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Approximated EU GHG inventory: proxy GHG estimates for 2013

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Executive summary

Objective of the report

This report provides estimates of greenhouse gas (GHG) emissions in the European Union (EU) and its Member States for the year 2013, covering the full GHG inventory (all sectors, except land use, land-use change and forestry (LULUCF), and all gases). These estimates are also referred to as approximated ('proxy') estimates or inventories in this report as they cover the year for which no official GHG inventories have been prepared yet. The proxy estimates are based on incomplete activity and/or emissions data at country level and they should be considered as preliminary until the official inventory submissions are reported to UNFCCC in 2015. The proxy inventories in this report are based on GHG emission estimates reported by Member States to the European Commission under existing EU legislation ([1]) and on calculations made by the European Environment Agency (EEA) using activity and/or emissions data at country level. The official submission of 2013 inventories to the United Nations Framework Convention on Climate Change (UNFCCC) will take place in 2015. The proxy estimates greatly improve the timeliness of information on GHG emissions and are used for analysis of emission trends and progress to EU climate targets.

2013 presents a special case in GHG emissions reporting as it entails a change in the methodology and Global Warming Potentials (GWPs) used to estimate non-CO_2 GHG gases. Under the UNFCCC rules, the official GHG inventories for 2013, to be submitted in 2015, will have to follow the 2006 IPCC Guidelines for national inventories and use the GWPs from the IPCC Fourth Assessment Report (AR4). These changes will reduce the comparability of the 2013 estimates with the previous inventories, in particular in areas where the revised IPCC methodologies will trigger changes in the methods used. As it is impossible to accurately quantify the different impacts arising from these changes on the 2013 inventory estimates, it is expected that the approximated estimates will show larger deviations relative to the final inventories submitted in 2015 than the approximated results for the past years.

The executive summary and Chapter 2 are based on proxy estimates reported by Member States as well as EEA estimates when Member States did not report proxy estimates by 31 of July. Chapter 3 is based on EEA proxy estimates for all Member States. The estimates in both chapters are based on GWPs from the IPCC Second Assessment Report (SAR) However, for reasons of consistency the paragraphs referring to the split between EU ETS and non-ETS emissions are based on GWPs from the IPCC AR4 and the scope-corrected ETS data for 2012.

Proxy GHG emission estimates for 2013 at EU level

The 2013 inventory estimates indicate that for the EU-28 emissions continued to decrease slightly between 2012 and 2013. Compared to the 2012 official emissions reported to the UNFCCC and published earlier this year, the fall in emissions between 2012 and 2013 is estimated to be – 80.0 million tonnes of CO_2-equivalents (Mt CO_2-eq) or – 1.8 % for the EU-28 (total GHG emissions without LULUCF). For EU-28, total GHG emissions in 2013 are estimated to be – 20.7 % below 1990 emissions.

The 1.8 % emission decrease for EU-28 came along with a slight increase in Gross domestic product (GDP) of 0.1 % on average in 2013 compared to 2012. As in 2012, notwithstanding economic developments in specific sectors and countries, there was no common pattern between GDP and GHG emissions on average for the EU in 2013. The economic situation in the EU improved during 2013 compared

([1]) Regulation (EU) 525/2013 of the European Parliament and of the Council on a mechanism for monitoring and reporting greenhouse gas emissions (EU MMR).

to 2012, where GDP had contracted by – 0.5 %. Yet, GHG emission reductions in 2013 compared to 2012 were even larger than in 2012 compared to 2011 (1.8 % and 1.3 %, respectively). Some Member States achieved significant emission reductions in 2013 while also recording positive economic growth (see Figure ES.0).

For the understanding of emission trends, climate factors need to be considered as well. The winter in Europe was generally warmer in 2013 than it was in 2012. Higher winter temperatures led to lower heating demand and lower emissions from the residential and commercial sectors ([2]).

