

Appendix 4: Emissions analysis and methods used for DA EU ETS and non EUETS emissions.

Background

The data analysis and reporting of GHG emission inventories in the UK, both at the national and sub-national level, is increasingly coming under scrutiny for the purposes of energy and climate change policy development, evaluation and appraisal. In recent years the GHG inventory improvement programme has focussed on developing close consistency with emissions data from new data reporting systems from UK-wide policy mechanisms such as the European Union Emissions Trading Scheme (EUETS).

For the UK to achieve progress in emission reductions across the economy, a detailed understanding of the scope, level and trend of non-traded GHG emissions (i.e. those emission sources that are not within the EUETS) is needed to support evidence-based policy development within the climate change strategies and programmes implemented by DECC and the governments of Scotland, Wales and Northern Ireland; good quality GHG emissions data by source will enable the DAs to design and implement devolved policy mechanisms that are effective and cost-effective in achieving GHG reduction targets, to complement the actions through reserved UK-level policies and measures.

The analysis of the emissions and trends in the non-traded sector are of particular relevance for the Welsh Government, as the GHG reductions targets in Wales exclude the emissions from sites in EUETS.

UK Context: The Greenhouse Gas Effort Sharing Decision

In December 2008, the Greenhouse Gas (GHG) Effort Sharing Decision (ESD) was agreed as part of the EU 2020 Climate and Energy package of measures; the ESD sets EU Member State GHG reduction targets for the economic sectors that are not covered by the EU Emissions Trading System.

The UK target under the ESD equates to a reduction in emissions in the non-ETS sections of the UK economy of 16% below 2005 levels, by 2020. Furthermore the ESD includes a binding annual emissions reduction trajectory from 2013 to 2020 to keep the EU on track to meet its emissions reduction targets over that period, monitoring and evaluation provisions and flexibility mechanisms to enable Member States to cost-effectively meet their targets.

Each Member State has autonomy over which policy measures to use to meet their national targets, and in the UK the national mechanisms will be governed by the Climate Change Act, the Energy Act, the Renewable Energy Strategy and the Low Carbon Transition Plan.

At the national level, the UK GHG inventory has recently been subject to a detailed review by the European Commission, to assess data quality of the traded and non-traded components of the UK inventory. This review has focussed on the veracity of the current baseline inventory totals for 2005 and 2008-2010 and the level of consistency between data reported through the EUETS and the GHG inventory.

Non-Traded Emissions in the UK

Non-traded GHG emission sources in the UK comprise:

- ✓ small-scale fuel combustion sources in industry, the commercial sector, public sector and residential sector;
- ✓ transport emissions;
- ✓ agricultural emissions;
- ✓ Land Use Change and Forestry emissions / sinks; and
- ✓ Waste sector emissions.

The small-scale fuel combustion sources are usually sources where comprehensive accurate data on energy use and / or emissions are not available at DA level. DA emissions in the traded sector are much more certain, since the mechanism for trading requires site-specific reporting of detailed emissions, activity and emission factor data. The current approach to deriving the non-traded fuel combustion emission estimates is therefore by difference from the total DA GHG inventory for energy emissions and the EUETS emissions data:

Non-traded emissions	=	total emissions	–	traded emissions
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The DA GHG inventory data are derived from the UK GHG inventory data, which in turn is linked directly (for high emitting, energy-intensive sites, such as those within the EUETS) to industry-specific fuel allocations within the Digest of UK Energy Statistics (DUKES).

Through research with DECC energy statisticians, the UK GHG inventory team has integrated EUETS activity and emission factor data into national energy statistics and GHG inventory estimates in order that close consistency has been achieved in the UK between the ETS and GHGI; the traded / non-traded analysis presented for the DAs in this report outlines a handful of minor data inconsistencies still to be resolved, but overall the data quality for the non-traded sector in the UK has improved greatly in recent years.

