	114%	5,291	5,981	113%	92,214	86,014
Sweden	9,558	10,770	113%	3,259	3,526	108%	2,860	3,126	109%	399	400	100%	30,279	34,222
United Kingdom	57,373	58,414	102%	39,005	18,998	49%	39,005	18,998	49%	0	0	100%	2,567,078	2,899,030
EU 28	502,588	508,677	101%	699,516	647,926	93%	689,488	637,657	92%	10,028	10,269	102%	15,059,121	16,113,062

Note: NO is used if there is no consumption; Data on solid fuel consumption for Ireland has been corrected as reported data is confidential.

In comparison to the published early CO_2 estimates in May 2017 there has been a recalculation for Ireland. This recalculation is based on changes in the consumption of solid fuels and peat due to an error in the calculation.

Source: Extraction from Eurostat database in the specific year

For calculating the early CO_2 emission estimates for the year 2016 some of the trend changes shown in Table 3-30 need to be adapted as explained in Chapter 3.4.1. Table 3-31 shows the final calculation of the early CO_2 estimates for the year 2016.

Table 3-31: Calculation of early CO_2 emissions for the year 2016

Member States	GHG Inventory data CO_2 emissions from liquid fuels (UNFCCC 2017)	Trend change liquids without biofuels	CO_2 emissions liquid fuels calculated with monthly Eurostat data	GHG Inventory data CO_2 emissions from solid fuels without peat (UNFCCC 2017)	Trend change solids without peat	CO_2 emissions solid fuels calculated with monthly Eurostat data	GHG Inventory data CO_2 emissions from peat (UNFCCC 2017)	Trend change peat	CO_2 emissions from peat calculated with monthly Eurostat data	GHG Inventory data CO_2 emissions from natural gas (UNFCCC 2017)	Trend change natural gas	CO_2 emissions natural gas calculated with monthly Eurostat data	**CO_2 emissions without waste and other fossils calculated with monthly Eurostat data**	
	2015	2016/2015	2016	2015	2016/2015	2016	2015	2016/2015	2016	2015	2016/2015	2016	2015	2016
	Liquid Fossil Totals			Solid Fossil Totals			Peat[5,6]			Gaseous Fossil Totals				
	kt CO2	%	kt CO2	kt CO2	%	kt CO2	kt CO2	%	kt CO2	kt CO2	%	kt CO2	kt CO2	**kt CO2**
Belgium	43,284	99%	42,754	5,237	92%	4,815	NO	-	NO	30,171	102%	30,678	78,692	**78,248**
Bulgaria	12,006	104%	12,427	28,655	87%	24,854	NO	-	NO	4,958	104%	5,145	45,619	**42,425**
Czech Republic	19,932	93%	18,483	58,764	99%	58,342	NO,NA	-	NO,NA	14,836	108%	16,059	93,532	**92,885**
Denmark	17,092	103%	17,673	7,195	115%	8,301	NO	-	NO	6,814	101%	6,903	31,101	**32,878**
Germany	235,856	100%	235,470	324,914	97%	315,324	0	100%	0	150,440	110%	165,235	711,210	**716,030**
Estonia[1]	564	153%	861	14,156	97%	13,666	164	73%	120	874	110%	959	15,759	**15,607**
Ireland[2]	17,759	108%	19,259	5,659	92%	5,215	3,658	89%	3,247	8,960	112%	10,001	36,036	**37,722**
Greece	33,666	103%	34,720	28,976	83%	23,959		-		5,726	130%	7,458	68,368	**66,137**
Spain[4]	127,684	105%	134,245	51,506	93%	47,652	NO,NA	-	NO,NA	57,603	102%	58,744	236,793	**240,641**
France	189,169	98%	186,017	37,168	98%	36,384	NO,NE	-	NO,NE	77,559	109%	84,172	303,896	**306,573**
Croatia	9,405	101%	9,531	2,407	109%	2,617	NO	-	NO	3,842	109%	4,184	15,654	**16,333**
Italy	143,104	93%	132,997	50,179	88%	44,283	NO	-	NO	131,159	105%	137,744	324,443	**315,023**
Cyprus[5]	5,834	107%	6,256	15	17%	2	NO	-	NO	NO	-	0	5,849	**6,258**
Latvia	3,669	104%	3,800	184	91%	168	1	100%	1	2,520	104%	2,611	6,374	**6,581**
Lithuania	6,962	109%	7,563	647	101%	653	88	189%	166	2,617	89%	2,332	10,314	**10,715**
Luxembourg	6,594	97%	6,400	168	106%	179	NO,NA	-	NO,NA	1,827	92%	1,685	8,589	**8,264**
Hungary[4]	15,056	102%	15,349	9,231	96%	8,848	NO,NA	-	NO,NA	16,298	108%	17,555	40,585	**41,752**
Malta[5]	1,700	82%	1,390	NE,NA,NO	-	0	NO	-	NO	NO,NE	-	0	1,700	**1,390**
Netherlands[3]	48,279	110%	53,205	41,984	92%	38,621	NO	-	NO	63,489	98%	62,480	153,752	**154,306**
Austria	31,117	102%	31,742	3,943	97%	3,828	0	112%	1	15,397	106%	16,252	50,457	**51,823**
Poland	60,527	111%	67,082	196,065	97%	190,643	NO	-	NO	27,378	107%	29,195	283,970	**286,920**
Portugal	24,449	92%	22,437	12,651	88%	11,093	NO	-	NO	8,035	112%	9,038	45,135	**42,568**
Romania[4]	23,303	103%	24,035	23,368	91%	21,252	36	100%	36	19,998	102%	20,474	66,705	**65,798**
Slovenia	6,563	106%	6,943	4,495	105%	4,725	NO,NA	-	NO,NA	1,526	108%	1,650	12,584	**13,318**
Slovakia	7,717	107%	8,275	9,257	96%	8,928	NA,NO	-	NA,NO	7,678	103%	7,870	24,652	**25,073**
Finland	19,343	108%	20,881	9,361	114%	10,661	6,101	113%	6,896	4,524	93%	4,220	39,328	**42,657**
Sweden[6]	29,801	101%	30,047	3,924	109%	4,288	490	100%	491	1,649	113%	1,863	35,863	**36,690**
United Kingdom	162,358	102%	165,304	78,062	49%	38,021	8	100%	8	144,650	113%	163,355	385,078	**366,689**
EU 28	**1,302,793**	101%	**1,315,148**	**1,008,170**	92%	**927,326**	**10,547**	104%	**10,967**	**810,530**	107%	**867,863**	3,132,040	**3,121,304**

Note: [1] Trend changes of liquid fuels were calculated in TJ; [2] Consumption of solid fuels is adapted due to confidential data, [3] Market inland deliveries observed are used instead of calculated hard coal consumption; [4] Trend changes for solid fuel consumption are calculated in TJ; [5]Inventory submission as available under EIONET has been used, [6]Data for liquid fuel consumption in Sweden has been corrected

In comparison to the published early CO_2 estimates in May 2017 there has been a recalculation for Ireland. This recalculation is based on changes in the consumption of solid fuels and peat due to a calculation error.