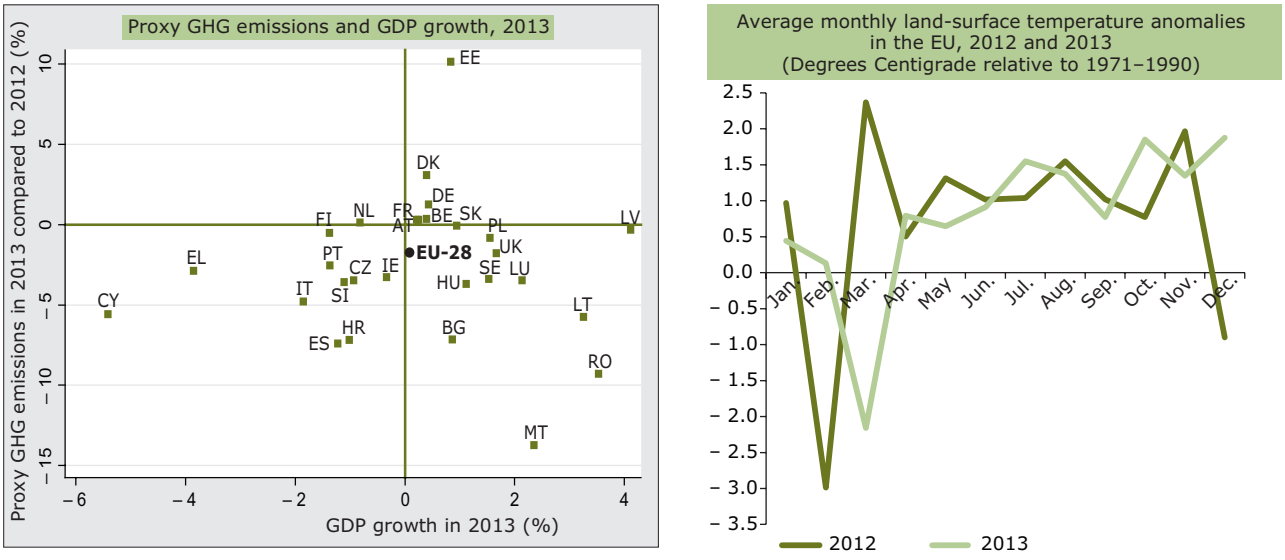
Figure ES.4 shows the expected change in total GHG emissions in 2013 broken down by European Emissions Trading System (ETS) and non-ETS sectors for the EU and by Member State. Between 2012 and 2013 emission reductions in the EU-28 were greater for the installations covered by the ETS (a decline in emissions of – 4.3 %) (see Figure ES.4) than they were in the non-ETS sectors (where emissions remained at a relatively stable level, growing by 0.2 %).

On a sectoral basis, the largest absolute emission reduction in the EU occurred in the energy sector (i.e. all combustion activities). GHG emissions fell by – 80.7 Mt CO_2-eq (– 2.2 %) across the EU-28. This decrease in emissions in the energy sector reflects the decline of gross inland energy consumption in the EU-28 in 2013. Within the energy sector, emissions decreased mostly in energy industries (– 59.5 Mt CO_2-eq), manufacturing industries and construction (– 10.1 Mt CO_2-eq) as well as for transportation (– 11.3 Mt CO_2-eq).

Primary energy consumption in the EU-28 dropped by – 0.3 % and reached the lowest level since 1995. The contribution of fossil fuels to the energy mix declined while renewables further increased.

Based on Eurostat monthly fuel consumption data (Eurostat, 2014), total fuel consumption in the EU fell by – 2.5 %, with different trends for the different fossil fuel types. Coal consumption dropped most significantly by – 4.0 %. Natural gas consumption fell by – 0.7 % and consumption of liquid fuels was reduced by – 2.5 %. The changes in solid fuel consumption between 2012 and 2013 are strongly

Figure ES.0 GHG emissions, GDP growth and monthly temperatures in the EU, changes 2012–2013



Note: GDP from DG ECFIN's Ameco database, European Commission. Average monthly land-surface temperatures from the E-OBS dataset, EU-FP6 project ENSEMBLES (http://ensembles-eu.metoffice.com) and the data providers in the ECA&D project (http://www.ecad.eu) (Haylock et al., 2008).

Source: EEA.

([2]) Data based on the E-OBS, EU-FP6 project ENSEMBLES. No heating degree days available from Eurostat for the year 2013 at the time of production of this report.

connected with the trends in electricity generation. Hydroelectric generation increased by 8 % in the EU with strong regional differences: south-eastern Europe experienced high rainfalls and a very favourable year for hydro electricity production, while the northern countries faced the opposite conditions with low rainfall and declining net hydro generation.