Detailed analysis of the 2010 EUETS dataset was conducted as part of the UK GHGI compilation work programme for the 2012 inventory submission; the report from this analysis is yet to be published, but the analysis sought to maximise the usefulness of the EUETS data within (i) the compilation of UK energy statistics for specific sectors, (ii) the development of UK and DA fuel-specific emission factors within the UK and DA GHG inventories, and hence (iii) the estimation of UK and DA traded and non-traded GHG emissions. The research focussed on analysis of the 2010 EUETS dataset, looking in detail at the available data for a wide range of source sectors. Analysis of the Phase II EUETS dataset (comprising data from 2008 to 2010) has facilitated a greater understanding of the emissions and fuel quality data from EUETS within each of the constituent countries of the UK, improving the accuracy of the DA and UK GHG inventories for several high-emitting source sectors; the analysis has enabled the resolution of data inconsistencies that had previously been evident between data from ETS and the UK energy statistics for specific sectors such as refineries and unclassified industrial consumption of fuels.

The estimates derived for the traded and non-traded sectors of the DA GHG inventories presented in this report are for the years 2008 to 2010 only, as the earlier years of EUETS data covering 2005 to 2007 were during Phase 1 of the scheme when a more limited scope of installations was included. Comparison of data from Phase I and Phase II is therefore of little value.

Traded and Non-traded Inventory Estimates: Data Quality and Reporting Format Issues

The EUETS site data have been analysed to allocate fuels and sites to align with inventory criteria, in consultation with DECC DUKES energy statisticians and EUETS regulatory experts from the Environment Agency of England and Wales, the Scottish Environment Protection Agency and the Northern Ireland Environment Agency.

The research comprised a detailed comparison of sector activity data (fuel use, mineral use) between the 2010 EUETS and the DECC national energy statistics within DUKES, as well as reviewing the latest fuel quality information by sector available from EUETS. The research showed that direct comparison of EUETS data and alignment with DUKES sectors and GHG inventory IPCC sector reporting format is problematic for a number of reasons:

- Disparity between EUETS and national activity statistics.** For most economic sectors, the EUETS does not cover 100% of sites and fuel use in the UK, and therefore the sum of EUETS activity data for most sectors is expected to be lower than the national statistics published by DECC DUKES (for energy use) and the British Geological Survey (for mineral use such as limestone, dolomite, clays). There were several industrial sectors where large differences were evident in the 2010 fuel allocations within DUKES, compared to the data reported by operators under EUETS. The activity data from EUETS are generally considered to be of good quality, having been subject to a rigorous data checking and verification process. The EUETS does not always cover 100% of sites within a sector, however. *There were a number of instances where the EUETS fuel use data were higher than the data reported within DUKES; source-activity combinations where EUETS data were therefore used within the UK and DA GHG inventory compilation, deviating from the national statistics included refinery and industrial use of other petroleum gases (OPG), upstream oil and gas use of LPG and OPG and gas supply network use of natural gas.*
- Differences in scope and definitions between IPCC sectors and EUETS reporting.** IPCC reporting requires that a distinction is made between fuel combustion emissions and process emissions, and all emissions from all sources need to be captured. The scope of EUETS reporting is not always comprehensive, i.e. emissions from some sources on site may be excluded from EUETS data. Furthermore, the reporting format of the EUETS does not explicitly separate the GHG emission sources between different activities on site. These scope and reporting limitations make it very difficult to either directly use in, or reconcile the reported data with the IPCC format emissions calculated and presented within the UK and DA GHG inventories.

As a result of these data format and data quality issues, the derivation of traded and non-traded emission estimates requires:

- IPCC sector aggregation or division, altering the detail of the IPCC sector reporting format, to match the level of detail available from EUETS reporting for specific industries. Examples include the division of 1A1c to enable data to then be aggregated with other IPCC sectors for iron and steel sector reporting (1A1c coke production, aggregated with 1A2a, 2A3 and 2C1), oil & gas sector reporting (1A1c gas use, aggregated with 1B2c flaring and venting), leaving 1A1c (gas production) and 1A1c (other energy industries) to be reported separately. In addition, cement combustion (1A2f cement) must be reported aggregated with the decarbonisation sources (2A1) to enable comparison against EUETS.
- Calculation of non-traded DA GHGI data such that the data inconsistencies between DUKES and EUETS fuel use are minimised, removing the inconsistencies by (in most cases) assuming that the EUETS data for a given sector are the more accurate estimates.