Source: Eurostat database and Member States' inventory submissions UNFCCC 2015 submitted in April 2017

Table 3-31 shows the results for early CO_2 estimates for the year 2016 based on the method described in section 2.1. These early estimates suggest that the CO_2 emissions from fuel combustion decreased for eleven Member States and increased for the other seventeen Member States in 2016 in comparison to the year 2015 (see Figure 3-2). The calculations do not include CO_2 emissions from the new categories waste fuels and other fossil fuels, as there are no Eurostat monthly energy data available that could indicate the trend changes.

Figure 3-2: Relative changes in total fossil fuel consumption for all Member States for 2016/2015

Source: Eurostat early estimates

The early estimates indicate that CO_2 emissions from the energy sector decreased by 0.34 % for the EU-28 between 2015 and 2016.

To check if calculated trend changes are reliable, trend developments in net electricity generation as available in the Eurostat database and ENTSOE data (European Network of Transmission System Operators for Electricity) on net electricity generation from nuclear, lignite, hard coal, gas, oil and also renewables (wind, solar, biomass, hydro) have been used.

Short explanations for decreases or increases in emissions in 2016 for certain Member States are provided below:

- The decrease of CO_2 emissions from fuel consumption in Malta is due to the start of the operation of a power cable between Malta and Sicily in April 2015. Thus, Malta is no longer bound to produce all electricity itself, but can import electricity also from Italy, which led to a decline of conventional power generation in Malta.[6]
- In Bulgaria total electricity generation from fossil fuels decreased by12 %. Especially electricity generation from lignite was reduced in 2015.
- In Portugal the use of hydro power for electricity generation increased considerably in 2016, which led to decreased electricity generation from solid fuels.
- The United Kingdom shows a decline of CO_2 emissions, especially from solid fuel consumption. This is due to a decrease of electricity generation from coal.
- Increases in CO_2 emissions in Finland are due to a colder winter and a decrease in electricity generation from hydropower due to dryer periods.

[6] http://www.enemalta.com.mt/index.aspx?cat=2&art=247&jse=0

- For Cyprus no further information is available, but changes in CO_2 emissions from EU ETS (combustion) and changes in electricity generation from fossil fuels (Eurostat) confirm the 7.0 % change of the early CO_2 estimates.
- Slovenia exported more electricity in 2015 which is accompanied by increased electricity generation from lignite.
- In Denmark electricity generation from hard coal increased in 2015, while electricity generation from natural gas consumption and from wind decreased.

3.5. Summary and conclusion

The report verifies the results of the 2015 CO_2 estimates and shows the differences between the calculation of early CO_2 emission estimates and final GHG inventory CO_2 emission for the year 2015. It provides an analysis of the differences in the data sources used to calculate early CO_2 estimates and the final GHG inventory and finally presents the results of the early CO_2 estimates for the year 2016.

Results of the comparison of the early CO_2 estimates and final inventory data for the year 2015 show a very good match on the level of the EU-28. Trend changes for total CO_2 emissions from energy consumption from the early CO_2 estimates show an increase between 2014 and 2015 of 0.6 % on the level of EU-28. Trend changes calculated with final GHG inventory data increased by 0.8 %. There are sixteen Member States with differences to final inventory data below 2 %, which contribute 77 % to total EU-28 emissions. Ten Member States show differences to final GHG inventory between 2 % and 5 % and contribute 22 % to final EU-28 emissions. Only two Member States show differences above 5 %, but contribute only 1 % to total EU-28 emissions. Thus the early CO_2 estimates give an early and good indication on the development of the CO_2 emissions on the level of EU-28 and for most MS also on individual country level.

Most differences in the trend changes between early CO_2 estimates and final GHG inventory data can be explained by the quality of monthly Eurostat data. Improved data quality for the year 2015 affected the trend changes as well as deterioration of data quality in 2015. This might be caused by the fluctuation in monthly Eurostat data showing an over reporting in one year and an underreporting in the next year. Trend changes for the calculation of the early CO_2 estimates are only influenced by the data quality of monthly Eurostat data. The trend changes of the final GHG inventory data are further affected by changing shares in the amount of carbon stored in liquid, solid and gaseous fuels. This affects the results of the trend changes in Member States that show a high share of carbon sored in total fuel consumption. For carbon stored no data sources are available at the level of monthly energy statistics. Thus, this uncertainty will further remain in the methodology.

In Chapter 3.2 the differences between monthly Eurostat data, annual Eurostat data and GHG inventory data are analysed. This is done for each Member State and for the aggregated fuel categories liquid, solid and natural gas. The analysis starts at the most aggregated level of trend changes for CO_2 emissions from liquid, solid and gaseous fuels, followed by the level of aggregated liquid (in kt), solid (in kt) and gaseous fuel (in TJ NCV) consumption and ends up with explanations on the level of single fuel categories for differences above ±3 % in total liquid, solid or gaseous fuel consumption.

The analysis shows that on Member States level and on the level of aggregated fuel categories the differences are much bigger than the results of the early CO_2 estimates propose. On the level of liquid and solid fuel consumption the differences in the reporting between annual and monthly Eurostat data increased again in 2015. Only the reporting of natural gas improved in 2015. However, the deterioration of the data quality could not be identified with the outlier and gaps analysis which was carried out in spring 2016 for the monthly Eurostat data 2015.

For the calculation of the 2016 early CO_2 estimates only a few outliers and gaps could be identified in the monthly Eurostat data for 2016. Most Member States that were asked to confirm data or send corrected values confirmed their data. Only in a few cases updated questionnaires have been sent. The early CO_2 estimates 2016 include corrections for hard coal consumption in the Netherlands (using market inland deliveries instead of gross inland consumption), for peat and hard coal consumption in Ireland and for liquid fuel consumption in Sweden. Further corrections

are related to the calculation of trend changes in TJ instead of kt. This applies for liquid fuel consumption in Estonia and for solid fuel consumption in Spain, Hungary and Romania.

Finally the application of the trend method to estimate early CO_2 emissions for all EU Member States represents a robust procedure that adjusts systematic errors of under- or over reporting in Eurostat monthly data. The advantage of the method is the simplicity that ensures a fast and straightforward calculation for each Member State. By applying the trend change method, inconsistencies in the reporting of Eurostat monthly energy data compared to Eurostat annual or GHG inventory data can be levelled out, if these inconsistencies persist throughout the entire time series of Eurostat monthly energy data. For many Member States that show differences above 3 % between monthly Eurostat data and the other data sources (annual Eurostat data and GHG inventory data), the use of the trend changes method levels out the differences and leads to good results for the early CO_2 estimates.