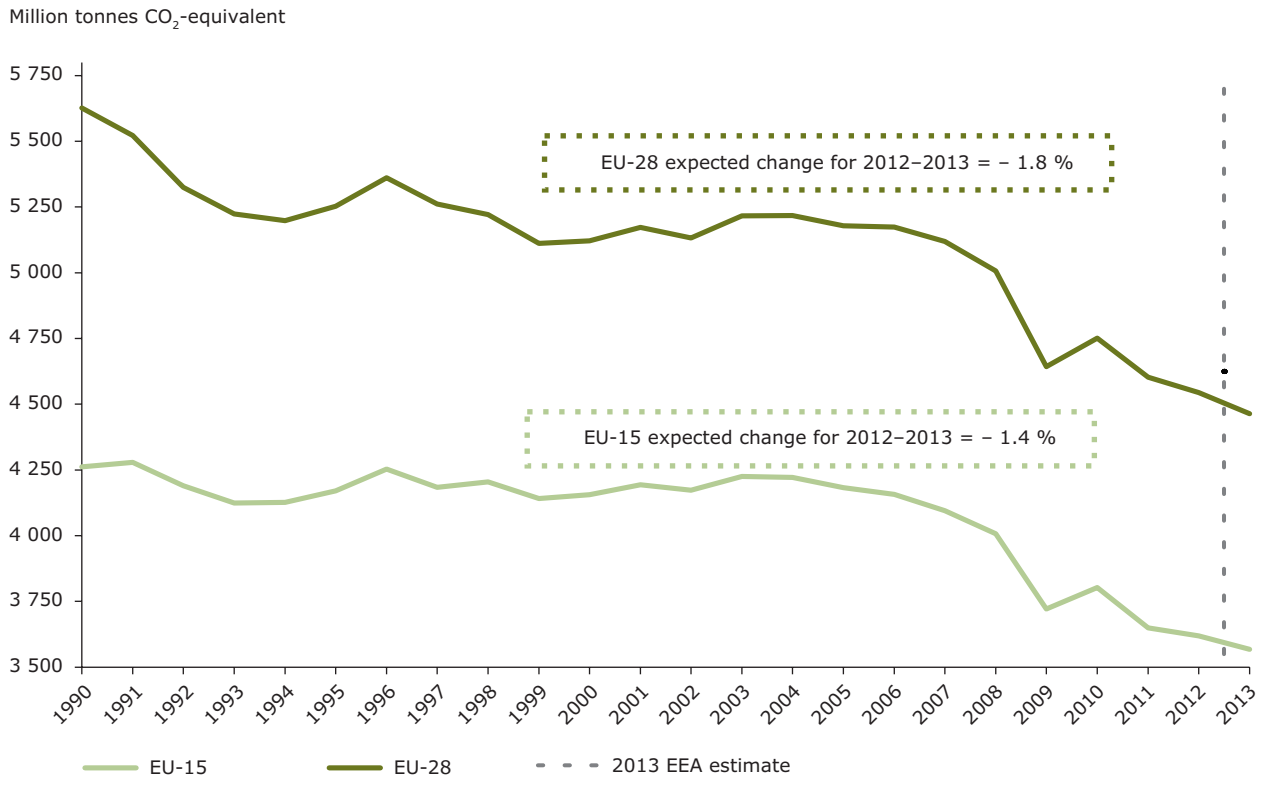
Electricity production from renewable sources other than hydro increased considerably. Net wind generation grew by about 20 % in the EU (Eurostat, 2013). Also solar consumption continued with a strong growth by 17 %. Thus, the use of renewables continues to play an important role in GHG mitigation efforts by the EU and its Member States.

Nuclear electricity production across the EU-28 decreased slightly by – 1 % in 2013 compared to 2012 according to Eurostat monthly data.

GHG emissions from industrial processes increased slightly in 2013 compared to 2012, up by 0.8 % in the EU-28. Emissions from mineral products fell by – 1.4 % in the EU-28 in 2013 compared to 2012. This is consistent with the decrease in emissions from cement and lime production under the EU ETS in the same period. Emissions released by metal production rose by 3.3 % in the EU-28 between 2012 and 2013. Emissions from chemical production remained relatively stable in the EU-28 (falling by only – 0.3 % between 2012 and 2013).

Figure ES.1 shows the emission trend for total GHG emissions without LULUCF in the EU-15 and EU-28 in the period 1990–2013 ([3]).

Figure ES.1 Trends in total GHG emissions



Note: Total GHG emissions without LULUCF, based on the 2014 EU GHG inventory submitted to the UNFCCC for the years 1990–2012 as well as proxy estimates for 2013 submitted by Member States using the GWPs from the IPCC SAR.

Source: EEA.

([3]) This is not equivalent to the difference to base year emissions because of accounting rules such as the selection of the base year (which varies from country to country) for F-gases and the continuing recalculations of GHG inventories.