The comparison between reported EUETS emissions and the DA GHG inventory data are presented by (amended) IPCC sector. [Note that the data presented in the tables below have been rounded to 3 or 4 significant figures, and the data may not always appear to be fully consistent as a result.] Detailed tables showing the full DA traded and non-traded emission estimates for 2008-10, including detail of the additional end user emissions from use of electricity and non-electricity fuels, are provided in the supporting MS Excel spreadsheet.

DA Traded and Non-Traded GHG Emission Estimates (2008-2010)

The traded and non-traded emission estimates for each of the DAs in 2008 to 2010 are summarised in the tables below. In each case, data are presented for:

- Annual total traded GHG emissions;
- Annual total non-traded GHG emissions;
- Annual total GHG inventory emissions; and
- Non-traded sector percentage share of the total GHG inventory.

Table A4.1 DA Traded and Non-Traded Emission Estimates, 2008-2010

Country	Emissions scope (all units: kt CO₂e)	2008	2009	2010
ENGLAND	Traded Emissions	193,376	168,541	169,382
	Non-Traded Emissions	286,917	269,480	279,052
	Total inventory emissions	480,293	438,021	448,434
	<i>Traded Share</i>	<i>40.3%</i>	<i>38.5%</i>	<i>37.8%</i>
SCOTLAND	Traded Emissions	23,765	21,962	24,040
	Non-Traded Emissions	29,764	27,867	29,207
	Total inventory emissions	53,529	49,829	53,247
	<i>Traded Share</i>	<i>44.4%</i>	<i>44.1%</i>	<i>45.1%</i>
WALES	Traded Emissions	26,608	21,842	24,060
	Non-Traded Emissions	22,693	21,305	22,579
	Total inventory emissions	49,301	43,147	46,639
	<i>Traded Share</i>	<i>54.0%</i>	<i>50.6%</i>	<i>51.6%</i>
N IRELAND	Traded Emissions	5,864	4,332	4,627
	Non-Traded Emissions	15,629	15,418	15,833
	Total inventory emissions	21,492	19,749	20,460
	<i>Traded Share</i>	<i>27.3%</i>	<i>21.9%</i>	<i>22.6%</i>
UNALLOCATED	Traded Emissions	15,166	14,997	15,044
	Non-Traded Emissions	2,249	2,232	2,430
	Total inventory emissions	17,415	17,229	17,474
	<i>Traded Share</i>	<i>87.1%</i>	<i>87.0%</i>	<i>86.1%</i>
UNITED KINGDOM	Traded Emissions	264,779	231,674	237,152
	Non-Traded Emissions	357,251	336,301	349,101
	Total inventory emissions	622,030	567,975	586,253
	<i>Traded Share</i>	<i>42.6%</i>	<i>40.8%</i>	<i>40.5%</i>

Analysis of emissions 2008 – 2010.