4. References

ENTSOE Database on Net electricity generation:
https://www.entsoe.eu/data/statistics/Pages/default.aspx

Eurostat data:

- Data from Eurostat database for monthly and annual fuel consumption for the years 2013 – 2016 normally extracted between mid and end April in the year after the reference year
- Monthly data on net electricity generation

Inventory data: Data as reported by Member States to the UNFCCC in CRF table 1.A.(b).Submissions 2017 for the year 2015:
http://unfccc.int/national_reports/annex_i_ghg_inventories/national_inventories_submissions/items/8812.php

IPCC 2006, *2006 IPCC Guidelines for National Greenhouse Gas Inventories*, Prepared by the National Greenhouse Gas Inventories Programme, Eggleston H.S., Buendia L., Miwa K., Ngara T. and Tanabe K. (eds). IGES, Japan.

Early national statistics

Denmark:
https://ens.dk/en/our-services/statistics-data-key-figures-and-energy-maps/annual-and-monthly-statistics

Germany:
http://www.ag-energiebilanzen.de/6-0-Primaerenergieverbrauch.html

Netherlands:

http://statline.cbs.nl/Statweb/publication/?DM=SLEN&PA=37281eng&D1=0-16,20-21&D2=0,2,8-10&D3=44-48,138,143,148&LA=EN&HDR=G2,G1&STB=T&VW=T

5. Annex

5.1. Data tables

Table 5-1: Differences between monthly, annual Eurostat and GHG inventory data for fuel consumption

Fuel		Liquid fuels									Solid fuels									Natural gas								
Member States	Year	Cumulated Monthly Eurostat data	Annual Eurostat data	GHG inventory data	Difference Monthly Eurostat - Annual Eurostat data		Difference Monthly Eurostat - GHG inventory data		Differences GHG inventory - annual Eurostat data		Cumulated Monthly Eurostat data	Annual Eurostat data	GHG inventory data	Difference Monthly Eurostat - Annual Eurostat data		Difference Monthly Eurostat - GHG inventory data		Differences GHG inventory - annual Eurostat data		Cumulated Monthly Eurostat data	Annual Eurostat data	GHG inventory data	Difference Monthly Eurostat - Annual Eurostat data		Difference Monthly Eurostat - GHG inventory data		Differences GHG inventory - annual Eurostat data	
		kt			kt	%	kt	%	kt	%	kt			kt	%	kt	%	kt	%	TJ NCV			TJ NCV	%	TJ NCV	%	kt	%
Belgium	2013	21,984	21,497	21,965	487	2%	19	0%	468	2%	3,994	4,970	4,917	-976	-20%	-923	-19%	-53	-1%	594,578	602,704	602,704	-8,126	-1%	-8,126	-1%	0	0%
	2014	22,469	21,794	22,395	675	3%	74	0%	601	3%	4,678	4,848	4,849	-170	-4%	-171	-4%	1	0%	520,738	527,506	524,869	-6,768	-1%	-4,130	-1%	-2,638	0%
	2015	22,943	22,384	22,379	559	2%	564	3%	-5	0%	4,618	4,660	4,690	-42	-1%	-72	-2%	30	1%	571,535	584,775	584,775	-13,240	-2%	-13,240	-2%	0	0%
Bulgaria	2013	3,509	3,481	3,473	28	1%	36	1%	-8	0%	30,409	30,585	30,585	-176	-1%	-176	-1%	0	0%	96,513	99,977	99,977	-3,464	-3%	-3,464	-3%	0	0%
	2014	3,680	3,858	3,847	-178	-5%	-167	-4%	-11	0%	33,281	33,369	33,370	-88	0%	-89	0%	1	0%	95,599	98,917	98,917	-3,318	-3%	-3,318	-3%	0	0%
	2015	3,914	4,179	4,148	-265	-6%	-234	-6%	-31	-1%	37,020	36,926	36,926	94	0%	94	0%	0	0%	105,557	108,637	108,637	-3,081	-3%	-3,081	-3%	0	0%
Czech Republic	2013	7,996	7,992	7,955	4	0%	41	1%	-37	0%	46,801	45,945	46,747	856	2%	54	0%	802	2%	289,558	290,832	291,435	-1,274	0%	-1,877	-1%	602	0%
	2014	8,490	8,477	8,455	13	0%	35	0%	-22	0%	45,718	45,494	45,697	224	0%	21	0%	203	0%	258,585	258,833	259,389	-247	0%	-804	0%	556	0%
	2015	8,305	8,415	8,376	-110	-1%	-71	-1%	-39	0%	45,516	45,633	47,309	-117	0%	-1,793	-4%	1,676	4%	271,380	271,420	272,007	-40	0%	-628	0%	587	0%
Denmark	2013	6,303	5,950	5,930	353	6%	373	6%	-20	0%	5,485	5,364	5,479	121	2%	6	0%	115	2%	139,353	138,833	138,833	520	0%	520	0%	0	0%
	2014	6,152	5,765	5,686	387	7%	466	8%	-79	-1%	4,447	4,041	4,293	406	10%	154	4%	252	6%	116,431	117,789	117,790	-1,358	-1%	-1,358	-1%	0	0%
	2015	6,120	5,669	5,711	451	8%	409	7%	42	1%	2,952	3,154	3,154	-202	-6%	-202	-6%	0	0%	118,427	119,426	119,425	-999	-1%	-998	-1%	-1	0%
Germany	2013	98,991	99,857	100,479	-866	-1%	-1,488	-1%	622	1%	237,599	247,279	246,447	-9,680	-4%	-8,848	-4%	-832	0%	3,075,491	3,051,546	3,178,642	23,944	1%	-103,151	-3%	127,096	4%
	2014	97,508	97,958	98,196	-450	0%	-688	-1%	238	0%	233,670	240,308	238,777	-6,638	-3%	-5,107	-2%	-1,531	-1%	2,738,165	2,681,949	2,688,044	56,216	2%	50,120	2%	6,095	0%
	2015	98,438	98,201	95,370	237	0%	3,068	3%	-2,831	-3%	228,927	239,848	239,333	-10,921	-5%	-10,406	-4%	-515	0%	2,823,782	2,727,882	2,811,535	95,900	4%	12,247	0%	83,653	3%
Estonia	2013	310	415	413	-105	-25%	-103	-25%	-2	0%	20,649	20,770	20,770	-121	-1%	-121	-1%	0	0%	23,233	23,233	23,083	0	0%	149	1%	-149	-1%
	2014	269	351	351	-82	-23%	-82	-23%	0	0%	20,556	20,906	20,906	-350	-2%	-350	-2%	0	0%	18,236	18,236	17,808	0	0%	428	2%	-428	-2%
	2015	125	229	229	-104	-45%	-104	-45%	0	0%	17,381	18,052	18,061	-671	-4%	-680	-4%	9	0%	16,348	16,348	15,826	0	0%	522	3%	-522	-3%
Ireland	2013	5,792	5,946	5,762	-154	-3%	30	1%	-184	-3%	6,021	5,890	6,043	131	2%	-22	0%	153	3%	168,227	161,940	162,109	6,287	4%	6,118	4%	170	0%
	2014	5,733	5,699	5,536	34	1%	197	4%	-163	-3%	6,270	5,707	5,688	563	10%	582	10%	-19	0%	162,531	155,855	155,787	6,676	4%	6,744	4%	-68	0%
	2015	6,014	5,982	5,869	32	1%	145	2%	-113	-2%	6,567	5,840	5,981	727	12%	586	10%	141	2%	157,111	157,100	157,447	12	0%	-336	0%	348	0%
Greece	2013	11,180	10,669	10,687	511	5%	493	5%	18	0%	53,193	54,688	54,688	-1,495	-3%	-1,495	-3%	0	0%	135,392	135,497	135,497	-104	0%	-104	0%	0	0%
	2014	10,993	11,017	11,014	-24	0%	-21	0%	-3	0%	49,200	52,152	52,152	-2,952	-6%	-2,952	-6%	0	0%	103,783	104,013	104,013	-230	0%	-230	0%	0	0%
	2015	11,493	11,729	11,502	-236	-2%	-9	0%	-227	-2%	41,372	44,548	44,548	-3,176	-7%	-3,176	-7%	0	0%	111,881	112,077	112,077	-196	0%	-196	0%	0	0%
Spain	2013	46,235	46,305	45,467	-70	0%	768	2%	-838	-2%	20,420	20,633	20,633	-213	-1%	-213	-1%	0	0%	1,092,011	1,092,028	1,093,235	-16	0%	-1,223	0%	1,207	0%
	2014	45,406	45,248	44,507	158	0%	899	2%	-741	-2%	21,961	21,477	21,477	484	2%	484	2%	0	0%	990,950	990,860	991,961	90	0%	-1,011	0%	1,101	0%
	2015	46,844	47,782	47,024	-938	-2%	-180	0%	-758	-2%	21,520	24,641	24,653	-3,121	-13%	-3,133	-13%	12	0%	1,028,018	1,027,362	1,027,362	656	0%	656	0%	0	0%