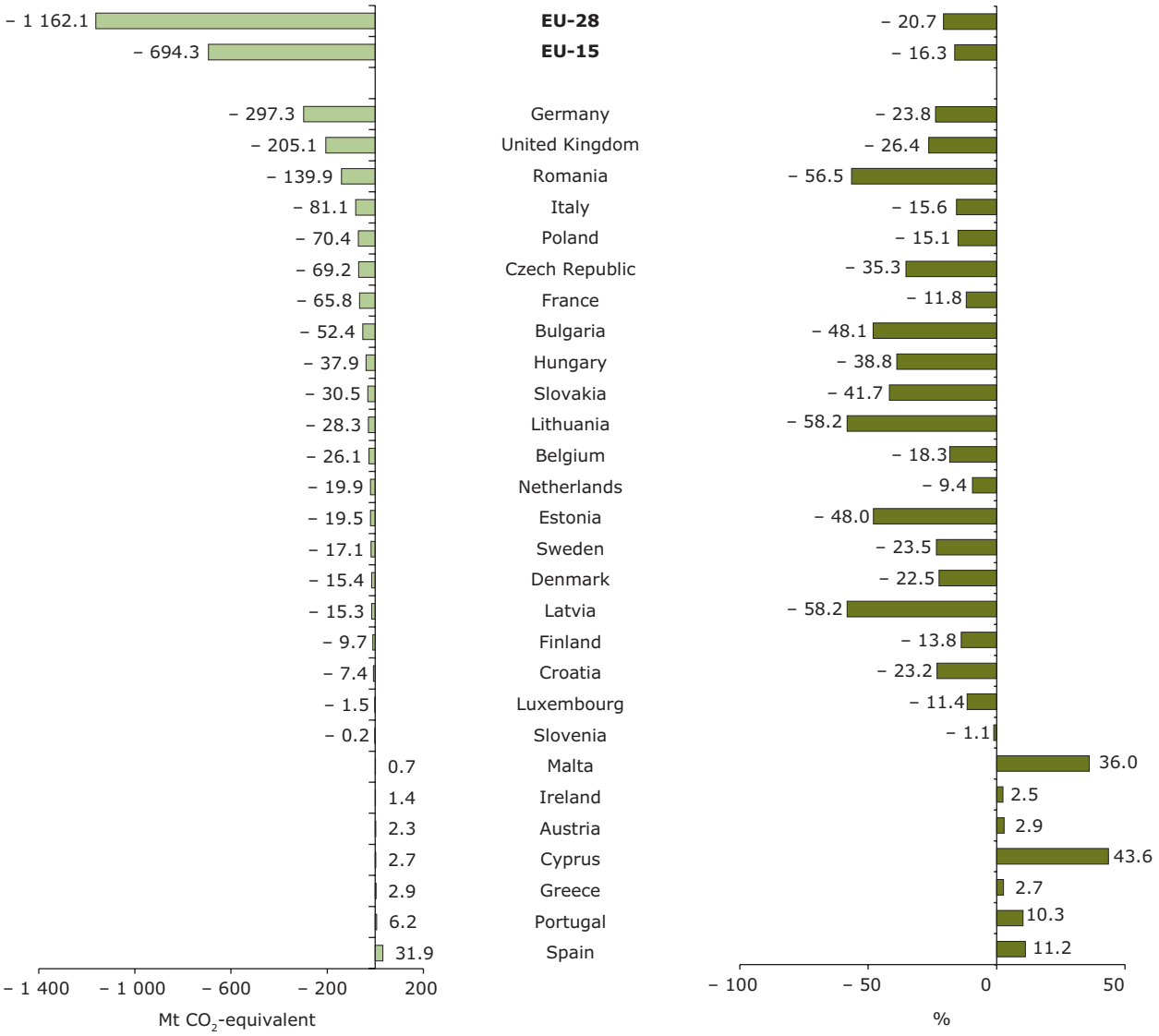
Change in GHG emissions in the period 1990–2013

Figure ES.2 presents the estimated change in GHG emissions for each Member State between 1990 and 2013 ([4]).

Based on these 2013 estimates, total EU-15 emissions in 2013 will be 16.3 % below the 1990 level and 16.6 % below base year level. For EU-28, total GHG emissions excluding LULUCF in 2013 are estimated to be almost 20.7 % below 1990 emissions. Including CO_2 emissions from international aviation the reduction in total GHG emissions would reach 19.3 % in 2013 — less than a percentage point from the EU's internal 20 % emission reduction target.

A wide range of factors and policies (climate-related and non-climate-related) have contributed to the long-term decline in GHG emissions in the EU,

Figure ES.2 Member States emissions, change 1990–2013



Note: Total GHG emissions without LULUCF, based on the 2014 EU GHG inventory submitted to the UNFCCC as well as proxy estimates for 2013 submitted by Member States using the GWPs from the IPCC SAR.

Source: EEA.

([4]) The percentage change cannot be directly compared to the emission reduction obligations under the Kyoto Protocol and the Effort Sharing Decision because Member State net balances under the ETS need to be taken into account and the fixed base-year emissions are not identical to the latest recalculation of 1990 emissions. Furthermore, Member State use of flexible mechanisms and LULUCF activities also contribute to compliance with the Kyoto targets.

particularly for CO_2. These include improvements in energy efficiency, the shift to less carbon-intensive fossil fuels, and the strong increase in renewable energy use ([5]). Implementation of the EU's Climate and Energy Package should lead to further reductions in emissions. The effects of the Montreal Protocol in reducing emissions of ozone-depleting substances have also indirectly contributed to very significant reductions in emissions of some potent GHGs such as chlorofluorocarbons. Specific polices to reduce fluorinated gases (F-gases) have also slowed the growth in consumption of fluorinated gases with high global warming potential. Other EU policies such as the Nitrates Directive, the Common Agriculture Policy (CAP), and the Landfill Waste Directive have also been successful in indirectly reducing GHG emissions from non-CO_2 gases such as methane and nitrous oxides.