- The DA data above illustrate the regional differences in the EUETS coverage and significance in the context of the overall DA inventories, which indicates the level of opportunity for DA policy actions in the non-traded sector. These estimates of non-traded emissions may affect the analysis to determine DA GHG emission reduction targets, where those targets are applied to the non-traded sector only, rather than to the complete DA GHG inventories.
- Note that the traded share percentages in the table above are influenced by the impact of LULUCF sources and sinks on the overall DA inventories; in both Wales and (especially) Scotland there is a net carbon sink in the LULUCF sector which reduces the net GHG inventory emissions total in the table above. Hence the higher traded share percentage for Wales and Scotland is somewhat misleading in the context of GHG emissions in energy and industrial process sources.
- In the analysis of the above data, it must be noted that there are considerable uncertainties in the DA inventory estimates due to the limited energy consumption data by DA. Therefore whilst it is perhaps useful to consider the relative opportunity for DA policy action in future mitigation efforts across different sectors by looking at the non-traded data in more detail, there is an underlying need for greater data gathering at DA level to improve the evidence base for policy development.
- Considering the total GHG inventories and the traded share of GHG emissions, the **UK** traded share was 43% in 2008, down to 40% in 2009 and 2010. The inventory data indicates that as the recession affected the economy in 2008-9, the traded emissions declined at a greater rate (12.5% in one year) than the non-traded emissions (down 6% 2008-9). As the economy then picked up in 2009-10, the non-traded emissions grew at a greater rate (up 3.8%) than the traded sector emissions (up 2.4%).
- The non-traded estimates for **England, Wales and Scotland** all exhibited trends similar to the UK average during 2008-9 of around a 6% decline, whereas in 2009-10 the increase in Scotland and Wales non-traded emissions is higher than the UK average at 4.8 and 6% increases respectively.
- In **Northern Ireland**, the non-traded share of GHG emissions declined by only 1.4% between 2008-2009, and then grew by only 2.7% in 2009-10; note that there is greater uncertainty in the non-traded emission estimates in Northern Ireland due to the much greater reliance on solid and liquid fuel use within the economy, the estimates of which are more uncertain than those for metered fuels (gas, electricity). Nevertheless, this notably lower reduction in the non-traded share in Northern Ireland in 2008-9 and lesser growth in 2009-10 may reflect the greater impact on emissions related to the energy-intensive industries evident in GB, where a lesser demand for fuels within a shrinking UK economy would be expected to have a knock-on effect to ancillary services to the energy sector (for example, a reduction in energy and heavy industry transport-related emissions, which are within the non-traded sector).
- The data for **Wales** show that the coverage of the EUETS is consistently higher than the UK average, which reflects the high share of heavy industries in Wales; Wales exports electricity to England and has a high percentage of UK refinery capacity and iron and steel manufacture. As a result, the non-traded sector in Wales (which is the focus for WG Climate Change Strategy policy actions and targets) is only around 50% of total GHG emissions, compared to the UK average of around 60% of emissions in the non-traded sector.
- In 2007 (the last year of Phase I of the EUETS) the non-traded share of **Wales** carbon dioxide emissions was estimated to be around 42% of the total inventory; the expansion of the coverage of sites and sources within EUETS in Phase II of the scheme (which runs from 2008 to 2012) has increased the traded share in Wales by a further 5% of total carbon dioxide emissions. The expansion of the EUETS scope in Wales may affect the WG Climate Change

Strategy targets, where emission baselines of the non-traded sector emissions need to account for the full scope of EUETS emissions.

- The traded share estimates for **Scotland** (45% in 2010) are routinely higher than the UK average (41% in 2010), indicating that the significance of Phase II EUETS is higher than the UK average. Review of sector-specific EUETS data across the UK shows that Scotland has a disproportionately high share of EUETS emissions in industrial combustion sectors where Scottish sites account for 17% of the UK traded emissions in 2010. The Grangemouth refinery accounts for 13% of UK refinery sector emissions in 2010 whilst gas terminals in Scotland account for 28% of total UK sector traded emissions.
- The **Northern Ireland** inventory has a much higher non-traded element compared to GB, with only 23% of inventory emissions within the EUETS in 2010, compared to the 41% UK average; this reflects the lower level of heavy industry in Northern Ireland, where there are no refineries, oil & gas terminals or iron and steel works for example. Analysis of the 2010 EUETS data shows that Northern Ireland has a 2.5% share of the power sector traded emissions, whilst the only sectors where Northern Ireland has a higher share are in the cement sector (3.9% of UK sector traded emissions), glass sector (3.7% of UK sector emissions) and the public sector (3.2% of UK sector traded emissions) in 2010.
- **England** traded share of emissions is around 38-39% of the inventory total in recent years, which is a few percent lower than the UK average of around 40-41%. There are many industrial and commercial sectors where England has a high share of the UK traded emissions in 2010; for example, sites in England account for 80% of power generation EUETS emissions, 84% of public sector traded emissions and 81% of cement sector traded emissions. England has a lower representative share of EUETS emissions in the iron and steel sector (50%), refinery (66%) and oil & gas sectors (49%), reflecting the high incidence of such sites in Wales and Scotland