Fuel		Liquid fuels									Solid fuels									Natural gas								
Member States	Year	Cumulated Monthly Eurostat data	Annual Eurostat data	GHG inventory data	Difference Monthly Eurostat - Annual Eurostat data		Difference Monthly Eurostat - GHG inventory data		Differences GHG inventory - annual Eurostat data		Cumulated Monthly Eurostat data	Annual Eurostat data	GHG inventory data	Difference Monthly Eurostat - Annual Eurostat data		Difference Monthly Eurostat - GHG inventory data		Differences GHG inventory - annual Eurostat data		Cumulated Monthly Eurostat data	Annual Eurostat data	GHG inventory data	Difference Monthly Eurostat - Annual Eurostat data		Difference Monthly Eurostat - GHG inventory data		Differences GHG inventory - annual Eurostat data	
		kt			kt	%	kt	%	kt	%	kt			kt	%	kt	%	kt	%	TJ NCV			TJ NCV	%	TJ NCV	%	kt	%
France	2013	72,138	70,725	73,018	1,413	2%	-880	-1%	2,293	3%	20,052	18,824	21,317	1,228	7%	-1,265	-6%	2,493	13%	1,570,531	1,633,145	1,629,936	-62,614	-4%	-59,405	-4%	-3,209	0%
	2014	71,208	69,896	73,144	1,312	2%	-1,936	-3%	3,248	5%	14,774	13,796	15,879	978	7%	-1,105	-7%	2,083	15%	1,364,721	1,364,669	1,355,461	52	0%	9,260	1%	-9,208	-1%
	2015	71,180	70,628	73,722	552	1%	-2,542	-3%	3,094	4%	14,367	13,520	15,113	847	6%	-746	-5%	1,593	12%	1,477,662	1,467,062	1,434,662	10,600	1%	43,001	3%	-32,400	-2%
Croatia	2013	3,083	3,014	3,073	69	2%	10	0%	59	2%	1,146	1,139	1,138	7	1%	8	1%	-1	0%	87,207	95,537	95,537	-8,330	-9%	-8,329	-9%	0	0%
	2014	2,903	2,955	3,044	-52	-2%	-141	-5%	89	3%	1,099	1,103	1,103	-4	0%	-4	0%	0	0%	79,616	84,549	84,620	-4,933	-6%	-5,005	-6%	72	0%
	2015	2,982	3,142	3,174	-160	-5%	-192	-6%	32	1%	1,008	1,021	1,020	-13	-1%	-12	-1%	-1	0%	89,085	87,165	87,164	1,920	2%	1,920	2%	-1	0%
Italy	2013	53,495	53,455	55,913	40	0%	-2,418	-4%	2,458	5%	21,783	21,632	21,330	151	1%	453	2%	-302	-1%	2,402,257	2,402,667	2,402,951	-410	0%	-694	0%	284	0%
	2014	51,314	51,525	53,552	-211	0%	-2,238	-4%	2,027	4%	20,975	21,057	21,458	-82	0%	-483	-2%	401	2%	2,122,967	2,122,962	2,121,784	5	0%	1,183	0%	-1,178	0%
	2015	52,175	53,492	53,821	-1,317	-2%	-1,646	-3%	329	1%	20,083	19,894	20,735	189	1%	-652	-3%	841	4%	2,315,403	2,315,363	2,314,079	40	0%	1,324	0%	-1,284	0%
Cyprus	2013	1,816	1,826	1,830	-10	-1%	-14	-1%	4	0%	NA	1	13	-	-	-	-	12	-	NO	NO	NO	-	-	-	-	-	-
	2014	1,864	1,877	1,887	-13	-1%	-23	-1%	10	1%	4	4	4	0	0%	0	-4%	0	4%	NO	NO	NO	-	-	-	-	-	-
	2015	1,882	1,891	1,901	-9	0%	-19	-1%	10	1%	6	6	6	0	0%	0	0%	0	0%	NO	NO	NO	-	-	-	-	-	-
Latvia	2013	1,105	1,254	1,192	-149	-12%	-87	-7%	-62	-5%	132	131	131	1	1%	1	1%	0	0%	50,200	50,438	50,544	-238	0%	-344	-1%	106	0%
	2014	1,197	1,291	1,213	-94	-7%	-16	-1%	-78	-6%	100	105	98	-5	-5%	2	2%	-7	-7%	45,274	45,286	45,386	-13	0%	-112	0%	100	0%
	2015	1,232	1,340	1,254	-108	-8%	-22	-2%	-86	-6%	70	82	83	-12	-15%	-13	-15%	1	1%	46,009	45,987	46,096	22	0%	-87	0%	109	0%
Lithuania	2013	2,193	2,189	2,372	4	0%	-179	-8%	183	8%	513	513	427	0	0%	86	20%	-86	-17%	90,554	90,624	90,608	-69	0%	-54	0%	-16	0%
	2014	2,384	2,353	2,542	31	1%	-158	-6%	189	8%	428	367	443	61	17%	-15	-3%	76	21%	86,157	86,437	86,450	-280	0%	-293	0%	13	0%
	2015	2,455	2,570	2,603	-115	-4%	-148	-6%	33	1%	328	288	267	40	14%	61	23%	-21	-7%	86,536	86,561	86,562	-25	0%	-26	0%	1	0%
Luxem-bourg	2013	2,365	2,372	2,363	-7	0%	2	0%	-9	0%	76	80	81	-4	-5%	-5	-6%	1	1%	37,259	37,258	37,258	1	0%	1	0%	0	0%
	2014	2,209	2,232	2,225	-23	-1%	-16	-1%	-7	0%	78	90	91	-12	-13%	-13	-14%	1	1%	35,302	35,302	35,302	0	0%	0	0%	0	0%
	2015	2,151	2,143	2,134	8	0%	17	1%	-9	0%	79	84	84	-5	-6%	-5	-6%	0	0%	32,193	32,194	32,194	-1	0%	-1	0%	0	0%
Hungary	2013	5,784	5,524	5,662	260	5%	122	2%	138	2%	10,796	10,736	10,720	60	1%	76	1%	-16	0%	320,365	322,601	322,601	-2,237	-1%	-2,237	-1%	0	0%
	2014	6,044	6,222	6,137	-178	-3%	-93	-2%	-85	-1%	10,359	10,314	10,299	45	0%	60	1%	-15	0%	292,156	292,307	292,307	-150	0%	-150	0%	0	0%
	2015	6,583	6,700	6,669	-117	-2%	-86	-1%	-31	0%	10,329	10,448	10,493	-119	-1%	-164	-2%	45	0%	312,136	313,622	313,622	-1,486	0%	-1,486	0%	0	0%
Malta	2013	712	733	773	-21	-3%	-61	-8%	40	5%	NO	NO	NO	-	-	-	-	-	-	NO	NO	NO	-	-	-	-	-	-
	2014	730	769	762	-39	-5%	-32	-4%	-7	-1%	NO	NO	NO	-	-	-	-	-	-	NO	NO	NO	-	-	-	-	-	-
	2015	527	533	548	-6	-1%	-21	-4%	15	3%	NO	NO	NO	-	-	-	-	-	-	NO	NO	NO	-	-	-	-	-	-