Change in GHG emissions in the period 2012–2013 at Member State level

As Figure ES.3 illustrates, GHG emissions decreased in 21 Member States (Spain, Italy, Romania, the United Kingdom, Czech Republic, Bulgaria, Poland, Greece Hungary, Sweden, Ireland, Croatia, Portugal Lithuania, Slovenia, Cyprus, Malta, Luxembourg, Finland, Latvia and Slovakia). The largest absolute decrease of emissions occurred in Spain (– 25.2 Mt CO_2-eq or – 7.4 % compared to 2012), Italy (22.1 Mt CO_2-eq or – 4.8 % compared to 2012), followed by Romania (11.0 Mt CO_2-eq or 9.3 %) and the United Kingdom (– 10.4 Mt CO_2-eq or – 1.8 %). The largest relative fall in emissions compared to the previous year took place in Malta (– 13.7 %), followed by Romania (– 9.3 %), Spain (– 7.4 %), Croatia (– 7.2 %) and Bulgaria (– 7.1 %). The largest absolute growth in emissions occurred in Germany (11.7 Mt CO_2-eq or 1.2 %) and the largest relative increase in Estonia (10.1 %). Chapter 2 of the main report includes explanations for some of the change in emissions by Member State.

Twenty-one Member States submitted preliminary 2013 GHG data to the European Commission and the EEA by 31 July 2014. Austria, Belgium, Croatia, Estonia, Finland, France, Germany, Hungary, Italy, Latvia, Lithuania, Malta, the Netherlands, Poland, Slovakia, Slovenia and Spain submitted complete emissions in the form of Common reporting format (CRF) Summary 2 tables. Denmark, Greece Sweden and the United Kingdom submitted largely complete CRF Summary 2 tables ([6]).

According to the country estimates, as shown in Figure ES.3, the expected change in GHG emissions in 2013 compared to 2012 is as follows: Austria (+ 0.4 %), Belgium (+ 0.3 %), Croatia (– 7.2 %), Denmark (+ 3.1 %), Estonia (+10.1 %), Finland (– 0.5 %), France (+ 0.3 %), Germany (+ 1.2 %), Greece (– 2.9 %), Hungary – 3.7 %), Italy (– 4.8 %), Latvia (– 0.3 %), Lithuania – 5.8 %), Malta (– 13.7 %), the Netherlands (+ 0.1 %), Poland (– 0.8 %), Slovakia (– 0.1 %), Slovenia (– 3.6 %), Spain (– 7.4 %), Sweden (– 3.4 %) and the United Kingdom (– 1.8 %).

Using the available proxy emission estimates by Member States, EU-28 emissions are expected to decrease by 1.8 % between 2012 and 2013 (and matching to 1.8 % when using EEA proxy estimates only).

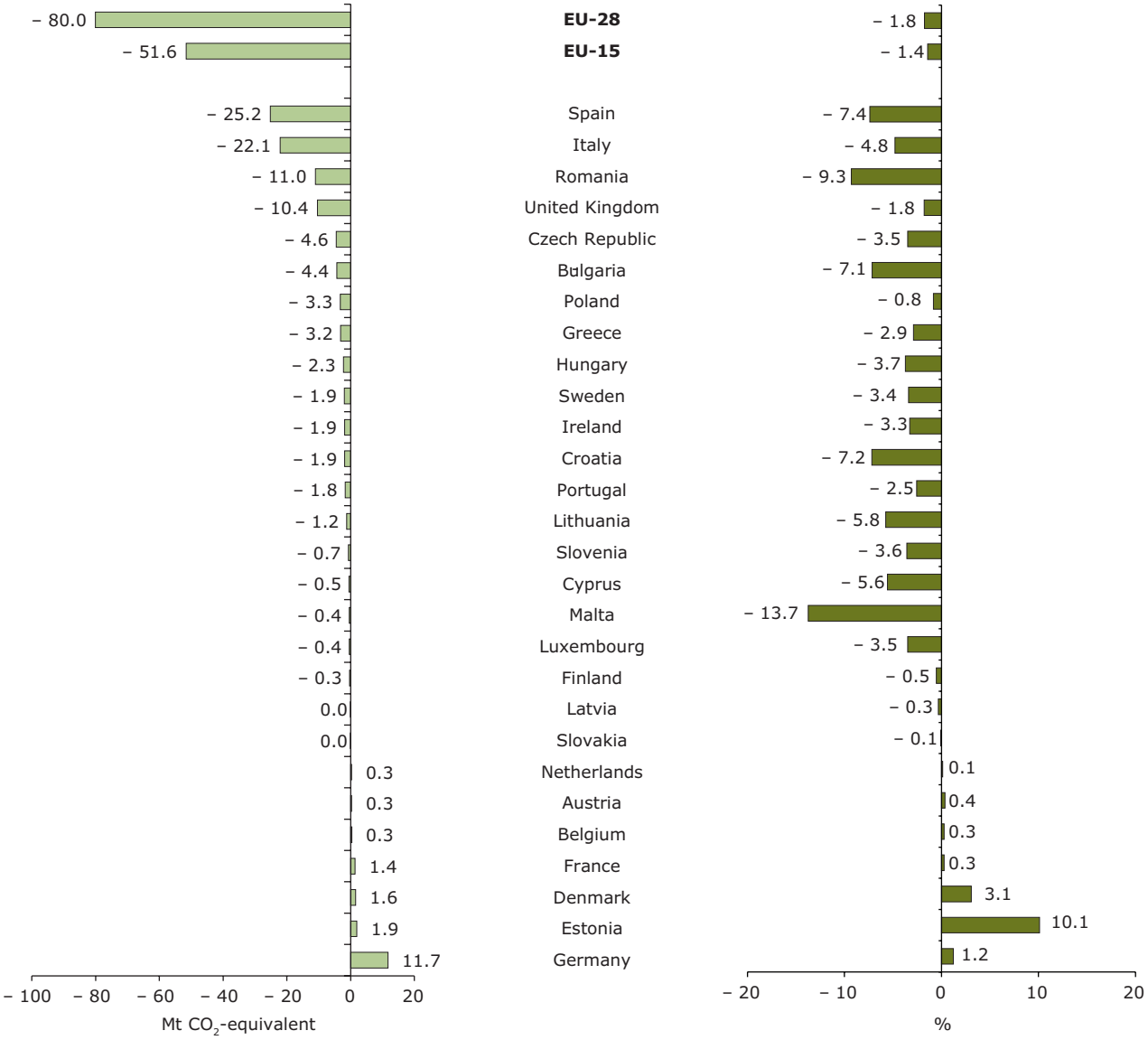
In general, the preliminary estimates from both sources (i.e. both EEA-sourced proxy data and Member States' own estimates) matched well with differences smaller than ± 2 %, except for Croatia (where the difference was 4.5 %), Greece (5.0 %), Lithuania (3.1 %), Malta (2.3 %) and Slovakia (3.1 %).

Official 2013 GHG emissions for the EU will be available in the late May or early June 2015, when the EEA publishes the EU GHG inventory 1990–2013, and the inventory report 2015 for submission to the UNFCCC.

([5]) See EEA, 'Why did GHG emissions decrease in the EU between 1990 and 2012?', http://www.eea.europa.eu/publications/why-are-greenhouse-gases-decreasing.

([6]) Luxembourg submitted proxy data on 14 August 2014. As this submission was after the deadline, proxy data of Luxembourg could not be taken into account in the calculations of the EU proxy but it is presented in Annex 5.1 for transparency reasons. Belgium submitted revised proxy data on 15 September 2014. As these revised data were submitted after the deadline, only the proxy data of Belgium's first submission by 31 July 2014 were taken into account.