Fuel		Liquid fuels									Solid fuels									Natural gas								
Member States	Year	Cumulated Monthly Eurostat data	Annual Eurostat data	GHG inventory data	Difference Monthly Eurostat - Annual Eurostat data		Difference Monthly Eurostat - GHG inventory data		Differences GHG inventory - annual Eurostat data		Cumulated Monthly Eurostat data	Annual Eurostat data	GHG inventory data	Difference Monthly Eurostat - Annual Eurostat data		Difference Monthly Eurostat - GHG inventory data		Differences GHG inventory - annual Eurostat data		Cumulated Monthly Eurostat data	Annual Eurostat data	GHG inventory data	Difference Monthly Eurostat - Annual Eurostat data		Difference Monthly Eurostat - GHG inventory data		Differences GHG inventory - annual Eurostat data	
		kt			kt	%	kt	%	kt	%	kt			kt	%	kt	%	kt	%	TJ NCV			TJ NCV	%	TJ NCV	%	kt	%
Nether-lands	2013	27,926	28,178	28,739	-252	-1%	-813	-3%	561	2%	12,890	13,056	13,668	-166	-1%	-778	-6%	612	5%	1,394,339	1,383,983	1,396,200	10,355	1%	-1,862	0%	12,217	1%
	2014	26,657	29,664	26,397	-3,007	-10%	260	1%	-3,267	-11%	13,183	14,659	15,242	-1,476	-10%	-2,059	-14%	583	4%	1,217,665	1,207,294	1,207,180	10,371	1%	10,485	1%	-114	0%
	2015	24,297	26,295	26,569	-1,998	-8%	-2,272	-9%	274	1%	14,005	17,984	18,602	-3,979	-22%	-4,597	-25%	618	3%	1,203,719	1,210,647	1,210,533	-6,928	-1%	-6,814	-1%	-114	0%
Austria	2013	12,032	11,448	11,680	584	5%	352	3%	232	2%	4,449	4,869	4,835	-420	-9%	-386	-8%	-34	-1%	290,772	293,567	293,566	-2,795	-1%	-2,794	-1%	-1	0%
	2014	11,149	11,218	11,421	-69	-1%	-272	-2%	203	2%	4,563	4,441	4,441	122	3%	122	3%	0	0%	267,122	269,832	269,832	-2,710	-1%	-2,710	-1%	1	0%
	2015	11,252	11,330	11,523	-78	-1%	-271	-2%	193	2%	4,998	4,802	4,802	196	4%	196	4%	0	0%	284,576	287,931	287,931	-3,355	-1%	-3,355	-1%	0	0%
Poland	2013	21,781	21,538	21,593	243	1%	188	1%	55	0%	137,563	137,871	137,827	-308	0%	-264	0%	-44	0%	574,372	574,674	574,674	-302	0%	-302	0%	0	0%
	2014	21,375	21,299	21,536	76	0%	-161	-1%	237	1%	129,964	130,418	131,324	-454	0%	-1,360	-1%	906	1%	562,338	561,217	561,217	1,121	0%	1,121	0%	0	0%
	2015	22,927	22,674	22,979	253	1%	-52	0%	305	1%	129,973	128,034	129,398	1,939	2%	575	0%	1,364	1%	572,716	576,764	576,764	-4,048	-1%	-4,048	-1%	0	0%
Portugal	2013	10,569	9,214	9,341	1,355	15%	1,228	13%	127	1%	4,450	4,449	4,410	1	0%	40	1%	-39	-1%	162,206	157,251	157,799	4,955	3%	4,407	3%	549	0%
	2014	9,725	8,802	8,890	923	10%	835	9%	88	1%	4,519	4,526	4,377	-7	0%	142	3%	-149	-3%	149,900	145,422	146,369	4,478	3%	3,531	2%	947	1%
	2015	9,918	9,083	9,322	835	9%	596	6%	239	3%	5,499	5,427	5,326	72	1%	173	3%	-101	-2%	166,504	170,575	172,791	-4,072	-2%	-6,287	-4%	2,216	1%
Romania	2013	8,095	7,987	8,139	108	1%	-44	-1%	152	2%	25,754	26,669	26,663	-915	-3%	-909	-3%	-6	0%	430,846	410,052	410,052	20,794	5%	20,794	5%	0	0%
	2014	8,227	8,035	8,325	192	2%	-98	-1%	290	4%	25,840	26,979	26,929	-1,139	-4%	-1,089	-4%	-50	0%	404,690	392,065	392,065	12,625	3%	12,625	3%	0	0%