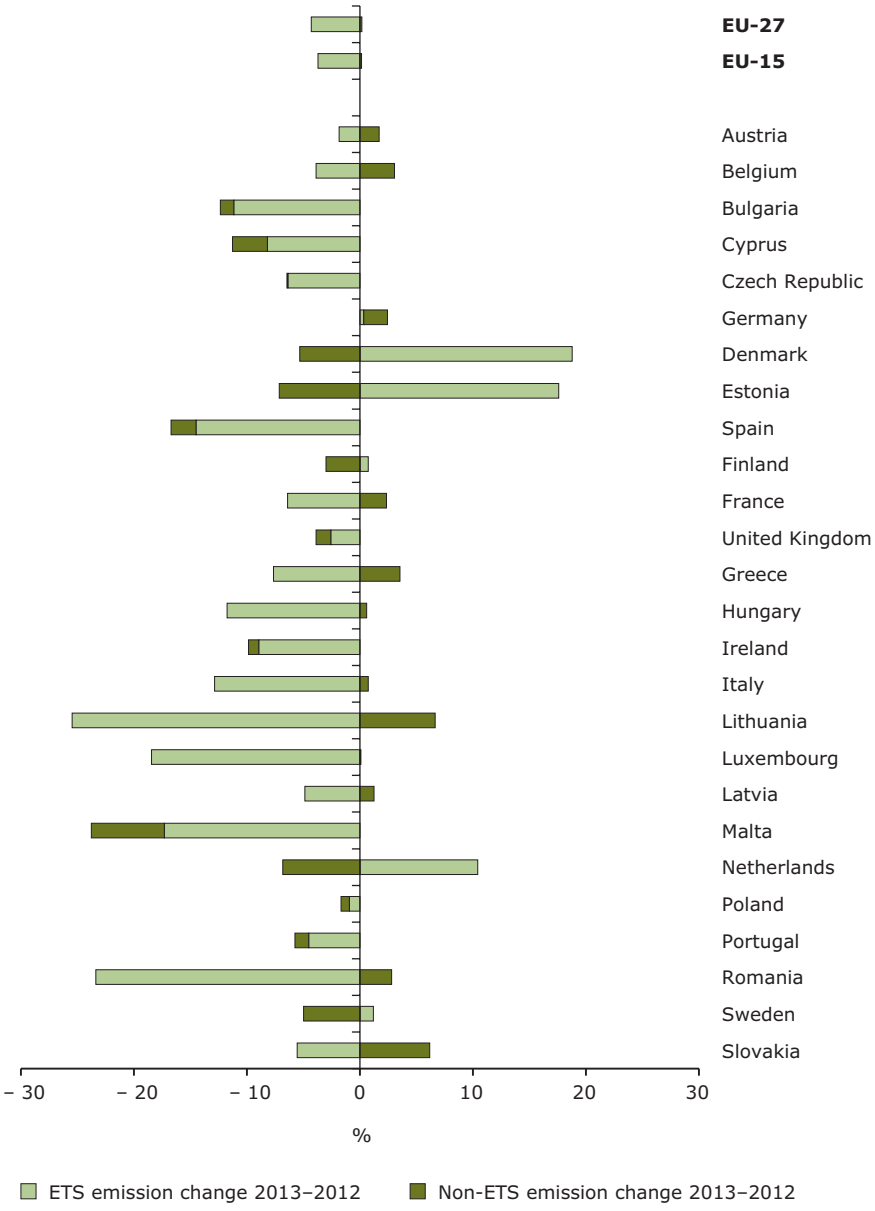
Figure ES.3 Member States emissions, change 2012–2013



Note: Total GHG emissions without LULUCF, based on the 2014 EU GHG inventory submitted to the UNFCCC as well as proxy estimates for 2013 submitted by Member States using the GWPs from the IPCC SAR.

Source: EEA.

Figure ES.4 ETS and non-ETS emissions, change 2012–2013



Note: EU-27 as Croatia only joined in EU ETS in 2013.

Source: EU 2014 submission to UNFCCC for 2012, proxy estimates for 2013 and verified emissions from European Union Transaction Log (EUTL) as of August 2014. The split between ETS and non-ETS is based on GWPs from the AR4 and the scope-corrected ETS data for 2012 (see Section 2.3 of the full report).

Rationale for proxy GHG emission estimates

The EU, as a Party to the UNFCCC, reports annually on GHG emissions within the area covered by its Member States (i.e. emissions occurring within its territory). National GHG inventories for EU Member States are only available with a delay of one and a half years. Inventories submitted on 15 April of the year X therefore include data up to the year X–2. For example, the data submitted on 15 April 2014 included data covering all of 2012, but not 2013. Thus, the timeliness of the data is not always optimal and does not allow for timely analysis of emission trends and progress towards targets.

The latest official EU data available (1990–2012) covering all countries, sectors and gases was released in May 2014 with the annual submission of the EU GHG inventory to the UNFCCC (EEA, 2014a). The inventory data include GHG emissions not controlled by the Montreal Protocol, both from sectors covered by the ETS and from non-trading sectors. However, whereas UNFCCC emissions run on a year X–2 basis, Kyoto registries and EU ETS information are available on a year X–1 basis. Verified EU ETS emissions are therefore already available for 2013 (EEA, 2014b).

There are clear advantages in generating proxy GHG estimates for all sectors. Under the Kyoto Protocol, the EU-15 took on a common commitment to reduce emissions by 8 % between 2008 and 2012 compared to emissions in the base year. When Member States set national emission caps for installations under the ETS for the period 2008–2012, they allocated part of their Kyoto emission budget (Kyoto Assigned Amounts) to the EU ETS and fixed the overall contribution of the ETS sectors towards reaching Kyoto national targets. ETS information runs on a year X–1 timeline but success in reducing emissions from sectors not covered by the EU ETS (running on a year X–2 timeline) will determine whether governments need to use Kyoto flexible mechanisms to achieve their targets.