	2015	8,617	8,730	8,859	-113	-1%	-242	-3%	129	1%	27,359	27,897	27,855	-538	-2%	-496	-2%	-42	0%	389,761	373,685	373,685	16,076	4%	16,076	4%	0	0%
Slovenia	2013	2,163	2,332	2,330	-169	-7%	-167	-7%	-2	0%	4,045	4,487	4,487	-442	-10%	-442	-10%	0	0%	28,954	28,967	28,967	-13	0%	-13	0%	0	0%
	2014	2,188	2,275	2,273	-87	-4%	-85	-4%	-2	0%	3,163	3,617	3,617	-454	-13%	-454	-13%	0	0%	26,241	26,210	26,210	31	0%	31	0%	0	0%
	2015	2,161	2,228	2,228	-67	-3%	-67	-3%	0	0%	3,209	3,628	3,614	-419	-12%	-405	-11%	-14	0%	27,788	27,814	27,814	-25	0%	-26	0%	1	0%
Slovakia	2013	3,042	3,105	3,134	-63	-2%	-92	-3%	29	1%	6,657	6,902	6,902	-245	-4%	-245	-4%	0	0%	203,223	201,571	201,628	1,651	1%	1,595	1%	57	0%
	2014	2,919	2,851	3,027	68	2%	-108	-4%	176	6%	6,522	6,524	6,305	-2	0%	217	3%	-219	-3%	133,253	157,940	157,818	-24,687	-16%	-24,565	-16%	-122	0%
	2015	3,278	3,126	3,156	152	5%	122	4%	30	1%	6,350	6,413	6,413	-63	-1%	-63	-1%	0	0%	161,427	162,425	162,154	-998	-1%	-728	0%	-270	0%
Finland	2013	7,196	7,187	7,647	9	0%	-451	-6%	460	6%	11,337	11,507	11,719	-170	-1%	-382	-3%	212	2%	118,526	119,611	119,622	-1,085	-1%	-1,096	-1%	11	0%
	2014	8,196	8,598	8,117	-402	-5%	79	1%	-481	-6%	10,755	10,849	11,059	-94	-1%	-304	-3%	210	2%	104,086	105,223	105,243	-1,137	-1%	-1,157	-1%	20	0%
	2015	7,838	7,713	7,274	125	2%	564	8%	-439	-6%	9,712	10,002	10,154	-290	-3%	-442	-4%	152	2%	92,214	93,628	93,647	-1,414	-2%	-1,433	-2%	19	0%
Sweden	2013	11,558	11,404	12,178	154	1%	-620	-5%	774	7%	3,252	3,669	3,669	-417	-11%	-417	-11%	0	0%	40,068	39,996	39,996	72	0%	72	0%	0	0%
	2014	11,471	11,325	11,746	146	1%	-275	-2%	421	4%	3,398	3,372	3,308	26	1%	90	3%	-64	-2%	33,245	33,245	33,396	0	0%	-150	0%	150	0%
	2015	9,558	9,642	9,894	-84	-1%	-336	-3%	252	3%	3,259	3,324	2,686	-65	-2%	573	21%	-638	-19%	30,279	30,296	30,450	-17	0%	-171	-1%	154	1%
United Kingdom	2013	65,925	55,371	56,009	10,554	19%	9,916	18%	638	1%	61,027	60,778	61,270	249	0%	-244	0%	492	1%	2,747,482	2,750,037	2,756,655	-2,555	0%	-9,173	0%	6,618	0%
	2014	55,470	56,339	56,882	-869	-2%	-1,412	-2%	543	1%	48,781	48,722	49,559	59	0%	-778	-2%	837	2%	2,511,757	2,503,045	2,500,355	8,712	0%	11,402	0%	-2,690	0%
	2015	57,373	57,559	57,597	-186	0%	-224	0%	38	0%	39,005	38,629	38,066	376	1%	939	2%	-563	-1%	2,567,078	2,565,661	2,574,227	1,418	0%	-7,149	0%	8,566	0%
EU 28	2013	515,278	500,968	509,118	14,310	3%	6,160	1%	8,150	2%	750,492	763,437	766,917	-12,945	-2%	-16,425	-2%	3,480	0%	16,163,517	16,188,567	16,334,109	-25,051	0%	-170,593	-1%	145,542	1%
	2014	497,930	499,693	503,107	-1,763	0%	-5,177	-1%	3,414	1%	718,286	729,245	732,747	-10,959	-2%	-14,461	-2%	3,502	0%	14,441,507	14,386,962	14,379,572	54,545	0%	61,935	0%	-7,390	0%
	2015	502,582	505,389	505,834	-2,807	-1%	-3,252	-1%	445	0%	695,512	714,785	719,371	-19,273	-3%	-23,859	-3%	4,586	1%	15,059,121	14,972,405	15,033,466	86,716	1%	25,655	0%	61,061	0%