Starting this year, the legal basis for the proxy GHG emission estimates is Regulation (EU) 525/2013 on a mechanism for monitoring and reporting GHG emissions (EU MMR). Article 8 requires Member States to submit to the Commission, where possible, approximated GHG inventories for the year X–1 by 31 July every year. These estimates are used to assess progress towards GHG emission targets.

Publishing a proxy GHG emissions report also fulfils the goals of the 'Beyond GDP' process (EU, 2014), which encourages authorities to produce data on the environment with the same frequency and timeliness as they produce data on the economy.

Methodology for proxy GHG emission estimates

The present report sets out estimated GHG emissions for 2013 based on national EU Member States estimated GHG emissions, submitted to EEA by 31 July 2014 (see Annex I). From these data, aggregated EU-15 and EU-28 proxy 2013 GHG emission estimates were derived (see Chapter 2).

Under the recently adopted Regulation (EU) 525/2013 on a mechanism for monitoring and reporting GHG emissions (EU MMR) and its implementing provisions, Member States are to submit, where possible, to the European Commission approximated GHG inventories by 31 July every year for the preceding year X–1 (in this case 2013). Where a Member State has not submitted a 'proxy' inventory, the EEA uses its own estimates for gap-filling purposes in order to have a complete approximated GHG inventory at Union level.

Member States are responsible for the methodological choice regarding their own estimates. For gap-filling, the EEA uses the latest activity data available at country level to estimate the emissions. For emission sources for which no appropriate datasets exist, emissions are extrapolated from past trends, or emissions from the previous year are kept constant if historic data do not show a clear linear trend. The emission estimates assume no change in emission factors or methodologies as compared to the latest official inventory submissions to UNFCCC for the year X–2. On this basis, a detailed bottom-up approach has been developed covering the full scope of emissions included in a GHG inventory submission.

The GHG estimates in this report have been compiled by the EEA's European Topic Centre on Air Pollution and Climate Change Mitigation (ETC/ACM). Chapter 2 shows the complete dataset of EU proxy GHG emission estimates, based on the submissions made by Member States and EEA's gap-filling of the remaining Member States which did not submit, where applicable. Chapter 3 shows the proxy GHG emission estimates by Member State based entirely on the methods and data sources developed by the EEA and its ETC/ACM as described in Annex III. The detailed results for each Member State are shown in Annex I and Annex II of this report in order to

ensure complete transparency regarding the different GHG estimates available.

The EEA has used the proxy estimates of 2013 GHG emissions produced by Member States to assess progress towards GHG emission targets in its annual 'Trends and projections' report (to be published end-October). In that report, the EEA's proxy estimates for 2013 were only used for countries that lack their own estimates to track progress towards national and EU targets.

Where Member States' estimates are missing, gaps are filled with estimates by the EEA and its ETC/ACM (see Annex II). In recent years, a methodology to estimate GHG emissions using a 'bottom-up' approach has been developed (see Annex III). It uses data sources (or estimates) that were published prior to the end of July of 2014 for individual countries, sectors and gases to derive EU GHG estimates for the preceding year (X–1). For transparency, this report shows the country-level GHG estimates from which the EU estimates have been derived. The estimates cover total GHG emissions as reported under the Kyoto Protocol and the UNFCCC excluding the LULUCF sector.

Estimates by the EEA and ETC/ACM are made for all major source categories in all sectors. For the most important source categories, data sources with updated activity or emissions data for the year t-minus-1 were identified and used to calculate emissions. For source categories for which no international datasets with updated activity data exist or which are too complex for such an approach, emissions were extrapolated from past trends (linear extrapolation), or emissions from the previous year were kept constant if historic data did not show a clear trend. On this basis, a detailed bottomup approach was developed covering the full scope of emissions included in a GHG inventory submission.

The EEA estimates (see Chapter 3 and Annex II) are based on publicly available datasets at the national, European and international levels. These datasets are disaggregated by major source categories in all sectors reported under the UNFCCC and the Kyoto Protocol.

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- Monthly data on crude oil production (indicator code 100100, product code 3100);
- Monthly total consumption data for natural gas (indicator code 100900, product code 4100);
- Production data for natural gas (indicator code 100100, product code 4100);
- annual data for the final energy consumption of motor spirit, automotive diesel oil and kerosene/jet fuels;
- Monthly data on production of nuclear energy (indicator code 100100, product code 5100);
- Monthly data for the internal market deliveries of motor spirit, automotive diesel oil and kerosene/jet fuels;
- Monthly production data for crude steel production and blast furnace iron production of the World Steel Association;
- Annual statistics on livestock population for dairy cattle, non-dairy cattle, swine, sheep, goats;
- Annual road freight transport by type.

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