Note: Green: difference ≤ ± 2%, Yellow: difference ± >2 and ≤ 5%, Red: difference > ± 5%

Differences for comparison of monthly and annual Eurostat data and annual Eurostat data and GHG inventory data: annual Eurostat data = 100 %, a positive value indicates that monthly data is higher than annual data; a negative value indicates that monthly data is lower than annual data. For comparison of monthly Eurostat data and GHG inventory data: GHG inventory data = 100%, a positive value indicates that monthly Eurostat data is higher than GHG inventory data; a negative value indicates that monthly Eurostat data is lower than GHG inventory data.

Source: Own compilation based on extraction from Eurostat database in the specific year, GHG inventory submission CRF table 1.A(b)

Table 5-2: Net calorific values used for the purposes of converting GHG inventory data in physical units and for calculating trend changes in TJ for the year 2015

			BE	BG	CZ	DK	DE	EE	IE	GR	ES
FUEL TYPES			TJ/kt								
Liquid fossil	Primary fuels	Crude oil	42.2	42.5	42.4	43.0	42.5		42.8	42.3	41.9
		Orimulsion		50.0		27.7		39.0			
		Natural gas liquids	45.2							41.6	
	Secondary fuels	Gasoline	44.0	42.4	44.5	43.8	42.3	44.0	44.6	42.8	44.8
		Jet kerosene	43.0	43.0	43.3	43.5	42.8	43.0	44.1	44.1	43.2
		Other kerosene	43.0		42.8		42.8		44.2	43.8	43.2
		Shale oil						39.4			
		Gas/diesel oil	42.6	42.0	42.6	42.7	42.5	42.3	43.3	42.8	43.1
		Residual fuel oil	40.0	40.0	39.5	40.7	40.7	40.2	41.2	40.6	40.3
		Liquefied petroleum gases (LPG	46.0	46.0	45.9	46.0	45.4	45.5	47.2	47.3	44.8
		Ethane									
		Naphtha	44.0	44.0	43.6	44.5	44.0		44.0	44.5	44.8
		Bitumen	39.0	37.7	40.2	39.8	39.0	40.2	37.7	40.2	40.2
		Lubricants	42.0	42.3	40.2	41.9	41.8	40.2	42.3	40.2	40.2
		Petroleum coke	32.0	31.4	38.5	31.4	32.0		31.9	32.1	32.2
		Refinery feedstocks	42.2	39.8	40.3	42.7	42.5		44.6	43.0	43.0
		Other oil	41.8	40.4	39.5	47.8	38.4		43.6	40.2	40.2
Solid fossil	Primary fuels	Anthracite	28.4	28.8	28.5		29.7		27.8		21.3
		Coking coal	29.3		29.5		28.7		29.1		28.2
		Other bituminous coal	26.3	27.6	22.0	24.1	27.0	27.2	25.5	24.8	22.6
		Sub-bituminous coal									12.8
		Lignite		6.8	12.0		9.0	9.0	19.8	5.4	12.8
		Oil shale and tar sand						9.0			
	Secondary fuels	BKB[(4)] and patent fuel	20.0	13.4	19.8	18.3	20.8		20.0		
		Coke oven/gas coke	29.3	28.5	28.8	29.3	28.7	28.5			27.8
Peat								10.4	8.8		

			FR	HR	IT	CY	LV	LT	LU	HU	MT
FUEL TYPES			TJ/kt								
Liquid fossil	Primary fuels	Crude oil	42.0	42.7	42.7		42.3	42.8	42.3	42.3	
		Orimulsion	27.5	49.4						40.0	
		Natural gas liquids	44.0	46.1				44.2		43.0	
	Secondary fuels	Gasoline	44.0	44.6	44.3	44.3	44.0	44.8	43.0	44.0	44.3
		Jet kerosene	44.0	44.0	43.0	44.1	43.2	43.2	43.1	43.4	43.8
		Other kerosene	44.0	44.0	43.0	43.8	43.2				43.8
		Shale oil	36.0				39.4	38.1			
		Gas/diesel oil	42.0	42.7	42.6	43.0	42.5	43.1	42.5	43.0	43.0
		Residual fuel oil	40.0	40.2	40.4	40.4	40.6	43.1	40.0	40.4	40.0
		Liquefied petroleum gases (LPG	46.0	46.9	46.0	47.3	45.5	46.4	46.0	47.0	46.0
		Ethane	46.4								
		Naphtha	45.0	44.6	44.0					42.0	
		Bitumen	40.2	33.5	39.0	40.2	41.9	39.0	40.2	37.7	
		Lubricants	40.2	33.5	42.0	40.2	41.9	42.0	40.2	39.8	42.0
		Petroleum coke	32.0	31.0	32.0	32.5			32.5	32.5	
		Refinery feedstocks	44.8	42.7	41.9			42.2		41.8	
		Other oil	40.2	42.7	40.0	40.2	41.9	40.0	42.5	42.5	
Solid fossil	Primary fuels	Anthracite		29.3				25.0	26.7		
		Coking coal	26.0		31.0			25.0	22.2	29.4	
		Other bituminous coal	26.0	25.1	25.3	25.7	23.9	25.1	24.4	23.4	
		Sub-bituminous coal	20.0	17.0	18.8			23.0		17.4	
		Lignite	17.0	10.5	10.3				22.2	6.9	
		Oil shale and tar sand	9.4				9.2				
	Secondary fuels	BKB[(4)] and patent fuel	32.0					15.0	22.2	20.0	
		Coke oven/gas coke	28.0	29.3	28.5		26.8	29.3	28.5	28.5	
Peat							10.1	11.7			

			NL	AT	PL	PT	RO	SI	SK	FI	SE	UK
FUEL TYPES			TJ/kt									
Liquid fossil	Primary fuels	Crude oil	42.7	42.5	41.0	42.6	41.3	42.9	42.0	42.7	42.3	43.4
		Orimulsion	27.5		42.5	28.0	48.0		41.5	42.5		42.5
		Natural gas liquids	44.0	42.5			49.5		37.0	45.2		45.5
	Secondary fuels	Gasoline	44.0	41.0	44.0	44.0	44.0	43.9	43.9	43.0	44.0	44.8
		Jet kerosene	43.5	43.4	43.0	43.0	48.6	43.5	43.3	43.3	43.0	43.9
		Other kerosene	43.5	43.4	43.0	43.7	43.0			43.1	43.0	43.9
		Shale oil	38.1									
		Gas/diesel oil	42.7	42.2	43.3	43.3	42.4	42.6	42.1	42.8	42.9	42.6
		Residual fuel oil	41.0	41.4	40.4	40.2	40.4	41.4	40.4	40.8	40.4	40.7
		Liquefied petroleum gases (LPG	45.2	46.1	46.0	46.0	48.1	46.1	46.0	46.2	46.1	46.0
		Ethane	45.2								49.5	45.9
		Naphtha	44.0	45.0	44.0	44.0	44.0		44.0	44.3	44.0	45.3
		Bitumen	41.9	41.8	39.0	39.0	35.2	40.2	40.0	40.2	39.0	40.5
		Lubricants	41.4	41.8	42.0	42.0	35.2	40.2	40.7	40.2	42.0	42.9
		Petroleum coke	35.2	30.8	32.0	32.0	34.3	33.6	34.9	33.5	34.8	34.0
		Refinery feedstocks	43.0	42.3	42.5	44.0	43.0		42.0	42.5	44.2	42.0
		Other oil	43.6	41.8	38.5	43.7	39.8	40.2	42.5	42.0	40.2	43.6
Solid fossil	Primary fuels	Anthracite	29.3	28.0		27.2	25.5		26.6	27.7		26.7
		Coking coal	28.6	29.0	29.5	28.2	27.5		29.7	29.0	30.0	30.2
		Other bituminous coal	25.0	28.4	22.1	25.6	26.0	27.0	26.3	25.5	27.4	25.8
		Sub-bituminous coal	18.9	22.1			24.6	18.7				
		Lignite	20.0	20.6	8.1	16.4	7.9	11.4	11.2			
		Oil shale and tar sand	8.9									
	Secondary fuels	BKB[(4)] and patent fuel	20.7	19.3	20.0				28.0			20.7
		Coke oven/gas coke	28.5	28.6	28.5	29.4	26.4	30.1	28.0	28.1	28.1	29.8
Peat			9.8	9.8			8.8			10.1	10.8	9.8

Note: There might be small differences for NCVs used for calculating early CO_2 estimates in TJ and for converting GHG inventory data in physical units. This is due to inconsistencies that could only be identified after comparison of GHG inventory data with annual Eurostat data

Source: Database Eurostat annual data, GHG inventory data, IPCC 2006 GL

5.2. Data gaps and Outliers in 2016 monthly Eurostat data

Table 5-3: List of gaps for individual months examined in the monthly fuel data for the year 2016

Country	Name	Flow	Summe 2015		201601	201602	201603	201604	201605	201606	201607	201608	201609	201610	201611	201612	Summe 2016
AT	Crude Oil	Imports	**8,078**		596	603	646	38	588	669	715	707	631	721	713	708	**7,335**
BG	Motor gasoline	Exports	**1,564**		113	130	41	121	122	129	182	135	123	138	135	156	**1,525**
CZ	Lignite	Imports	**985**		4	1	3	6	9	23	0	1	16	1	2	13	**79**
DE	Lignite	Exports	**911**		0	0	0	0	0	0	0	0	0	0	0	0	**0**
DK	Refinery feedstocks	Imports	**112**		0	0	0	0	0	0	0	0	0	0	0	0	**0**
DK	Crude Oil	Imports	**4,166**		412	332	285	26	273	239	468	450	316	418	331	287	**3,837**
EE	Other Hydrocarbons	Exports	**749**		41	32	59	7	52	68	30	49	77	97	72	65	**649**
EE	Gas/Diesel Oil	Imports	**719**		139	29	53	62	65	53	60	74	70	62	72	68	**807**
ES	Coke oven/Gas Coke	Imports	**339**		0	28	17	8	15	24	33	4	17	20	8	10	**184**
FI	Other Kerosene	Imports	**113**		0	55	84	0	39	0	0	0	17	8	40	106	**349**
FR	Refinery Feedstocks	Exports	**919**		0	0	0	0	0	0	0	0	0	0	0	0	**0**
HU	NGL	Imports	**146**		9	14	8	1	0	0	1	0	0	0	0	0	**33**
HU	Other Hydrocarbons	Production	**63**		0	0	0	0	0	0	0	0	0	0	0	0	**0**
HU	Naphtha	Imports	**305**		8	6	16	40	26	41	20	11	0	0	18	51	**237**
LT	NGL	Imports	**198**		0	0	0	0	0	0	0	0	0	0	0	0	**0**
LV	Natural gas	Imports	**71,431**		193	176	10	176	74	7,452	13,262	15,081	14,846	1,674	116	130	**53,190**
LV	Gas/diesel oil	Exports	**741**		60	28	37	80	50	53	38	22	41	40	35	372	**856**
MT	Gas/Diesel oil	Exports	**314**		24	27	19	55	5	23	12	0	15	26	24	17	**247**
MT	Residual fuel oil	Exports	**217**		1	0	0	0	2	0	0	21	0	0	0	0	**24**
NL	Coke Oven Gas coke	Imports	**348**		134	30	4	22	13	23	28	17	4	56	74	35	**440**
NL	Crude oil	Exports	**291**		74	35	18	22	74	0	0	0	1	55	27	21	**327**
NL	Coke Oven Gas coke	Exports	**406**		33	25	50	49	53	24	50	37	59	0	73	16	**469**
PT	Hard Coal	Imports	**5,602**		492	477	442	370	170	329	387	487	425	564	472	521	**5,136**
PT	Natural gas	Exports	**14,418**		0	0	0	0	0	0	0	3,065	2,912	0	2,919	26	**8,923**
RO	Lignite	Exports	**378**		0	0	0	0	0	0	0	0	0	0	3	0	**3**
SI	Jet Kerosene	Imports	**315**		26	0	15	36	27	0	41	0	41	0	42	0	**228**
UK	Coke oven/gas Coke	Exports	**212**		0	0	0	0	0	0	0	0	0	0	0	0	**0**

Note: This table shows the most relevant gaps (yellow coloured) and outlier (orange coloured) found in the 2016 monthly Eurostat data. Stock changes are not included here.

Source: Extraction from Eurostat database March/April 2017

5.3. Differences for calculation of 2015 early CO_2 estimates for trend changes calculated in TJ and in kt

Table 5-4: Differences for calculation of 2015 early CO_2 estimates for trend changes calculated in TJ and kt for liquid and solid fuels

	Trend changes Liquid fuels kt	Trend changes Liquid fuels TJ	Differences		Trend changes Solid fuels kt	Trend changes Solid fuels TJ	Differences
	2016/2015				2016/2015		
Belgium	-1.2%	-1.3%	-0.1%		-8.1%	-8.0%	0.1%
Bulgaria	3.5%	3.0%	-0.5%		-13.3%	-14.2%	-0.9%
Czech Republic	-7.3%	-7.0%	0.3%		-0.7%	-0.3%	0.4%
Denmark	3.4%	3.3%	-0.1%		15.4%	15.4%	0.0%
Germany	-0.2%	-0.2%	0.0%		-3.0%	-3.1%	-0.2%
Estonia	52.6%	51.5%	-1.1%		-3.5%	-3.3%	0.1%
Ireland	8.4%	8.2%	-0.3%		-21.0%	-21.0%	0.0%
Greece	3.1%	2.6%	-0.5%		-17.3%	-16.6%	0.7%
Spain	5.1%	5.2%	0.1%		-6.5%	-7.5%	-1.0%
France	-1.7%	-1.8%	-0.2%		-2.1%	-2.1%	0.0%
Croatia	1.3%	1.9%	0.5%		8.7%	8.7%	0.0%
Italy	-7.1%	-6.9%	0.1%		-11.8%	-11.6%	0.2%
Cyprus	7.2%	7.5%	0.2%		-83.3%	-83.3%	0.0%
Latvia	3.6%	3.6%	0.0%		-8.7%	-8.7%	0.0%
Lithuania	8.6%	8.1%	-0.5%		1.0%	1.0%	0.0%
Luxembourg	-2.9%	-3.0%	0.0%		6.3%	6.4%	0.0%
Hungary	1.9%	2.0%	0.1%		-1.8%	-4.1%	-2.3%
Malta	-18.2%	-17.9%	0.3%		-	-	-
Netherlands	10.2%	10.5%	0.2%		-8.0%	-8.1%	0.0%
Austria	2.0%	2.0%	0.0%		-2.9%	-2.9%	0.0%
Poland	10.8%	10.9%	0.1%		-2.8%	-2.3%	0.5%
Portugal	-8.2%	-8.1%	0.2%		-12.3%	-12.3%	0.0%
Romania	3.1%	2.8%	-0.3%		-10.1%	-9.1%	1.1%
Slovenia	5.8%	5.7%	0.0%		5.1%	5.2%	0.1%
Slovakia	7.2%	7.4%	0.2%		-3.6%	-2.8%	0.7%
Finland	7.9%	8.0%	0.0%		13.9%	13.3%	-0.6%
Sweden	12.7%	13.4%	0.8%		9.3%	9.2%	-0.1%
United Kingdom	1.8%	1.9%	0.1%		-51.3%	-51.1%	0.2%

Source: Own calculation based on monthly Eurostat data 2015 and 2016 and GHG inventory data 2017 submission for the year 2015